Report of the Industry–Government Task Force on the China Power Sector

July 1986

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CANADIAN EXPORT ASSOCIATION
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July 23, 1986

The Honourable Patricia Carney, P.C., M.P.,
Minister for International Trade
The Honourable Monique Landry, P.C., M.P.,
Minister of State for External Relations,
Department of External Affairs,
Lester B. Pearson Building,
125 Sussex Drive,
Ottawa, Ontario
K1A 0G2

Dear Ministers,

I am pleased to submit the final report of the Industry-Government Task Force on the China Power Sector which was created by your predecessors in February of this year.

China, the most populous country in the world, is modernizing rapidly and is already Canada's fifth largest export market. China's power systems have almost as much capacity as Canada's at present and will probably be twice as large by the year 2000 because they are expanding more rapidly. China will probably spend between $140 and $200 billion in expanding its power sector over the next fifteen years. Up to $30 billion of equipment and services will likely be imported.

We are convinced that Canadian exporters can win a reasonable share of this business, provided Canada uses its available resources systematically.

We have also examined Canadian trade performance and prospects in six other key sectors in China: agriculture, forestry, mining, oil and gas, telecommunications and transportation. Canadian exports of commodities will continue to dominate bilateral trade in the first three of these sectors but we note good prospects for increasing exports of Canadian services and equipment in each sector.

Our report provides an analysis of trade opportunities in these seven principal sectors in China and suggests elements of a Canadian strategy which could increase our exports in this major market. As requested, we have concentrated on actions by the federal government which can support parallel actions by the exporters.

Our focus has been strongly oriented to commercial opportunities in China for Canadian suppliers. We appreciate, however, the strong linkages which exist with our development assistance. Because of the geography, history and resources development experience in both countries, we see continuing opportunities to provide Canadian technical assistance for economically sound developmental projects in China which are compatible with expanding trade between the two countries.

Throughout this assignment we have become increasingly aware of the complexities and dynamics of the huge market which China represents. Events have moved rapidly since our Task Force was created some five months ago. For example:

- China finalized its Seventh Five Year Plan, covering the period 1986-1990;

- Official visits to China were made by the Prime Minister, the President of CIDA and the Minister for International Trade;

- CIDA announced the doubling of its planned commitments under the China bilateral program to $200 million between 1987 and 1992;

- EDC announced the establishment of a $350 million concessional financing facility for China;

- CIDA announced its new Technology Development Program to provide $5 million for feasibility studies in China;

- Babcock and Wilcox Canada won orders of some $200 million for boilers in two Chinese power plants, with financing by EDC;

- China has accepted CIDA's offer to finance the feasibility study by a Canadian consulting consortium of the world's largest hydro project at Three Gorges on the Yangtze River. Concurrently other Canadian consultants are expected to help plan power systems in Southern China under another CIDA project; and

- Encouraging progress has been made in promoting sales of Canadian equipment and services for the Gehe Yan hydro project (proposed to be supported by concessional EDC credit-mixte financing).

We believe that our report will prove to be a valuable resource document for Canadian exporters to China, as well as to the various departments of the federal and provincial governments which support such exporters. Accordingly, we hope that you will agree to make this report available to a larger audience.

Our analysis of trade opportunities in the power sector has been more extensive than in other sectors because of the focus of our terms of reference. We recognize, however, that export prospects are as great or greater in other sectors in China and suggest a more detailed analysis might also be warranted in certain other sectors.

My colleagues on the Task Force - Peter Haines, Al Kilpatrick, Robert Walker - and I have appreciated having been asked to undertake the assignment, which we have enjoyed completing. We would welcome an opportunity to discuss this report further with you.

Yours sincerely,

Frank Petrie

Frank Petrie
President

/jjm

enclosure

SUMMARY

China is emerging as a significant economic power whose total GNP is already approximately the same as Canada's. China's economy grew substantially, although somewhat erratically, over the period 1949 to the mid-70's. Following introduction of an economic reform program in 1978, economic growth has been substantial. A growing trade deficit in late 1984 and throughout 1985 has led Chinese authorities to be more selective with their imports.

Infrastructure bottlenecks, particularly in electric power and transportation systems, are constraining China's economic development. Government policies emphasize accelerated investment in such infrastructure in the Seventh Five Year Plan, covering the period 1986 to 1990. Despite the dampening of overall economic growth to a more manageable target of 7 per cent per annum, there is clear evidence that infrastructure improvements, particularly in the power sector, are receiving priority and that the volume of associated imports is increasing.

Canada has made intermittent efforts to interest China in the capabilities of Canada's power industry, following the establishment of diplomatic relations in 1970. The level of meaningful contacts, with China's Ministry of Water Resources and Electric Power and with other power industry organizations, was significantly increased from 1981 onward and has led to the identification of major areas of potential cooperation and to a modest but growing level of exports.

China represents one of the largest markets in the world for electric power equipment. Its power systems have almost as much total capacity as Canada's at present and will probably be twice as large by the year 2000. Investments in the China power sector in the next fifteen years are expected to total between $140 billion and $200 billion. Much equipment will be imported because of limitations in Chinese manufacturing capacity and as a means of acquiring up to date technologies.

Canadian exports to China of power systems equipment totalled less than $40 million during 1981 to 1985, but business is increasing as Canadian firms become more active in this market. Earlier this year Canada won an order worth approximately $200 million for boiler components for two large thermal generating plants. Business prospects are also enhanced by the activities of Canadian consulting engineers who have been working for the Chinese power authorities on several major projects: the HVDC transmission line between Gezhouba and Shanghai and three hydroelectric stations - Gehe Yan, Three Gorges and Longtan.

Export prospects have been assessed in China for the electric power sector and, in less detail, for six other key sectors: agriculture, forestry, mining, oil and gas, telecommunications and transportation. Canadian exports to China from these seven sectors have averaged an estimated $1.4 billion annually in the past three years, with 90 per cent for commodities, particularly wheat. A tentative estimate indicates that prospective future exports might rise slightly by 1990, with increased exports of services and equipment plus more forestry commodities offsetting anticipated declines in sales to China of agriculture and mining commodities. Total annual export levels to China might increase to $2.5 billion by 1995 and $3.5 billion by 2000. Canadian exports to China over the period 1986 to 2000 could total between $30 billion and $40 billion according to this projection.

Many factors will combine to determine actual future levels of Canadian exports to China, including that country's overall balance of trade. Canada may not represent a major market for exports from China but Canadian willingness to buy Chinese goods will certainly affect export prospects to that country.

This report concentrates on past and future activities of the federal government in support of exporters in the China market, particularly in the power sector. There have been four principle types of federal financing for exports other than wheat:

a) CIDA's Bilateral Program has committed an average of some $20 million annually since 1982 on technical assistance projects, *mainly concentrating on agriculture, energy, forestry and human resources development. This development assistance, which is projected to double in the next five years, has aroused considerable interest about China but has not involved export of capital equipment.*

b) *Some $6.8 million was disbursed during the past five years under CIDA's Industrial Cooperation Program. These funds support initiatives by Canadian exporters to develop trade with China. Pre-feasibility studies of six power projects represented 38 per cent of this program funding in China. In June, 1986, a Technology Cooperation Program for China was announced which will provide further funding for feasibility studies.*

c) *External Affairs has provided three types of funding for trade activities in China. Some $7.7 million was authorized for 759 PEMD projects in the past four years plus $1.3 million for trade fairs and mission support. In addition $0.9 million was provided for three pre-investment studies in the power sector as part of a trade promotion initiative.*

d) *The Export Development Corporation has provided financing for Canadian exports to China by means of a $2 billion line of credit, first extended in 1979 and renewed in 1984. Some $158 million has been committed over the period to mid-1986, 90 per cent in the power sector. The recent establishment of a $350 million concessional financial facility, expected to be part of the EDC line of credit, could provide up to some $1 billion of credit mixte finance if blended with funds at Consensus rates.*

Commercial lending activities by Canadian banks in China have been modest in the past but five banks have now established offices in China and may be expected to expand their activities in future. If the banks are prepared to lend approximately $1 billion in total over the next fifteen years in China, an assumption which appears reasonable, and if the banks were to finance 15 per cent of the value of export transactions supported by EDC, the combined total export financing which might be available from EDC and the banks to the year 2000 might be of the order of some $7 billion. This figure is considerably less than the $30 to $40 billion which would result from the prospective total Canadian exports outlined earlier, some of which would, however, be supported by the Canadian Wheat Board. Although the amount of available financing will apparently not constrain exports in the near term, this matter warrants consideration and monitoring in the longer term.

China has obtained financing from a variety of sources to support its ongoing transformation to a major economic power. In 1980 China joined the World Bank, which approved more than $3 billion in loans in the five years from mid-1981. Roughly 20 per cent of these loan funds were for power sector projects. China joined the Asian Development Bank in 1986 and will be eligible to start borrowing from that institution in 1991.

Barter arrangments finance a very large amount of China's international trade. All trade with the USSR is based on barter, as is most trade with other COMECON countries. China apparently swaps its oil exports with Japan for steel imports, a transaction valued at US$ 2.7 billion in 1984 alone.

Other OECD countries have agreed to provide extensive concessional financing to support their exports to China. Facilities currently in existence provide for more than $6 billion on concessional terms, with almost 90 per cent offered by Japan. Other countries also offer such subsidized financing in order to win specific contracts. Most of this concessional financing is targeted on infrastructure projects. The recently announced EDC facility for concessional financing should make it easier for Canadian exporters to win orders in the competitive Chinese market.

Canadian trade with the world's most populous country already places China as Canada's fifth most important trading partner. Canada-China trade relations are evolving rapidly, particularly as China establishes a new framework of laws and regulations governing its internal and external commercial activities and moves toward full participation in the General Agreement on Tariffs and Trade. The Task Force is convinced that Canada needs *a coherent overall strategy to guide trade development efforts in this large, complex and dynamic market. Wheat sales, for example, have accounted for approximately half of total exports in recent years, but such sales are declining as China becomes more self-sufficient. Deliberate policies are required to focus on alternative opportunities for exports in all sectors as China's economy evolves.*

Provincial governments also provide support to Canadian exporters and there is scope for closer coordination between the federal and provincial governments in these matters.

The Task Force concludes that the federal government needs to maintain a consistent and systematic overview of political and economic developments in China in order to guide trade development activities there. Recommendations which apply to all sectors, including the power sector, follow:

a) The China Working Group, an ad hoc inter-departmental body in existence since 1984, should be formalized and strengthened as the primary focus of the federal government for trade promotion in China.

b) Specific sectoral and geographical responsibilities which are assigned to each trade officer dealing with China should be made known to the China Working Group and to all exporters active in the China market.

c) Federally supported activities to assist in generating business in China should routinely contribute to Canadian understanding of that market.

d) Political and diplomatic support from the federal government should be sustained and augmented by increased sectoral information gathering and dissemination.

e) External Affairs and DRIE should continue to organize specific technical missions to visit China to help Canadian exporters to *become better informed about specific export opportunities and to meet potential clients in specialized sub-sectors.*

f) The China Working Group should develop consistent criteria for supporting pre-investment activities in China.

g) In providing federal support to Canadian exporters, apart from support for market analysis or market penetration activities such as those funded through PEMD, consideration should be given to factors concerning the exporter's long term commitment to developing business in China.

h) Better information is required on the capabilities and capacities of most Chinese industries as well as regular updating of information on the capabilities, capacity and competitiveness of Canadian industries. Accordingly, the federal and provincial governments are encouraged to develop up-to-date surveys of key industrial sectors in Canada and in China.

i) The government should consider providing credit mixte financing for strategically selected capital projects in China to permit exporters to continue to win orders where Canadians offer world-class technology at competitive prices.

j) An evaluation of the effectiveness of the trade and developmental activities in China of External Affairs and CIDA's Industrial Cooperation Programme and an examination of how to make them more effective in future should be planned and implemented under the guidance of the China Working Group.

Certain recommendations pertaining to the power sector are offered by the Task Force in addition to the foregoing general recommendations covering all sectors:

a) The Task Force supports the offers made by the federal government to support three specific activities in the power sector: the Three

Gorges feasibility study, the South China planning study and the model study of the hydraulic turbine for the Three Gorges project.

b) *Special attention should be focussed upon opportunities for supplying equipment and services for thermal power plants and EHV transmission developments.*

c) *Federal government assistance, particularly for pre-feasibility and feasibility studies, should only be offered for projects where there is a strong likelihood that Canadian exporters will have the opportunity of bidding and winning contracts during project implementation.*

d) *EDC financing at Consensus rates, or concessional rates if required to match foreign competition, should be sustained for power sector projects. Canada should consider offering concessional financing in support of implementation of the Gehe Yan hydroelectric project, for which an official request for such assistance has been received. Further requests for financing of thermal power plants can be anticipated and should receive comparable consideration.*

e) *A decision on the request for additional financing for engineering studies of the Longtan project should be deferred until the results of the present studies have been analyzed and the possible justification for further assistance carefully considered.*

The Task Force has concentrated its attention on the power sector in China because of its mandate from Ministers. However, this review of trade patterns and prospects between Canada and China has confirmed that there are very real opportunities for increasing Canadian exports in several other sectors. Further analysis, discussion and action by industry exporters and supporting government departments and agencies could be profitable and should be undertaken.

TASK FORCE ON CHINA POWER SECTOR

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Exchange rate (April 1986)
US $1.00 = Rmb 3.20
C $1.00 = Rmb 2.30

ABBREVIATIONS

$	- Canadian dollars
US$	- US dollars
Rmb	- Chinese Renminbi
AC	- Alternating current
DC	- Direct current
CAPSEP	- Canadian Association of Power System Export Promotion
CCC	- Canadian Commercial Corporation
CGE	- Canadian General Electric
CEA	- Canadian Electrical Association
CIDA	- Canadian International Development Agency
CIPM	- Canadian International Project Managers
COMECOM	- Communist Economic Community
DRIE	- Department of Regional Industrial Expansion
ECGD	- Export Credit Guarantee Department
EDC	- Export Development Corporation
EEMAC	- Electrical & Electronic Manufacturers Association of Canada
EHV	- Extra high voltage (for transmission in China considered at 300 kv and 500 kv levels).
EMR	- Energy, Mines and Resources
GW	- Gigawatt (1,000,000 KW)
GWh	- Gigawatt Hours (1,000,000 KWh)
HIPDC	- Huaneng International Power Development Corporation
HVDC	- High Voltage Direct Current
IBRD	- International Bank for Reconstruction and Development
IDA	- International Development Association
IPF	- Indicative Planning Figure
ITC	- Industry, Trade and Commerce
kV	- kilovolt
kW	- kilowatt
kWh	- kilowatt hours
MW	- Megawatt (1,000 KW)
MWh	- Megawatt hours (1,000 KWh)
OECD	- Organization of Economic Cooperation and Development
PEMD	- Program for Export Market Development
PRC	- People's Republic of China
SITC	- Standard International Trade Classification
TWh	- Terawatt hours (1,000,000,000 KWh)
UHV	- Ultra High Voltage - (for transmission in China considered to be above 500 kv AC or DC).
MOFERT	- Ministry of Foreign Economic Relations and Trade
MWREP	- Ministry of Water Resources and Electric Power

1.0 INTRODUCTION

Synopsis

This chapter explains the genesis of the Task Force and how it carried out its review of Canada's past and prospective future involvement in the power sector and six other sectors of importance which together account for more than 95 per cent of Canadian exports to China.

1.1 MANDATE

The industry-government Task Force on the China Power Sector was created in February, 1986 by the Minister for External Relations, the Honourable Monique Vézina, and the Minister for International Trade, the Honourable James Kelleher. Four members were appointed to serve on the Task Force, two from the private sector and two from the public sector, as follows:

Chairman: Mr. Frank Petrie
President, Canadian Export Association

Members: Mr. Peter J. Haines
Vice-President, Professional Services Branch
Canadian International Development Agency

Mr. R. A. Kilpatrick
Assistant Deputy Minister
International Trade Development Branch
External Affairs Canada

Mr. Robert L. Walker
R.L. Walker & Partners
Consulting Engineers

The Ministers asked the Task Force to review Canada's involvement in the power sector in China and to prepare a report focussing on three primary issues:

a) an inventory of federal financing available for trade development in China and the place of the power sector in an overall federal strategy; and,
b) the likely extent of private sector demands for federal assistance in power projects in China during the next five to fifteen years.
c) the selection of firms for federal support.

The Task Force was asked to examine the competitiveness of Canadian firms in the power sector and to identify criteria which the federal government could use to choose projects to be supported. The Task Force was also requested to comment on how federal assistance for hydroelectric projects should be related to assistance for other projects in the power sector and to Canadian opportunities in other sectors in China.

The terms of reference of the Task Force are set forth in the letter dated February 7, 1986 from the Ministers for External Relations and

International Trade inviting Mr. Petrie to chair the Task Force. A copy of this letter is attached hereto, as Annex I. It should be noted that the emphasis on hydro power in the Minister's letter was subsequently ammended to include all aspects of power sector development.

The Task Force has interpreted its mandate as concerning mainly the trade relationships between Canada and China since the Canadian International Development Agency (CIDA) has already planned and is implementing Canada's development assistance program. However, because China is Canada's fifth biggest trading partner and our aid and trade objectives converge in the power and other sectors of commercial and development priority in China, the Task Force has not hesitated to explore the impact of various CIDA programs in the context of all relevant federal programs which affect present and future trade relationships between China and Canada.

1.2 PROCESS

Shortly after it was established the Task Force set up Working Groups to prepare briefs on the power sector and on six other major economic sectors of interest to Canadian exporters: agriculture, forestry, mining, oil and gas, telecommunications and transportation. These seven sectors have accounted for just over 95 per cent of Canadian exports to China during the last five years. Each Working Group included sector specialists from federal agencies and departments and several consultants, all of whom had direct experience with the Canadian resource base and/or the development needs and commercial opportunities within the relevant sector in China. Each Working Group was encouraged to seek information and experience from Canadian private sector organizations which have been actively pursuing work in China. Many individuals and firms were contacted in this process.

The Task Force arranged for more formal consultations with selected organizations from the power sector, the principal focus of the assignment. Each organization was asked to submit a written presentation which responded to certain common topics outlined in advance by the Task Force. Senior representatives from each organization were invited to make verbal presentations to Task Force members. A total of 24 written presentations were received and 14 organizations discussed their presentations with the Task Force. These organizations are listed in Annex II.

The sector briefs for the seven principal economic sectors provide valuable background and contain much information which is not repeated in the body of this report. These companion documents form Appendices A to G of this report and follow a common format, with four principal chapters in each:

1. Opportunities in China
2. Canadian Industry Capability and Capacity
3. Competitive Considerations re Chinese Exports
4. Possible Federal Role in Supporting Sector Exports

Each sector brief includes a list of firms consulted in the process of preparing the overview on the China market.

In mid-April the Task Force submitted a progress report to Ministers Vèzina and Kelleher which is attached as Annex III. This final report of the Task Force was prepared after the seven sector briefs were reviewed.

To respond to the mandate of the Task Force, Chapter 2 begins with an overview of prospective developments in China's economy to the year 2000 and then reviews potential opportunities for Canadian firms in the power and other major sectors. Chapter 3 examines the potential demands and sources of financial support for Canadian exporters to China. The fourth and final chapter concludes with suggested elements of a federal strategy and recommendations as how to make the best use of available federal resources to maximize exports to China.

1.3 Acknowledgements

The members of the Task Force wish to acknowledge that this assignment could not have been completed without extensive support and assistance.

A small group of advisors met regularly and provided continuous support. These advisors included:

CIDA - Bill Fisher, Bob Hamilton, Don McMaster and Scott Wade
EDC - Tom MacDonald
External Affairs - Wayne Robinson and Peter Sutherland
DRIE - Bill Terry

Other members of these federal organizations also provided considerable background information.

Working groups were created to prepare the briefs on seven sectors of concentration in China. Members of these working groups, comprising representatives of CIDA and relevant federal departments and external consultants, are listed on the title page of the seven Sector Briefs which comprise Appendices A though G of this report.

Exporters with China interests and activities were consulted widely. Those in the power sector which were contacted directly by the Task Force are listed in Annex II. Working groups in other sectors also contacted exporting firms during the preparation of the Sector Briefs. These contacts are listed in each Sector Brief.

The consulting firm of R.L. Walker & Partners was appointed to serve as Secretariat to the Task Force.

The support of all individuals and organizations involved in the preparation of this report is gratefully acknowledged.

2.0 FUTURE TRADE OPPORTUNITIES IN CHINA

Synopsis

China's international trade has increased substantially since an ambitious series of economic reforms was begun in 1978. Urban reforms introduced in 1984 encourage more market-oriented operations by many industrial sectors, although energy and transport are among several key sectors which remain under state planning control.

Infrastructure bottlenecks are to receive particular attention during the Seventh Five Year Plan (1986 to 1990). Between 1986 and 2000 China is expected to invest from $140 to $ 200 billion in the power sector. China lacks the capacity to manufacture all the power systems equipment needed and also the technologies for large generation plant and EHV transmission. Hence it is importing equipment on a substantial scale and is seeking associated technology transfer as a component of major contracts.

Statistics Canada data indicate that total Canadian exports to China have averaged $1.3 billion annually over the past five years, primarily for wheat, mineral and forestry commodities. Canadian exports of power equipment to China have been modest.

Increased official contacts between Chinese and Canadian power authorities and recent technical assistance programs supported by CIDA and External Affairs have improved Canadian prospects for winning considerably more orders in the years ahead. An overview is also provided of Canadian prospects in the agriculture, forestry, mining, oil and gas, telecommunications and transportation sectors.

2.1 OVERVIEW OF CHINA'S ECONOMY

China's uneven economic performance, as reflected by the growth in GNP over successive five-year plans since 1953, is illustrated in Figure 1.

Following establishment of People's Republic of China in 1949, rigidities soon set in. One of the more serious was a price structure that bore little relation to the supply of and demand for goods and services. The dislocation caused by the Great Leap Forward (1958 to 1960), the suspension of Soviet aid in 1960 and widespread disruption caused by the Cultural Revolution (1966 to 1976) all contributed to slowing down technological development in virtually all areas of industry. This series of destabilizing events, coupled with policies that placed excessive emphasis on the development of heavy industry, has left the country with power shortages which will persist until the end of the century, serious weaknesses in transport and communications, and a lack of well-trained managers, technicians and planners. Although China is still very poor (per capita income was US$300 in 1980), the country has made significant progress in easing widespread poverty and in providing better health care and nutrition for its people.

To combat the above problems and to achieve a higher overall level of prosperity, an ambitious series of economic reforms was begun in 1978. In rural areas, private leasing has replaced the commune system, contracting has replaced mandatory production quotas, commodity prices have been allowed to rise to reflect demand, and a limited free market has been allowed to flourish. As a result, agricultural output, including rural industrial activity which employs a growing percentage of the rural workforce, has grown on average by 10 per cent per annum since 1979 (against 4 per cent per annum between 1970 and 1978). Rural incomes in real terms have nearly doubled since 1978 and record harvests have allowed food rationing to be eased.

Following these successes in the countryside, a plan for urban reforms was introduced in October 1984. These reforms aim to stimulate economic activity by endowing enterprises with more decision-making powers, tying remuneration more closely to performance, allowing a limited free market in certain sectors and restructuring the prices of goods to better reflect their true value. Despite this borrowing of elements of a free market economy, China is certainly far from transforming itself into a capitalist economy; the key economic sectors of energy, raw materials, defence, steel, electronics and chemicals remain subject to mandatory plans.

A final aspect of China's new economic direction is the so-called open-door policy. Recently, China has sought to speed up its economic development by encouraging joint ventures with foreign firms, sending technicians and managers abroad for training, setting up special economic zones to attract foreign investment and granting foreign exchange privileges to import modern machinery and certain consumer goods.

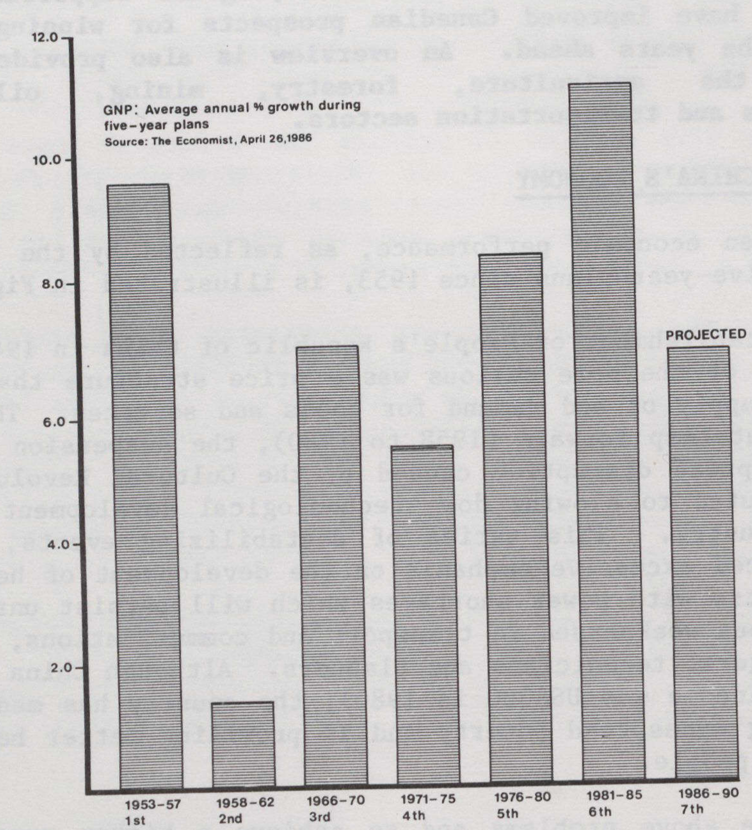


Figure 1:
China-GNP Performance

China's medium term development objective, which was formalized at the 12th National Congress of the Chinese Communist Party in September 1982, calls for a quadrupling of agricultural and industrial output between 1980 and 2000. GNP in the same period should grow from about U.S. $300 per capita to U.S.$800 per capita (in 1980 dollars)1/.

The Chinese economy in 1984 and 1985 suffered from overheated growth and excessive imports (see Table 2.1). Industrial output jumped 21.4 per cent in 1985 following a 16.3 per cent increase in 1984. Agricultural output growth after a number of years of healthy growth declined to 3.0 per cent in 1985, in part because of adverse weather conditions affecting large areas of the country.

TABLE 2.1
CHINA - OVERALL REAL ECONOMIC GROWTH, 1980 to 1985

	Agricultural Output	Industrial Output	Other Sectors	Total Gross Output Value	National Income	Gross Domestic Product
(Percent Growth)						
1980	1.4	11.0	9.1	8.4	6.4	na
1981	5.9	4.6	2.7	4.6	4.9	6.5
1982	11.3	7.8	13.5	9.5	8.3	8.1
1983	7.7	11.2	10.7	10.3	9.8	9.0
1984	11.7	16.3	7.4	13.8	13.9	14.2
1985	3.0	21.4	15.2	16.2	12.3	12.5
(Billion Current Rmb)						
1985	358	969	298	1,624	677	778
$ equivalent (billions)	156	421	130	706	294	338

Souces: Rock Creek Research, China Macroeconomic Newsletter, Vol. 2, No. 5 March 10, 1986.

Infrastructure, however, has not kept pace with the impressive gains in industry and agriculture. Besides rail, road, port and communications bottlenecks, outdated extractive technology, poor transport and inefficient industries are causing serious energy shortfalls and rationing is common.

As a result of a record trade deficit in 1985, China is imposing stricter import controls, limiting exchange privileges and placing a greater emphasis on exports. Since half of China's exports are primary products for which prices are falling (oil alone accounts for 25 per cent of export value) the success of manufactured exports such as textiles, themselves threatened by increasing protectionism, will be crucial. Inflation running at between 8 and 11 per cent and corruption, both largely by-products of the economic reform process, are two other serious problems for China's leadership.

1/ For comparison, the 1984 per capita GNP (in US$) of selected countries was as follows: India - $ 260; China - $ 310; Hong Kong; $6,300; Japan - $ 10,390; Canada - $ 13,140. (Source: World Bank Atlas, 1986)

The Seventh Five-Year Plan (1986 to 1990) stresses that a slow-down in economic growth will occur gradually during 1986 and 1987, but State investment for capital construction will remain at about 1985 levels for 1986 and 1987. China's investment priorities for energy, transport and communications in the near and intermediate term were confirmed in Premier Zhao Ziyang's presentation of the Seventh Five-Year Plan (1986 to 1990) at the National People's Congress in March 1986. It is evident that China is continuing to import equipment and services required to eliminate infrastructure bottlenecks, particularly in the power sector.

The emphasis during the coming years will be on consolidation rather than innovation. The main thrust of reform will continue, however, with emphasis on endowing enterprises with greater decision-making power, closing the gap between planned prices and market prices and establishing a more regulation oriented macro-economic management system. In the medium term, of far more importance to China's leaders than impressive economic performance, will be the successful consolidation of these structural reforms which, it is hoped, will guarantee stable economic growth into the next century. This in turn is dependent upon the ability of the top leadership to forge a broad consensus on the ideological and technical questions raised by China's ambitious drive towards modernization.

Acquisition of foreign technology has consistently been an important part of investment planning since China's initial opening of its market to Japan and western economies in the 1970's. In recent years China has shown increasing willingness to import capital goods and raw or semi-finished materials. At the same time the Chinese authorities emphasize the need for joint ventures and technology transfer to help upgrade Chinese industrial capabilities. These two themes - willingness to import essential capital goods plus insistence on technology transfer - present very important opportunities and challenges to potential exporters from Canada as China transforms itself into a major economic power.

2.1.1 Foreign Trade

China's balance of trade has fluctuated in recent years, being in overall surplus from 1981 through 1983, peaking at US$ 6 billion in 1982. Imports soared in 1985, while exports increased modestly, resulting in a visible trade deficit of US$ 9.7 billions for 1985, as shown in Figure 2. This was offset by invisibles and repayment of loans so that official data indicate a net decrease in foreign exchange reserves for 1985 of US$ 4.1 billion.

China's net commodity trade exports with its major trading partners from 1976 through 1985 are summarized in Table 2.2, and its performance in selected import and export categories from 1981 through 1985 is illustrated in Figures 3 and 4.

As is evident for Figure 3, electrical machinery has represented over the years 1981 through 1985 the second largest category of imports (after iron and steel). The total tonnage of grain imports and, of particular interest to Canada, wheat, had declined by 1985 to levels approximately one-third of those of 1981 and 1982, while grain exports, as illustrated in Figure 4, have risen dramatically over the same period.

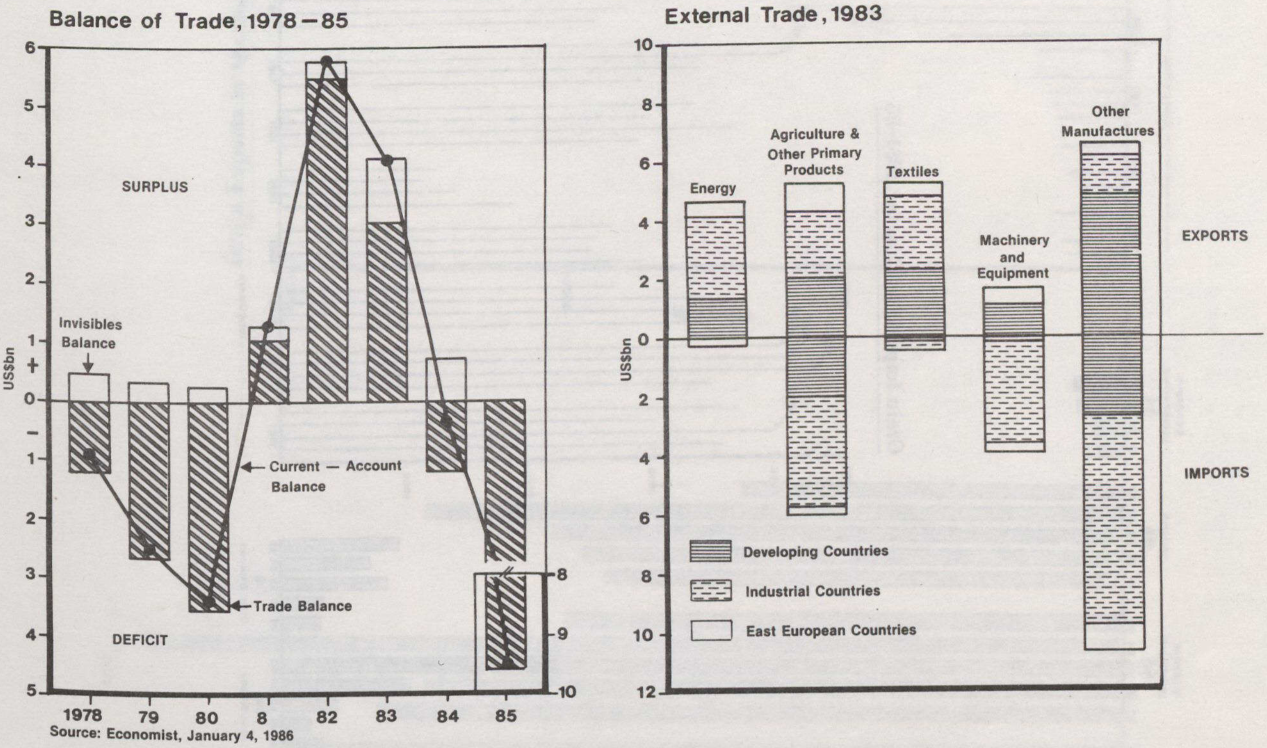


Figure 2:
China's External Trade

China's major exports, apart from clothing and photographic equipment, are dominated by commodity trade, agricultural products, oil and coal. Both its heavy and light industrial production has been oriented to supplying domestic requirements. However, modernization of industry, particularly light industry, is in rapid transition with a view to developing products to standards which will make them more saleable in international markets.

Canadian trade with China has been fairly steady over the past five years. China is Canada's fifth largest export market and we are China's fifth largest supplier. Total bilateral trade over the past five years is summarized on Figure 5, with more detailed data provided in Annex IV. Total Canadian exports have been on average 4.53 times larger than the total imports over the past five years. Annual ratios have ranged from a peak of 6.54 in 1983 to a low of 3.12 in 1985.

Canadian exports to China in the period 1981-1985 have ranged from a low of \$ 1,018 million in 1981 to a high of \$ 1,607 million in 1983, averaging \$ 1,277 million annually. Wheat sales, the largest single item, accounted for 53 per cent over five years and has been the major variable, ranging from \$917 million in 1983 to \$ 445.6 million in 1985. Mineral and metal exports (copper, aluminium, zinc, iron and steel) accounted for 17.9 per cent of total exports; wood products, pulp, lumber, paperboard and newsprint for 15 per cent; fertilizers for 4.5 per cent ; and equipment and machinery for 1.1 per cent.

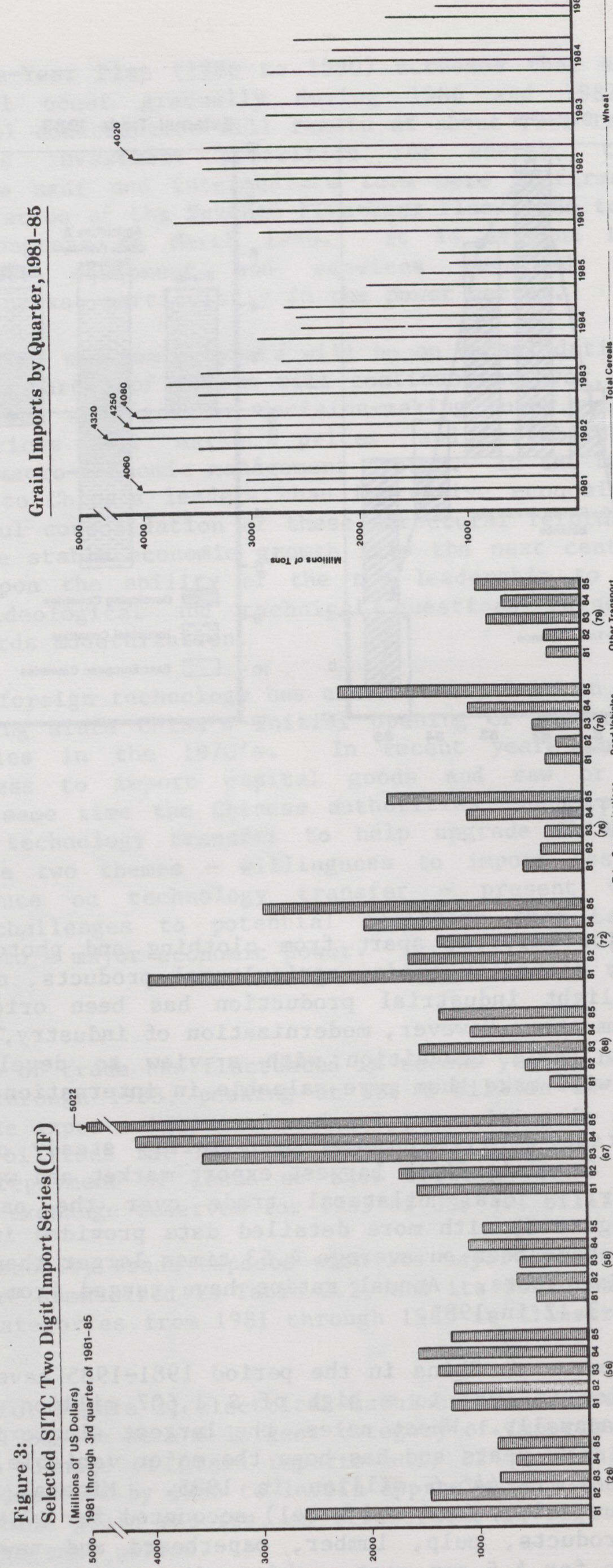
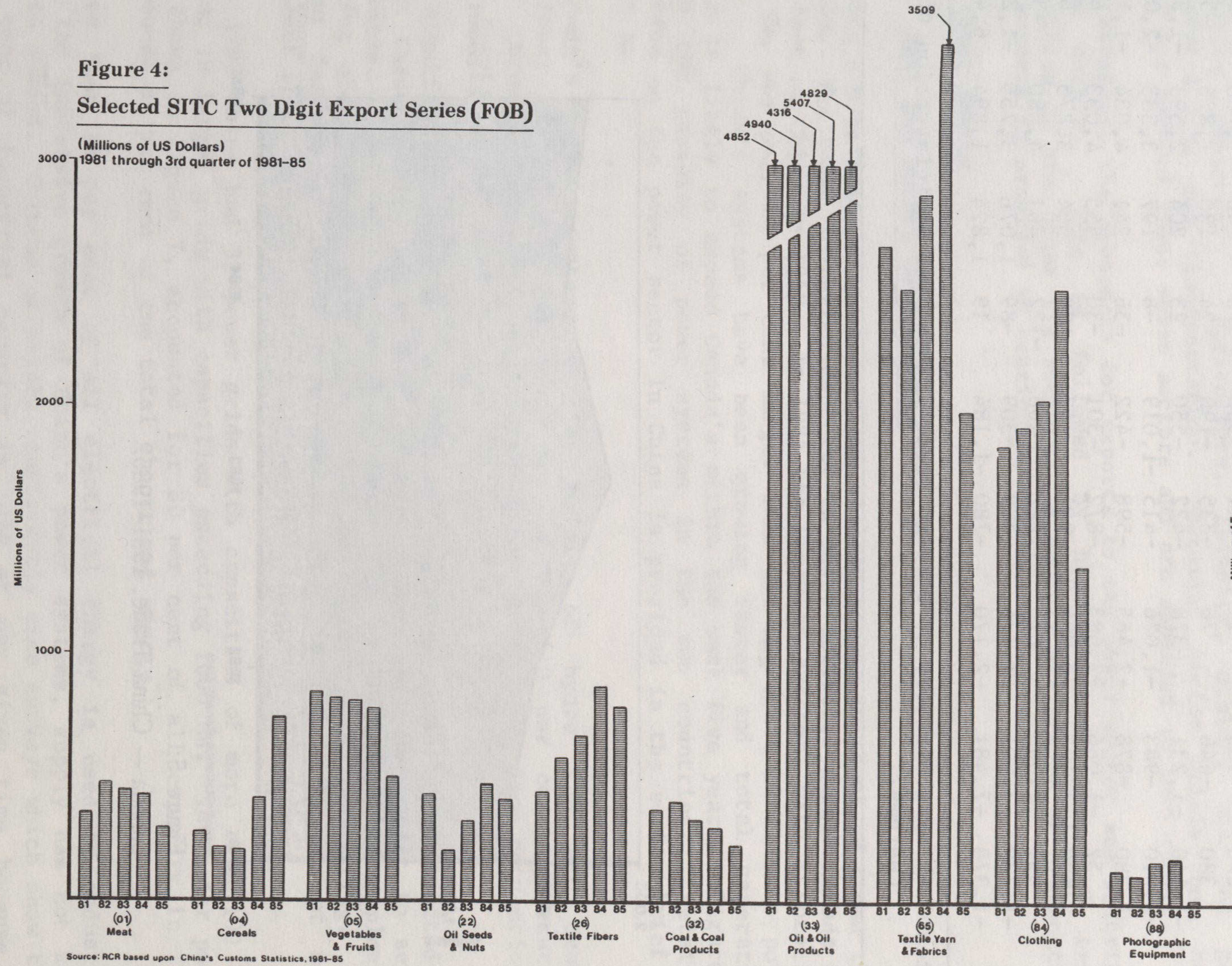


Figure 3:
Selected SITC Two Digit Import Series (CIF)

Grain Imports by Quarter, 1981-85

Figure 4:

Selected SITC Two Digit Export Series (FOB)



Source: RCR based upon China's Customs Statistics, 1981-85

Grain Exports by Quarter, 1981-85

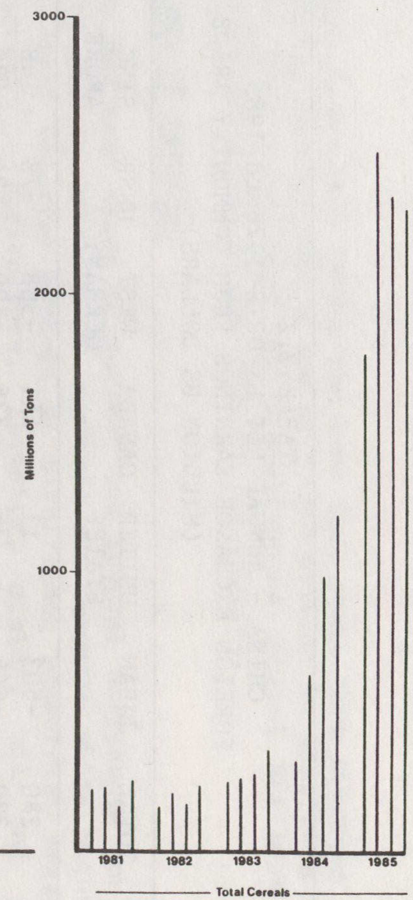


TABLE 2.2
CHINA - ANNUAL NET EXPORTS 1976 to 1985
FOREIGN EXCHANGE EARNINGS FROM COMMODITY TRADE
(MILLION US DOLLARS)

YEAR	TOTAL	JAPAN	UNITED STATES	CANADA	WEST GERMANY	USSR	SING APORE	HONG KONG	OTHER
1976	280	-503	11	-141	-388	-78	148	1,788	-558
1977	380	-646	76	-335	-190	24	130	1,876	-556
1978	-1,140	-1,231	-378	-422	-550	23	204	2,593	-1,379
1979	-2,010	-983	-1,076	-415	-1,019	-8	197	3,333	-2,039
1980	-1,280	-878	-2,465	-598	-422	-36	241	4,034	-1,156
1981	52	-1,086	-2,683	-872	-301	-30	555	4,033	436
1982	2,999	1,105	-2,098	-951	-47	-100	554	3,875	662
1983	835	-1,065	-823	-1,222	-168	-122	461	4,080	-306
1984	-1,720	-3,001	-1,175	-709	-309	-89	1,076	3,755	-1,268
1985	-1,378	-7,481	-2,170	-780	-1,184	19	1,824	1,894	6,499

Sources: Chinese Ministry of Foreign Trade and General Administration of Customs.

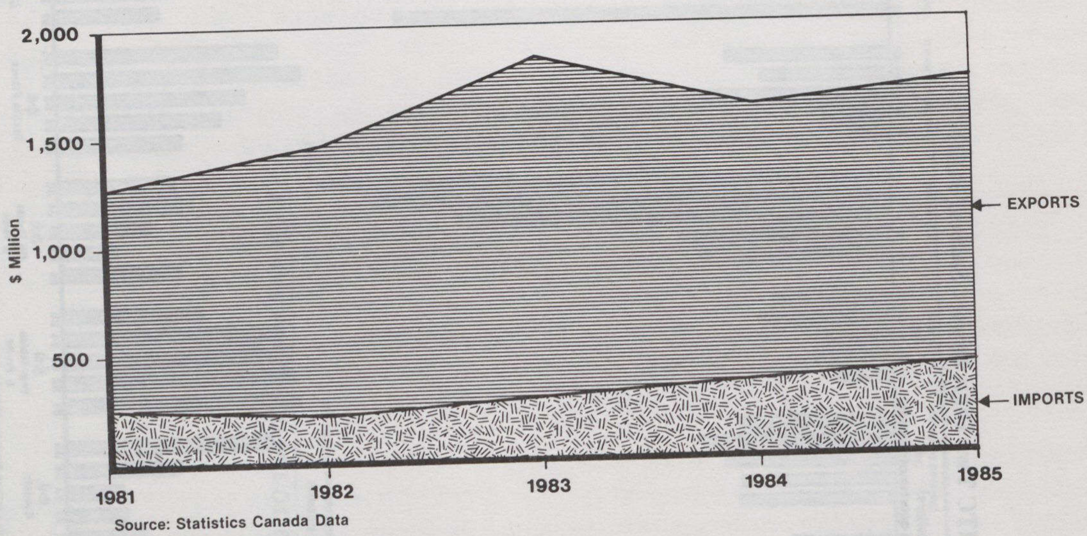


Figure 5:
Canada — China Trade, 1981-1985.

Canadian imports from China during the same five years have averaged only $ 282 million annually, ranging from a low of $ 204 million in 1982 to a high of $404 million in 1985. Outerwear and miscellaneous apparel has been the largest category, accounting for 40 per cent of all imports.

2.2 INDUSTRY SECTORS OF INTEREST

The Task Force has been asked to suggest how federal assistance for the power sector should fit in relation to requests for support which might be anticipated within other selected sectors of significant commercial interest to Canadian exporters: agriculture, forestry, mining, oil and gas, telecommunications and transportation. Detailed sector briefs have been prepared for each of these seven sectors and are appended to this report.

Hereinafter, the prospects for exports to the power sector are described in some detail. This is followed by highlights of perceived trade opportunities in the other six sectors. A summary projection of prospective future exports is provided in section 3.4.3.

2.2.1 Power Sector

2.2.1.1 Past and Future Developments

China's population of just over one billion people is about 40 times that of Canada. The total installed capacity in power utilities across Canada was double that of China in 1960. In 1985 the Canadian systems, with a total of 95,000 MW, was only 10 per cent larger than the aggregate of China's power systems. China's systems have been growing faster and total generating capacity is likely to exceed Canada's within the next five years. Figure 6 compares the capacity of power systems in the two countries. Detailed information on the power sector in China is provided in the sector brief of Appendix A.

Canada's power systems consist mainly of hydro (58 per cent), conventional thermal (31 per cent) and nuclear (10 per cent) generating plants. China, by contrast, obtains two-thirds of its power from conventional thermal plants (mostly coal burning) and one-third from hydro.

A significant portion of the Chinese generating capacity constructed in the past three decades consists of relatively small stations built to serve local loads. In 1982, for example, more than 80,000 small hydro plants, comprising about 35 per cent of total hydro capacity, were operating. An important feature of the Chinese power sector is the existence of many independent power systems with relatively weak interconnections.

In 1983 China had 32 power grids with capacities of more than 100 MW, including 13 larger grids with capacities exceeding 1000 MW. The major power grids, shown in Figure 7, accounted for 80 per cent of all capacity in 1982 and produced 90 per cent of the total electrical energy.

More than 75 per cent of all electrical energy is used by industry. Despite the impressive growth of China's power systems, supply has not kept pace with demand. Chinese officials consistently cite surveys which show that 20 per cent of industrial capacity is idle at any given time because of electric power shortages.

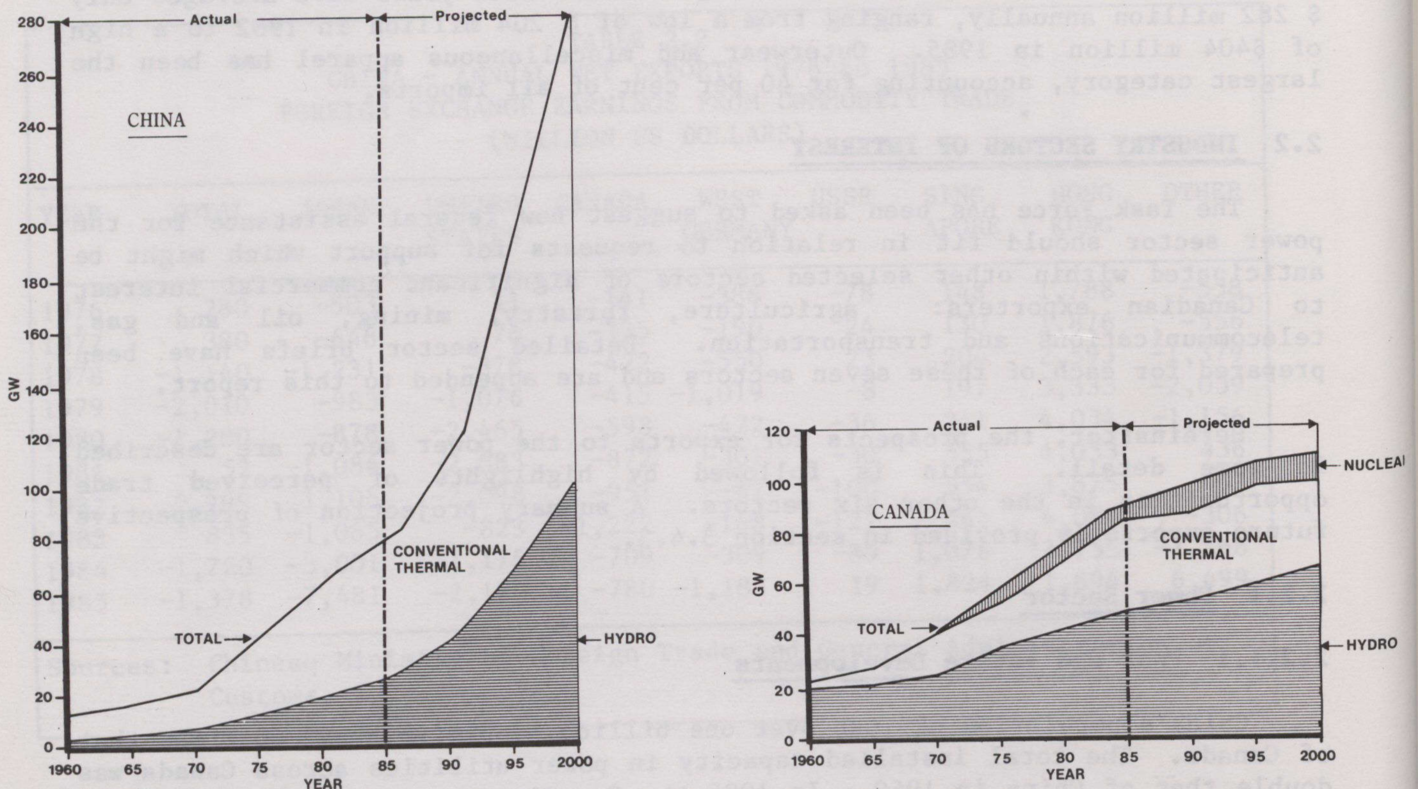


Figure 6:
Power Systems Capacity in China and Canada, 1960-2000.

China has abundant resources of both coal and hydro, but most of these resources are not located near the main load centres. Figure 8 provides an overview of economic activity illustrating the concentration in China's East and Central regions. Although coal mines exist in all regions, the greatest reserves are in the North Central region, particulary in Shanxi Province. The main hydroelectric resources are in the Southwest region (mainly rivers flowing away from the Himalaya Mountains) and in the Central region (including the Yangtze[1] and Hongshui Rivers).

The Ministry of Water Resources and Electric Power (MWREP) is the central authority which oversees all aspects of power sector development. MWREP intends to construct at least 30,000 MW of additional capacity during the Seventh Plan; some 25,000 MW of coal burning thermal plants and 5,000 MW of hydro developments. MWREP's Minister, Madam Qian Zhengying, has stated that even more capacity, up to 40,000 MW, would be preferred to facilitate ongoing modernization. These expansions are very large indeed. By way of comparison, the Canadian power utilities added some 30,000 MW of capacity to their systems

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1/ In China the Yangtze River is known as the Changjiang or Long River.

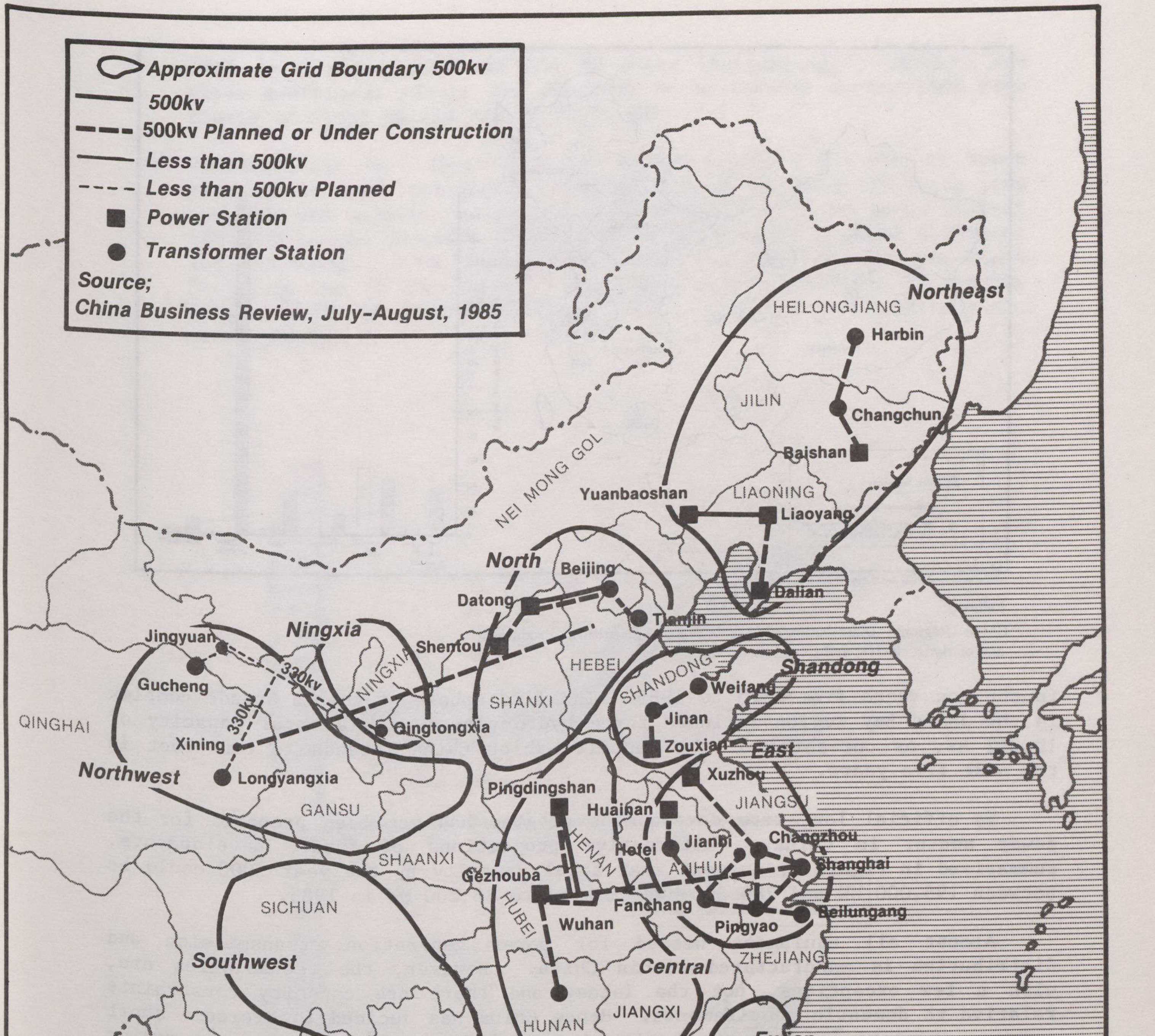
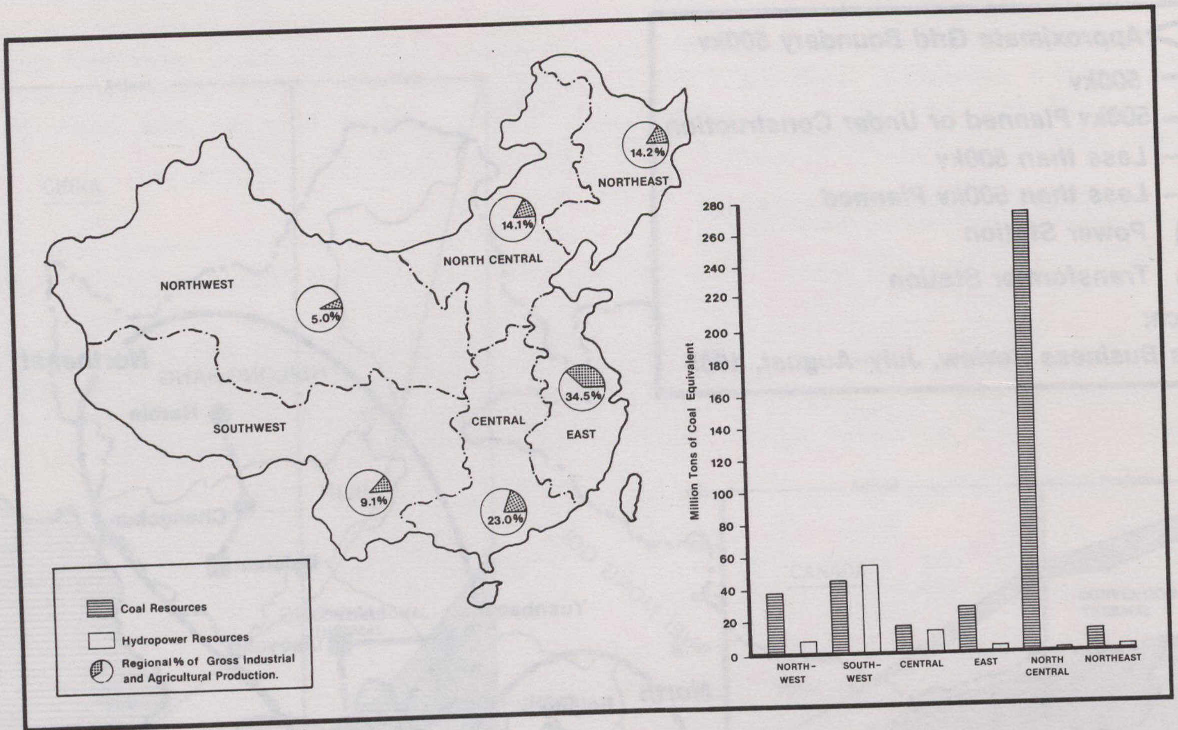


Figure 7:
China Power Grids and Principal Transmission Lines.



Source: Ministry of Water and Electric Power, 1983

Figure 8:
China–Regional Distribution of Industrial and Agricultural Production and of Hydroelectric and Coal Resources.

in the ten years from 1975 to 1985. The first phase of the La Grande complex in the James Bay region included three hydro plants with a total capacity of 10,282 MW, or one-third of the capacity which China intends to construct in the next five years.

No official long term development program has yet been prepared for the power sector in China. Alternative projections of future developments, summarized in Figure 9, suggest that total capacity by the year 2000 could be between 195,000 MW and 280,000 MW compared to 86,200 MW in 1985.

Almost all equipment needed for power generation, transmission and distribution is manufactured within China. However, the technologies are, with a few exceptions, not the latest and there are capacity constraints relative to domestic requirements. Hence China has decided to overcome short term constraints by importing major items of equipment and over the medium term to modernize its electric power industry by arranging for technology transfer through licensing and joint venture agreements.

Recent examples of Chinese willingness to import equipment are:

a) Thermal generating stations. China intends to purchase some 8,400 MW of complete thermal plants from abroad in 1986 and 1987. Six different plants have already been contracted for and four more are expected to be under procurement in 1986. In 1985 China requested international tenders from 11 groups in many countries, including Canada, for four coastal power stations (each 2x350 MW); and negotiated with Czechoslovakia for two 500 MW thermal plants and with the Soviet Union for an 800 MW plant. Bids were received in early

1986 on a plant with two 600 MW units (Beilungang). Tenders for three additional plants are expected to be invited during 1986 (two plants of 2x350 MW and one of 2x600 MW).

b) Hydroelectric developments. The Lubuge project (600 MW) in Yunan Province is being built with a combination of external financing from the IBRD and supplier's credits. Tianshengqiao low dam hydro project (880 MW) on the Hongshui River is being built with Japanese equipment and financing. (The feasibility study for this project was grant funded by the US Government). The IBRD is also expecting to provide financing for the Yantan (1100 MW) and Shuiko (1400 MW) hydrelectric developments.

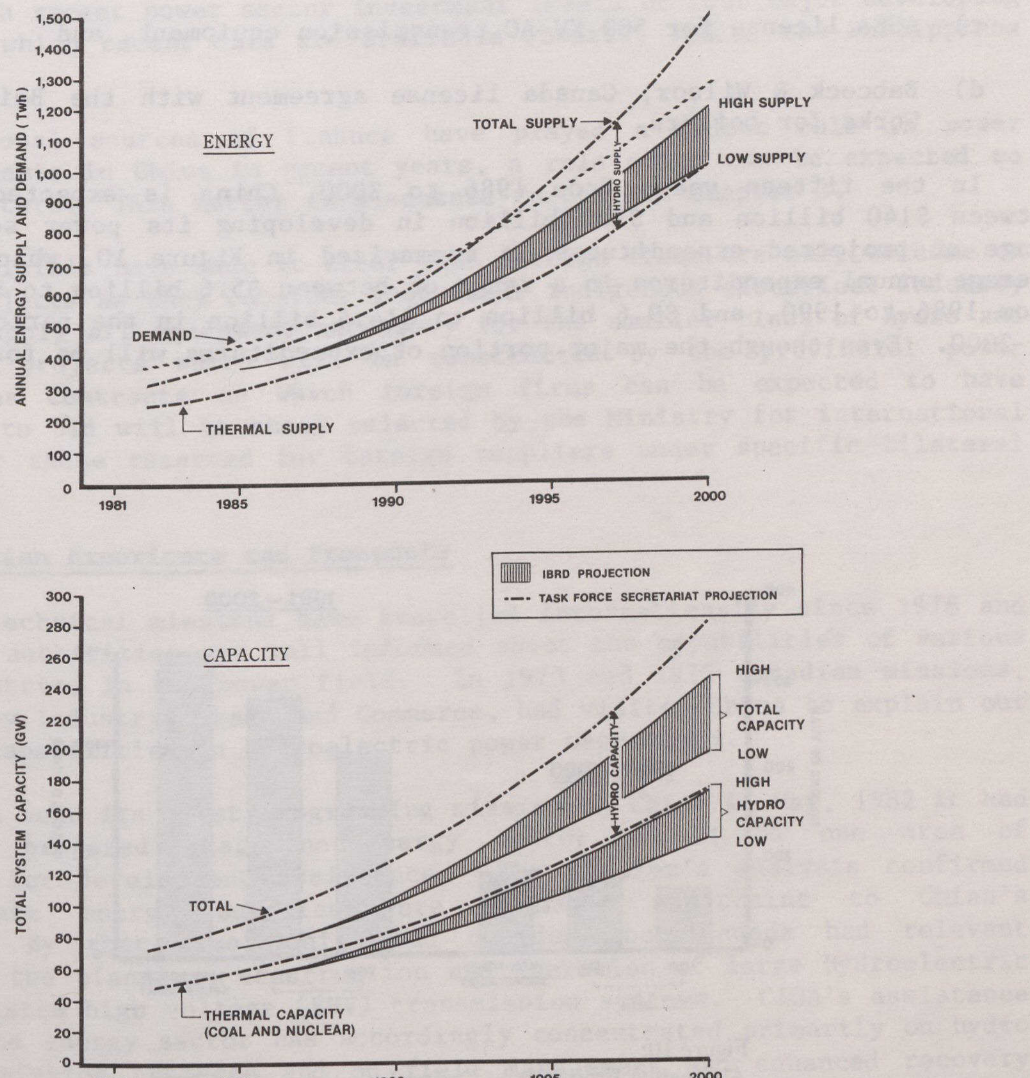


Figure 9:
China Power Sector: Alternative Projections of Energy Supply and Demand, 1985-2000.

c) EHV transmission systems. Canadian firms and others were invited to bid in 1984 for equipment for up to ten 500 KV AC sub-stations. A European consortium (Brown Boveri and Siemens) concluded a contract for a 500 KV DC system in 1984 on which a Canadian consultant (Teshmont) had been involved in preparing the specifications. (This DC equipment is not manufactured in China or in Canada).

Joint venture and licensing agreements with Chinese enterprises have been completed by several leading equipment manufacturers, including:

a) Combustion Engineering for 600 MW boiler units at Harbin and Westinghouse for 300 MW turbine generator units at Shanghai (1980 licenses),

b) General Electric and a Sichuan factory for co-production of 600 MW turbine generators,

c) ASEA license for 500 KV AC transmission equipment, and

d) Babcock & Wilcox, Canada license agreement with the Beijing Boiler Works for boilers.

In the fifteen years from 1986 to 2000, China is expected to invest between $140 billion and $200 billion in developing its power sector. The range of projected expenditures is summarized in Figure 10, which indicates average annual expenditures in a range of between $5.6 billion to $7.6 billion from 1986 to 1990, and $9.6 billion to $14.4 billion in the period from 1991 to 2000. Even though the major portion of expenditures will be for domestic

Figure 10:
Alternative Projection of Capital Investment, 1986-2000.

equipment and services, it is projected that from 10 to 20 per cent of expenditures will likely be for foreign supplied equipment and services.

The very high projected investment levels imply a major increase in the share of the power sector in total domestic investment by China. Power sector investment will need to rise from a level representing somewhat less than 1 per cent of GDP from 1980 through 1985 to approximately 2 per cent during 1986 to 2000.

The share of investment allocated to the power sector has in the past been lower in China than in many other developing and industrialized countries. The increased share estimated for the future is not unreasonable given China's target of quadrupling industrial and agricultural output between 1980 and 2000. The World Bank estimates that power sector investment requirements in all developing countries will represent about 2 per cent of aggregate GDP during the period from 1982 to 1992. This is also broadly comparable with recent power sector investment levels of four major developing countries for which recent data are available (Brazil, India, the Philippines and Thailand).

International sources of finance have played a modest role in power sector investments in China in recent years, a role which can be expected to increase in future. This matter is discussed further in Chapter 3.

MWREP officials have made it clear that foreign firms are only welcome on the larger projects as they consider that their indigenous electrical industry can readily supply all equipment necessary for the smaller class of hydro and steam thermal projects which will be constructed by the provincial power bureaux. Thus contracts on which foreign firms can be expected to have opportunities to bid will be those selected by the Ministry for international competition or those reserved for foreign suppliers under specific bilateral arrangements.

2.2.1.2 Canadian Experience and Prospects

Chinese technical missions have travelled internationally since 1978 and Chinese power authorities are well informed about the capabilities of various exporting countries in the power field. In 1973 and 1979 Canadian missions, co-ordinated by Industry, Trade and Commerce, had visited China to explain our interest and capabilities in hydroelectric power technology.

When CIDA sent its first programming mission to China in May, 1982 it had already been proposed that the energy sector should be one area of concentration for development assistance. The mission's analysis confirmed that inadequate energy supplies were a major constraint to China's development. By that time, China had decided that Canada had relevant experience in the planning, construction and operation of large hydroelectric projects and extra high voltage (EHV) transmission systems. CIDA's assistance to China in the energy sector has accordingly concentrated primarily on hydro and EHV transmission projects and on field management and enhanced recovery within the North China oilfield which has characteristics similar to those of oilfields in Western Canada.

During his visit to Canada early in 1984, Premier Zhao Ziyang enquired whether Canada might be willing to co-operate with China in the development of China's power sector, in particular in the development of major hydroelectric projects such as the Three Gorges project on the Yangtze River. Subsequently Canada was invited to make a presentation outlining Canadian capabilities and sent a delegation led by External Affairs to China, in November 1984, for discussions with MWREP. This delegation included representation from the Canadian power industry and financial community as well as officials of External Affairs, CIDA, the Department of Regional Industrial Expansion (DRIE) and the Export Development Corporation (EDC). The delegation presented Chinese authorities with a formal submission concerning Canadian capabilities.[1] During the delegation's stay in Beijing the first power sector Memorandum of Understanding was signed between MWREP and Canada, confirming China's request for technical assistance and financial support for three specific hydroelectric projects: Three Gorges, Gehe Yan and Longtan. A copy of this MOU is attached at Annex V.

In October, 1985, a Chinese delegation led by Madame Qian Zhengying, the Minister for Water Resource and Electric Power, visited many parts of Canada, including major hydro and thermal generating plants. Discussions were held on a variety of subjects relating to Canada-China cooperation in the fields of hydro, thermal and nuclear energy. This delegation concluded a second Memoradum of Understanding concerning future cooperation between the two countries in the development of China's power sector. (See Annex VI).

In the past five years CIDA and External Affairs have agreed to finance eleven technical assistance projects in the power sector, worth $11.3 million in total. These projects, summarized in Table 2.3, deal mainly with hydroelectric generation and EHV transmission studies. The largest project in financial terms, worth $7.45 million, involves five Canadian power utilities cooperating to assist six of MWREP's research institutes in applied research for power systems development.

Canadian power sector exports to China, apart from the government-supported activities have been relatively small until the past year. At least seven different organizations have been successful in winning contracts worth approximately $240 million, as summarized in Table 2.4. Two of the successful firms (ASEA Canada Inc. and Cegelec) won their first orders after China invited Canada to compete for supply of equipment for up to ten 500 kV sub-stations in 1984, no doubt as a result of the official dialogue about future cooperation in the power sector. The largest order, worth $ 203 million, the boiler-island components of the two thermal generating stations (Shan An and Nantong), was awarded in February, 1986 to Babcock & Wilcox Canada as part of a successful consortium led by General Electric of U.S.A. and including Ansaldo of Italy. This consortium won a turnkey contract in stiff international competition for the complete supply of two thermal generating stations, each of 700 MW. For those contracts the export credit agencies supporting all competitive bidders agreed to adhere to Consensus rates. EDC financing for the Canadian portion of the contract has been successfully concluded.

Future Canadian prospects for winning contracts in the power sector in China depend on several related factors: China's requirements, federal government support and, most important of all, the competitiveness of Canadian exporters. In this context it is useful to recall the observations made about

1/ Canadian Capabilities for the Development of Major Hydroelectric Projects and EHV Transmission Facilities, Department of External Affairs, October 1984.

Table 2.3

CANADIAN GOVERNMENT FUNDING COMMITMENTS AND EXPENDITURES FOR POWER PROJECTS IN CHINA[1]

Project Description	Canadian Executing Agency	Chinese Client Agency	Funding ($'000)	Implementation Period	Remarks
A. CIDA Bilateral Program					
1. Electric Power Research Project	B.C. Hydro	MWREP Electric Power Research Institute	7,450.0	1985-1987	Power utility research organizations of Quebec, Ontario, Manitoba Saskatchewan and British Columbia cooperating to provide the best available Canadian expertise.
B. CIDA Industrial Cooperation Program					
1. Zhao Ping Hydro Project - Pre-Feasibility Study (Guai River in Guangxi Province)	CIPM	Guangdong Bureau of Electric Industry	160.0	1981-1982	Small provincial project (72 MW) which has not proceeded to implementation because of lack of support from central government.
2. Gezhouba-Shanghai HVDC Transmission Study	Teshmont Consultants	MWREP - ZEPDI/YVPO	250.0	1983-1985	Consultant paid further $ 450,000 by client for additional services.
3. Gehe Yan Water Control Project - Feasibility Report (Hubei Province)	Hydro Quebec International and CIPM	Yangtze Valley Planning Office	445.0	1985	Capacity 1,200 MW. Prospects identified for Canadian equipment and services valued at up to $ 345 million, for which concessional financing being sought.
4. Northwest China Microwave Communication System - Project Definition Study	B.C. Hydro	Northwest Power Administration Bureau	231.8	1985-1986	Study of communications systems for transmission system.
5. Lijiang Water Control Project (Guangxi Province)	Tecsult International	Guilin Travel and Tourism Corporation	193.0	1985	Project's primary objective is to increase minimum flows. Power component about 40 MW. Study also financed by Quebec Government ($ 100,000). Implementation would cost about $ 200 million, of which $ 70 million could be Canadian content.
6. Three Gorges Water Control Project - Preliminary Investigations	CIPM-Yangtze Joint Venture	Yangtze Valley Planning office	1,300.0	1985-1986	Additional financing of $ 300,000 by External. Four discrete tasks due for completion by July, 1986.
Sub-Total Industrial Cooperation Program			2,579.8		
C. External Affairs					
1. Longtan Hydro Project - Design Study (Guangxi Province)	CIPM-Yangtze Joint Venture	Changsha Hydropower Survey and Design	612.0	1985-1986	Very large hydro project (some 5,000 MW) whose implementation is not expected to commence until after 1990.
2. Three Gorges Water Control Project - Preliminary Investigations	CIPM-Yangtze Joint Venture	Yangtze Valley Planning Office	300.0	1985-1986	In conjunction with funding of $ 1.3 million from CIDA INC program.
3. Review of Investment Opportuntinites in Power Sector Development	R.L. Walker & Partners	(Reviewed with MWREP and YVPO)	42.0	1985-1986	Study of financing of Three Gorges and Gehe Yan projects completed in January/86 in association with Niagara Consulting Services.
4. Three Gorges Hydro Project - Model of Hydraulic Turbine	Canadian General Electric	MWREP	300.0	To be determined	Financing offer not yet accepted, pending decision of final reservoir level for project.
Sub-total, External Affairs			1,254.0		
TOTAL			11,800.0		

[1] Excluding PEMB grants, trade and technical mission exchanges and CIDA project preparation missions.

Table 2.4

RECENTLY SUCCESSFUL CANADIAN EXPORTERS IN CHINA POWER MARKET

Company	Approximate Value of Contracts ($ million)	Sources of Finance	Products	Contract Period	Remarks
Babcock & Wilcox Canada	203.0	EDC	Boilers for two 2x350 MW thermal power plants	1986-1988	Consortium led by General Electric of USA won two contracts totalling over $ 500 million for turnkey erection of two coal-fired power plants. Eleven consortia bid in international competition.
ASEA Canada (Inc.)	10.0	EDC	Instrument Transformers	1984-1985	Includes contract for 500 kV substation, bid under Canadian Commercial Corporation. Two other contracts from parent firm.
Trench Electric	9.0	China; World Bank; EDC	Transmission line reactors, line traps and capacitive line transformers	1982-1986	First visit in 1981 with PEMD support. Technology assistance agreement negotiated. Most sales through German marketing office.
Timberland Equipment	8.0	China; World Bank; Commercial Banks	Conductor stringing equipment	1978-1986	Contracts in each year since 1978. Well established in China market.
Westinghouse Canada	7.0	China	Steam turbine assemblies for boiler feed drives	1985	
Cegelec	4.1	EDC	500 kV SF6 circuit breakers	1984-1985	Initial contract for 500 kV substation, bid under Canadian Commercial Corporation.
Canadian General Electric	0.6	China	Two static exciters for Gezhouba hydro generators	1985-1986	
B.C. Hydro	0.5	World Bank	Review of designs and specifications for 500 kV transmission line	1985-1986	Consulting assignment for East China Power Bureau on Second World Bank power project (Xuzhou to Shanghai transmission line)

Note: These contracts were won without financing from CIDA or External Affairs
Source: Information from Canadian exporters

Canadian power equipment by the Chinese Minister of Water Resources and Electric Power, Madame Qian, during her two week visit to Canada in October, 1985:

a) **Quality.** In Madame Qian's opinion, the quality of Canadian goods and services is world class.

b) **Price.** Canada is perceived as being too expensive.

c) **Terms and conditions of financing.** Madame Qian was of the opinion Canadian terms for loans and credits were not soft enough.

d) **Willingness to transfer technology.** Technical training is a definite priority, however, Madame Qian was unclear whether a willingness to transfer technology would be adequate compensation for a higher price.

e) **Balance of trade between China and the vendor country.** The impression given by Madame Qian was that the more equitable the balance, the more predisposed MWREP would be to purchase goods and services. It seems likely that China will use its import requirements in support of a broader balance of trade and foreign policy objectives in future.

Commercial prospects for Canadian exporters will clearly depend in large measure on the amount of export financing which Canada is prepared to offer China for project implementation, as discussed in Chapter 3 of this report.

A precise list of all future projects of interest to Canadian firms is difficult to prepare, in part because information concerning all projects which have been approved for inclusion in the Seventh Plan, covering the period 1986 to 1990, has not been released.[1/] It is not clear whether the Chinese authorities have a firm list of priority projects after 1990, although a number of hydro and thermal developments have been referred to as likely candidates for implementation in the next plan period.

Appendix A includes a list of all major power projects identified by MWREP and the World Bank. Specific hydro projects in which Canadian firms have already been involved are outlined hereafter and explained further in Appendix A.

The Three Gorges Water Control Project on the Yangtze River is believed to be the largest single water resources project being studied for implementation anywhere in the world. It includes a planned power capacity of between 13,000 and 17,000 MW (depending upon final selection of the reservoir normal pool level in the range between 150 m to 170 m), and twin flight shiplocks capable of passing 10,000 ton tows to enhance river transportation. The reservoir storage will be operated to provide major flood control benefits to downstream areas. Project construction could take from 15 to 17 years to complete after project financing is arranged. Capital costs, as estimated by MWREP, for project development and associated transmission facilities, amount to $9 billion (1985 prices) for the 150 m design normal pool level.

1/ China has not, in the past, released information on specific projects to be finalized under its planned program in advance of formal project authorization.

The Three Gorges project has not been specifically included in the Seventh Plan. However, it is understood that under the Seventh Plan funds have been set aside for large projects which may be approved during the plan period. It is probable that the Three Gorges project will be approved in 1987 or 1988, after completion of a bankable feasibility study which is estimated to cost $ 8 million and require 12 to 15 months to complete. CIDA's President confirmed in Beijing in April, 1986 that Canada was prepared to provide a grant for this study. MWREP confirmed its intent to proceed with the feasibility study of the Three Gorges Project on June 18, 1986 and accepted CIDA's offer to provide the services of CIPM-Yangtze Joint Venture, which is already working on certain aspects of the preliminary design studies for the Three Gorges project, jointly funded by External Affairs and CIDA/INC.

The Gehe Yan Water Control Project is a multi-purpose project including 1,200 MW generating capacity, located on the Qingjiang, a tributary to the Yangtze River some 100 km downstream from the Three Gorges Project. A CIDA-supported feasibility study was completed in October, 1985 by Hydro Quebec International and CIPM. The study indicated that the project is technically and economically feasible and would cost Rmb 1,583 million ($ 688 million) in mid-1985 prices, exluding price escalation and interest during construction. The consultants have estimated that Canadian equipment and services valued at up to $350 million could be required for project implementation over eight years, and have requested consideration of concessional financing support. One problem affecting consideration of project support is understood to be the concern of the Hubei Provincial Power Bureau regarding the terms under which any available Canadian financing would be onlent by the Bank of China.

The Longtan hydro project in South China involves the largest of a cascade sequence of ten proposed hydro developments on the Hongshui River. Design studies of aspects of this 4,000 MW project are being undertaken by CIPM-Yangtze Joint Venture with financing from External Affairs. This project is earmarked for inclusion in the 1990 to 1995 development plan. The Canadian consultant has recently requested a further $252,000 from External Affairs to carry out additional studies aimed at determining the optimum design.

As already indicated it is expected that thermal power developments over the next 15 years will constitute about 75 per cent of new generation capacity additions to China's power systems. Table 2.5 lists 33 large thermal projects which are expected to be built during the Seventh Plan. Many of these projects have already been tied to particular suppliers or countries under bilateral financing arrangements. Two of these stations, Shan An and Nantong, have been contracted to a consortium led by GE of the USA, which included Babcock and Wilcox of Canada and Ansaldo of Italy. However, of the 13 projects for which suppliers have yet been determined, it has been suggested that Luo Huang and the Yinkou projects followed by the Han Zhou and Huangpu projects may be the best prospects for Canadian suppliers. There are indications that the Huaneng International Power Development Corporation (a separate enterprise of MWREP which is charged with responsibility for turnkey import contracts for thermal power stations) is likely to pursue future contracts on a negotiated basis, requesting concessional financing, rather than issuing international invitations to bid as was the case for the four stations contracted for in 1986.

TABLE 2.5

THERMAL POWER STATIONS IN SEVENTH PLAN PERIOD (1986-1990)

POWER PLANT	PROVINCE	CAPACITY	TYPE	BUYER	SUPPLIER/COUNTRY	LOAN	STATUS
Shan An	Hebei	2 x 350	Coal	HIPDC	GE/Ansaldo/BW(Can)	Commercial	Signed
Dagang	Tianjin	2 x 330	Coal	C W E	GEI/Italy	Mixed	
Datong	Shanxi	3 x 220	Coal	MWREP	Hungary	Barter	
Shen Tou	Shanxi	2 x 220	Coal	MWREP	Czechoslovakia	Barter	
Zhangze	Shanxi	4 x 220	Coal	MWREP	Russia	Barter	
Ji county	Tianjin	2 x 500	Coal	MWREP	Czechoslovakia	Barter	
Ji Min	Inner Monogolia	2 x 500	Coal	MWREP	Russia	Barter	
Mu Dan Jian	Helongjiang	2 x 200	Coal	MWREP	Russia	Barter	
Dalian	Liaoning	2 x 350	Coal	HIPDC	Mitsubishi	Supplier's Credit	Signed
Shuan Ya Shan	N.E.	2 x 200	Coal	MWREP	Russia	Barter	
Liaoning	Liaoning	2 x 200	Coal	MWREP	---------NOT YET DECIDED------		Most probably barter
Yingkou	Liaoning	2 x 350	Coal	------------------NOT YET DECIDED------			
Yingkou	Liaoning	2 x 300	Coal	------------------NOT YET DECIDED------			2nd stage
Huan Zhong	Liaoning	2 x 800	Coal	MWREP	Russia	Barter	
Yuan Bao Shan	Liaoning	1 x 600	Coal	MWREP	--------NOT YET DECIDED------		
Shanghai	Shanghai	2 x 600	Coal	HIPDC	--------NOT YET DECIDED------		
Nantong	Jiangsu	2 x 350	Coal	HIPDC	GE/Ansaldo/BW(Can)	Commercial	Signed
Wu Jing	East	2 x 300	Coal	MWREP	--------NOT YET DECIDED------		
Beilungang	Ninbo	2 x 600	Coal	MWREP	1 x 600 ---------W.B.--------		Tender
	Zhejiang				1 x 600 NOT YET DECIDED------		Most probably to be negotiated with tender winner
Xinghai	Lian Yun Harbour	2 x 200	Coal	Province	--------NOT YET DECIDED------		Most probably barter
Huan Dao	Shandong	2 x 200	Coal	MWREP	Russia	Barter	
Fuizhou	Fujian	2 x 350	Coal	HIPDC	Mitsubishi	Supplier's Credit	Signed
Dezhou	Shandong	2 x 350	Coal	HIPDC	Hitachi(?)		Negotiated
Yao Meng	Henan	2 x 300	Coal	MWREP	Belgium	Mixed	Signed
Yao Meng	Henan	2 x 300	Coal	MWREP	--------NOT YET DECIDED------		
Han Zou	Hubei	2 x 300	Coal	MWREP	--------NOT YET DECIDED------		Invitation to bid
Yue Uang	Hunan	2 x 300	Coal	HIPDC	U.K.	Soft	
Sha Jiao	Guangdong	2 x 350	Coal	MWREP	--------NOT YET DECIDED------		
Huangpu	Guangdong	2 x 300	Coal	MWREP	--------NOT YET DECIDED------		
Lai Bin	Guangxi	2 x 125	Coal	MWREP	--------NOT YET DECIDED------		
Jiang You	Sichuan	2 x 350	Coal	CWE(?)	Alsthom	Soft	Negotiable
Luo Huang	Chongqing	2 x 350	Coal	HIPDC	--------NOT YET DECIDED		
Pu Sheng	Shaanxi	2 x 320	Coal	MWREP	Romania	Barter	

Source: Canadian industry - not confirmed by official Chinese sources.

2.2.2 Agriculture

China's agricultural policies and programs have been remarkably successful so that the world's most populous country is now essentially self-sufficient in food production. China's arable lands are virtually all under production so the emphasis will continue to be on increases in productivity. The State Council of China estimates that the entire rural economy will require a cummulative \$500 to \$700 billion in investment funds by the year 2000.

Food processing, storage and distribution have been identified as key bottlenecks, which require significant investments to further increase the output of China's agricultural sector.

Wheat sales, the cornerstone of Canada's trade with China, are declining as China becomes increasingly self-sufficient. Canadian agriculture interests should increase efforts to generate new demand for feed grains and canola by helping to develop Chinese livestock, feed milling, oilseed processing, malting and brewing industries. Further sales of dairy cattle and semen should also be pursued as China's agricultural policies seek to diversify production away from staples towards animal husbandry, vegetables and industrial crops.

Technical assistance provided by CIDA facilitated the negotiation of China's first animal quarantine agreement with a foreign country, Canada, and this has recently led to exports of breeding stock to China.

Further details of activities and potential opportunities for agriculture sector exports are described in Appendix B.

2.2.3 Forestry

Proposed targets for forest establishment and management will involve costs estimated at $ 24 billion over the period 1985 to 2000, mostly for local labour, although some equipment may be imported under projects supported by the World Bank and CIDA.

The wood products industry will need to make major investments to supply necessary lumber, particularly for housing which in turn is driven by increasing rates of urbanization in China. Probable investment levels and specific projects have yet to be identified but many opportunities are envisaged for Canadian suppliers of equipment and services for wood harvesting and transport, manufacturing, waste control and energy saving.

Paper-making capacity will have to double by 1990 to meet planned targets and increase by a similar amount in the following decade. Probable investment levels are unavailable. Excellent prospects are judged to exist for Canadian participation in the supply of equipment and high quality pulps and related technical services.

Further details of current activities and potential opportunities for the forestry sector are described in Appendix C.

2.2.4 Mining

China has the world's second largest proven coal reserves, located regionally as illustrated in Figure 4. Coal is the dominant energy source, providing 70 per cent of China's overall energy requirements. Production was 790 million tons in 1985, and is targetted to reach 1200 million tons by the year 2000. Open pit mining, in which Canadian companies have considerable technological expertise, will continue to expand in China although underground mines will remain the mainstay of Chinese production for the foreseeable future.

The Canadian mining industry is the third largest in the world and Canada is the leading minerals and metals exporting nation, including sales averaging some $ 250 million annually to China (excluding potash) over the past few years. China has become the sixth largest producer in the world of nonferrous metals and the fourth largest producer of steel. China's aim is to double the production of most minerals during the 1986 to 1990 period. A large number of investment projects have been identified for the years ahead but the Sector Working Group was unable to assemble the information base necessary to develop a clear picture of overall market prospects and their potential value, despite the activities and some commercial successes of several Canadian firms selling services and equipment. In general terms the best prospects for Canada appear to be in the following areas:

- technical and scientific cooperation;
- mineral exploration technology and equipment;
- mining, processing and smelting of copper, lead and zinc ores, concentrates and metals;
- mining and processing of gold ores; and
- coal mining and processing.

Further details of current activities and potential opportunities on the mining sector are described in Appendix D.

2.2.5 Oil and Gas

Oil provides about 20 per cent of China's commercial energy requirements while gas provides only 3 per cent. China exports some 10 per cent of production as crude oil and refined products, mainly to Japan, and these have accounted for 20 to 25 per cent of its foreign exchange earnings. The recent drop in world oil prices is having an adverse impact on China's foreign exchange balance. However, the impact is less severe than suggested by the price decline as much as China's oil exports are on long term contracts.

In the 1980 to 1985 period China invested an average of about \$1.3 billion yearly in the oil and gas sector, 30 per cent for exploration and 70 per cent for development, according to the World Bank. Investment requirements for future exploration and development are expected to average about \$ 3.0 billion annually, or \$ 45 billion in total in the next 15 years. Refinery investments could total \$ 20 billion over this same period. No estimate is available for requirements for pipelines and distribution systems.

China views Canada as a world leader in certain technologies, including long distance pipelines (particularly control systems), sour gas processing, heavy oil development, production monitoring and control systems and equipment and services for remote areas. In 1985 Alberta-based companies in the petroleum sector exported goods and services to China valued at \$ 77 million.

Future prospects for Canadian industry in this sector in China are good, based on the growing mutual understanding of experts in both countries. Because individual Canadian exporters tend to operate somewhat independently it is difficult to obtain an overview by industry of the potential level of future exports.

Further details on current activity and potential opportunities for exporters within oil and gas systems are described in Appendix E.

2.2.6 Telecommunications

China's total imports of telecommunications equipment, including sound recording and reproducing equipment, were valued at US$ 1.15 billion in 1984, according to China Business Review (September-October, 1985) with Japan accounting for 74 per cent of the total. During the 1986 to 1990 plan period China proposes to spend some $ 5 billion in the telecommunications sector, with emphasis on the importation of technology. However The Economist (January 11/86) has reported that "statistics on the Chinese telecoms market are scarce and unreliable. Estimates of the market size in 1985 for equipment varied from US$ 250 to US$ 600 million".

Canada's telecommunciations equipment manufacturing industry is very large, with global exports accounting for an increasing share of the business. The industry has produced equipment valued at an average of $ 2.7 billion annually in recent years, with exports increasing from 50 per cent in 1982 to 78 per cent in 1984. Remote sensing revenues have increased rapidly, reaching $ 120 million in 1984, including 40 per cent from exports.

Two large competitors to Canada - Cable & Wireless from Britain and ITT from USA - were the first to set up joint ventures in China.

Many Canadian firms have been interested and active in China, with sales over the last three years totalling between $ 50 and $ 100 million. The Chinese see Canada as a good and reliable supplier of telecommunications equipment, based on the:

- excellence of Canadian domestic networks,
- provision of services to rural and remote areas, and
- development of remote sensing applications.

Canadian companies expect to be able to achieve sales to China of between $ 50 and $ 100 million annually within the next five years, representing 3 per cent to 6 per cent of China's expected imports in the telecommunications sector. There seems little demand for consulting services except when associated with specific technology transfer.

Further details of the current activities and projects for exports in the telecommunications sector are described in Appendix F.

2.2.7 Transportation

Transportation constraints are repeatedly identified by Chinese officials as one of the two most critical bottlenecks in the economy. Energy is the other bottleneck and the two are closely related, since coal accounts for roughly 40 per cent of all freight carried by the railroads.

Annual investments for transportation infrastructure are accordingly expected to be very large, averaging $ 5 billion annually over the period 1986 to 1990. Some 40 per cent will be spent on railways, 20 per cent on marine transportation, 20 per cent on roads, and 20 per cent on civil aviation and urban transportation.

Near term prospects appear to lie in urban transit technology, such as joint-venture manufacture of subway cars and bilevel rail cars. The Urban Transportation Development Corporation (UTDC) and Lavalin are currently studying an ALRT line for Beijing. Prospects for Canada also appear to be strong in the railway field, which is projected to utilize 11 per cent of the national budget over the next five years. Canadian Pacific Consulting Services have won a $ 2 million contract (in 1984) for a feasibility study of a coal handling system in Shanxi Province and have undertaken several other assignments. CANAC Consultants are now studying the pilot application of a railway yard computer operation system, an activity which could lead to efficiency improvements and future business throughout the country.

In the aviation sub-sector, de Havilland has sold nine Twin Otters to China. Pratt and Whitney Canada have shipped 40 aircraft engines in the past three years and expect to deliver another 40 in the current and next year.

The Sector Working Group estimates that Canada could sell from $ 30 to $ 100 million annually of transport products and services to China, with prospects rated as follows:

Good

- Specialized consulting services
- Computer software - technology transfer
- Light rapid transit
- Subways and commuter equipment (bilevel coaches)
- Telecommunications
- Containerization technology
- Bulk commodity handling technology
- Aircraft (medium/small) and engines

Possible

- Locomotives and/or diesel engines
- Rotary dump wagons or components
- Electrification supplies
- Signalling equipment
- Containerization equipment
- Bulk commodity handling equipment

Further details of current activities and projects for exports in the transport sector are described in Appendix G.

3.0 FINANCING CONSIDERATIONS FOR CANADIAN EXPORTS

Synopsis

Since it became a member in 1981, China has agreed to borrow more than US$ 3.0 billion from the World Bank, including some US$ 0.5 billion for four power projects. However, barter deals and bilateral concessional finance have accounted for the largest portion of China's power sector imports. Many Canadian exporters now regard China as a spoiled market.

Japan, China's largest trading partner, has offered two credit-mixte facilities totalling some $5.7 billion, primarily for energy, transportation and communications equipment. In 1984 and 1985, ten other OECD countries offered concessional financing of up to $1.6 billion on 48 contracts. China also arranged with Eastern European countries for barter transactions worth very large but indeterminate amounts to pay for the importation of capital goods and commodities.

Since 1979 EDC has offered a line of credit to China totalling $2.0 billion, of which some $159 million had been committed by mid-1986. In May, 1986 a concessional financial facility worth up to $350 million was announced. It is expected that this facility will be blended with the existing EDC line of credit for China, permitting Canadian exporters to access upwards of $1 billion on more competitive financing terms.

Since 1982, CIDA has disbursed about $20 million annually under its bilateral program, primarily concentrating on developmentally sound projects in agriculture, energy, forestry and human resource developments, and plans to double its program during the next five years. Some $6.8 million have been disbursed by CIDA's Industrial Cooperation Program for pre-feasibility activities during the past five years. The recently announced Technology Cooperation Program provides funds for feasibility studies on projects selected by Chinese authorities.

External Affairs has authorized $9.2 million since 1982 to assist exporters under its PEMD and fairs and mission programs.

Power sector planning activities in China have utilized $12 to $13 million of federal support in the past five years and a further $13 million have been requested. Consultants and manufacturers are convinced that future exports will, in large measure, depend upon the amount and terms of financial support which can be provided, assuming that Canadian quality and price meet those offered by our competitors.

3.1 GENERAL

As a consequence of the progress of economic reforms flowing from China's more open-door policy, China's foreign trade nearly quadrupled between 1975 and 1984 and grew even more rapidly in 1985. In recent years China has managed to preserve a healthy trade balance with exports generally exceeding imports until 1985, when imports surged in response to continuing internal economic reforms. The 1985 negative trade balance of about US$ 9.7 billion caused the government to take measures to restrict certain classes of investments and imports and to increase exports.

Several aspects of China's current trade policy which will affect Canadian exports can be discerned, but the overall impact on future Canadian exports is difficult to predict, because the mechanisms for policy implementation are still being developed, tested and refined.

One significant longer term policy, according to the World Bank, is to incur moderate foreign trade deficits, with increased but cautious reliance on external finance. Another overall policy is to use limited foreign reserves to import essential technology and critically short materials. These policies should result in an increased willingness to use foreign exchange to finance important projects in sectors judged to have overall priority for national development, particularly the power, transport and communications sectors which are definite bottlenecks.

A somewhat contradictory policy, however, makes it easier for industries earning foreign exchange to import equipment and services than for industries which do not earn foreign exchange. Electrical energy and transportation services (other than the international air carrier services of CAAC) are not marketed internationally and do not earn foreign exchange directly. Hence these sectors have had to struggle to obtain permission to import. The oil and gas sector, by contrast, accounts for a substantial part of China's foreign exchange earnings and reportedly has little difficulty in importing necessary equipment and services.

Chinese policy makers are apparently now willing to consider increased imports of equipment and services in the power sector in recognition of the sector's indirect role in helping other industries to win more export business. The recent order for thermal power plants is an example. The same may be true in the transport sector, particularly railroads where large numbers of locomotives have been ordered from General Electric (USA). But such infrastructure projects appear to depend in large measure on associated external finance as the authorities try to minimize the overall trade imbalance. Exporters in these sectors can expect continuing pressure from Chinese agencies to provide export credits and to be willing to undertake countertrade.

China's willingness to import technology is expected to be influenced in large measure by its overall economic performance, particularly as this affects its balance of trade and foreign exchange reserves. Recent increases of imports for its power and transport sectors and to modernize industrial production facilities appear to be influenced by export credits, as discussed in the following section.

Since 1949 China has developed a significant trade relationship with COMECON countries; primarily on a barter basis. Although this level of trade declined during the 1960's and early 1970's, during the past decade China has increasingly turned to long term barter agreements with the USSR and with COMECON countries, despite continuing disagreements which have inhibited normalization of diplomatic relations.

3.2 International Sources of Finance

Commercial financing, official export credits and developmental assistance on a bilateral (i.e. CIDA) or multilateral basis from the

International Bank for Reconstruction and Development (IBRD) can be used to provide convertible currency to Chinese borrowers to purchase goods and services from abroad. In some case, this convertible currency can be made available to cover certain aspects of local costs incurred within China.

Canadian financing sources for projects in China are reviewed in Section 3.3 of this report.

The objectives of the different lending institutions vary widely. Concessional lending is commonly extended to a developing country by aid agencies to finance large projects, often in cases when the projects do not by themselves generate sufficient foreign exchange to enable the country to repay these loans on a commercial basis but are judged to be essential for the orderly development of the sector. The International Development Association (IDA) of the World Bank group lends on this basis. The IBRD, on the other hand, lends at terms slightly above its cost of funds for developmental projects in countries deemed capable of repaying loans on more commercial terms.

China joined the Asian Development Bank in 1986, and will be eligible to start borrowing from that institution in 5 years.

Since mid-1981, in excess of $ 3 billion in loans has been approved for China by the World Bank group. IDA involvement in China has been primarily in education and health. The IBRD is mainly active in telecommunications, power and other infrastructure activities.

The IBRD has so far agreed to finance four power projects: two hydro plants, one transmission system and one thermal plant (including transmission facilities). Details are provided in Table 3.1. These four projects have accounted for roughly 10 per cent of World Bank lending in China. IBRD loans of US$ 539.4 million accounted for 17 per cent of total project costs and are being used mainly to finance specialized equipment not readily available in China. In the two hydro projects the IBRD is not financing turbines and generators, since these are expected to be co-financed by export credits offered by suppliers. The World Bank's largest loan of US$ 225 million is for a two-unit thermal plant (Beilungang), with the Bank financing only the foreign costs of the first unit. The second unit is expected to be financed by commercial bank loans and/or export credits.

If the pattern of recent years persists, with the IBRD committing in excess of $ 1 billion to China annually, power sector loans might be expected to account for US$ 100 to US$ 200 million annually.

The IBRD's expressed policy in the power sector in China is to concentrate in future on hydropower developments and backbone transmission lines. This indicates that thermal generating projects, expected to account for some 75 per cent of additional capacity in the next fifteen years, will not be supported by World Bank financing.

Most Canadian exporters report that China has been so successful recently at obtaining concessional financing from export credit agencies that China is now regarded in certain circumstances as a spoiled market. Six other countries have offered credit-mixte financing to the Bank of China worth a total of $6.4 billion, as summarized in Table 3.2. In addition to these

Table 3.1

CHINESE POWER PROJECTS FINANCED BY WORLD BANK

No	Title & Description	Total Project Cost	World Bank Loan		Items to be Financed
			Amount	Date Approved	
		US $ million			
1	Lubuge Hydro - 450 MW (Yunan Province)	811.7	145.4	Jan/84	Selected civil works specialized equipment, consultants; and training
2	Second Power Project - (Jiangsu Province, East China Power Grid). 500 kV transmission line, Xuzhou to Shanghai	282.8	117.0	Jan/85	Specialized equipment, consultants and training
3	Third Power Project-1200MW Coal-Fired Thermal plant at Beilungang (East China Power Grid) using coal from Shanxi	1,044.9*	225.0*	June/86	Major equipment for first of two units; consultants and training
4	Yantan Hydro - 1100 MW Guangxi Autononous Region	1,033.1	52.0	June/86	Specialized equipment and consultants
TOTAL		3,172.5	539.4		

Source: World Bank

facilities, Sweden, Italy, France and West Germany offer credit-mixte financing on a fairly regular but ad hoc basis. Australia, the Netherlands and Austria have each offered similar financing for specific contracts.

The USA is reportedly considering legislation to provide credit-mixte financing of $300 million to $500 million annually, in terms of higher authorization by the Export Import Bank and authorization to the US Agency for International Development (USAID) to operate in a communist country. These funds are not yet approved or targeted on any particular country so the potential impact on competition for exports to China is unclear at this time.

Concessional financing for preliminary studies of investment projects in China has been provided from the USA through the Trade and Development Program of its International Development Cooperation Agency. At the end of 1985 some $4 million of the total available funds of $6 million had been committed for studies of projects in various sectors. In January 1986, USA officials offered the remaining US$ 2 million for engineering studies of the Three Gorges hydroelectric project, but this offer was rejected by China. However, the same funds were apparently included in revised USA offer (of March 1986) to finance a bankable feasibility study of this project by American consultants.

Table 3.2

CURRENT CONCESSIONAL FINANCING OFFERED TO CHINA BY OTHER COUNTRIES

Country and Institution	Facility	Amount Cdn $Millions	Currency	Rate and Terms	Targeted Sectors
Japan/EID or MITI	Dedicated to seven projects	2,370	Yen	i: 3.5% g: 10 yrs r: 40 yrs	Hydro-electric power, railways and telecommunications
Japan/EID or MITI	Untied line of credit	3,346	Yen	i: 6.5% g: 2-6yrs r: 9-13yrs	Oil and coal development projects
Britain/ ECGD	Line of credit	206	£Sterling	i: 5.0% g: 5 yrs r: 15 yrs	Unofficially power and mining projects
Denmark/ EKR	Line of credit	28	U.S.$	i: 0.0% g: 10 yrs r: 35 yrs	General purchases of capital equipment
Denmark/ EKR	Dedicated to specific projects	117	U.S.$	i: 0.0% g: 10 yrs r: 35 yrs	N/A
France/ BFCE	Line of Credit	272	U.S.$	N/A	Telecommunications
Switzerland/ GERG	Line of Credit	50	U.S.$	i: 0.0% g: 10 yrs r: 20 yrs	Not targeted. To be blended with consensus rate funds for specific projects.
Belgium/ MFA	Line of Credit	10	U.S.$	i: 0.0% g: 10 yrs r: 30 yrs	General purchases of Belgian capital equipment.
TOTAL		6,399			

i: Interest Rate
g: Grace Period
r: Repayment Term

Notes:

1. Exchange rate as of December 6, 1985
2. Amounts from Japan and Britian represent blended total utilizing concessional funds. Amounts from other countries represent concessional funds which can be blended with loans at Consensus rates to provide increased total funding.

The UK announced earlier this year that it is offering China an expanded £300 million per year concessionary loan fund for 5 years. Loans will carry an interest rate of 5 per cent over 20 years including a five year grace period. Lenders are to be reimbursed the difference between the cost of the soft loan and that of commercial loans. This will allow UK exporters to select their own commercial sources of credit, with the Export Credit Guarantee Department subsidizing the cost of capital.

Notifications from competing export agencies of concessional financing offered between January, 1984 and December 1985 indicate that eleven OECD countries, in attempts to win contracts, have offered concessional funding on 51 occasions worth up to $ 2.2 billion. These notifications are summarized in Table 3.3. The power sector has attracted the largest amount of such concessional financing offers.

Japan has become China's most active trading partner, with net exports to growing from low levels in 1983 and early 1984 to more than US$ 1.6 billion in the fourth quarter of 1984 and nearly US$ 5 billion in the first half of 1985. These amounts exclude Japanese goods trans-shipped through Hong Kong, which, if included, would increase Japan's trade surplus further. Official Chinese Customs Statistics, compiled by the Rock Creek Research Institute, show that net exports to China by Japan have been particularly heavy in SITC category 7, machinery and transport, far in excess of net exports by all other countries. In 1984, for example, Japan's net exports to China of category 7 equipment totalled US $3,664 million, compared to US$ 1,068 million from the USA, US$ 420 million from West Germany and only US$ 16 million from Canada. In the first quarter of 1985 net exports of machinery and equipment increased considerably, with Japan continuing to be the dominant supplier. China reportedly swaps its oil exports to Japan for steel.

Much of Japan's exports are facilitated by two credit-mixte facilities, worth in total some $5.7 billion and targeted on hydroelectric power, railways, telecommunications, oil and coal development projects. This concessional financing by Japan is in large measure responsible for the strength of that country's favourable trade position concerning machinery and transport, the second largest category of net imports by China and a category of great interest to Canadian industry.

3.3 Canadian Sources of Finance

Several sources of finance can be provided by Canada to support exports for capital projects in the power and other sectors in China. In order of importance these include the federal government, the commercial banks, the provincial governments and equity participation by investors. Each is discussed separately.

3.3.1 Federal Government

Federal agencies involved in financing Canadian exports include the Export Development Corporation and the Canadian Wheat Board. The Wheat Board confines its activities to extending credit to foreign buyers of western Canada grains, normally for payment within three years. EDC provides credit insurance or guarantees for grains not covered by the Wheat Board, other commodities and for capital goods and services.

Table 3.3

CHINA: SUMMARY OF CONTRACTS OFFERED CONCESSIONAL FINANCING BY OTHER COUNTRIES IN 1984 AND 1985

A. BY SECTOR

Sector	Number of Notifications	Contract Amount[2] (up to Cdn. $ Millions)	Average Grant Element (%)
Manufacturing	17	526.1	26.8
Agriculture	15	230.1	39.5
Power	10	766.3	26.1
Telecommunications	5	545.4	28.9
Forestry	3	60.0	28.4
Petro-Chemical	1	58.5	25.3
Total	51	2,186.4	29.6

B. BY COUNTRY

Country	Number of Notifications	Contract Amount (up to Cdn. $ Millions)	Average Grant Element (%)
1. Denmark	15	386.8	37.6
2. Sweden	13	575.0	25.6
3. Italy	7	115.8	37.6
4. West Germany	4	144.0	29.3
5. France	4	147.9	32.2
6. Japan	3	537.6	18.8
7. Belgium	1	4.5	20.9
8. Australia	1	45.5	25.0
9. Britain	1	37.9	25.0
10. Netherlands	1	10.5	25.4
11. Austria	1	180.0	26.6
Total	51	2,186.4	29.6

EDC also provides medium and long-term export financing directly to foreign buyers of Canadian goods and related services, and indirectly through note purchase arrangements at terms consistent with the OECD Arrangement on Officially Supported Export Financing. Except for the nuclear sector, the OECD arrangement requires that repayment terms not exceed ten years for loans to China. (Separate agreements specify different terms for some specific sectors of export activity). Minimum interest rates (Consensus rates) are also set by the OECD, according to schedules that vary with the cost of funds, but nonetheless allow for financing proposals in China at rates which are fixed at the time of commitment for the life of the loan. At present the minimum permitted Canadian dollar interest rate for China under the Consensus is 8.8 per cent[1]. EDC has in place a General Financing Protocol, signed with the Bank of China in October 1984, to facilitate the provision of financing support totalling up to $2.0 billion to Canadian exporters. The current

1/ China is a category III country and is entitled to the best rate. Rates are subject to review every six months.

protocol replaces an previous line of credit from 1979 with the same ceiling. Under these protocols some $35 million was committed over the period 1979 to 1985 and a further $124 million in the first half of 1986. (Some 90 per cent of EDC total funding of $159 million has been in the power sector).

The government announced in May, 1986 the establishment of a $350 million concessional financial facility to be established between EDC and the People's Republic of China. The $350 million made available is intended to form part of the General Financing Protocol signed between EDC and the Bank of China in October 1984. Transactions requiring concessional financing support will be considered on a case-by-case basis in accordance with prevailing guidelines for financing support under Section 31 of the Export Development Act. This concessional financing could result in soft loans in excess of $1 billion if blended with Section 29 funds at Consensus rates.

Government financing on a grant basis is provided by CIDA for projects requested by the Government of China that meet developmental eligibility guidelines as well as Canadian content criteria. This funding is normally provided under CIDA's bilateral program.

When CIDA's bilateral program in China began in 1981 its Indicative Planning Figure (IPF) for the period 1982 to 1987 was $80 million, or about $16 million annually.[1] The CIDA bilateral program has concentrated on agriculture, energy, forestry and human resources development with commitments as outlined in Table 3.4. CIDA's bilateral program focusses on technical assistance and does not provide for financing of capital projects. In 1985 the IPF was increased to $100 million or $20 million annually. Prime Minister Mulroney announced in Beijing in May 1986 that CIDA's committments for projects in China will increase to $200 million for the period 1987 to 1992.

Table 3.4

CIDA BILATERAL PROJECTS APPROVED IN CHINA, 1982-1986

Sector	No. of Projects Approved	Commitments Amount $Million	Commitments % of Total
Agriculture	7	20.0	23.8
Forestry	3	17.0	20.3
Energy	2	13.8	16.5
Human Resources Development	15	32.0	38.1
Other	6	1.1	1.3
TOTAL	33	83.9	100.0

Source: CIDA

[1] Disbursements by CIDA, which necessarily lag the commitments, have ranged from less than $1 million in 1982 to more than $16 million in 1985/86.

CIDA's 1985/90 IPF of $102 million is already more than 80 per cent committed. With additional resources becoming available after 1986, new projects can be developed which respond to Chinese needs and Canadian interests.

Cabinet decided not to implement the proposed Trade and Development Fund. However, it has been announced that credit-mixte loans, which may be extended under EDC's Canada Account to match foreign concessional financing, should be counted as part of Canada's Official Development Assistance in accordance with internationally accepted developmental criteria.

CIDA also operates the Canadian Project Preparation Facility through the Industrial Cooperation Division (INC), which provides up to $350,000 for eligible prefeasibility or project definition studies in less developed countries. The program is responsive to exporter requirements and assumes that follow-on project financing will not invove CIDA's bilateral program. The Industrial Cooperation program also includes grants to exporters to offset project identification costs, preliminary and viability studies, and testing and adaptation costs associated with proposals to transfer Canadian technology through joint ventures for projects in less developed countries.

In June, 1986 a new CIDA/INC program was announced to finance feasibility studies by Canadian firms. A total of $5 million will be provided under the Technology Cooperation Program for feasibility studies on priority projects identified by the Ministry of Foreign Economic Relations and Trade (MOFERT).

Since 1981 the Industrial Cooperation Division has disbursed $6.8 million to support its program for China. More than half of these funds were for studies under the Canadian Project Preparation Facility. Details are provided in Table 3.5. The six power projects which have received a total of $2.58 million from the Industrial Cooperation Program, represent 38 per cent of total funding provided for China and 71 per cent of funds from the Project Preparation Facility account.

In May 1985, the Cabinet Committee on Economic and Regional Development approved funding for trade development and trade promotional initiatives for the Asia/Pacific and United States regions. Out of these funds, approximately $6.5 million was allocated for initiatives in the Asia/Pacific region. External Affairs has been able to undertake the following activities in the power sector in China, (included in Table 2.3):

a) A feasibility study of the Longtan Hydro Project - $600,000.
b) Part of the feasibility study for Three Gorges - $300,000.
c) Study of Possible Investment in Chinese Power Sector - $42,000.

More funds are expected to be made available between 1986 to 1990, although the amount to be allocated for China is as yet unclear. So far, the only activity that has been earmarked for the power sector in China for 1986 to 1987 is a $300,000 commitment to support Canadian General Electric in the development of a turbine model for the Three Gorges project.

Table 3.5

CIDA - INDUSTRIAL COOPERATION PROGRAM DISBURSEMENTS FOR CHINA PROJECTS 1981-1986

PROJECT TYPE		NUMBER OF PROJECTS AND DISBURSEMENT BY YEARS 81/82	82/83	83/84	84/85	85/86	FIVE YEAR TOTAL
Project	No.	--	(1)	(1)	(5)	(7)	
Identification	$	--	21,891	18,800	540,386	73,745	654,822
Seminar Workshop	No.	--	(7)	(7)	(9)	(9)	
Meetings	$	--	300,000	218,437	305,828	50,200	874,465
Missions	No.	--	--	--	(2)	(6)	
	$	--	--	--	4,275	327,619	331,894
Industrial	No.	--	--	(2)	(5)	(5)	
Development	$	--	--	261,413	312,965	44,023	618,401
Starter Study	No.	--	(6)	(6)	(15)	(39)	
Starter Study	$	--	10,000	69,183	56,788	52,269	188,240
Viability	No.		(1)	(1)	(8)	(18)	
Study	$		45,325	20,538	158,950	90,341	315,154
Canadian Project Preparation	No.	(1)	(1)	(1)	(2)	(5)	
Facility	$	125,000	238,114	156,000	937,000	2,169,410	3,625,524
Technical	No.	--	(2)	(2)	(4)	(2)	
Input	$	--	74,000	50,686	88,125	38,475	251,286
TOTAL	No.	(1)	(18)	(20)	(50)	(91)	
	$	170,325	664,543	774,519	2,404,317	2,807,607	6,821,311

Source: CIDA

Support is also available through External Affairs' Program for Export Market Development (PEMD), where provision for a cost-sharing arrangement with the exporter can facilitate the presentation of feasibility studies to potential buyers on very favourable terms. PEMD will also assist in defraying costs associated with bid preparation, market identification, trade fair participation, consortia formation and defining and implementing market penetration proposals.

In all cases, PEMD assistance is repayable from incremental sales generated. In the past four years PEMD approved a total of 759 project applications for China and authorized $7.7 million in federal assistance, of which 38 per cent had actually been spent by the end of March 1986. PEMD activities in China have increased steadily each year as a proportion of the overall PEMD program so that China is now the most active country. Further information on the PEMB program support for China is summarized in Table 3.6.

External Affairs also provides support for trade fairs and missions. Support to participate in trade fairs and mission to China and missions from China to Canada totalled $1.3 millions from 1982 to 1983 through 1985 to 1986 as indicated in Table 3.7. Expenditures in 1985 to 1986 included $547 thousand supporting Canadian participation in a major international agriculture trade fair in Beijing.

Table 3.6

PEMD SUPPORT FOR CHINA ACTIVITIES, 1982-1986

Fiscal Year	No. of Projects Approved	Assistance Authorized ($000)	Actual Expenditures ($000)	Recorded Benefits ($000)	Total Repayment ($000)
1982/83	69	733.4	552.4	6,912.9	5.1
1983/84	135	1,062.0	614.1	349.7	7.0
1984/85	243	3,505.3	1,418.2	337.5	6.8
1985/86	312	2,383.7	371.5	0	0
4 YEAR TOTAL	759	7,684.4	2,956.2	7,600.1	18.9

Year	1982/83	1983/84	1984/85	1985/86
China Projects approved as % of Total	1.7	3.2	5.3	8.7
China Assistance Authorized as % of Total	1.8	2.5	5.2	6.7

Source: External Affairs

3.3.2 Commercial Banks

Canada's commercial banking sector, including the Schedule B banks, also has an interest in the China market. Some concern has been expressed about the effects of continued weakness in the export price of oil, which is contributing to pressure on China's trade balance, and about the impact of heavy borrowings forecast over the medium term to meet the country's high growth targets. However, all Canadian Schedule A banks have expressed a keen interest in extending financing in that market, notwithstanding the strong competition for business that has reduced lending margins. Five Canadian banks have now established offices in China. In most cases these banks are currently well under their authorized lending limits for this market. An

Table 3.7

TRADE FAIRS AND MISSIONS SUPPORT FOR CHINA 1982 to 1986

FISCAL YEAR	TOTAL BUDGET
1982 to 1983	$ 27,000
1983 to 1984	295,555
1984 to 1985	200,075
1985 to 1986	784,200
Four Year Total	$1,306,830
1986 to 1987	$ 223,500*

* Projected
Source: External Affairs

enhanced commercial presence may be possible through co-financing ventures that are promoted by international financial institutions such as the World Bank.

It is difficult to obtain a reliable indication of the volume of loans which Canadian banks might be willing to make for major projects in China. Informed opinion indicates that all banks in total might be prepared to lend a total of $1 billion over the next 15 years provided that good projects were proposed and that China's economic and financial situation remains healthy.

Many export transactions involve EDC financing up to 85 per cent of the Canadian export value with the remaining 15 per cent financed from other sources such as commercial banks. If the Canadian commercial banks were prepared to lend $1 billion for projects in China, and if EDC could provide funds in the 85:15 ratio, a combined total of some $6 billion might be available to finance Canadian exports. Of course, such export orders could not be won unless many conditions were met, particularly competitive prices and competitive financing terms.

3.3.3 Provincial Governments

To an ever increasing extent provincial governments are becoming involved in China trade promotion. At the present time, Ontario has five full-time officers working on China trade and British Columbia has set up a special three-man task force on China headed by Canada's former Minister-Counsellor (Commercial) in Beijing. Alberta has two officers and a large support staff. Quebec has two full-time officers and the remaining Provinces have at least one officer who dedicates a significant amount of time to trade with China. These officers also service the twinning relationships that have been established between Canadian and Chinese provinces.

Most provincial governments offer some funding assistance to exporters. Alberta, Ontario and Quebec in particular have programs that include loans to exporters to assist in financing various costs associated with exporting, including prefeasibility and feasibility studies, travel and advertising. Assistance from these sources, however, is quite modest in relation to capital project requirements. Quebec may also be prepared, through the Société du Développement Industriel, to consider guaranteeing export loans to foreign buyers, to complement financing arranged through EDC or other financing intermediaries.

The provincial governments and in certain cases cities are also hoping to establish a presence in China. Ontario is working with the Province of Jiangsu to establish a Technology Exchange Centre in Nanjing which will house two co-directors from Ontario. The city of Montreal is planning to establish a representative in Shanghai, its sister city in China.

All of this increasing activity is useful for Canada and the exporting community. However, it also highlights the need for increased coordination and discipline to ensure that Canadian interests are represented in a consistent manner.

The East Asia Bureau of External Affairs meets informally with the China program officers of the Provinces three to four times a year to discuss areas of mutual interest. Recently these meetings have been poorly attended and usually by different officials on each occasion. These meetings should be continued and the Provincial Governments should be asked to name representatives who will be their China liaison with Ottawa and Beijing.

3.3.4 Equity Investment

In November, 1984 Madame Qian Zhengying, China's Minister of Water Resources and Electric Power, inquired about the possibility of Canadian joint venture co-operation in development of key projects such as large hydroelectric schemes. Equity participation in terms of joint ventures between Canada and China was examined for External Affairs[1]. The analysis suggested that equity participation in selected projects could provide an effective demonstration of how China could establish power utility enterprises which are self-financing. It also identified the key principles and a framework of conditions which would have to be adopted by China to attract equity participation or significant foreign exchange loans for large power projects such as the Three Gorges and Gehe Yan developments.

Chinese authorities have not put in place the necessary framework of conditions to permit such foreign participation so there is little practical point in considering equity investments in the power sector at this time. In the reform era now underway in China, however, this situation could change rapidly.

3.4 POTENTIAL DEMANDS BY CANADIAN EXPORTERS

Virtually all Canadian exporters contacted by the Task Force expressed the view that competitive financing for export orders needs to be provided,

1/ Review of Investment Opportunities in Power Sector Development in the People's Republic of China, R.L. Walker & Partners and Niagara Consulting Services (1981) Ltd., January, 1986.

along with high quality goods and services at competitive pricing, if Canadian firms expect to win significant orders from China. The same point has been made consistently by Chinese officials at all levels, including the Minister of Water Resources and Electric Power during her 1985 visit to Canada.

Some suppliers may be able to win orders in China without having to be too concerned about Canadian financing. Contracts financed by the World Bank require that Chinese authorities use international competitive bidding procedures but, as explained earlier (section 3.2), such financing is concentrated on specialized equipment and services and often excludes conventional equipment which can be supplied from within China or co-financed. The policy of the World Bank is to use its limited financial resources to help generate co-financing of other components through export credits.

Suppliers of highly specialized equipment, such as Timberland Equipment and Trench Electric, have been able to win contracts because the Chinese authorities are prepared to spend modest amounts of foreign exchange for their equipment. Such specialty equipment suppliers can also expect to win some business as subcontractors to larger firms. But contracts of this nature are usually valued at most at a few million dollars. Competitive financing needs to be provided for suppliers on the larger contracts because without such financing suppliers will be handicapped and jobs will be lost in Canada.

3.4.1 Types of Financial Assistance

Several different types of financial assistance to support exports can be identified as discussed hereunder.

a) Market Penetration and Client Influencing

Most exporters value highly the seed money provided by the federal government to help them develop business intelligence and contacts, particularly in the China market because of its vastness and complexity. External's PEMD and trade fairs and mission programs and CIDA's Industrial Cooperation Program are the major instruments and both are intended to complement efforts and expenditures by serious exporters. Together these programs have authorized nearly $16 million for activities in many sectors in China over the past five years, with the level of activity and the amounts involved increasing year by year to a total of just over $6 million in 1985 to 1986. However, some $4.7 million of authorized PEMD assistance has not actually been disbursed so overall expenditure are about two thirds of the figures indicated. (Details are given in Tables 3.4, 3.5 and 3.6).

Although the Task Force has not seen any comprehensive analysis of the probable economic benefit to Canada generated by those expenditures, it recognizes that the programs are effective and should be continued. Certain recommendations on how these programs can be improved are provided in the Chapter 4.

b) Technical Assistance for Economic Development

CIDA's bilateral program in China, funded in 1985 to 1986 at some $15 million annually, focuses primarily on technology transfer and training in three sectors - agriculture, energy and forestry as well as on human resources development for all parts of China's economy. Chinese officials and Canadian exporters are well aware that the goodwill such technical cooperation can generate can be an extremely valuable adjunct to trade promotion.

The IPF for CIDA's bilateral program has recently been doubled and assistance will continue to be concentrated in the four sectors agreed between CIDA and China. The Task Force believes the CIDA bilateral program has been and will continue to be helpful in meeting China's developmental objectives and in supporting exports in certain key sectors.

c) Financing of Pre-Investment Studies

An increasingly common practice of competitive exporting nations, including Canada, is to seek to improve prospects for future export sales by offering free studies to help Chinese authorities in the pre-investment stages of major development projects. Most exporters endorse this concept - particularly consulting engineers - and the government uses four different programs to finance these studies:

- CIDA Industrial Cooperation Program (generally limited to $350,000 per project). As indicated in Table 3.5, some $3.6 million has been committed on studies under the Canadian Project Preparation Facility in the past five years for pre-feasibility studies.

- External Affairs trade development and trade promotion initiatives have committed $942,000 for three power sector studies in the past two years. Details are provided in Table 2.3. It should be noted that there were special circumstances and External would not normally devote as much of its resources to one sector.

- The CIDA bilateral program has offered $8 million for a feasibility study of the Three Gorges hydro development in 1986.

- PEMD can also be used for feasibility studies.

The results of these studies cannot yet be evaluated in terms of economic benefit to Canada because, by their very nature, the studies concentrate on pre-investment activities. It is often several years after completion of the feasibility studies that the projects in question are implemented. There are both direct and indirect linkages between economic benefits to Canada and these specific studies. The goodwill generated by CIDA's activities in the power sector is believed to have indirectly resulted in Canadian firms being invited to bid on the Lubuge hydroelectric project and on the package of 500 KV transmission sub-station equipment which ultimately resulted in export orders of more than $10 million. Moreover, the commercial insights obtained while actually working with MWREP institutes is normally much more detailed than can be obtained through normal business development activities.

Canadian exporters might be expected to have fewer opportunities to bid on contracts to China if Canada does not continue to provide such free studies. Other exporting countries are doing it, and the Chinese authorities now regard the practice as a type of entry fee for access to their market.

The instruments which have been available to support pre-investment activities have had a significant gap. The CIDA bilateral program does include feasibility studies - these studies are, however, selected on the basis of the developmental impact within CIDA's agreed priority program for China and the number of feasibility studies is likely to be limited. The other principal instruments providing support for pre-investment studies to Canadian exporters (PEMD, CIDA/INC-CPPF) are essentially intended to cover only up to apre-feasibility level of project assessment. EDC financing is available to cover pre-investment studies. However, experience has shown that most such studies undertaken by foreigners are provided on a free of charge basis. Accordingly it seems unlikely that China would apply for EDC financing of these studies except where they form a part of a package of capital investment financing.

The USA has had a Trade Development Fund in place for a number of years. The World Bank has established a US$25 million technical assistance line of credit (with IDA funds) for project preparation activities. Many bilateral competitors are supporting full pre-investment studies on a grant basis. Hence, in competing for major capital projects in China, Canadian exporters have been at a disadvantage in not having a facility which can be accessed to cover the final pre-investment stage of project investigations. The recently announced Technology Cooperation Program of CIDA/INC should help bridge this gap.

The strategy should obviously focus financing of pre-investment studies on sectors and projects with good prospects for generating future exports from Canada. Recommendations on this subject are offered in Chapter 4.

d) Commercial Finance

In addition to piggy-back loans with EDC, commercial banks may also finance the purchase of Canadian goods and services by lending directly to the purchaser.

Power projects in China have not been commercially financed until quite recently. In mid-1985, however, bids were called internationally for four coal-fuel generating plants valued at $1.0 billion. A Canadian firm (Babcock & Wilcox Canada) in an international consortium used EDC support to help win some $203 million of work. Similar opportunities can be expected in the power and certain other sectors in future.

e) Concessional Financing

Canada has recently (May 1986) offered China concessional financing for matching competitive financing offers as required to assist Canadian exporters to win contracts for implementing capital projects. Several other countries have been successfully winning contracts in the power sector in China by offering concessional financing to back competitively priced proposals, as summarized in Table 3.2. The most notable example of the successful use of this tactic is provided by Japan.

3.4.2 Specific Demands in Power Sector

Federal government financing, totalling $11.3 million for major activities in the past five years, has been authorized to support the activities of Canadian firms pursuing work in the China's power sector. Power sector organizations have also benefitted from the $7.7 million approved under

PEMD for China and a small share of the activities under CIDA's Industrial Cooperation Program which are not included in Table 3.5. Total approved federal government support to the China power sector over the past five years is accordingly estimated to be in the order of $12 to $13 million.

The federal government has already received further requests from the Government of China for about $13 million for financing of technical assistance in the power sector, as follows:

- $8 million for the feasibility study of the Three Gorges water control project;
- $4.5 million for the South China planning study;
- $0.25 million for further studies of the Longtan hydro project.

Some 68 per cent of China's electric power is produced by thermal generating plants, a pattern which will persist for some time. During the past year China has decided that it is necessary to accelerate its development of thermal generation capacity and a special agency, the Huaneng International Power Development Corporation, has been established to import about 10 per cent of its annual thermal capacity additions on a turnkey basis. Major contracts worth in total about $1.0 billion were signed earlier this year for four thermal generating stations, each of 700 MW capacity. The first significant contract under this new thermal program was awarded to an international consortium with significant Canadian participation.

EDC has already agreed to provide a total of $159 million at Consensus terms in support of Canadian exporters to China's power sector. EDC has also been approached with a request to consider provision of up to $350 million of concessional financing for Canadian equipment and services for construction of the Gehe Yan hydro project. (This could be achieved by blending Section 29 and Section 31 funds). Further requests for concessional financing of thermal power plants can be anticipated. The judicious use of some of the recently announced concessional financing from EDC as credit mixte could help Canadian exporters win strategically important power projects.

Starter studies of hydro developments by consultants, typically costing between $200,000 and $600,000, tend to lead to further requests for government funding - either for more detailed studies (Three Gorges and Longtan projects) or for project implementation (Gehe Yan). Such hydro projects by their nature take a long time to study and implement. So far Canadian firms have won several small contracts from Chinese clients in the hydro generation sub-sector, including two static exciters sold by CGE for the Gezhouba hydro plant. China is obviously going to devote more capital to thermal generating projects than hydroelectric projects in the next five to fifteen years. Canadian firms can be expected to continue to pursue contracts for both types of generation projects and to seek EDC financing for support.

The starter study for the Gezhouba EHV transmission line provided additional fees on that work for the Canadian consultant (Teshmont) from the Chinese client. Canadian suppliers have sold some $15 million of equipment for sub-stations. There are likely to be increasing opportunities for Canadian firms to win additional contracts for EHV transmission systems associated with the rapid expansion of power system projected over the next 15 years.

Substantial additional requests can be expected for future power sector activities in China, bearing in mind recent developments in this market and the increase in activities by Canadian firms. While it is obviously not possible to be precise about the financing requirements it has been estimated that China will likely spend between $140 billion and $200 billion in the power sector over the period 1986 to 2000, of which some 15 per cent or from $20 to $30 billion might be anticipated for import of foreign equipment and services. It is not unreasonable to postulate that Canadian firms could win up to 10 per cent of this business, representing between $2 and $3 billion in contracts over the next 15 years, for most of which Canadian financing would be required.

Historically Canada was amongst the top six exporters of heavy electrical equipment internationally but lost this position some years ago. Domestic orders and occasional export contracts were sufficient through the late 1960's and 1970's to effectively utilize Canadian industrial capacity. However, the heavy electrical industry is currently reported to be operating at about 40 per cent overall capacity utilization level. Although not all electrical and mechanical equipment for Canadian power systems is Canadian sourced, the majority of power utility equipment is manufactured domestically. Electrical and mechanical equipment represents about 40 per cent of power utility investements. Currently total investments by Canadian utilities are running at about $6 billion annually and are expected to continue at about this level throught the 1990's (see Figure 11, Chapter 4).

The Canadian electrical industry is reported to have a capacity which would represent approximately $6 billion per year at an 80 per cent utilization level, half of which is currently not being used. On the basis that Canadian exports to China power sector developments might total $2 billion over 15 years, it seems reasonable to assume that there would not be a significant capacity constraint should this level of Canadian exports materialize.

As discussed in Section 3.3.2, a total of $6 billions of Canadian financing might be available over the next 15 years and would be more than sufficient to meet anticipated demands for power sector exports. However, as discussed hereinafter in Section 3.4.3, potential financing requirements for export sales identified across the seven sectors reviewed by the Task Force appears to considerably exceed the level of financing assumed to be available at this time. While the amount of available Canadian financing does not appear likely to constrain exports in the near term, the situation should be monitored closely in the light of future updating of projected export prospects.

3.4.3 Prospective Future Exports

In accordance with its mandate the Task Force has concentrated on prospects of Canada's electric power sector for further exports in China. Consideration has also been given to the export prospects of other sectors since the potential demands for government assistance should bear some relationship to anticipated levels of future exports.

Some indication of exports by all seven sectors in the recent past and the potential level of exports in future years is provided in Table 3.8.

Average past exports listed in Table 3.8 are slightly higher than data reported by Statistics Canada in Annex IV. Discrepancies may be partly due to the inclusion of services in Table 3.8 (not reported by Statistics Canada) and differing estimates by industry groups of past sales.

The figures in Table 3.8 indicate that total exports from the seven key sectors averaged $1.4 billion annually over the past three years, with commodity exports in the agriculture, forestry and mining sectors accounting for 90 per cent of the total. Agricultural commodities alone account for approximately half of past total exports.

If wheat and flour exports decline as expected in the near term, overall Canadian exports in 1990 might nevertheless be some $1.7 billion, reaching $2.5 billion annually by 1995 and $3.9 billion annually by the year 2000. Exports of Canadian forestry products could increase substantially and account for 46 per cent of all exports by the year 2000, according to this projection. These figures indicate that overall export sales to China could reach an aggregate total of some $30 to $40 billion over the fifteen year period 1986 to 1990.

It is interesting to note that commodity exports have dominated our total exports in the recent past and are expected to increase in 1995 and 2000. However the exports of services and equipment are projected to increase faster than commodities, increasing from about 10 per cent of total exports in the past to more than 30 per cent by the year 2000. Opportunities for services and equipment exports from the mining, oil and gas, telecommunications and power sectors are each considered to offer significant potential for growth.

These projections are necessarily speculative, but serve to illustrate a level of exports which might be achieved if China's economy progresses as expected and Canadian exporters are determined, competitive and well-supported by programs of the federal government. Such a level of exports will also depend on Canadian willingness to increase imports from China.

Table 3.8

PAST AND PROSPECTIVE EXPORT SALES TO CHINA BY SECTORS

SECTOR	AVERAGE ANNUAL EXPORTS: RECENT PAST 1983-1985 1/	PROSPECTS IN FUTURE 2/: 1990	1995	2000	REMARKS
	--$ million/year--				
A. Services & Equipment					
Agriculture					
Services	2	4	6	9	
Equipment	6	8	10	15	
Forestry					
Services	N/A	4	6	8	
Equipment	N/A	16	24	42	
Mining					
Services	N/A	25	50	50	Some mining equipment may be included in automotive and industrial equipment
Equipment	10	75	150	200	
Power					
Services	1	10	25	25	Assumes 10% Canadian share of Chinese imports in low investment scenario
Equipment	18	75	150	150	
Oil & Gas					
Services and Equipment	62	150	200	250	
Telecommunications					
Services and Equipment	25	50	100	200	
Transportation					
Services	2	30	45	60	
Equipment	10	40	60	80	
SUB-TOTAL	136	487	826	1,089	
B. Commodities					
Agriculture	688	400	450	490	Mainly wheat and flour.
Fertilizer	64	90	110	130	Potash.
Forestry	210	400	800	1,600	
Mining	325	300	300	200	
Sub-Total	1,287	1,190	1,660	2,420	
Total	1,423	1,677	2,486	3,509	

1/- Past exports based on Statistics Canada data and/or industry estimates.
2/- Future prospects estimated by Sector Working Groups.

4.0 TOWARDS A CANADIAN STRATEGY FOR CHINA TRADE

Synopsis

Export sales of Canadian equipment generate substantial employment, estimated from 32 to 49 person years per $1 million sales in seven key sectors. The Canadian heavy electrical manufacturing sector is experiencing a major recession and needs to increase export sales to keep this important industry healthy.

The federal government has limited resources available to support exports to China so needs to utilize these resources in the context of an overall export strategy. China's economy, now larger than Canada's, is evolving rapidly and represents major opportunities and challenges to Canadian exporters.

Good prospects for export sales have been identified in the seven major sectors which currently account for more than 95 per cent of Canadian exports to China.

The Task Force presents eleven recommended actions by the federal government which apply to all sectors and additional six recommendations focussed on the power sector. The government requires a more formal mechanism to provide an ongoing focus for trade promotion in China.

4.1 OBJECTIVES OF FEDERAL SUPPORT

A major objective of federal support for trade initiatives in China is to increase exports from Canada to the world's most populous country and thereby maximize net economic benefits to Canada. The principal benefit of such exports will be increased employment of Canadians. CIDA requires that any projects it supports must be developmentally sound.

Related primary objectives of the export promotion program include improving Canada's overall balance of trade and furthering technological developments in Canadian industry.

A secondary objective of the federal export strategy should be to use exports to China to strengthen Canadian industry in the light of our long term domestic needs. This is particularly relevant for the electric power industry.

Investments by Canadian power utilities peaked in 1978 and have declined to less than $6 billion in 1985. The situation facing the Canadian power sector within its domestic market is mirrored in the United States, which has experienced an even larger proportionate reduction of investments by its power utilities as illustrated in Figure 11. The USA has traditionally been a major export market for Canadian heavy electrical products. Faced with severely constrained markets in Canada and the USA, and increasing competion in offshore markets, the heavy electrical manufacturing sector is currently reported to be operating at about 40 per cent of capacity.

Domestic demand for electricity continues to grow, although more slowly than in 30 years prior to 1980. Utilities across the country will begin spending more to expand and improve their power system as the current surplus

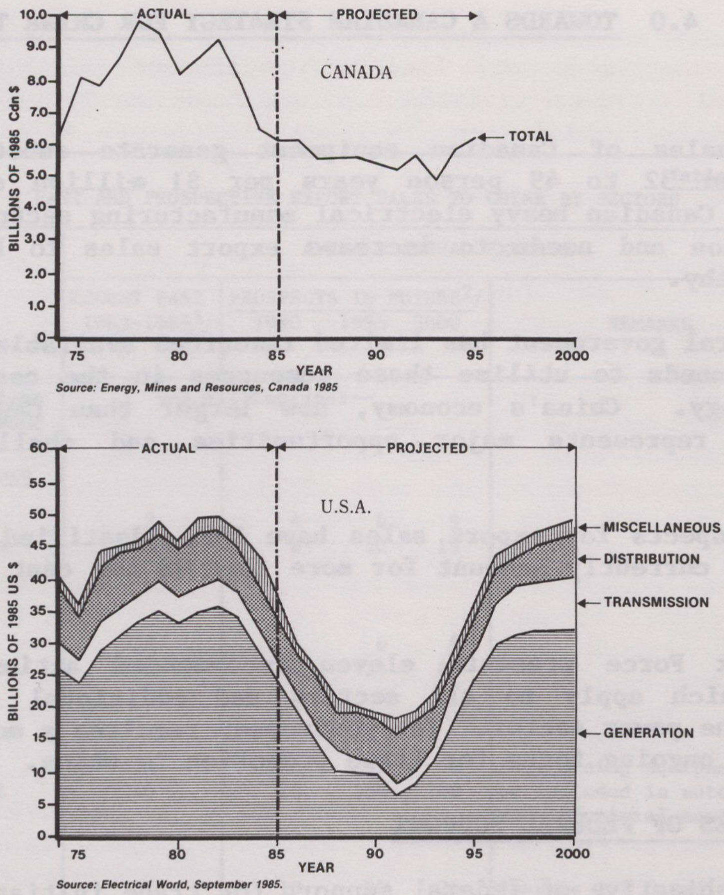


Figure 11:
Capital Expenditures by Power Utilities in Canada and U.S.A., 1974-2000.

capacity is absorbed. A strategy for the Canadian power industry should be to promote exports from those parts of the industry whose economic health is important for longer term domestic needs, both for the maintenance of existing systems and the construction of new facilities. As illustrated in Figure 6, hydroelectric power provides the majority of our electrical energy at present. Future growth in capacity is expected to continue this pattern, with projected develoment of hydroelectric power accounting for 50 per cent of the increased total capacity by the year 2000. Conventional thermal plants and nuclear generation are each projected to account for approximately 25 per cent of the total increase.

The employment impact of export projects, potentially a very useful economic indicator, has been estimated in different ways. One of the most active consulting groups in China, CIPM, has estimated that hydroelectric and thermal generating projects generate about 10 Canadian person years of direct labour for each $1 million of total Canadian cost. DRIE uses similar figures in the electrical products manufacturing sector.

CAPSEP, the committee of Canadian associations promoting exports by the power industry, has indicated that a hydroelectric power station provides 36 person years of direct and indirect employment for each $1 million of equipment exported from Canada compared to 46 person years for equipment in a thermal generation project.

Estimates by EDC, presented in Table 4.1, indicate that the total employment (direct, indirect and induced) for each $1 million of export sales varies by sector from 32 person years to 49 person years.

The difference in these estimates of employment impact arise primarily from differing assumptions regarding Canadian content and the multiplier effect of direct employment.

Table 4.1

ESTIMATED EMPLOYMENT PER $1 MILLION EXPORT SALES FOR VARIOUS SECTORS

Sector	Person-Years per $ Million of Canadian Exports	Industry Canadian Content Coefficient	Employment in Person-Years per $1 Million Contract Value: Direct & Indirect	Induced	Total
Electric Power	49	.76	24	13	37
Hydroelectric Generation	47	.85	26	14	40
Agriculture	56	.87	40	9	49
Forestry	47	.69	21	11	32
Mining	47	.69	21	11	32
Oil and Gas	46	.69	21	11	32
Telecommunications	44	.81	23	13	36
Transport	57	.63	23	13	36

Source: Export Development Corporation

4.2 AVAILABLE INSTRUMENTS FOR FEDERAL SUPPORT

The federal government has a variety of instruments which can be used to increase exports to China, as discussed previously. These include:

a) Support to exporters through External Trade, PEMD and fairs and missions programs, various DRIE programs and CIDA's Industrial Cooperation Program. Such support aims to facilitate efforts by industry to analyze opportunities and penetrate the China market.

b) CIDA's bilateral assistance program which provides mainly technical assistance and training for developmentally sound projects in areas where the Government of China requests assistance and agrees that Canada has special expertise to offer. Capital projects are not funded.

c) Export finance through EDC. This can include loans on commercial terms, in accordance with Consensus rates, or on concessional terms under Section 31.

d) Contracting services through Canadian Commercial Corporation (CCC). Certain suppliers, usually the smaller firms, may want CCC to market their products to the Chinese purchasers by means of government-to-government contracts.

e) Diplomatic and political activities, which can include:

- information gathering and analysis of developments in China;
- assistance from embassy officers in introducing and promoting Canadian exporters;
- memoranda of understanding between Ministries in the two governments;
- representations to sensitize Chinese officials and decision makers to exports from Canada; and
- support for Chinese participation in international bodies.

f) Canadian policies concerning the importation of Chinese goods and services. The level of exports to China will no doubt be affected by Chinese success in selling to Canada and introduction of Canadian importers to China's exporters may become increasingly important.

g) Federal government leadership with provincial governments and the private sector. Such leadership, properly exercised, can serve to mobilize and direct available Canadian resources in pursuit of agreed overall objectives.

All of these instruments should continue to be used to enhance Canadian exports to China. As the economic connections between the two countries are strengthened, increasing opportunities will exist for the creative utilization of the available federal instruments to maximize Canadian trade with China, in the power sector and in other sectors of concentration.

Many linkages exist between these federal instruments which, properly utilized, can provide useful leverage to help increase Canadian exports to China. However, such potential leverage cannot be made use of unless it is carefully planned, coordinated and effectively exercised.

Different departments and agencies of the federal government have their own perspectives on China and the market it represents for Canadian industry. In April 1984 an ad hoc group of federal offices was drawn together to assist the Canada-China Joint Trade Committee. The China Working Group, initially set up by External Affairs for this purpose, includes representatives from CIDA, DRIE, EDC, Agriculture, CCC, Energy Mines and Resources plus other departments as required, for example, Finance. This China Working Group meets intermittently to try to coordinate federal government perspectives and programs in China and has proven to be a valuable inter-departmental mechanism. It is not a formally constituted body.

Strategic considerations and tactics to use available federal instruments to meet Canadian objectives in China are suggested hereafter.

4.3 STRATEGIC CONSIDERATIONS

The federal government's resources available for supporting exports to China are limited and need to be targeted to activities which best meet Canadian objectives, particularly maximizing the economic return for Canada. Before discussing particular tactics it is useful to review certain key points affecting Canada's overall strategy for exports to China.

a) China's economy is already larger than Canada's and is growing faster. Experts predict that China's Gross Domestic Product in the year 2000 will be roughly equal to that of Japan's at the present time[1]. China is already on the way to becoming a major economic power and expects to be one of the world's super powers by the year 2050. Canadian aid and trade programs in China should complement one another in view of our long term perspectives and our hoped-for relationships with China in the 21st Century.

b) China continues to make dramatic changes in the way its economy is managed, changes of major significance to its trading partners. For example, export opportunities in certain sectors, particularly the power sector, have increased greatly within the past two years. An effective Canadian strategy requires that the federal government maintain and communicate to industry a continuous overview of political and economic conditions within China, including trade opportunities and the emerging commercial law regime in China.

c) Not all Canadian sectors can hope to be equally successful in exporting to China. Chinese officials have already formed views on Canada's strengths and weaknesses in various sectors. The federal government must maintain a realistic overview of the relative strengths of industry sectors and subsectors within Canada, and be ready to concentrate scarce federal resources on our best prospects.

d) Industry must take the initiative in making export sales. Government programs can assist in many ways - including market information gathering and analysis, introducing firms to the market through participation in fairs and mission programs, and providing finance and support in client dealings - but individual firms have to accept basic responsibility for marketing their products.

e) Individual Canadian firms report difficulties in obtaining reliable information on the overall market and on the capacity of Chinese industry in various sectors and sub-sectors. Most exporters see a need for the federal government to assist industry in gaining accurate perspectives on the China market.

f) The commercial prospects of Canadian exporters are enhanced if they are perceived by their Chinese clients to be somehow endorsed by the

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1/ China Projection Report, Fall, 1985, Rock Creek Research.

Canadian government. Thus one role of the federal government is to be seen to be offering official endorsement for Canadian firms. This need might change as the volume of trade with Canada grows and Chinese buyers become better informed and more confident with Canadian exporters.

g) Making sales in China requires persistence and usually involves considerable efforts and expenditures by exporters, particularly at the outset. This means that firms must have the resources to be able to incur considerable front end costs, which makes it difficult for small firms with limited resources to be successful in selling directly to Chinese clients. Such firms are more likely to win export orders as sub-contractors to the larger firms which deal directly with Chinese clients. Federal government support should be concentrated on firms which are willing to be involved in selling directly to Chinese clients on a long term basis.

h) Since one of China's main interests is to upgrade its economy through technology transfer, Chinese buyers want to deal with firms which are in control of their own technology and are willing to consider licencing and joint ventures to manufacture in China. Canadian firms which lack the control over their technology should acquire such control before receiving federal government support in the China market.

i) Canadian organizations accepting federal government support for their business endeavours in China should be expected to cooperate with the government, and hence with other firms in the industry, in gathering and sharing market information which is not commercially confidential among serious exporters in the sector. The federal government should arrange to receive feedback from all firms it supports and to analyze and disseminate such information systematically.

j) Chinese authorities have been quite willing to accept free studies by foreign consultants at the pre-feasibility and feasibility stages of projects. Consideration should be given to providing a program which would allow for funding of comprehensive pre-investment studies of selected developmental projects. Canadian offers of such studies, basically federally funded efforts at business promotion, should only be made where there are strong reasons to believe that they will generate subsequent business for Canadian firms.

k) All federal programs to support exports to China should be systematically monitored and evaluated so that lessons can be learned continuously. Changes will be necessary, possibly frequently, to take account of the very dynamic and rapid developments of Chinese economic and trade policies as well as to reflect increasing Canadian experience in that market.

l) Competitive financing should be provided for eligible export sales to China. To the extent possible, this should be offered at Consensus rates and terms. However, concessional support should be made available for specific projects when necessary to match credit terms offered by foreign competitors or in selected cases where it is clear from the state of the market and the activities of other suppliers that concessionary financing is required to win the project.

m) The federal government, through External Affairs, needs to take a more active role in obtaining, analyzing and disseminating commercially valuable information on principal export sectors in China. Recognizing this need, several sector working groups have suggested the addition of sector specialists to our embassy in Beijing. There may be more cost effective ways to achieve the objective, which must depend on cooperation and two way communications between active exporters, relevant government departments and agencies and those responsible for the appropriate systems of evaluating and disseminating commercial information.

4.4 FUTURE CONCENTRATION BY CANADIAN EXPORTERS

While all sectors of Canadian export activity should monitor the potential in the Chinese market, it is felt at this time that the best opportunities are in sectors and subsectors where Canadian strengths match Chinese needs. Based on the analysis of current conditions in China, the Task Force believes that Canadian exporters should concentrate in the following sector components:

a) **Power:** consulting services and equipment supply, particularly in large generating projects (conventional thermal and hydroelectric) and extra high voltage transmission systems.

b) **Agriculture:** basic commodities (particularly feed grains, malting barley and canola products as wheat sales stabilize or decline further), livestock and genetics, and services and infrastructure for agribusinesses within China.

c) **Forestry:** afforestation, wood products, paper products, consulting services, and equipment.

d) **Mining:** non-ferrous mineral sales, consulting services, and equipment.

e) **Oil and Gas:** service intensive activities in wellfield exporation and development, and capital intensive projects for gas treating facilities, pipeline and refineries (specially for heavy oil).

f) **Telecommunications:** public domestic switched telecommunications networks, international networks, spectrum management systems, remote sensing, and navigation systems.

g) **Transportation:** emphasis on railway and urban transit sub-sectors, with best prospects for consulting services, computer software, telecommunications, containerization technology, services relating to bulk commodity handling, light rapid transit, and subways.

4.5 SUGGESTED FEDERAL ACTIONS FOR SUPPORTING EXPORTERS

The Task Force recommends that the federal government undertake a series of related actions to support exporters in the China market. Because of the importance, complexity and dynamic nature of this particular market, the Task Force recommends that special attention be provided and that federal government activities for China be organized more responsively than at present. This implies a flexible and innovative approach for China, which may have to be modified, based on future developments within China and on Canadian experience in winning export orders.

The more specific actions recommended for the power sector are outlined after general actions which apply to all sectors, including the seven sectors which have been examined separately.

4.5.1 General

1) **The China Working Group, an ad-hoc interdepartmental body in existence since 1984, should be formalized and strengthened as the primary focus of the federal government for trade promotion in China.**

   A consistent and systematic overview should be maintained of overall political and economic developments in China and of the results and prospects for Canadian exporters. Various federal programs for support and promotion of exports to China, particularly those of External Affairs, CIDA, DRIE and EDC, should be focussed and coordinated in accordance with policies developed by the China Working Group. External Affairs should provide a permanent Secretariat to record the activities and conclusions of the China Working Group as well as to coordinate an expanded program of activities involving all relevant departments of government. The China Working Group should also liase regularly with counterparts of the China trade sections in the provincial governments to encourage cooperation and consistency of approach.

   The China Working Group should consider how best to arrange for appropriate sectoral expertise relative to China, bearing in mind the following functional requirements:

   - monitoring and analyzing published reports of sector developments within China from all available sources;
   - visiting China regularly to meet key sector officials and keeping abreast of developments;
   - visiting international agencies active in China to learn their perspectives on current developments;
   - collating and reporting periodically on sector developments within China, including views and actions by relevant Chinese government officials;
   - briefing and debriefing Canadian exporters travelling to China;
   - convening periodic workshops among interested and active Canadian exporters; and
   - providing technical support to embassy staff in Beijing on sector matters.

2) **Specific sectoral and geographical responsibilities which are assigned to each trade officer dealing with China should be made known to the China Working Group and to all exporters active in the China market.**

In the first half of 1986 the number of Canadian based officials concentrating on trade in China will increase to eleven (eight in Beijing, two in Shanghai and one in Hong Kong). The names, positions and responsibilities of all officers in External Affairs in Ottawa who are responsible for trade promotion in China should be similarly communicated regularly to the same audience.

3) **Federally supported activities to assist in generating business in China should routinely contribute to Canadian commercial understanding of that market.**

Any organization requesting federal financial assistance to win business in China should be required to agree in advance that the China Working Group will be kept well briefed of potential business opportunities. Commercially confidential information relating to the organization's particular interest in a specific project could be excluded from the debriefing material which would be shared with others active in the sector. For funding of $25,000 or less the business organization's responsibilities would be fulfilled by the presentation of a detailed report within two weeks of the return of the mission. For larger funding the information to be shared would include a written report plus a debriefing meeting in Ottawa. The China Working Group should define the general format of the appropriate reports and determine how best to utilize the information gathered in this manner, such as periodic reports or workshops between Canadian organizations active in the each sector. The China Working Group should ensure that all such arrangements to generate and utilize sector specific analyses are defined before the end of 1986 and that all financial assistance offered from 1987 onwards should be conditional on the recipients' agreement to participate in such a commercial information system.

4) **Political and diplomatic support from the federal government should be sustained and augmented by increased sectoral information gathering and dissemination.**

China has indicated a preference for dealing with Canadian organizations which receive obvious political and diplomatic support from the federal government. All sectors acknowledge that the support programs providing for financing of trade missions, trade fairs and hosting of Chinese sector specialists to visit Canadian facilities are important, and that Ministerial visits provide important opportunities to establish Canadian interests with Chinese authorities.

5) **External Affairs and DRIE should continue to organize specific technical missions to visit China to help Canadian exporters to become better informed about specific export opportunities and to meet potential clients in specialized sub-sectors.**

Such technical missions should investigate the level of technology available from Chinese manufacturers and the capability and capacity of Chinese suppliers in the domestic market.

Consideration should be given to arranging such highly focused missions on topics including:

- power sector: possible missions on high voltage, long distance transmission systems and on thermal generation;
- oil and gas sector: mission on heavy oil refineries (already scheduled for October, 1986);
- transportation sector: possible mission re containerization handling or urban subways.

6) **The China Working Group should develop consistent criteria for supporting pre-investment activities in China.**

The primary criterion for federal government support to export projects in China should be the anticipated net economic benefits to Canada. EDC already has such a methodology for estimating such benefits, which should be considered for use by the China Working Group.

7) **In providing federal support to Canadian exporters, apart from support for market analysis or market penetration activities such as those funded through PEMD, consideration should be given to such factors as whether the exporter:**

   i) Controls its own technology and hence is in a position to discuss technology transfer directly with Chinese authorities;
   ii) Appreciates the nature of the Chinese market and is prepared to invest its own resources for one year or more in market development activities before expecting to be successful in winning orders;
   iii) Intends to remain active in the Chinese market and is not opportunistically seeking government-supported sales in a single marketing endeavour; and
   iv) Is willing to cooperate with the government and other exporters in expanding Canadian exports to China.

8) **Better information is required on the capabilities and capacities of most Chinese industries as well as regular updating of information on the capabilities, capacity and competitiveness of Canadian industries. Accordingly, the federal and provincial governments are encouraged to develop up-to-date surveys of key industrial sectors in Canada and in China.**

Several sectors have expressed a need for Canadian industry to package its services and equipment to suit Chinese market conditions, which often militate against the many smaller contracts which are more common in Canada. Support from provincial and federal governments may be necessary to help exporters organize appropriate packages.

9) **The government should consider providing credit mixte financing for strategically selected capital projects in China to permit exporters to continue to win orders where Canadians offer world-class technology at competitive prices.**

EDC has in place a concessionary line of credit which could be used to help Canadian exporters win contracts on strategically selected projects. The competitive advantage such concessionary financing provides is likely to be significant to all sectors in view of our favourable trade balance with China.

10) **An evaluation of the effectiveness of the trade promotion programs in China of External Affairs and of CIDA's Industrial Cooperation Program and an examination of how to make them more effective in future should be planned and implemented under the the guidance of the China Working Group.**

In the past five years some $16 million has been authorized under the PEMD and Fairs and Missions Programs of External Affairs and under CIDA's Industrial Cooperation Program to support industry initiatives in China. A formal evaluation should be useful in providing guidance for future activities.

4.5.2 Power Sector

Certain recommendations pertaining to the power sector are offered in addition to the general recommendations covering all sectors.

1) **The Task Force supports the offers that the federal government has made to provide funding support for the following activities, all of which have been discussed extensively with the Chinese authorities:**

   a) Three Gorges feasibility study;
   b) South China planning study; and
   c) Three Gorges turbine model study

   The Three Gorges Water Control Project includes the largest hydroelectric plant in the world. Recent discussions with MWREP by the CIDA Mission to China and with the World Bank suggest that MWREP and the Preparatory Office of the China Three Gorges Development Corporation are aiming to obtain final approval for this project in the fall of 1987. China's Seventh Plan does not yet include this project but does provide significant funding for "large projects to be approved during the plan period". If Canadian consultants are associated with this feasibility study, they will be well positioned to provide follow-on management services during implementation and Canadian industry will be well informed on opportunities for equipment supply.

   The South China planning study would focus on China's seventh and newest power grid, inter-connecting the Guangxi and Guangdong power systems in China's southern most provinces. During this three-year study, the Canadian consultants would become extremely well informed about future investments in this region. China's power authorities have indicated they accord a high priority to hydroelectric developments along the Hongshui River and anticipate development of some 6,000 MW of additional capacity by the year 2000. One of these projects is the Longtan development, in which the CIPM-Yangtze Joint Venture is currently involved.

The Three Gorges feasibility study will necessitate examination of power systems expansion throughout the Central and East China regions. Arising from this study, as from that for South China, will be a detailed identification of upcoming requirements for EHV transmission systems. These transmission systems are of particular interest to a number of Canadian suppliers who have already succeeded in securing modest orders from China for this class of equipment.

The turbine generator sets and other powerhouse electrical equipment for the Three Gorges and Longtan projects are of a type and capacity for which Canadian suppliers have demonstrated world-class technology and competence. The opportunity to provide the turbine model studies should place Canadian suppliers in a preferred position for future equipment supply and joint venture (and licensing) of indigenous Canadian technology.

2) **The Task Force recommends that special attention be focussed upon opportunities for supplying equipment and services for thermal power plants and EHV transmission developments.**

To date the majority of commercial imports by China's power sector have been for thermal power projects and EHV transmission facilities. About 75 per cent of China's future additions to its generating capacity over the next 15 years will be conventional thermal plants. In addition to gathering and disseminating information on opportunities for direct exports, priority should be accorded to promoting Canadian capabilities in thermal power and EHV transmission as has already been done for hydro power and EHV transmission, with greater emphasis on gaining an appreciation of China's manufacturing capabilities in the thermal and EHV transmission fields so as to identify opportunities for licensing and joint venture operations in China.

3) **The Task Force recommends that federal government assistance, particularly for pre-feasibility and feasibility studies, should only be offered for projects where there is a strong likelihood that Canadian exporters will have the opportunity of bidding and winning contracts during project implementation.**

Chinese officials have confirmed that Canadian assistance in the power sector should be reserved for projects of national importance since provincial authorities within China are well able to plan and implement smaller projects.

4) **The Task Force recommends that EDC financing at Consensus rates, or concessional rates if required to match foreign competition, be sustained for power sector projects. Canada should consider offering concessional financing in support of implementation of the Gehen Yan hydroelectric project. Further requests for financing of thermal power plants should be anticipated and should receive comparable consideration.**

China has officially requested concessional financing for the purchase of Canadian equipment and services for the 1,200 MW Gehe Yan hydro development which is located in the Yangtze Basin, near the Three Gorges complex. Canadian consultants have completed a study which concludes that the project is technically and economically feasible. The cost of equipment and services which Canada could provide has been estimated by the consultants at up to $350 million.

It is evident that China intends pursuing development of its power sector with as much concessional financing as it is able to secure. China has already been successful in securing substantial amounts of such financing from Canada's major competitors who are thereby taking selected projects off the market. Canada has a vital interest in maintaining its advanced hydro power technology at the leading edge of world capability to support anticipated domestic developments as well as to secure export orders from China and other importing countries.

The Minister of Water Resources and Electric Power has suggested that such Canadian cooperation for the Gehe Yan project could provide a useful demonstration of Canadian technologies and management competence in large hydroelectric projects. A favourable impression created by Canada in this way would likely influence our commercial prospects for the Three Gorges development which is nearby and which is not expected to begin implementation until several years after a start is made on the Gehe Yan project.

Further requests for Canadian financing for thermal power plants can be anticipated. The Huaneng International Power Development Corporation will likely be contracting for three additional turnkey thermal projects over the next six months and may enter into direct negotiation with selected suppliers who can offer concessional financing.

5) **The Task Force recommends that a decision on the request for additional financing for engineering studies of the Longtan project be deferred until the results of the present studies have been analyzed and the possible justification for further assistance carefully considered.**

If the Canadian consortium can win a commercial contract on this project, the federal govenment should be willing to consider financial assistance in future for a bankable feasibility study, provided of course that other reasonable criteria are met, including the likelihood of the project being approved for implementation using foreign equipment and services.

ANNEX I

Ministre des Relations extérieures — Minister for External Relations

February 7, 1986

Mr. Frank Petrie
President
Canadian Export Association
Second Floor, 99 Bank Street
Ottawa, Ontario
K1P 6B9

Dear Mr. Petrie:

As you know, Canada faces exciting challenges in China's hydro development. But given the limited financial resources and the escalating demands, we have decided to establish a Task Force to review Canada's involvement in China's hydro sector.

In this regard, we wish to invite you to chair a small Industry-Government Task Force charged with the preparation of a report to Mr. Kelleher and me on Canada's participation in this important Chinese sector. The Task Force would be composed of four members, two from the private sector and two from the federal government. We anticipate that the Task Force will be able to report by the end of April. It will have the full support of the federal departments involved in developing Canada's approach on this matter.

We believe that the Task Force's report should focus on three issues:

(i) an inventory of federal financing available for trade development in China and the place of the hydropower sector in the overall strategy;

(ii) the likely extent of private sector demand for federal assistance in China's hydropower projects in the next five to fifteen years; and

(iii) the selection of firms for federal support.

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(iii) the selection of firms for federal support.

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Ottawa Canada K1A 0G2

In addition to these issues, the Task Force would want to examine: better coordination of the various federal instruments, the leveraging of commercial sales by judicious use of concessional financing and grants, the need to identify criteria that could be used by the Government for determining which projects should be favoured for federal involvement and the competitiveness of Canadian firms in this sector.

We see a need for an early warning report, something that will lay out the immensity of China's proposed hydro sector expansion and give the Government a better feel for the size and nature of the demands that will be made upon us for financing. It would be useful for the Task Force to focus on hydropower projects in which Canadians are either already involved or have been approved for involvement: Geheyan, Longtan, Shuikou, Three Gorges, Yantan and certain transmission studies.

The Task Force would be expected to give a sense of where Canadian assistance to the private sector for hydropower projects should fit in relation to other energy (thermal or nuclear) opportunities and to other sectors in China such as telecommunications and transportation where Canada may be better able to land commercial deals.

Critical to our success will be to develop a cohesive, united Canadian approach to China's hydro development. Thus, in preparing this report, it will be crucial that the Task Force work closely with the various Canadian private firms that have expressed an interest in China's hydro sector. In addition, the Task Force must also consult with relevant federal departments, such as the Canadian International Development Agency, External Affairs, Energy, Mines and Resources, Regional Industrial Expansion, Finance and the Export Development Corporation.

We have attached previous ministerial correspondence on the establishment of the Task Force together with a short background paper on recent involvement in the hydro sector and a longer paper to a Chinese delegation concerning the Canadian government's involvement

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in this sector. For further information, you should contact Mr. Don McMaster, Country Program Director for the China desk at CIDA.

We very much hope that you will accept this important responsibility. We look forward to your positive response.

Monique Vézina

James Kelleher

Att.

TASK FORCE ON CHINA POWER SECTOR

ORGANIZATIONS MAKING PRESENTATIONS TO TASK FORCE

Organization	Written Subm'n	Verbal Presentation
Acres International Ltd.	X	
Alcan Wire and Cable	X	X
Babcock & Wilcox Canada	X	X
B.C. Hydro	X	
Canada Wire International	X	
Canadian General Electric	X	X
Canadian International Construction Consortium	X	X
Atlas-Gest International Inc.		
BG Checo International Ltd.		
Fitzpatrick Construction Ltd.		
The Foundation Company of Canada Ltd.		
Janin Construction Ltd.		
Pitts Engineering Construction		
Sintra Inc.		
Canadian International Project Managers	X	X
Acres		
Lavalin		
SNC		
CIPM-Yangtze Joint Venture includes CIPM plus		
Hydro Quebec International		
BC Hydro		
Canadian Thermal Power Consortium for China	X	X
AMCA International Ltd. (Dominion Bridge)		
Brown Bovari Howden		
Combustion Engineering Canada Inc.		
Monenco		
CP Coal Engineers	X	
Federal Pioneer Ltd.	X	
Hydro Quebec International	X	X
Lavalin International	X	X
Manitoba Hydro	X	
Monenco Consultants Ltd.	X	X
Monenco Transmission Consortium	X	X
Manitoba Hydro		
Monenco		
Ontario Hydro		
Teshmont		
Mutual Forest Industries Ltd.	X	
Ontario Hydro	X	
SNC International Ltd.	X	X
Sogex International Ltd.	X	X
Marine Industries Ltd.		
Cegelec Industries Inc.		
BC Checo International Ltd.		
Tecsult International Ltd.	X	X
Timberland Equipment Ltd.	X	X
Westinghouse Canada Inc.	X	
Wright Engineers Ltd.	X	

Note: Verbal presentations took place in Canadian Export Association Offices in Ottawa during week of March 24-27, 1986.

TASK FORCE ON CHINA POWER SECTOR

ORGANIZATIONS MAKING PRESENTATIONS TO TASK FORCE

Organization	Written Brief	Verbal Presentation
Acres International Ltd.	X	
Alcan Wire and Cable	X	X
Babcock & Wilcox Canada	X	X
B.C. Hydro	X	
Canada Wire International	X	
Canadian General Electric	X	X
Canadian International Construction Consortium	X	X
Atlas-Gest International Inc.		
BG Checo Internatonal Ltd.		
Fitzpatrick Construction Ltd.		
The Foundation Company of Canada Ltd.		
Janin Construction Ltd.		
Pitts Engineering Construction		
Sintra Inc.		
Canadian International Project Managers	X	X
Acres		
Lavalin		
SNC		
CIPM-Yangtze Joint Venture includes CIPM plus		
Hydro Quebec International		
BC Hydro		
Canadian Thermal Power Consortium for China	X	X
AMCA International Ltd. (Dominion Bridge)		
Brown Boveri Howden		
Combustion Engineering Canada Inc.		
Monenco		
CP Coal Engineers	X	
Federal Pioneer Ltd.	X	
Hydro Quebec International	X	X
Lavalin International	X	X
Manitoba Hydro	X	
Monenco Consultants Ltd.	X	X
Monenco Transmission Consortium	X	X
Manitoba Hydro		
Monenco		
Ontario Hydro		
Teshmont		
Mutual Forest Industries Ltd.	X	
Ontario Hydro	X	
SNC International Ltd.	X	X
Sogex International Ltd.	X	X
Marine Industries Ltd.		
Cegelec Industries Inc.		
BG Checo International Ltd.		
Tecsult International Ltd.	X	X
Timberland Equipment Ltd.	X	X
Westinghouse Canada Inc.	X	
Wright Engineers Ltd.	X	

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ANNEX III

TASK FORCE ON THE CHINA POWER SECTOR

PROGRESS REPORT

Members of Task Force:

Frank Ferris, Chairman

Peter J. Haines

R.A. Kilpatrick

R.L. Walker

April 11, 1986

TASK FORCE ON THE CHINA POWER SECTOR

PROGRESS REPORT

Members of Task Force:

Frank Petrie, Chairman

Peter J. Haines

R.A. Kilpatrick

R.L. Walker

April 11, 1986

TASK FORCE ON THE CHINA POWER SECTOR

PROGRESS REPORT

Task Force Activities

The Task Force first met on February 18, just before one of our members, Bob Walker, proceeded to China on a month-long CIDA power sector mission to review official requests for Canadian assistance for a feasibility study of Three Gorges project and for power systems planning studies for South China. Both of these studies are of immediate concern to Canada's longer term involvement in China's power sector development.

The Task Force has spent many hours consulting with representatives of leading Canadian organizations in the power sector. A working group, comprising our Secretariat plus key staff in CIDA and relevant federal departments and agencies, is preparing a detailed brief on the power sector which covers four principal topics:

i. Opportunities in China
ii. Canadian Industry Capability and Capacity
iii. Competitive Considerations re Canadian Exports
iv. Possible Federal Role in Supporting Sector Exports

Shortly after the Task Force first met, working groups were also set up in six other major sectors: agriculture, forestry, mining, oil and gas, telecommunications and transportation. These working groups, comprising sector staff from federal departments and agencies, have been consulting informally with key firms in each of these sectors and have produced briefs for each sector concerning the same topics as that for the power sector.

During the past two months our efforts have been concentrated on getting a clear understanding of the commercial opportunities in the power and other main sectors in China and on the experience and perspectives of Canadian firms which have been active in these sectors. This stage of the work is nearing completion and we are now turning our attention to the task of preparing an overall report which synthesizes this information and our interpretation of strategies for government support to the seven sectors examined. The first draft of this report should be complete within one month.

Based on the information and analyses recently completed by the working groups in seven sectors, the Task Force can now offer some preliminary conclusions and recommendations. We have separated these between specific aspects concerning the power sector and more general matters which pertain to all sectors.

Power Sector

Demand for electric power is growing much faster in China than in Canada. It is anticipated that the total capacity of Chinese power systems will surpass those of Canada in the next five years and will probably be twice Canadian capacity by the year 2000. Chinese industry is severely constrained by power shortages at present and development of this essential infrastructure is accorded top priority in the latest national development plan.

China's developmental target is to quadruple its gross industrial and agricultural output between 1980 and 2000. Informed observers agree that this target can be met, or even exceeded. To keep pace with this overall development target it appears likely that China may have to source from 10% to 15% of total requirements for power systems outside of the country. This would imply offshore purchases of between C$ 1.0 to 1.5 billions per year between 1986-1990, rising to between C$ 1.5 to 2.5 billion a year between 1991-2000.

The power sector is very capital intensive. Between 1986 and 2000 China may be expected to invest between C$ 140 billion and C$ 200 billion for power sector development, depending upon the overall strength and directions of its economic growth. Past discussions with the Ministry of Water Resources and Electric Power (MWREP) have indicated that China is anxious to acquire Canadian technologies applicable to large hydroelectric developments and extra high voltage (EHV) transmission systems. Hence, this has been the main focus of sector activities supported by CIDA and External Trade.

Between 1982 and 1985 the federal government has committed some $11.2 million in technical assistance grants to China's power sector through CIDA and External. Hydroelectric and EHV transmission components have received the majority of this financial support. It will be recognized that these components of the sector involve projects with long lead times for preparation. Nevertheless, the firms involved are confident that sustained development activities in these capital intensive areas will lead to significant downstream commercial opportunities for Canada as specific investment projects are implemented.

Based on China's recognition of Canadian capabilities and technological edge in key components of the power sector, continued official support seems particularly well justified to secure a significant share of these export opportunities. This is important as the Canadian power sector currently faces a continued downturn in domestic activities. Power sector investments in Canada are currently running at approximately two-thirds of the level experienced during the latter half of the 1970's. Contraction of the domestic power sector market is not expected to end before about 1994, according to the latest informaton compiled by Energy, Mines and Resources. This market slump parallels the experience and projections in the USA, one of our major competitors and markets for this sector.

Based on our analysis of the power sector in China and in Canada, the Task Force recommends that the federal government provide grant support for the following activities, all of which have been discussed extensively with the Chinese authorities:

i) Three Gorges feasibility study (about $7 million)
ii) South China planning study (about $3.5 million)
iii) Three Gorges turbine model study ($0.3 million)

The Three Gorges water control project represents the largest hydroelectric plant in the world. Recent discussions with MWREP by the CIDA Mission to China and with the World Bank suggest that MWREP and Three Gorges Preparatory Office are aiming to obtain final approval for this project in the fall of 1987. China's Seventh Plan (covering the period 1986-1990) does not include this megaproject but does provide significant funding for "large projects to be approved during the plan period". If Canadian consultants are associated with this feasibility study, they will be well positioned to provide follow-on management services during implementation and Canadian industry will be well informed on opportunities for equipment supply.

The turbine generator sets and other powerhouse electrical equipment for Three Gorges are of a type and capacity for which Canadian suppliers have demonstrated world-class technology and competence. The opportunity to provide the turbine model studies should place Canadian suppliers in a preferred position for future equipment supply and joint venture (and licensing) of indigenous Canadian technology.

The South China planning study would focus on China's seventh and newest power grid, inter-connecting the Guangxi and Guangdong power systems in China's southernmost provinces. During this three year study, the Canadian consultants would become extremely well informed about future investments in this region. China's power authorities have indicated they accord a high priority to hydroelectric developments along the Hongshui River and anticipate development of some 6,000 MW of additional capacity by the year 2000. One of these projects is the Longtan development, in which the CIPM-Yangtze Joint Venture is currently involved.

The Three Gorges feasibility study will necessitate examination of power systems expansion throughout the Central and East China regions. Arising from this study, as from that for South China, will be a detailed identification of upcoming requirements for EHV transmission at the 500 kV level. These transmission systems are of particular interest to a number of Canadian suppliers who have already succeeded in securing modest orders for this class of equipment.

The Task Force has received presentations from two engineering consortia concerning their interest and experience in China. These consortia include most of the major power engineering consultants in Canada, together with representation from our four largest provincial power utilities. It is apparent that the potential opportunities to assist in the development of China's power sector are likely to exceed Canada's capabilities. Thus, there appears to be considerable merit in providing official support to assist both these major consortia to obtain a share of the technical assistance studies currently under consideration by CIDA and thereby expose China's power authorities to a broad spectrum of Canadian capabilities.

The Task Force recommends that Canada offer concessional financing in support of implementation of the Gehe Yan project. This 1,200 MW hydro development is located in the Yangtze Basin, near the Three Gorges complex. Hydro Quebec International and CIPM have together completed a study which concludes that the project is technically and economically feasible. The cost of imported equipment and services which Canada could provide has been estimated at about $216 million.

The Minister of Water Resources and Electric Power, Madame Qian Zhengying, has suggested that such Canadian cooperation for the Gehe Yan project could provide a useful demonstration of Canadian technologies and management competence in large hydroelectric projects. A favourable impression created by Canada in this way would likely influence our commercial prospects for the Three Gorges development which is nearby and which would begin implementation after a start is made on the Gehe Yan project.

Some 68% of China's electric power is produced by thermal generating plants, a pattern which will persist for some time. During the past year China has decided that it is necessary to accelerate its development of thermal generation capacity and a special agency, the Huaneng International Power Development Corporation has been established to import about 10% of its annual thermal capacity additions on a turnkey basis. Major contracts worth in total about $1.0 billion were signed earlier this year for four thermal generating stations, each of 700 MW capacity. The first significant contract under this new thermal program was awarded to an international consortium with significant Canadian participation. Babcock & Wilcox Canada have a $200 million contract for the "boiler island" components of two of these plants.

The Task Force recommends that EDC financing at concensus rates, or those matching any exporters, be sustained for power sector projects including thermal power turnkey projects and other opportunities for generation and EHV transmission components. It is expected that the Huaneng International Power Development Corporation will be tendering additional turnkey thermal projects over the next few years. There will also be continued commercial oportunities, under international competitive bidding, for power projects financed by the World Bank.

Manufacturers and consultants generally agree on the need for Canada to continue to provide grant funding for starter studies which introduce Chinese planners to Canadian experts and technology. However any future studies supported in this manner should meet certain criteria, including the likelihood that downstream benefits can accrue to Canadian industry. Such criteria will be developed in our report.

In the power sector, Chinese authorities have clearly indicated that foreign support will be directed toward larger projects and will require willingness by foreign firms to transfer technologies. Small projects are essentially within China's indigenous capabilities and central authorities have indicated that they would not allocate scarce foreign exchange support to projects for which their capacities and capabilities are considered adequate.

General

All sectors indicate a need, particularly in China, for increased systematic gathering, analysis and dissemination of commercially useful intelligence. Such an intelligence system needs to be coordinated by the federal government, in conjunction with the private firms who would be expected to contribute information as well as utilize it. There are alternative mechanisms for implementing such systems, each sector specific and these will be addressed further in the Task Force report.

Several sectors have expressed a need for Canadian industry to package its services and equipment to suit Chinese market conditions, which often militate against the many smaller contracts which are more common in Canada. Support from provincial and federal governments may be necessary to help exporters organize appropriate packages. However, better information is required on the capabilities, capacities and competitiveness of most Canadian industries. Accordingly, the federal and provincial governments are encouraged to develop up-to-date surveys of key sectors, such as was provided through EEMAC for the electric power sector.

The government should consider providing credit mixte financing for carefully selected capital projects in China to permit our exporters to continue to win orders where we have world-class technology at competitive prices. One possibility would be for EDC to put in place a concessionary line of credit which could be used to actively pursue commercial contracts on selected projects. The Task Force will attempt to indicate such strategic projects in its final report. The goodwill which such concessionary financing would generate is likely to be significant to all sectors in view of our favourable trade balance with China.

China has indicated a preference for dealing with Canadian organizations which have the support of the federal government. All sectors acknowledge that the support programs providing for financing of trade missions, trade fairs and hosting of Chinese sector specialists to visit Canadian facilities are important and that Ministerial visits provide important opportunities to establish Canadian interests with Chinese authorities. This level of activity should be sustained and augmented by increased sectoral intelligence gathering and dissemination.

There is a need to establish criteria to select amongst competing requirements for official support. The Task Force will be addressing this issue in more detail in our report. However, in general there appears to be widespread industry support in all sectors favouring the identification and provision of support to organizations which demonstrate a sustainable interest in developing long-term business in China.

Five Year Summary of Principal Canadian Exports to China, 1981-1985

	1981	1982	1983	1984	1985	Five Year Total	% of Total
	$ millions						
Wheat	886.4	736.6	[illegible]	[illegible]	[illegible]	[illegible]	53.1
Aluminum, including Alloys	3.3	188.2	139.1	98.2	59.6	[illegible]	7.9
Wood Pulp and Similar Pulp	68.5	58.4	116.6	84.4	64.8	[illegible]	6.7
[illegible] and Fertilizer Materials	61.6	7.6	56.4	93.1	[illegible]	[illegible]	4.1
Copper and Alloys	–	–	135.2	67.4	[illegible]	[illegible]	3.6
Asbestos	37.3	10.5	5.4	[illegible]	[illegible]	[illegible]	[illegible]
Synthetic Rubber and Plastic Materials	23.4	49.4	15.8	25.8	[illegible]	[illegible]	[illegible]
Zinc, including Alloys	–	20.3	45.3	47.1	[illegible]	[illegible]	[illegible]
Sulphur	28.1	41.4	24.1	38.1	[illegible]	[illegible]	2.4
Other Wood Products	0.8	15.5	32.5	37.2	[illegible]	136.4	2.1
Lumber, Softwood	6.2	9.1	38.4	15.3	[illegible]	[illegible]	1.8
Hard Spring Wheat Flour	–	–	6.3	[illegible]	[illegible]	[illegible]	0.8
Plate, Sheet and Strip, Steel	4.8	20.8	6.5	[illegible]	[illegible]	38.3	0.6
[illegible] Board	5.0	1.6	4.5	[illegible]	[illegible]	[illegible]	0.6
[illegible]	15.3	0.3	24.3	[illegible]	–	[illegible]	0.6
[illegible] Motor Vehicles	–	–	3.7	–	26.3	[illegible]	[illegible]
Synthetic and Related Fibres	5.1	4.0	6.2	3.5	11.6	[illegible]	0.4
[illegible] Chemicals	1.8	1.3	0.2	[illegible]	13.3	[illegible]	0.4
Other Telecommunications and Related Equipment	1.0	1.4	0.6	3.7	[illegible]	[illegible]	0.4
Aircraft complete with Engines	–	–	–	–	16.4	[illegible]	[illegible]
Electric Lighting and Distribution Equipment	0.4	–	–	[illegible]	[illegible]	[illegible]	[illegible]
Sub-total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Miscellaneous	41.0	18.7	33.3	[illegible]	[illegible]	[illegible]	[illegible]
Total	1,017.4	1,227.8	1,607.2	[illegible]	[illegible]	[illegible]	100.0

By Section

	1981	1982	1983	1984	1985	Five Year Total	% of Total
Live animals	0.2	–	–	–	–	0.2	[illegible]
Food, beverages and tobacco	709.8	739.1	938.6	[illegible]	[illegible]	[illegible]	[illegible]
Crude materials, inedible	34.1	68.6	77.8	135.1	[illegible]	[illegible]	[illegible]
Fabricated materials, inedible	255.1	413.3	599.1	[illegible]	[illegible]	[illegible]	[illegible]
End products, inedible	17.7	6.5	12.5	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	–	0.7	–	[illegible]	[illegible]	[illegible]	[illegible]
Total	1,017.4	1,227.8	1,607.2	[illegible]	[illegible]	[illegible]	100.0

Source: Statistics Canada

There is a need to prioritize criteria to select amongst competing requirements for official support. The Task Force will be addressing this issue in more detail in due course. However, in general there appears to be widespread consensus support in all sectors favouring the identification and provision of support to organizations which demonstrate a sustainable interest in developing long-term business in China.

FIVE YEAR SUMMARY OF PRINCIPAL CANADIAN EXPORTS TO CHINA, 1981-1985

	1981	1982	1983	1984	1985	Five Year Total	% of Total
	$ million						
Wheat	686.6	736.6	916.9	602.2	445.6	3,387.9	53.1
Aluminium, including Alloys	3.3	190.2	139.1	70.5	98.5	501.6	7.9
Wood Pulp and Similar Pulp	88.5	89.1	118.8	64.5	66.0	426.9	6.7
Fertilizers and Fertilizer Materials	61.6	7.8	59.4	93.1	38.5	260.4	4.1
Copper and Alloys	-	-	135.2	67.6	40.9	243.7	3.8
Newsprint	37.3	10.5	5.4	26.2	98.7	178.1	2.8
Synthetic Rubber and Plastic Materials	33.6	49.4	15.8	23.8	65.4	188.0	3.0
Zinc, including Alloys	-	20.3	45.3	47.7	46.5	159.8	2.5
Sulphur	28.1	41.4	24.1	28.1	30.0	151.7	2.4
Crude Wood Products	0.8	19.5	32.5	57.1	26.5	136.4	2.1
Lumber, Softwood	4.2	9.1	39.4	32.5	30.0	114.9	1.8
Hard Spring Wheat Flour	-	-	6.3	31.6	12.8	50.7	0.8
Plate, Sheet and Strip, Steel	4.8	26.9	6.5	0.9	0.1	39.2	0.6
Paper Board	5.0	1.4	4.5	12.1	13.4	36.4	0.6
Barley	15.3	0.3	14.9	4.5	-	35.0	0.6
Other Motor Vehicles	-	-	2.7	-	26.3	29.0	0.5
Textile and Related Fibres	5.1	4.0	6.2	1.5	11.6	28.4	0.4
Organic Chemicals	1.0	1.3	0.3	6.7	17.3	26.6	0.4
Other Telecommunications and Related Equipment	1.0	1.4	0.6	3.7	19.8	16.6	0.4
Aircraft complete with Engines	-	-	-	-	16.4	16.4	0.3
Electric Lighting and Distribution Equipment	0.4	-	-	0.9	10.0	11.3	0.2
Sub-total	976.6	1,209.2	1,573.9	1,175.5	1,114.3	6,048.9	94.7
Miscellaneous	41.0	18.7	33.3	96.6	14.5	355.2	5.3
TOTAL	1,017.6	1,227.9	1,607.2	1,236.5	1,259.3	6,384.1	100.0
By Category							
Live animals	0.7	-	-	-	-	0.7	0.01
Food, feed, beverages and tobacco	709.8	739.1	938.6	640.3	464.4	3,492.2	54.7
Crude materials, inedible	34.1	68.8	77.0	135.1	110.5	425.0	6.7
Fabricated materials, inedible	255.1	413.3	579.1	465.0	530.2	2,242.7	35.1
End products, inedible	17.7	6.5	12.5	26.1	152.2	215.0	3.4
Other	-	0.2	-	5.6	1.7	7.5	0.1
TOTAL	1,017.6	1,227.9	1,607.2	1,272.1	1,259.3	6,384.1	100.0

Source: Statistics Canada

FIVE YEAR SUMMARY OF PRINCIPAL CANADIAN IMPORTS FROM CHINA, 1981-1985

	1981	1982	1983	1984	1985	Five Year Total*	% of Total
	$ million						
Outerwear, except knitted	36.2	38.5	56.0	80.9	78.3	289.9	20.6
House furnishings	27.2	24.9	29.8	28.4	25.1	135.4	9.6
Miscellaneous apparel and apparel accessories	14.7	16.0	21.1	29.2	46.3	127.3	9.0
Outerwear, knitted	7.4	12.9	22.0	40.3	34.6	117.2	8.3
Broad woven fabrics, cotton	17.0	13.5	13.7	19.5	25.7	89.4	6.3
Miscellaneous vegetables and vegetable preparation	9.8	14.8	16.0	17.4	24.7	82.7	5.9
Other vegetables and vegetable preparations	9.8	14.8	15.9	17.4	24.7	82.6	5.9
Broad woven fabrics, mixed fibres	11.6	11.3	12.4	18.6	22.9	76.8	5.5
Other fresh vegetables	9.7	10.6	12.7	10.7	13.7	57.9	4.1
Nuts, except oil nuts	9.7	10.6	12.7	10.7	13.7	57.4	4.1
Miscellaneous Oil Seeds, oil nuts, oil kernels	32.8	3.2	2.0	7.4	0.9	47.1	3.3
Kitchen utensils, cutlery, tableware	6.0	7.0	5.0	6.0	6.0	30.0	2.1
Footwear	5.5	5.3	4.4	3.8	5.3	24.3	17.3
Organic chemicals	3.0	4.1	4.8	5.3	5.1	22.3	1.6
Games, toys and childrens vehicles	0.6	0.8	1.1	1.7	17.7	21.9	1.6
Other end products, inedible	2.5	2.5	2.8	3.6	8.6	20.0	1.4
Other personal household goods	2.2	2.0	1.7	2.7	7.9	16.5	1.2
Other basic hardware	-	-	2.3	7.4	2.9	12.6	0.9
Aluminium ores, conc. and scrap	-	0.4	0.9	5.6	5.3	12.2	0.9
Fish and marine animals	-	-	1.0	1.9	6.1	9.0	0.6
Sub-total	205.7	194.0	238.3	318.5	375.5	1,332.0	94.6
Miscellaneous	14.3	9.7	7.5	17.0	28.0	76.5	5.4
TOTAL	220.0	203.7	245.8	335.5	403.5	1,406.5	100.0
By Category							
Food, feed, beverages and tobacco	26.2	32.8	35.3	36.6	54.7	185.6	13.2
Crude materials, inedible	34.1	4.3	4.7	13.9	11.7	68.7	48.8
Fabricated materials, inedible	45.6	42.6	44.2	66.2	79.4	278.2	19.8
End products, inedible	110.4	119.3	156.6	213.0	250.7	850.0	60.4
Other	3.7	4.7	5.0	3.8	7.0	24.2	1.7
TOTAL	220.0	203.7	245.8	333.5	403.5	1,406.5	100.0

Source: Statistics Canada

MEMORANDUM OF UNDERSTANDING

1. During the week of [illegible], a delegation from Canada led by the Department of External Affairs and representing the Canadian hydroelectric power sector, construction industry, banking and investment community as well as Canada's Export Development Corporation (EDC), the Canadian International Development Agency (CIDA) and the Department of Regional Industrial Expansion (see Appendix A) met with representatives of the Ministry of Water Resources and Electric Power (MWREP) of the People's Republic of China (see Appendix B) and held detailed discussions on Canadian capabilities in the hydroelectric power field and the possibility of Canadian cooperation in the development of China's hydroelectric power potential. The following sets out the areas of understanding between the two parties.

2. The Canadian delegation presented the Chinese side with a submission to the Ministry of Water Resources and Electric Power, entitled "Canadian Capabilities for Development of Major

FIVE YEAR SUMMARY OF PRINCIPAL CANADIAN IMPORTS FROM CHINA, 1981-1985

	1981	1982	1983	1984	1985	Five Year Total	% of Total
	$ million						
Outerwear, except knitted	36.3	38.5	56.0	60.9	78.3	269.9	20.4
Home furnishings	27.2	24.9	22.8	25.4	35.1	135.4	9.6
Miscellaneous apparel and apparel accessories	14.7	18.0	21.1	32.3	46.3	127.3	9.0
Footwear, knitted	7.4	12.8	22.8	40.3	34.6	117.3	8.3
Broad woven fabrics, cotton	17.0	13.5	13.7	19.5	25.7	89.4	6.3
Miscellaneous vegetables and vegetable preparations	6.8	14.8	19.0	17.4	24.7	82.7	5.8
Other vegetables and vegetable preparations	9.8	14.8	15.9	17.4	24.7	82.6	5.9
Broad woven fabrics, mixed fibres	11.6	11.5	12.4	18.6	22.5	76.6	5.4
Other fresh vegetables	9.7	10.6	12.7	10.7	13.7	57.9	4.1
Nuts, except oil nuts	9.7	10.6	12.7	10.7	13.7	57.4	4.1
Miscellaneous oil seeds, oil nuts, oil kernels	32.6	3.2	2.6	7.6	0.9	47.1	3.3
Kitchen utensils, cutlery, tableware	6.0	7.0	5.8	6.0	6.0	30.0	2.1
Footwear	5.5	5.3	4.6	3.8	5.3	24.3	17.3
Organic chemicals	3.0	4.1	4.8	5.2	5.4	22.3	1.6
Games, toys and childrens vehicles	0.6	0.6	1.1	1.7	17.7	21.9	1.5
Other end products, inedible	2.3	2.5	2.8	3.4	8.6	20.0	1.4
Other personal household goods	2.2	2.0	1.7	2.7	7.9	16.5	1.2
Other basic hardware	–	–	2.3	7.4	2.9	12.6	0.9
Aluminium ores, conc. and scrap	–	0.4	0.5	1.6	5.2	12.2	0.9
Fish and marine animals	–	–	1.0	1.8	6.1	9.0	0.6
Sub-total	205.7	194.0	238.3	318.3	375.5	1,332.0	94.6
Miscellaneous	14.3	9.7	7.5	17.0	28.0	76.5	5.4
TOTAL	220.0	203.7	245.8	335.5	403.5	1,408.5	100.0

By Category

	1981	1982	1983	1984	1985	Five Year Total	% of Total
Food, feed, beverages and tobacco	26.2	33.8	35.1	36.4	54.7	185.6	13.2
Crude materials, inedible	34.1	4.3	4.7	13.9	11.7	68.7	4.9
Fabricated materials, inedible	45.6	42.6	44.2	66.2	79.6	278.2	19.8
End products, inedible	110.4	119.1	156.4	213.0	250.7	850.0	60.4
Other	3.7	4.7	5.6	5.8	7.6	24.1	1.7
TOTAL	220.0	203.7	245.8	335.5	403.5	1,408.5	100.0

Source: Statistics Canada

MEMORANDUM OF UNDERSTANDING

1. During the week of November 19, 1984 a delegation from Canada led by the Department of External Affairs and representing the Canadian hydroelectric power sector, construction industry, banking and investment community as well as Canada's Export Development Corporation (EDC), the Canadian International Development Agency (CIDA) and the Department of Regional Industrial Expansion (see Appendix A) met with representatives of the Ministry of Water Resources and Electric Power (MWREP) of the People's Republic of China (see Appendix B) and held detailed discussions on Canadian capabilities in the hydroelectric power field and the possibility of Canadian cooperation in the development of China's hydroelectric power potential. The following sets out the areas of understanding between the two parties.

2. The Canadian delegation presented the Chinese side with a submission to the Ministry of Water Resources and Electric Power, entitled 'Canadian Capabilities for Development of Major

Hydroelectric Projects and EHV Transmission Facilities'.

3. Both delegations agreed that there were major opportunities for Canada-China cooperation in the hydroelectric power generation and transmission fields.

4. The Canadian side explained that the Canadian hydro power mission to China was organized to express the interest of Canada in the development of hydro electric power in China and Canada's desire to co-operate in its implementation. The Canadian side reviewed Canadian capabilities in the hydro power sector, stressed the high priority of hydro power in the spectrum of Canada-China technical and financial cooperation and confirmed Canada's full support for China's development plans.

5. The Canadian side noted that this support applies to projects already discussed and currently under way or under review involving Canadian participation. The Chinese side took note of this position and welcomed Canadian offers on these projects.

6. The Canadian side also expressed its willingness to participate in the Three Gorges project and has agreed

to support the Canadian joint venture 'CIPM-Yangtze' formed with the approval of the Government of Canada to develop Canada's participation in this project. This consortium includes three of the largest management and engineering consulting firms in Canada, two public utilities operating large electric grids and is supported by the two largest turbine generator manufacturers in Canada.

The Chinese side welcomed the participation of the CIPM-Yangtze Joint Venture in the competition for the provision of consulting and technical services for the Three Gorges project and the support of this participation by the Government of Canada. The Chinese side requested a proposal from the CIPM-Yangtze Joint Venture for the following scope of work:

- engineering consulting services for
  a) the cofferdam scheme and the construction sequences related to the cofferdam scheme;
  b) planning and scheduling assistance
- management advisory services for
  a) project management organizational needs;
  b) project management computerized information and control systems.

7. The Canadian side requested the Chinese side to put forward other projects for possible cooperation between Canada and China that could be studied and reviewed promptly, particularly:

- projects involving a combination of management and engineering and financial participation together with the supply of production equipment, construction equipment and material, as well as transformation and transmission materials. These projects executed in close cooperation offer a greater assurance of success and satisfaction to both parties and a successful transfer of technology, particularly for projects requiring timely completion;
- projects requiring the supply of technical assistance and transfer of technology and expertise;
- projects involving construction cooperation, selection of construction methods and equipment and supply and operation of construction equipment;

- the supply of Canadian manufactured goods and equipment.

8. The Chinese side invited Canadian firms to participate in the competition for the provision of technical services for the planning design and implementation of regional EHV grids related to the Three Gorges project.

9. The Chinese side requested Canada to present proposals for the provision of consulting services for the general layout and design of earth and rock-filled dam scheme for the Longtan hydroelectric project.

10. The Chinese side made reference to the Co-operation Agreement recently signed between the Yangtze Valley Planning Office and Hydro Quebec International with respect of the Gehe Yan project and requested the Canadian side to facilitate the request for funding the Canadian costs of a feasibility study of this project.

The Canadian side acknowledged receipt of the request for assistance in facilitating this study and is currently reviewing the proposal and will respond forthwith.

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11. The Chinese side requested the Canadian Government to provide grant and soft loan financing as well as long term low interest loans for the PROVISION OF CONSULTING SERVICES AND THE construction of some elements of the Three Gorges project, the Gehe Yan project, the Longtan project and other hydropower and transmission projects to be agreed upon by both sides. The Canadian side agreed to consider this request.

12. The Chinese side made presentations to the Canadian delegation on the development of the reservoir area of the Three Gorges project and indicated the great potential for Canadian cooperation in this development. The Chinese side welcomed Canadian investment in a variety of projects which will be included in the reservoir development plan. The Canadian side agreed to look into these possibilities.

13. Canadian General Electric Co. (CGE) and Dominion Engineering Works (DEW) expressed their desire to offer a proposal for the development of a model turbine for the Three Gorges project as a follow up to the technical symposium held in Wuhan

in October 1984. The Chinese side agreed to receive this proposal.

14. Both sides agreed to review progress on all of these subjects at a mutually agreed time.

15. The Canadian side proposed that China send two high level delegations to Canada in 1985; one concentrating on power systems planning and operation, and the other concentrating on high earth and rock-filled dam design and construction.

The Chinese side welcomed this offer and discussions will be undertaken immediately in terms of the timing and the programme for these delegations.

16. The Chinese side, having reviewed all of the material provided by the Canadian side, requested the Canadian side to send two delegations to China in 1985, on subjects discussed elsewhere in this memorandum.

17. The Canadian delegation expressed its deep appreciation for the opportunity to outline Canada's

interest and capabilities in cooperating in China's hydroelectric power developments and agreed to follow up on the studies and projects discussed promptly.

18. The Chinese side thanked the Canadian delegation for its presentation and for its keen interest in cooperating in China's power developments, and agreed to continue discussion on the specific areas identified in more detail with Canadian firms as soon as possible.

Done in Beijing this 23rd day of November 1984, in duplicate in English and Chinese languages, both are authentic.

赵传绍

For the Ministry of Water Resources and Electric Power
The People's Republic of China
Mr. Zhao Chuanshao
Director
Department of Foreign Affairs

John Hadwen

For the Government of Canada

Mr. John G. Hadwen
Director General
East Asia Bureau
Department of External Affairs

MEMORANDUM OF UNDERSTANDING

1. During the visit of the Chinese Delegation to Canada headed by Her Excellency Madam Qian Zhengying the Minister of Water Resources and Electric Power of the People's Republic of China (MWREP), detailed discussions were held with Canadian Ministers, federal and provincial government officials, public utilities, financial institutions and private sector companies on a variety of subjects relating to Canada-China cooperation in the fields of hydro, thermal and nuclear energy. The following sets out the areas of understanding between the two parties and forms a secure basis for future cooperation.

2. Referring to the Memorandum of Understanding signed in November of 1984, both the Ministry of Water Resources and Electric Power and the Government of Canada expressed great satisfaction with the developments that have taken place over the past year.

3. In this regard, it was noted that the feasibility study report on the Geheyan Water Control Project by Hydro Quebec International and CIPM in cooperation with the Yangtze Valley Planning Office with financial assistance from the Canadian International Development Agency has been submitted. MWREP supported the beginning of discussions between the Hubei provincial government and the Canadian side in Montreal and Ottawa as soon as possible to identify more fully the precise nature of Canadian involvement in the further implementation of this project.

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Done in Beijing this 23rd day of November 1984, in duplicate in English and Chinese languages, both are authentic.

赵传绍	John Hadwen
For the Ministry of Water Resources and Electric Power The People's Republic of China	For the Government of Canada
Mr. Zhao Chuanshao Director Department of Foreign Affairs	Mr. John G. Hadwen Director General East Asia Bureau Department of External Affairs

MEMORANDUM OF UNDERSTANDING

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2. Referring to the Memorandum of Understanding signed in November of 1984, both the Ministry of Water Resources and Electric Power and the Government of Canada expressed great satisfaction with the developments that have taken place over the past year.

3. In this regard, it was noted that the feasibility study report on the Gehe Yan Water Control Project by Hydro Quebec International and CIPM in cooperation with the Yangtze Valley Planning Office with financial assistance from the Canadian International Development Agency had been submitted. MWREP supported the beginning of discussions between the Hubei provincial government and the Canadian side in Montreal and Ottawa as soon as possible to identify more fully the precise nature of Canadian involvement in the further implementation of this project.

4. The Canadian side announced in a press release by Mr. Kelleher that as a follow-up to the November 1984 MOU, Canada was contributing to the cost of a pre-feasibility report on the Longtan Hydroelectric Project to be undertaken by CIPM-Yangtze Joint Venture in cooperation with the Mid-South Design Institute for Hydroelectric Projects of MWREP. Work on this study will begin immediately.

5. The Canadian side also announced in statements by Minister Vézina and Minister Kelleher that Canada would contribute to the cost of part of the pre-feasibility work on the Three Gorges Hydroelectric Project to be undertaken by CIPM-Yangtze Joint Venture in cooperation with Yangtze Valley Planning Office. Work on this study will also begin immediately.

6. MWREP welcomed these announcements and wished to work with Canada on the further development of Canadian participation in the Gehe Yan and Longtan projects and on part of the Three Gorges Projects.

7. The Canadian side also announced in a statement by Mr. Kelleher that Canada was prepared to assist financially in cooperation with Canadian General Electric for the development of a model hydraulic turbine for China. MWREP welcomed this offer to produce the model turbine.

8. The Canadian side also announced in a statement by Madame Vézina that it would contribute to the cost of a study of microwave communications related to a hydro transmission project being carried out in Gansu, Qinghai and Shaanxi Provinces by the Northwest China Electric Power Administration. B.C. Hydro will carry out the study.

9. The Canadian side recalled Minister Carney's announcement, in China, that CIDA had chosen B.C. Hydro to implement a $7.5 million electric power research project with MWREP. The Canadian side reported satisfaction with B.C. Hydro's spring mission to China and welcomed a return mission to Canada, this November, of Directors of six MWREP research institutes.

10. The Canadian side reported that the CIDA bilateral program places a high priority on continued collaboration with MWREP and is committed to the development of other MWREP/CIDA bilateral projects.

11. During the visit MWREP initiated discussions of the following three projects for MWREP Canada cooperation in the Hydro power development and transmission sectors.

11. a) Based on the existing programs of cooperation in respect of the Three Gorges project, MWREP proposed to carry out the feasibility study of the overall project as a continuation of the pre-feasibility work mentioned in paragraph 5. The technical issues in this study will be defined by MWREP and reviewed by the Canadian side, while the financial options will be studied by the Canadian side and reviewed by MWREP. The feasibility study jointly done by MWREP and Canadians should be of such a standard, that it will be acceptable to the international community and supported by it financially. The Canadian side agreed to pursue this request immediately by sending a technical mission to China to discuss the scope of work as soon as possible.

11. b) TianshengQiao I power plant is to be put into operation by the mid 1990's. MWREP requests a power systems study for the integration of the power to be generated by this project into the regional grid.

11. c) MWREP proposed that the Canadian side undertake a study of peak load regulation in the South China power grid system.

12. MWREP proposed that these three projects be financed out of the funds planned for use on the South China power grid projects. The Canadian side agreed to discuss MWREP's proposal in Beijing as soon as possible.

13. The MWREP delegation visited Ontario Hydro's Nanticoke Thermal Power Plant and Keephills Thermal Plant in Alberta. The MWREP delegation was informed by the Canadian side of the discussions with Chinese authorities of a) Babcock and Wilcox of Canada as part of an international consortium, and b) the Monenco thermal power consortium for China. MWREP was also informed of the Canadian side's interest in further discussions with the Ministry of Foreign Economic Relations and Trade (MFERT) for the provision of equipment and financing for elements of China's thermal power requirements. The Canadian side invited a technical delegation from MWREP to come to Canada in early 1986 for discussion of the possibilities for further cooperation in the thermal power field.

14. Both sides welcomed these developments. The Canadian side emphasized that its cooperation with MWREP in this sector would of course be on the basis of high quality Canadian technology and internationally competitive prices and financing.

15. The Canadian side recalled that following the visit of the Power Systems Planning Mission to Canada in February, two Canadian groups (a consortium of Monenco, Teshmont, Manitoba Hydro, Ontario Hydro and CIPM-Yangtze Joint Venture) had submitted proposals to the MWREP for the development of a power systems plan for the Three Gorges project. The Chinese side indicated that these proposals were under active consideration.

16. Both sides recognized the importance of Joint Ventures and technical cooperation in the energy field as discussed in Beijing recently by Minister Carney and Madame Qian and agreed to encourage the further development of technology transfer and joint investment in power development and transmission including design, layout, construction, equipment supply and plant operation.

17. Minister Carney welcomed the opportunity to renew her friendship with Madame Qian, as well as the opportunity of a more organized approach in Canada-China energy relations. In this regard MWREP will report to the Chinese government and suggest to have discussions through diplomatic channels.

18. The Canadian side referred to Madame Qian's question about possible Canadian/PRC joint investment for large hydroelectric projects like Three Gorges made during the Canadian mission to China in November 1984 and announced that it had commissioned R.L. Walker and Partners to study this possibility and report on the degree of Canadian interest by January 1986. The Chinese side welcomed this development, expressed interest in receiving a final report, and appreciation for the discussions which took place in Toronto during the visit.

19. In this regard, MWREP announced that it intended to retain the Bank of Montreal as financial advisor to the Ministry of Water Resources and Electric Power. The Canadian side welcomed this development.

20. MWREP expressed appreciation for the Canadian sponsored seminar on financing of large scale projects recently conducted in Beijing and looked forward to working with Canadian financial institutions in the development of financing packages.

21. The Canadian side reported on recent discussions it had conducted with the World Bank on possible parallel financing of power projects in China; specifically, Yantan and Shuikou projects. The Chinese side welcomed this initiative and the further involvement of Canadians in such projects according to the rules and regulations specified by the World Bank. It was agreed that for very large projects multinational participation might be required.

22. During the MWREP visit, discussions were held with Ontario Hydro and AECL in Toronto and a visit was made to the Bruce Nuclear Generating Station. MWREP and the Canadian side welcomed existing prospects for nuclear cooperation between the PRC and Canada including the discussions which have taken place recently in Canada and the PRC on research in district heating reactor systems and the possibility of further discussions in due course with the objective of concluding an agreement on the peaceful uses of nuclear energy. MWREP noted that this subject involved several PRC government agencies, particularly the State Commission for Science and Technology.

23. Done in Canada this 21st day of October 1985 in duplicate in English and in Chinese languages both are authentic. A French translation is available.

For the Ministry of Water Resources and Electric Power	For the Government of Canada
Zhao Chunshao	John G. Hadwen

APPENDIX A

TASK FORCE ON CHINA POWER SECTOR

SECTOR BRIEF

FOR

ELECTRIC POWER SECTOR

Working Group Members:

Bill Fisher - CIDA
Brian Grover - Consulting Engineer
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July, 1986

EXECUTIVE SUMMARY

The Ministry of Water Resources and Electric Power has overall responsibility for guiding the development of electrical power systems throughout China. These systems have grown from a total capacity in 1949 of 1850 MW to 86,200 MW in 1985. Despite this remarkable overall growth in capacity, which has averaged 11.2 per cent per year, increasing shortages of electrical power have been experienced during the last decade.

Power systems expansion slowed during the Sixth Five-Year Plan (1981-1985) as a consequence of investment financing constraints. The energy demand deficit is reported by Chinese authorities to have reached a level of 50 TWh in 1985 (equivalent to about 12,500 average MW years of thermal plant output) and to have caused a continuing 20 per cent under-utilization of industrial capacity. By 1984, before the end of the Sixth Plan period, China's central authorities had assigned high priority to overcoming the bottleneck on economic development posed by continuing power shortages.

Sector development from 1986 to 2000 has been projected to require continued rapid expansion to keep pace with demands arising from the national economic target of quadrupling industrial and agricultural output over the period 1981 to 2000. The aggregate capacity of power systems throughout China is projected to reach between 200,000 MW and 280,000 MW by the year 2000, depending upon the rate at which structural reforms are introduced in other productive sectors of the economy. Investment in electric power facilities averaged $2 billion per year over the Sixth Plan, 1981 to 1985, but is projected to have to rise to between $6 and $7 billion per year during the Seventh Plan (1986 to 1990) and to between $10 and $15 billion per year throughout the following decade to keep pace with demand.

China's policies on debt financing tend to be conservative. However, based upon the recognition of the urgency of overcoming energy supply shortage for industry, which consumes more than 75 per cent of total electrical power supplies, it is anticipated that foreign financing of at least 10 per cent and perhaps up to 20 per cent of total requirements will be necessary. External finance will be needed not only to supplement domestic financing but to make up for capacity contraints within China's electrical power equipment manufacturing sector and to provide for acquisition of key technologies for a larger class of projects in both generation supply and long distance transmission, which represent the most economic additions to their interconnected systems.

China's power authorities have identified Canada as a source of technology particularly appropriate to the development of large hydroelectric plants and of long distance EHV transmission systems at and above the 500 kV level. Hence, trade promotion efforts in recent years have focussed upon responding to China's expressed interest in these specific areas. CIDA's bilateral program for the energy sector in China has also focussed on the power sector, specifically on EHV transmission systems and hydro projects.

Canadian exports to China's power sector have mostly been modest orders for transmission system components but, nevertheless, include a recent order for the boiler island components of two major thermal power projects. Thermal power represents nearly 70 per cent of the capacity of existing power systems and is likely to maintain this relative position throughout the balance of this century. During 1985, China initiated new programs to import significantly higher levels of thermal generation plant from Western countries under international competition and from COMECON countries under long-term barter arrangements.

While other sectors of China's economy, which directly earn foreign exchange through their exports, are being targeted to raise external financing on Consensus or commercial terms, infrastructure sectors, particularly the electrical power and transport sectors, appear to have been targeted to secure as much concessional financing as possible. In recent years China has been successful in arranging over $6 billion of concessional financing, at least half of which is earmarked to support development of its power sector.

The Canadian power industry (which includes the electrical power utilities, engineering consultants, contractors and electrical equipment manufacturers) has since the late 1970's faced a declining level of domestic requirements. Investments in power systems in Canada peaked in 1978 at a level of $9.7 billions. Current projections of investment requirements indicate a continued contraction until about 1994 by which time total investments are projected to be at a level of around $5 billions (in constant 1985 dollars). Thereafter, a modest growth of investment levels is foreseen as the surplus capacity created by projects initiated during the latter half of 1970's (some of which are still to be brought in service) is effectively utilized.

As a consequence of this recession, which has affected not only Canada but also the domestic power sectors of other OECD contries, Canadian companies and their OECD competitors have increasingly turned to the international markets in developing countries for survival. The power market in China is acknowledged to be the largest prospective market for exporters. Canadian firms have secured a very modest level of orders from China in recent years (totalling $39.2 million during the years 1981 through 1984). Canadian exports of power sector equipment have represented only 0.3 per cent of China's recent imports of electrical machinery.

Clearly the opportunities for increasing exports to China are large and, given appropriate support, it would not be unreasonable to target for Canadian exporters to secure in the order of 10 per cent of China's imports for power sector development. Projections of China's requirements for power sector imports range up to about $30 billion over the next 15 years. If realized (and prospects for China's continued economic growth appears to support a positive evaluation) availability of sufficient Canadian financing resources to support up to $3 billions of exports will be critical. Moreover, to achieve such a target level of exports other government instruments available to support Canadian industry must be more closely coordinated and focussed on sub-sector and project opportunities which meet both Canadian eligibility criteria for financing and Chinese criteria for involving foreign participation.

To achieve this coordination and support, the Working Group offers a series of recommendations.

1. CIDA's bilateral program in the power sector should be sustained and should continue to concentrate on technology transfer and training.

2. CIDA, through its Industrial Corporation Division, should continue to provide funding for preliminary studies of investment projects, subject to satisfying the following criteria:

   a) The proposed project should have formal support for international participation from China's central government.

   b) The proposed project must be in a field where Canadian exporters are well placed to win contracts subsequently, based on Chinese policies and previous sector experience.

   c) Firms being awarded such CIDA support must have a track record as serious exporters and be prepared to mount a sustained effort, using their own resources as well as government support, to market their products in China.

   d) A Canadian firm requesting federal support for preparatory studies should be required to prepare a confidential report for the federal government on downstream commercial prospects as a part of the study and should be required to provide periodic briefings to federal officials as the work proceeds.

3. Conventional EDC financing should continue to be offered for Canadian exporters in the power sector and concessional financing be made available to meet competitive offers on projects which meet criteria of providing significant economic benefit to Canada.

4. The federal government should develop consistent commitment criteria for evaluating the economic benefit to Canada of financial support for export programs.

5. Canada should offer concessional financing for the implementation of the Gehe Yan water control project. Comparable consideration should be given to anticipated requests from HIPDC for additional thermal plant once specific projects have been requested.

6. Government programs to help exporters penetrate the China market and influence potential clients should be continued.

7. The federal government should systematically monitor the Chinese power sector and disseminate its analyses to interested firms in the Canadian power industry.

8. Increased Canadian diplomatic and political support should be focussed on export opportunities in China's power sector.

9. Canadian industry and government should explore prospects for working with Chinese organizations in third country markets.

POWER SECTOR BRIEF

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ABBREVIATIONS

$	-	Canadian dollars
US$	-	US dollars
Rmb	-	Chinese Renminbi
AC	-	Alternating current
DC	-	Direct current
ACEC	-	Association of Consulting Engineers of Canada
B & W	-	Babcock & Wilcox
CAE	-	Canadian Aviation Electronics
CAPSEP	-	Canadian Association of Power System Export Promotion
CCC	-	Canadian Commercial Corporation
CCP	-	Chinese Communist Party
CGE	-	Canadian General Electric
CEA	-	Canadian Electrical Association
CIDA	-	Canadian International Development Agency
CIPM	-	Canadian International Project Managers
COMECON	-	Communist Economic Community
DRIE	-	Department of Regional Industrial Expansion
ECGD	-	Export Credit Guarantee Department
EDC	-	Export Development Corporation
EEMAC	-	Electrical & Electronic Manufacturers Association of Canada
EHV	-	Extra high voltage (for transmission in China considered at 330 kv and 500 kv levels).
EMR	-	Energy, Mines and Resources
fsl	-	full supply level
GW	-	Gigawatt
GWh	-	Gigawatt Hours
HIPDC	-	Huaneng International Power Development Corporation
HVDC	-	High Voltage Direct Current
IBRD	-	International Bank for Reconstruction and Development
IDA	-	International Development Association
INC	-	Industrial Cooperation Division of CIDA
ITC	-	Industry, Trade and Commerce
JPEPB	-	Jiangsu Provincial Electric Power Bureau
kV	-	kilovolt
kW	-	kilowatt
kWh	-	kilowatt hours
MW	-	Megawatt
MWh	-	Megawatt hours
OECD	-	Organization of Economic Cooperation and Development
PEMD	-	Program for Export Market Development
PVC	-	polyvinyl chloride
PRC	-	People's Republic of China
SEZ	-	Special Economic Zone
SITC	-	Standard International Trade Classification
TWh	-	Terawatt hours
UHV	-	Ultra High Voltage (for transmission in China considered to be above 500 kv AC or DC).
USBR	-	United States Bureau of Reclamation
USSR	-	Union of Soviet Socialist Republics
YPEPB	-	Yunan Provincial Electric Power Bureau
YVPO	-	Yangzte Valley Planning Office
EPPEI	-	Electrical Power Planning and Engineering Institute
HPPEI	-	Hydroelectric Power Planning and Engineering Institute
MOFERT	-	Ministry of Foreign Economic Relations and Trade
MWREP	-	Ministry of Water Resources and Electric Power
POP	-	Plan of Operation
ZEPDI	-	Zhongnan (Central and South) Electric Power Design Institute

ELECTRIC POWER SECTOR BRIEF

1. OPPORTUNITIES IN CHINA

A. Sector Organization and Responsibilities

The Ministry of Water Resources and Electric Power (MWREP) oversees all aspects of water resource management and electric power development including policy making, system planning, and the design, construction and operation of power and water resource projects of regional importance. MWREP is dependent on many of the other agencies of the State Council for monitoring and regulating its affairs. Planning (annual and 5-year plans) and allocation of resources are approved by the State Planning Commission (SPC) and the State Economic Commission (SEC). Financial regulations are issued by the Ministry of Finance (MOF). The People's Bank of China (PBC) is assuming the role of a central bank with primary responsibility for monetary and fiscal policies. Financing is arranged through other central banks (Bank of China, People's Construction Bank) to provide funds for construction and working capital. Prices for fuel and electricity are regulated by the General Price Bureau. Wages and payments to workers are regulated by the Ministry of Labor and Personnel. Foreign trade relations, including bilateral aid programs, are controlled through the Ministry of Foreign Economic Relations and Trade (MOFERT). All this ensures a high degree of centralized decision making and limits the autonomy of the regional power administrations, provincial power bureaux and state enterprises. Nevertheless there is a general trend towards decentralization which places increasing responsibility on the regional and provincial power authorities.

MWREP has 14 departments and bureaux in its headquarters in Beijing. Water resources and hydroelectric power developments are investigated and designed by various regional hydro power survey and design institutes under the guidance and direction of the Hydro Power Planning and Engineering Institute (HPPEI) of the Ministry. The Ministry has a Water Resources and Hydroelectric Power Construction Corporation which oversees the construction of new water resources and hydroelectric projects by the various construction bureaux of the Ministry. The planning and design of thermal projects, transmission and substation facilities is the responsibility of the regional power design institutes under the supervision of the Electric Power Planning and Engineering Institute (EPPEI). MWREP also directly manages a number of scientific research institutes, colleges, and training schools.

Under MWREP, there are six regional power administrations, listed in Table 1.1, which coordinate operations of the regional grids and develop long-term plans for the regions which are subsequently approved by the Ministry and the State Planning Commission. A seventh regional power administration covering Guangdong Province and the Autonomous Region of Guangxi is planned. The South China Power Network Bureau was established in 1985 to initiate integration between these power systems.

There are 26 power bureaux operating in the provinces and autonomous regions. Each power bureau is responsible for the development of the major grids (below 330 kV) in its area as well as small generating schemes,

Table 1.1

MAJOR POWER GRIDS IN CHINA, 1983

Grid	Area Covered	Installed Capacity (MW)	Energy Generated (GWh)
Regional Grids			
Northeast China	Liaoning, the major part of Heilongjiang and Jilin, and part of Nei Monggol	10,136	53,650
North China	Beijing, Tianjin, Shanxi, Hebei, and part of Nei Monggol	9,840	54,830
East China	Jiangsu, Anhui, Zhejiang and Shanghai	10,858	58,030
Northwest China	Shaanxi, Gansu, Ningxia and the major part of Qinghai	4,544	21,230
Central China	Henan, Hubei, Hunan, Jiangxi, and part of Sichuan	8,536	40,550
Southwest China	Parts of Sichuan, Guizhou, and Yunnan	4,860	21,230
Sub-total		48,774	249,520
Seven Major Provincial Grids		13,738	66,930
TOTAL		62,512	316,450
Per cent of National Total		81.6	90.0

Source: World Bank

transmission and distribution facilities. Sixteen of these bureaux operate under the six regional power administrations and the remaining ten operate in isolation. Among the latter, five are under the management of provincial governments and governments of autonomous regions. The remaining five isolated provincial networks have been turned over to and operate directly under MWREP because of their large-scale capital construction plans.

Development planning is initiated at the level of the provincial power bureaux, which are responsible for identifying with other provincial authorities anticipated industrial developments and preparing demand forecasts. Until recently the planning horizon had been restricted to the forthcoming five-year plan period, but the current 5-year plan includes a perspective plan outlining potential developments over an additional five to ten years.

The regional power design institutes aggregate the provincial plans on a regional basis and, in cooperation with HPPEI for hydro, identify the power generation sources and EHV transmission systems to be developed. The provincial power bureaux and their provincial electric power design institutes and hydro design institutes have been delegated full responsibility for the investigation and design of hydro stations of up to several hundred megawatts total capacity, thermal power stations with unit capacity of up to 200 MW and all transmission below 330 kV, together with associated sub-transmission and distribution. EPPEI (and HPPEI) retain responsibility for the investigation and design of large hydro generating plants, thermal generating stations having units above 200 MW capacity and all EHV transmission at 330 kV and above. The regional and isolated provincial plans for power development, after scrutiny by EPPEI, are passed to the Ministry for internal approval and forwarding to the State Planning Council for inclusion in the Five-Year Plan program.

Financing of the power sector was until recently based on annual allocations from the State Economic Commission in accordance with the approved Five-Year Plan program with adjustments to reflect actual progress. All power revenues, with the exception of minor amounts retained at the provincial power bureaux for employee retirement benefits, were forwarded to the State. Under the recent economic reform program in China, it appears that the power bureaux will in future retain most of the power revenues, remitting only a portion in the form of enterprise tax to the central government. Additional capital for development will be secured through credit allocations and borrowings (mainly from the People's Construction Bank and on-lending of foreign loans through the Bank of China).

In the past, large projects were designed and constructed by central units directly under MWREP. On completion, these projects were turned over to the provincial power bureaux which assumed operational responsibility. The Ministry is expected to continue to design and construct large projects and has recently created the Huaneng International Power Development Corporation with a specific mandate to import larger coal-fired thermal stations on a turnkey basis. A Preparatory Office for the China Three Gorges Project Development Corporation has also recently been established. In a discussion of options for financing the Three Gorges development MWREP Minister Qian advised that revenues from the Gezhouba project would be made available for financing final investigations and for implementation of the Three Gorges project. It is not clear whether this is an exceptional case or whether the Ministry will establish other development corporations for large hydro projects which will retain ownership and operate as bulk suppliers of power to regional and provincial grids.

These profound changes in the financing of power projects can be expected to have a major impact on future decision making and project selection. The provincial power bureaux and possibly a number of centrally controlled corporations will have to become financially responsible for their operations, more as autonomous utilities than as government departments dependant upon budget allocations. This in turn should cause them to generate more capital by increasing power rates, which were last revised in 1953.

The provision of development capital through the central banks, with the need to repay borrowings with interest, should force the power bureaux to concentrate on minimizing costs and maximizing revenues from existing and future projects. This new approach should result in much more attention being paid to power systems and project management to minimize construction periods and improve the overall efficiency of operations.

It is not yet clear how MWREP will deal with the future financing of foreign exchange requirements, although it appears likely foreign exchange credits will remain tightly regulated through the Bank of China. This in turn implies that any projects involving significant foreign financing will require approval by the Ministry, the State Planning Commission, the Ministry of Foreign Economic Relations and Trade as well as by central financial authorities including the Bank of China. Presumably such approvals will be limited primarily to larger projects of national significance.

B. Past Sector Developments and Present Needs

Rapid progress in the development of its electric power sector has been accomplished since the People's Republic of China was created in 1949. At that time the total installed generating capacity was only about 1,850 MW. This total had risen to 86,200 MW in 1985, representing an average increase of 11.2 per cent per year, and reflects the importance of electrical power in the modernization of China's economy. It is unlikely the role of electrical power will diminish as China approaches the year 2000.

A comparison between the development of the Chinese and Canadian power sectors is presented in Figure 1, which shows the growth in total generating capacity in both countries for the past 25 years. Although China's population is roughly 40 times that of Canada, the total installed generating capacity in Canada was double that of China in 1960 but only 10 per cent larger in 1985. China's power system has been growing at a faster rate and its total capacity is likely to exceed that of Canada from about 1991 onward.

In 1985 China's generating capacity was approximately 33 per cent hydro and 67 per cent conventional thermal, with, as yet, no operational nuclear plants. Canada, by comparison, relies on hydraulic generation for 58 per cent of capacity, conventional thermal for 31 per cent and nuclear plants for 10 per cent.

From 1953 through 1960 China relied upon the USSR, Czechoslovakia, East Germany, Hungary, Poland and Romania for all imports of equipment for its power industry. After 1960, when the USSR withdrew its experts, China's power sector was left with many partially completed projects and its source of supply of power generation equipment from COMECON countries was drastically reduced.

During the 1960's, China began to import from Japan and other western countries, while purchases from the USSR of heavy electrical equipment (boilers, turbines, transformers and electrical cable) continued at a low level. In May 1972, China signed a supplementary long-term agreement with the USSR for the supply of seven turbine-generator sets totalling 700 MW in addition to the usual annual agreements, under which the USSR had been supplying four turbine generator units. This pattern of importing Soviet

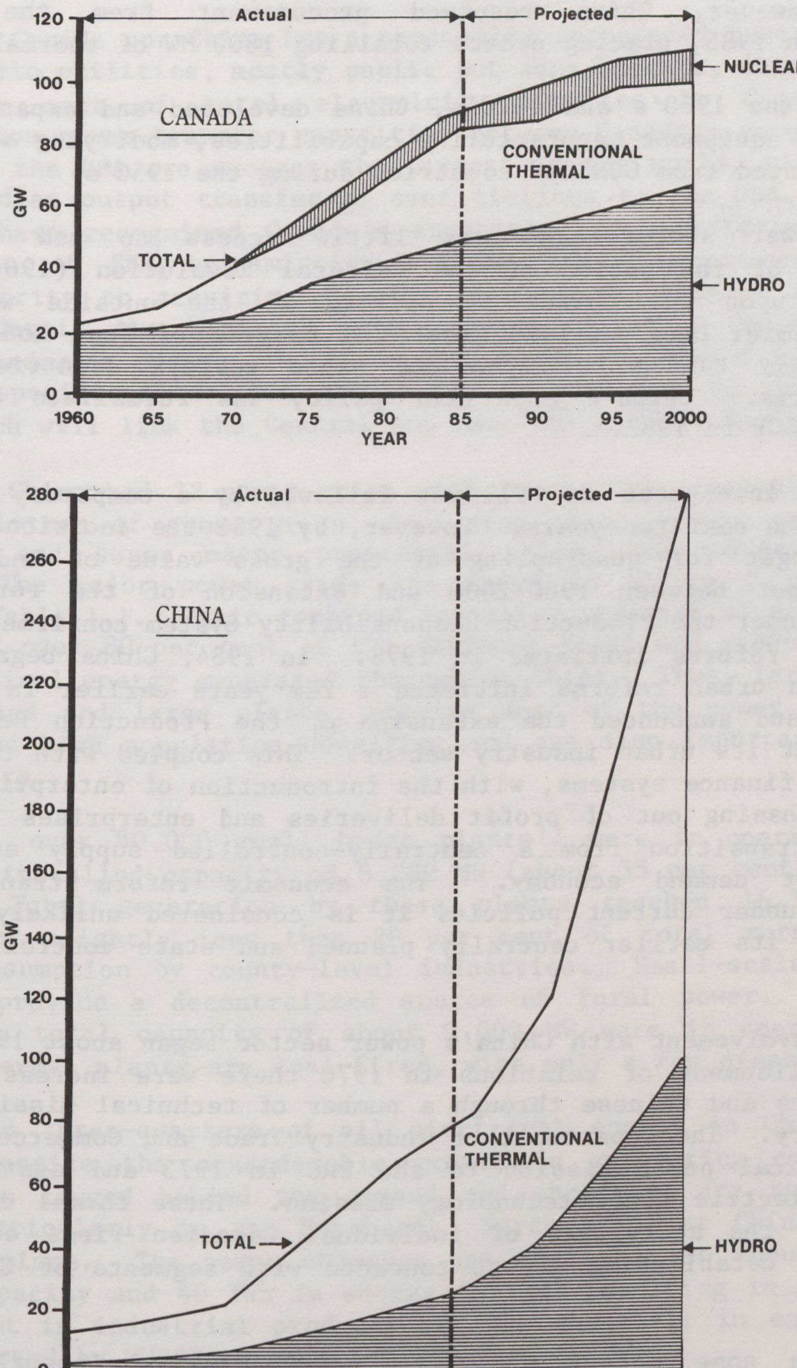

Figure 1
Power Systems Capacity in China and Canada, 1960–2000.

equipment continued through 1979. In 1980, China appeared to have removed power equipment from its list of USSR imports, presumably in part because of improved access to more sophisticated power generation equipment from western countries. However, China resummed procurement from the USSR and Czechoslovakia in 1985, placing orders totalling 1800 MW of thermal plant.

Throughout the 1960's and 1970's, China developed and expanded its own heavy electrical equipment manufacturing capabilities, modifying and improving the designs imported from COMECON countries during the 1950's.

China's power sector had very little access to new technologies throughout much of the period of the Cultural Revolution (1966 to 1976). However, based upon the policy of opening to the outside world, first announced by Premier Deng in 1978 under the program of four modernizations, China increasingly turned to Japan and other western countries for high technology imports. China's open door policy was formalized at the 12th Congress of the CCP in 1982.

A surge of investment in 1979 was followed by a temporary slowdown of imports during the next two years. However, by 1982 the decision of the 12th Congress to target for quadrupling of the gross value of industrial and agriculture output between 1980-2000 and extension of the rural economic reform program under the Production Responsibility System confirmed the thrust of the economic reforms initiated in 1978. In 1984, China began to expand upon trials with urban reforms initiated a few years earlier in its Special Economic Zones and announced the extension of the Production Responsibility System throughout its urban industry sector. This coupled with the reform of the banking and finance systems, with the introduction of enterprise taxes and loans and the phasing out of profit deliveries and enterprises allocations, signalled the transition from a centrally-controlled supply economy to a socialist market demand economy. The economic reform transition is continuing and under current policies it is considered unlikely that China would revert to its earlier centrally planned and state controlled economic framework.

Canada's involvement with China's power sector began about 1978, although following establishment of relations in 1970 there were increasing contacts between Canadians and Chinese through a number of technical missions visiting from each country. The Department of Industry Trade and Commerce sponsored a Canadian electrical power mission to the PRC in 1973 and again in 1979 a Canadian hydroelectric power technology mission. These formal contacts were complemented by the activities of individual Canadian firms exhibiting at trade fairs and establishing direct contacts with segments of China's power industry.

Apart from some modest sales of specialized equipment (Timberland Equipment in 1978), there appears to have been few Canadian exports of electrical equipment or the provision of services until the establishment in 1981 of CIDA's program of assistance to China.

A brief chronology of official supported activities since the beginning of 1982 is attached at Annex A. The opportunities for provision of Canadian goods and services, as reported in Chapter 2, correlates closely with the increased level of official Canadian interest in China's power sector and the establishment of bilateral programs under CIDA, EDC and External Trade.

Neither Canada nor China has a nationally integrated power system. There are 30 electric utilities, mostly public but some private, which generate more than 96 per cent of total electricity supplies in Canada. However, interconnection power transfer capacities between Canadian power utilities and utilities in the USA are amongst the largest in the world, with about 10 per cent of Canadian output transferred over tielines to the USA. Chinese power authorities have recognized Canada's strengths and experience in the design and operation of EHV transmission systems and interconnections and have accorded priority to acquiring Canadian technology. Hence for their first major DC intertie the Ministry turned to Teshmont of Canada, as a world recognized leader in engineering of DC facilities, to assist in developing the design and specifications for the 1,000 km ±500 kV DC Gezhouba-Shanghai intertie which will link the Central and East China Power Regions.

In 1983 China had 32 power grids with generating capacities greater than 100 MW. Thirteen of these grids, including those within the six regional power grids and seven major provincial grids, had capacities exceeding 1,000 MW. The major power grids are shown in Figure 2 and details are provided in Table 1.1. Their combined installed capacity of 62,512 MW in 1983 accounted for over 80 per cent of the national total and produced 90 per cent of the electrical energy generated throughout China. Thus, large grids, based on medium-sized and large plants, provide most of the power for areas with high loads and high population densities and are also important in supplying rural consumers.

In 1982, over 80,000 small hydro plants1/ were in operation in China, with a total installed capacity of 8,080 MW (about 35 per cent of total hydro capacity). Total generation by these plants reached 16.3 billion kWh, accounting for slightly less than 20 per cent of total rural consumption, including consumption by county-level industries. Small-scale thermal power plants also provide a decentralized source of rural power. Small thermal plants with a total capacity of about 2,000 MW were in operation in 1982. Most small thermal plants are coal-fired, with only a few diesel-fired plants.

More than three-quarters of all electrical energy in China is used by industry. Despite the considerable growth in generating capacity, supply capability has lagged behind the demand and shortages are reported in most regions - particularly in the Northeast, North and East China grids and in Guangdong Province. The power shortage was estimated at about 10,000 MW in generating capacity and 40 TWh in energy in 1982 resulting in a reported loss of 20 per cent in industrial production. The shortfall in energy supply in 1985 was reported by MWREP to have increased to 50 TWh.

Demand management has been carried out in affected regions by staggering working hours and holidays and by load shedding during periods of acute shortages according to agreed priorities. As a result, the North China grid

1/ Defined as stations with single generating units rated at less than 6 MW, or total station capacities (including several generating units) of less than 12 MW.

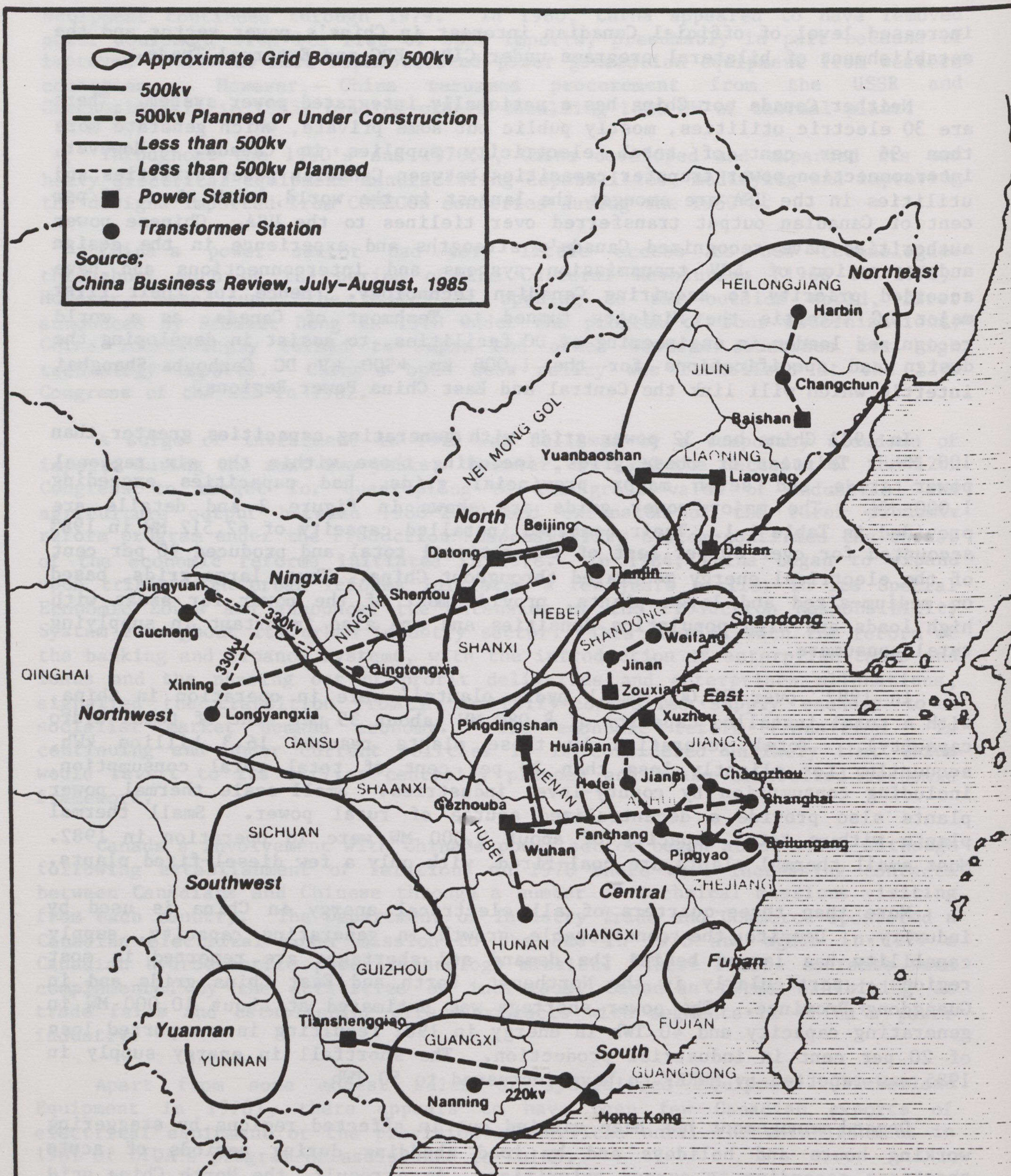

Figure 2
China Power Grids and Principal Transmission Lines.

increased its daily load factor to 86 per cent and annual load factor to 75 per cent in 1982. The East China grid achieved a daily load factor of 90 per cent and an annual load factor of around 83 per cent. Although the overall average annual running hours for thermal units in the country was around 5,500 kWh/kW, many of the larger plants in the industrialized regions report operating levels of between 7000 and 8000 kWh/kW per year. Such high levels of utilization represent a heavy burden on facilities. By way of comparison conventional Canadian coal-fired steam plant generated an average 4,449 kWh/kW in 1985. The two major thermal-based provincial systems are Ontario which generated 3,417 kWh/kW from coal-fired stations and Alberta which generated 6,788 kWh/kW from coal fired plant in 1985.

The development of transmission lines and substation facilities in China has lagged behind that of generation. This has consequences for the siting of new industries as well as upon line losses. The most common transmission voltage is 220 kV (about 36,800 km of transmission lines) but at this level is not capable of permitting significant power transfers over long distances. In 1983 there were only two lines of 330 kV (about 1,088 km) in Northwest and three lines of 500 kV (1,092 km) in Central and North China in operation. (Three single circuit 500 kV lines totalling 1,375 km were also under construction). No interconnection has yet been made between regions and there are about 10 provincial grids still operating in isolation. MWREP has estimated that China has a shortage of about 10,000 km of transmission lines at voltages above 110 kV. Similar shortages exist in substation capacity. The present plan is to develop 500 kV lines for the regional backbone transmission systems, which will be overlaid by higher voltage AC and DC transmission lines for regional interconnection in the future.

Lower voltage subtransmission and distribution are currently being financed by the provincial governments or municipalities. Local authorities have not allocated sufficient funds for the improvement and extension of these facilities.

C. Anticipated Sector Investments, 1986-2000

Electric power development is a top priority for China but the sector must compete at the level of the State Planning Commission and State Economic Commission for the allocation of scarce resources. While no official long-term development program has yet been prepared for the power sector, MWREP has prepared preliminary production profiles for 1985 to 2000 as a step towards the preparation of such a plan. The profiles are based on two broad power demand scenarios, with growth in generation rising to 500 or 520 TWh by 1990 and 1,000 or 1,200 TWh by the year 2000. These increases assume an average annual growth rate in total generation supply of between 6.5 per cent and 7.4 per cent respectively during the 1986 to 2000 period.

The present mix of generating capacity is not expected to change much over the next two decades. Due to the long lead time for nuclear and large hydro projects, the role of these types of generation will not alter substantially before the end of the century. According to the World Bank, at that time nuclear power might supply some 4 per cent of total generation and hydropower 18 to 19 per cent (or 22 to 23 per cent if small plants are included). Conventional thermal power will account for most of the balance. Current plans envisage the use of coal in virtually all new thermal power plants, and barring a dramatic increase in natural gas production, most existing oil and gas-fired power plants are planned to be gradually retired over the next two decades.

Many of the most favourable sites for hydropower projects (i.e. those relatively close to major load centers) have already been developed. The bulk of China's undeveloped hydropower potential is located in the Southwest and Northwest. Large scale hydropower development in these areas will require transmission over distances of 1,000 to 1,500 km to serve China's major industrial load centers. Gestation periods for large-scale projects are relatively long. Even at sites with favourable conditions, implementation periods from the time of project authorization to final completion of eight to ten years are typical.

The bulk of additional hydro power is expected to come from four long-term, large-scale river basin development systems, having capacities as indicated in Table 1.2. These river systems are shown in Figure 3.

Several of some 34 major hydro projects currently under construction (with a total installed capacity of 17,000 MW) are part of the development schemes summarized in Table 1.2.

Table 1.2

MAJOR HYDROELECTRIC POWER RESOURCES IN CHINA

River System	Total Capacity	Capacity to be Commissioned by the Year 2000
Upper Huanghe (Yellow)	12,600 MW	4,000- 6,000 MW
Hongshui	10,400 MW	5,000- 6,000 MW
Middle and Upper Changjiang (Yangtze)	40,000 MW	15,000-22,000 MW
Middle and Lower Lancang River (Mekong)	6,000 MW	2,000- 3,000 MW

Source: World Bank

Annex B lists the major hydro and thermal generating projects underway in 1984. It also outlines the large scale hydro and thermal generating projects being considered by MWREP for future development.

The total capacity of thermal projects under construction in 1983 was about 20,000 MW. The ongoing thermal power program is based mainly on the use of 200 and 300 MW units. Large coal-fired thermal stations with 300 and 600 MW units, and perhaps even 800 or 1,000 MW units, are planned near major new coal bases during the next two decades. Other large thermal stations will be located near suitable port facilities and load centers.

China has developed a step-by-step approach to grid expansion and integration, with the ultimate estabishment of a national integrated power grid foreseen. The existing regional grids will first be strengthened with 500 kV networks (or, in the case of the Northwest Regional grid, 330 kV networks). Many of the major grids will then be interconnected as surplus

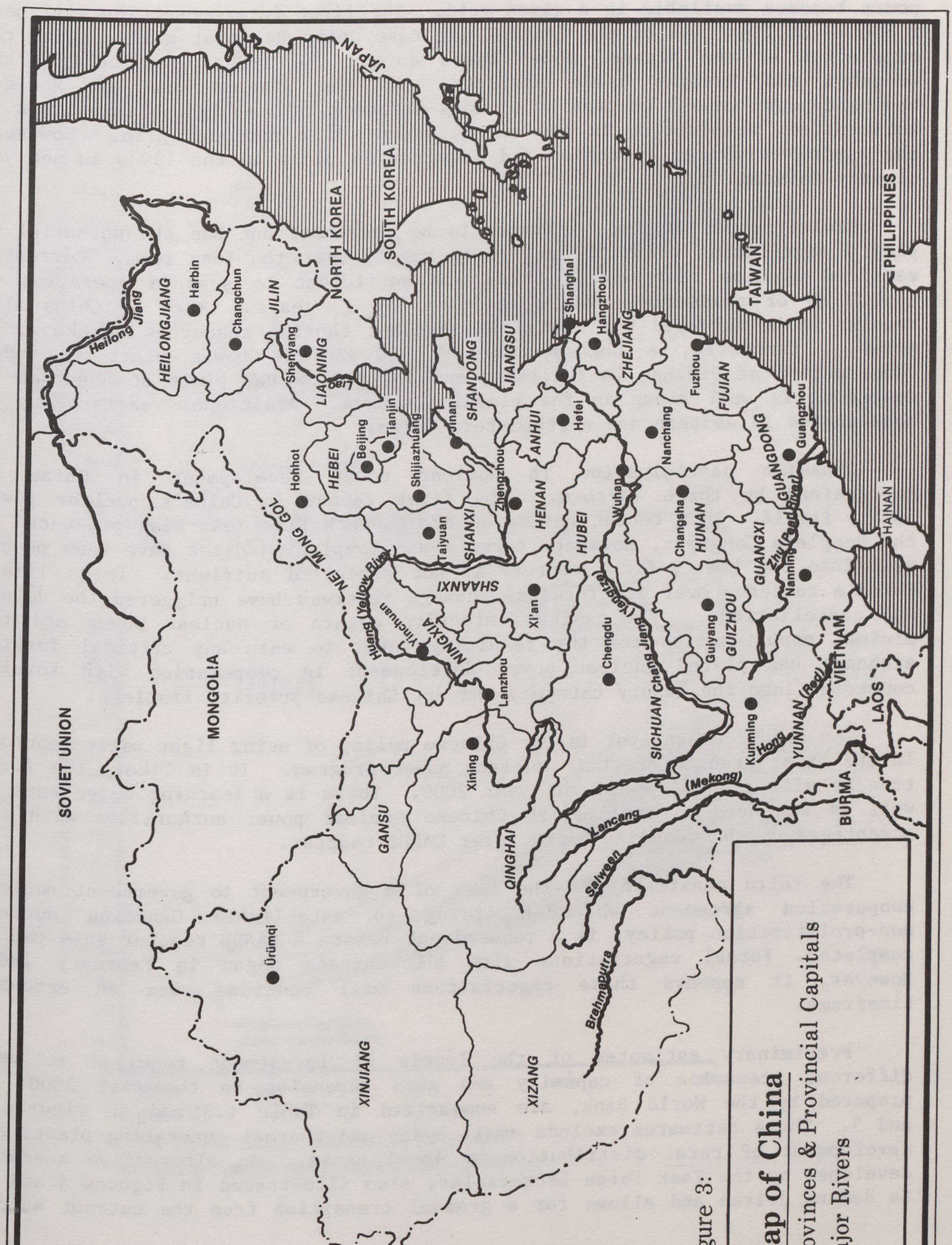

Figure 3:
Map of China
Provinces & Provincial Capitals
Major Rivers

power becomes available in a given grid. The first interconnection will be a ± 500 kV DC line linking the Central and East China Regional grids. With the completion of the planned power bases during the 1990s (particularly the Hongshui and Huanghe hydro projects, and the Shaanxi and Nei Monggol coal-and-power bases) an overlay of long-distance, ultra high voltage lines is anticipated, culminating in the establishment of a national grid. However, the timing of system expansion and integration plans in the 1990s is not yet clearly defined.

Nuclear power is just beginning to be developed but has the potential to play a significant role in electricity supply over the long term. Currently verified uranium reserves in China are sufficient to sustain operation of 15,000 MW of pressurized water reactors for 30 years. Much of China also remains to be surveyed for uranium. Abundant thorium resources are known to exist. Currently, a Chinese-designed 300 MW PWR power plant is under construction at Qinshan in Zhejiang, and a 2x900 MW PWR plant at Shenzhen in Guangdong is well along in the planning stages. Additional reactors may be constructed in eastern and northeastern China.

Canadian participation in nuclear power development in China is constrained by three factors. The first factor is China's nuclear power policy itself. In a recent review of the Seventh Five Year Plan presented to the People's Congress, megawatt targets and completion dates have been pushed well into the twenty-first century if not cancelled outright. It is likely China's concerns over its foreign exchange reserves have triggered the delays and cancellations. The capital intensive nature of nuclear power and the minimal opportunities for the resulting power to earn any critical foreign exchange has placed nuclear power development in cooperation with foreign countries into the luxury category and off Chinese priority listings.

The second constraint is the Chinese policy of using light water reactors in the first tranche of their nuclear power program. It is likely the first tranche will extend beyond the year 2000. There is a learning curve here as well as the need to familiarize Chinese nuclear power authorities with the advantages of the Canadian heavy water CANDU reactor.

The third constraint is the lack of a government to government nuclear cooperation agreement which according to established Canadian nuclear non-proliferation policy, is a requirement before a CANDU reactor sale can be completed. Formal negotiations with the Chinese began in February 1986. However, it appears these negotiaitons will continue over an extended timeframe.

Preliminary estimates of the levels of investment required to meet different scenarios of capacity and grid expansion to the year 2000, as prepared by the World Bank, are summarized in Table 1.3 and in Figures 4 and 5. These estimates exclude small hydro and thermal generating plants and development of rural distribution by local units. An alternative scenario developed by the Task Force Secretariat, also illustrated in Figures 4 and 5, is demand driven and allows for a gradual transition from the current supply

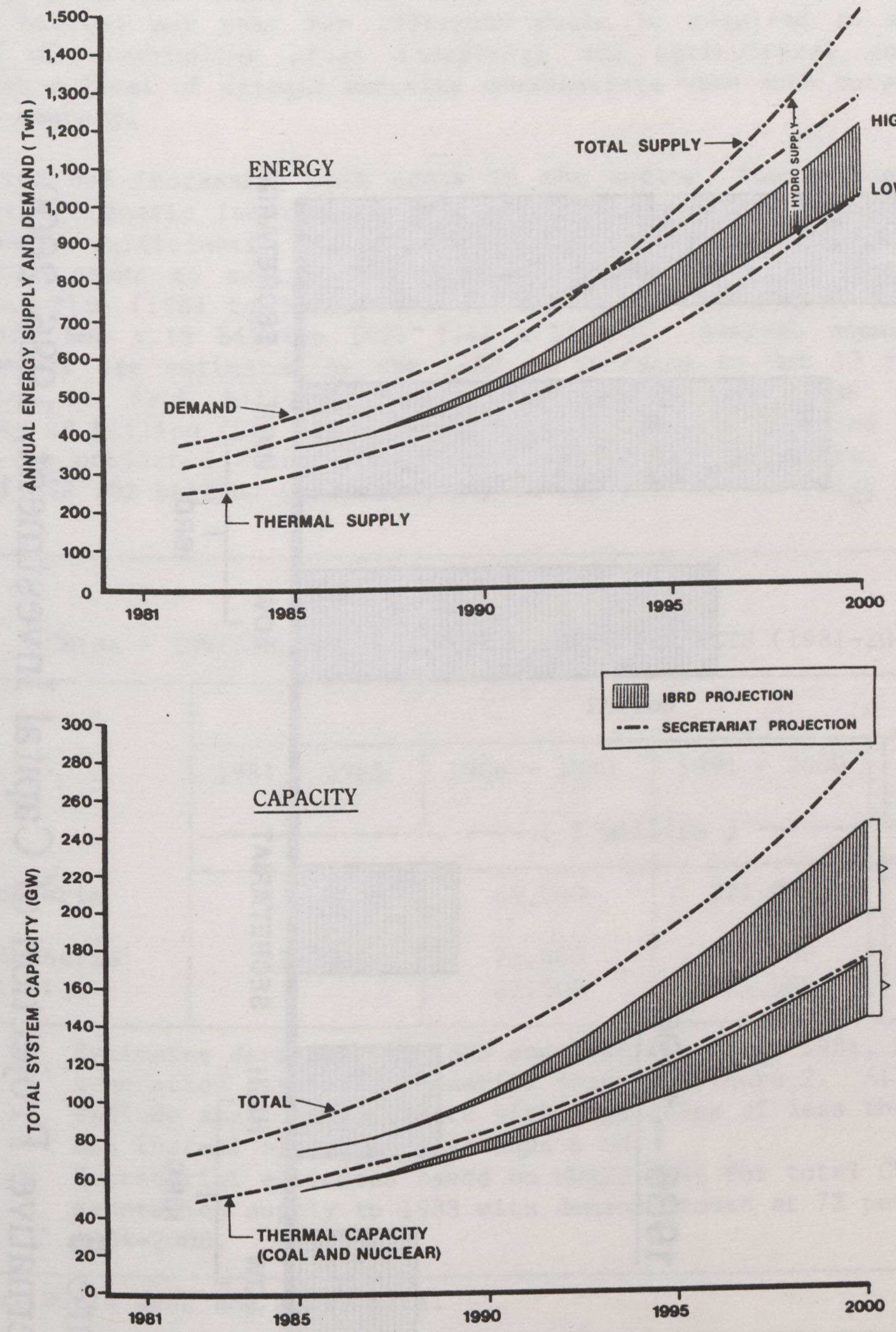

Figure 4
China Power Sector: Alternative Projection of Energy Supply and Demand, 1985-2000.

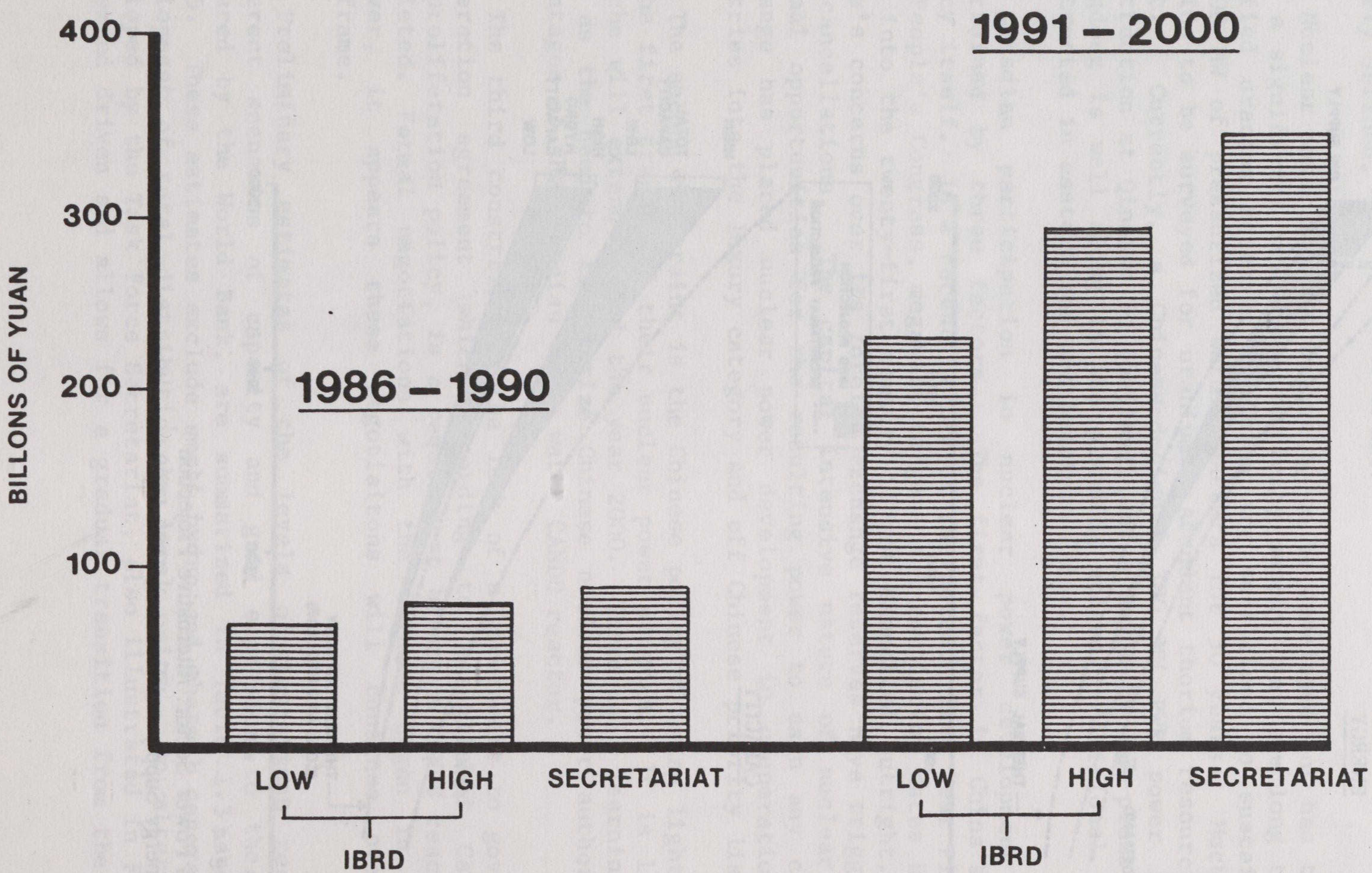

Figure 5
Alternative Projection of Capital Investment, 1986-2000.

deficit to a modest reserve level by 2000. This scenario suggests that investments in the order of Rmb 17.5 billion per year from 1986-90 and of Rmb 33 billion per year for 1991-2000 would be required to meet national targets of quadrupling gross industrial and agricultural output and to establish a level of systems security commensurate with such output by the end of this century.

Given the increasing unit costs in the sector, the estimates show the need for a dramatic increase in average annual investments if capacity is to be expanded sufficiently to relieve current supply constraints and provide additional power to sustain the planned economic growth. Under the Sixth Five-Year Plan (1981 to 1985), the average annual investment for the sector was about Rmb 4.15 billion (US$ 1.48 billion). Average annual investment requirements are estimated by the IBRD to increase to Rmb 13 to 15 billion (US$ 4.6 to $5.4 billion) during the period from 1986 to 1990 and Rmb 22 to 29 billion (US$ 7.9 to $10.4 billion) between 1991 and 2000[1]. This amounts to projected total expenditures in the next 15 years, from 1986 to 2000, of US$ 102 billion (low scenario) to US$ 131 billion (high scenario).

Table 1.3

CHINA - INVESTMENTS IN ELECTRIC POWER PROJECTS (1981-2000)

	Period			
	1981 - 1985	1986 - 1990	1991 - 2000	Total, 1986 - 2000
	(Y million)			
Low Scenario	23,000	64,000	221,000	285,600
High Scenario	23,000	75,800	290,000	365,800
Secretariat		87,500	331,000	418,500

Note: 1) Estimates developed by IBRD and MWREP in early 1984, based on generation expansion scenarios shown in Figure 2. All figures exclude small hydro plants with capacities of less than 5 MW and thermal plants of less than 6 MW.

2) Secretariat estimates based on MWREP data for total Chinese generation supply to 1983 with demand growth at 7% per year 1984-2000.

Source: World Bank and MWREP data.

The Secretariat projection would result in China's power system having an overall capacity of some 280,000 MW by the year 2000, whereas the IBRD high

1/ Projected capital expenditures by all Canadian power utilities, by comparison, are estimated to average $ 5.8 billion (US$ 4.1 billion) annually over the period 1986 to 1990 and $ 5.5 billion (US$ 3.9 billion) annually over the period 1991 to 1996, as illustrated in Figure 2.

scenario would result in overall capacity of some 240,000 MW. In large part this difference stems from non-recognition of the reported supply deficit and the exclusion of some 10,000 MW of existing small hydro and thermal plant from the 1984 base of the Bank's projection. These small plants contributed approximately 7 per cent of total electricity generated in 1983.

Although, under investment constraints, most probably the overall expansion of the power systems of China will be less ambitious than the Secretariat projection, it serves to establish an approximate upper limit to sector investments which would be necessary to satisfy fully demand by the year 2000.

D. Prospective Sources of Finance for Sector Investments

The projected power sector investment levels discussed above imply a major increase in the share of the power sector in total domestic investments in China. The share of power investment in GDP would need to rise from the somewhat less than 1 per cent per year invested during 1980 to 1985 to approximately 2 per cent per annum during 1986 to 2000.

The investments allocated to the power sector have in the past been lower in China than in many other developing or industrialized countries. The increased share estimated for the future is not unreasonable, given China's 1980-2000 target of quadrupling industrial and agricultural output. The World Bank estimates that power sector investment requirements in all developing countries will represent about 2 per cent of aggregate GDP during 1982 to 1992. This is also broadly comparable with the investment levels of four major developing countries for which recent data are available (Brazil, India, the Philippines and Thailand).

China's current concerns over the substantial drop in foreign exchange reserves experienced during 1984 to 1985 and the consequent balance of payments deficit is likely to cause a moderation of the very high rate of overall economic growth experienced over the latter years of the Sixth Plan period.

Nevertheless, despite the imposition of import and credit restrictions, recent trade statistics for Standard International Trade Classification (SITC) two digit series indicate continuing heavy imports of productive equipment, particularly electrical machinery (SITC Category 72) through the third quarter of 1985[1].

1/ Although detailed import statistics which breakdown SITC series between imports for the power sector and for other productive purposes are not available, Category 72 imports (electric machinery) totalled US$9.04 billions from 1981 through 1984. Imports under this category were quite high in 1981, but declined in each quarter from the beginning of 1981 up to the end of the first quarter of 1983. Thereafter a trend to increasing imports has been sustained up to the end of the third quarter of 1985 (the latest for which data are available) with imports of electrical machinery in the first three quarters of 1985 totalling US$2.96 billions.

International sources of finance have played a modest role in power sector investments in China until recent years, a role which can be expected to increase in future. At the same time it is evident that China expects to direct to its infrastructure development much of the concessional financing made available by other countries.

From January 1, 1984 to the present 51 Consensus notifications from competing export credit agencies have been issued, as reported in Table 1.4.

Table 1.4

CONSENSUS NOTIFICATIONS BY OTHER COUNTRIES FOR CHINA - 1984 & 1985

Sector	Number of Notifications	Contract Amount (up to Cdn. $ Millions)	Average Grant Element (%)
Manufacturing	17	526.1	26.8
Agriculture	15	230.1	39.5
Power	10	766.3	26.1
Telecommunications	5	545.4	28.9
Forestry	3	60.0	28.4
Petro-Chemical	1	58.5	25.3
Total	51	2,186.4	29.6

The amounts shown above are derived from the Consensus notification categories which give a range of contract values, the higher of which was used as an indication of the size of these projects.

The countries from which these credit-mixte notifications were issued is listed in Table 1.5.

Table 1.5

CONSENSUS NOTIFICATION FOR CHINA BY COUNTRY - 1984 & 1985

Country	Number of Notifications	Contract Amount (up to Cdn. $ Millions)	Average Grant Element (%)
1. Denmark	15	386.8	37.6
2. Sweden	13	575.0	25.6
3. Italy	7	115.8	37.6
4. West Germany	4	144.0	29.3
5. France	4	147.9	32.2
6. Japan	3	537.6	18.8
7. Belgium	1	4.5	20.9
8. Australia	1	45.5	25.0
9. Britain	1	37.9	25.0
10. Netherlands	1	10.5	25.4
11. Austria	1	180.0	26.6
	51	2,186.4	29.6

The methods by which these countries make credit-mixte financing available to the Bank of China are indicated in Table 1.6.

Table 1.6

CURRENT CONCESSIONAL FINANCING OFFERED TO CHINA BY OTHER COUNTRIES

Institution	Facility	Amount*(Cdn. $Millions)	Currency	Rate and Terms	Targeted Sectors
Japan/EID or MITI	Dedicated to seven projects	2,370	Yen	i: 3.5% g: 10 yrs r: 40 yrs	Hydro-electric power, railways and telecommunications
Japan/EID or MITI	Untied line of credit	3,346	Yen	i: 6.5% g: 2-6yrs r: 9-13yrs	Oil and coal development projects
Britian/ ECGD	Line of credit	206	£	i: 5.0% g: 5 yrs r: 15 yrs	Unofficially power and mining projects
Denmark/ EKR	Line of credit	28	U.S.$	i: 0.0% g: 10 yrs r: 35 yrs	General purchases of capital equipment
Denmark/ EKR	Dedicated to specific projects	117	U.S.$	i: 0.0% g: 10 yrs r: 35 yrs	N/A
France/ BFCE	Line of Credit	272	U.S.$	N/A	Telecommunications
Switzerland/ GERG	Line of Credit	50	U.S.$	i: 0.0% g: 10 yrs r: 20 yrs	Not targeted (to be blended with consensus rate funds for specific projects)
Belgium/ MFA	Line of Credit	10	U.S.$	i: 0.0% g: 10 yrs r: 30 yrs	General purchases of Belgian capital equipment.
TOTAL		6,399			

N.B.

i: Interest Rate
g: Grace Period
r: Repayment Term
* Exchange rate as of December 6, 1985

As can be seen from the above, most OECD countries offer a concessional line of credit to be blended with funds at Consensus rates and terms as necessary to win projects. Most are dedicated to specific projects or economic sectors. In addition to those facilities noted above, Sweden, Italy, France and West Germany offer credit mixte financing on a fairly regular but ad hoc basis.

Specific countries have achieved substantial success using a variety of credit-mixte strategies. These sales are often associated with long-term development projects in various economic sectors. Denmark has been particularly successful in identifying smaller projects in agriculture, food processing and manufacturing. Similarly, France has been able to conclude several large sales by concentrating concessional funds specifically in the telecommunications sector and working closely with the relevant Chinese authorities. Italy has implemented several large joint-ventures in China with state-owned Italian companies acting as the joint venture partner in such industries as automobile, truck and farm equipment manufacturing and participation in joint venture for thermal power plants.

West Germany appears to have been quite successful in increasing the level of its exports to China without the use of concessional financing by demonstrating a willingness to undertake extensive technology transfers carried out by its private sector over long periods of time. In addition, West Germany won a US$ 400 million contract to refurbish a steel mill primarily on the merits of its technological superiority. Stemming from this project several smaller transactions have been concluded.

The Japanese remain the largest exporters to China due to their exceptionally low prices for many goods and the availability of concessional funds. Although complete information is not available, it appears that the largest amounts of concessional financing to the power sector have been provided by Japan.

The World Bank made its first loan to China in 1982. In the subsequent four years through mid-1985 the World Bank committed US$ 2,275 million in loans on 19 projects in China. Two of these loans, totalling US$ 262.4 million, or some 10 per cent of the World Bank portfolio, have been for power projects. These loans have been at normal IBRD rates. If the pattern of recent years persists, with the World Bank committing in excess of US$ 1,000 million (combined normal World Bank lending and IDA funding) for projects in China annually, power sector projects might be expected to account for loans from US$ 100 to US$ 200 million annually. A summary of presently known World Bank power projects in China is presented in Table 1.7.

From the beginning of 1984 to the end of 1985 up to $ 766.3 million of below Consensus financing has been offered for projects in the power sector. It is not known to what extent these offers were accepted by China nor to what extent the total includes competing offers for the same projects, but presumably includes parallel financing from Japan for the Lubuge hydro development and Japanese bilateral financing for the Tianshengqiao hydro project. Assuming one-third to one-half of the total has been accepted and adding this to current IBRD commitments suggests that between US$ 450 and 500 million of foreign financing was arranged for the power sector over the past 2 years. In the first half of 1986 approximately US$ 1 billion for turnkey thermal projects and an additional US$ 310 million in World Bank loans are under negotiation.

This assumed total US$ 2.3 billion in commitments would represent annual expenditure levels of about US$ 265 million per year (taking into account the mix of hydro, thermal and transmission developments included) and provide for about 7 per cent of projected annual investment requirements during the 1986 to 1990 period.

Table 1.7

WORLD BANK POWER PROJECTS IN CHINA

No	Title & Description	Total Project Cost	World Bank Loan	Project Status
		US $ million		
1	Lubuge Hydro - 450 MW (Yunan Province)	811.7	145.4	Approved SAR-Jan 23/84 Loan 20 years including 5 yr grace period at IBRD standard variable interest rate (10.08% at time of aggreement): onlending to YPEPB for same period at 8% interest rate.
2	Second Power Project (Jiangsu Province, East China Power Grid) 500 kV transmission line, Xuzhou to Shanghai	282.8	117.0	Approved SAR-Jan 24/85 Loan 20 years including 5 yr grace period at IBRD standard variable interest rate: onlending to JPEPB for same period at 8.5% interest rate
3	Third Power Project - 1200 MW Coal-Fired Thermal plant at Beilungang (East China Power Grid) using coal from Shanxi	988.0	250.0	Negotiations in April/86
4	Yantan Hydro - 1100 MW Guangxi Autonomous Region	583.0	60.0	Negotiations in April/86
5	Power V - Shuikou Hydro - 1400 MW (Fujian Province)	NA	200.0	Appraisal in March/86
6	500 kV transmission Lines	NA	NA	Yet to be defined. Loan likely in FY/88

It appears that financing from international sources, including COMECON countries largely via barter arrangments, has accounted for about 10 per cent of China's investments in the power sector in the past five years, which in total amounted to some US$ 1.5 billion annually. If investments in the power sector triple in the next five years (1986 to 1990), as projected in Table 1.3, it is questionable whether foreign financing will increase as rapidly. The result will depend primarily on bilateral financing from major OECD countries, particularly Japan. The main point, however, is that all such international financing is unlikely to account for more than a very modest proportion, limited perhaps to some 10 to 15 per cent, of investments in China's power sector. The bulk of the capital will continue to be provided, as in the past, from domestic sources.

The Chinese authorities will be under increasing pressure from a macro-economic perspective to generate as much capital as possible through electricity tariffs. (These tariffs have not been increased since they were fixed in 1953). The World Bank will continue to encourage China to set tariffs at levels which reflect the long-run marginal costs of new projects. The rate at which the power sector can expand in China will depend fundamentally on the success of the authorities in mobilizing additional domestic resources. International financial resources may reach very impressive totals but are not likely to provide more than 10 to 15 per cent of total capital requirements for the power sector.

E. Major Projects of Commercial Interest to Canada

It is expected that over the next 15 years thermal power developments will constitute about 75 per cent of new generation capacity additions to China's power systems. General information on large projects of potential interest is provided in Annex B.

Table 1.5 lists 33 large thermal projects which are expected to be built during the Seventh Plan period (1986 to 1990) with foreign assistance. As noted in Table 1.5 many of these projects have already been tied to particular suppliers or countries under bilateral financing arrangements. Babcock and Wilcox, Canada are participants in the Shan An and Nantong projects.

Of the 13 projects listed in Table 1.8 for which suppliers have not yet been determined, it has been suggested that the Yinkou and Luo Huang projects followed by the Han Zhou and Huangpu projects may be the best prospects for Canadian suppliers.

The Huanung International Power Development Corporation (HIPDC) is a separate enterprise of MWREP charged with responsibility for turnkey import contracts for thermal power stations. HIPDC issued international tenders in 1985 for four thermal power station. There are indications that the Corporation may pursue future contracts on a negotiated basis with suppliers who can offer soft loan financing rather than calling international competitive bids.

Major hydro power projects of current interest to Canadian exporters are described in Annex C. These include the Gehe Yan, Three Gorges, Longtan and Lijiang Projects.

Many thousands of kilometers of EHV transmission facilities will be required to tie the foregoing thermal and hydro developments to the existing power systems and to reinforce the power grids. Specific requirements cannot be identified at this time, but significant opportunities for Canadian suppliers should be associated with major generation projects.

TABLE 1.8

THERMAL POWER STATIONS IN SEVENTH PLAN PERIOD (1986-1990)

POWER PLANT	PROVINCE	CAPACITY	TYPE	BUYER	SUPPLIER/COUNTRY	LOAN	STATUS
Shan An	Hebei	2 x 350	Coal	HIPDC	GE/Ansaldo/BW(Can)	Commercial	Signed
Dagang	Tianjin	2 x 330	Coal	C W E	GEI/Italy	Mixed	
Datong	Shanxi	3 x 220	Coal	MWREP	Hungary	Barter	
Shen Tou	Shanxi	2 x 220	Coal	MWREP	Czechoslovakia	Barter	
Zhangze	Shanxi	4 x 220	Coal	MWREP	Russia	Barter	
Ji county	Tianjin	2 x 500	Coal	MWREP	Czechoslovakia	Barter	
Ji Min	Inner Monogolia	2 x 500	Coal	MWREP	Russia	Barter	
Mu Dan Jian	Helongjiang	2 x 200	Coal	MWREP	Russia	Barter	
Dalian	Liaoning	2 x 350	Coal	HIPDC	Mitsubishi	Supplier's Credit	Signed
Shuan Ya Shan	N.E.	2 x 200	Coal	MWREP	Russia	Barter	
Liaoning	Liaoning	2 x 200	Coal	MWREP	--------NOT YET DECIDED----		Most probably barter
Yingkou	Liaoning	2 x 350	Coal	------------------NOT YET DECIDED------			
Yingkou	Liaoning	2 x 300	Coal	------------------NOT YET DECIDED------			2nd stage
Huan Zhong	Liaoning	2 x 800	Coal	MWREP	Russia	Barter	
Yuan Bao Shan	Liaoning	1 x 600	Coal	MWREP	---------NOT YET DECIDED------		
Shanghai	Shanghai	2 x 600	Coal	HIPDC	---------NOT YET DECIDED------		
Nantong	Jiangsu	2 x 350	Coal	HIPDC	GE/Ansaldo/BW(Can)	Commercial	Signed
Wu Jing	East	2 x 300	Coal	MWREP	--------NOT YET DECIDED------		
Beilungang	Ninbo	2 x 600	Coal	MWREP	1 x 600 --------W.B.--------		Tender
	Zhejiang				1 x 600 NOT YET DECIDED------		Most probably to be negotiated with tender winner
Xinghai	Lian Yun Harbour	2 x 200	Coal	Province	--------NOT YET DECIDED------		Most probably barter
Huan Dao	Shandong	2 x 200	Coal	MWREP	Russia	Barter	
Fuizhou	Fujian	2 x 350	Coal	HIPDC	Mitsubishi	Supplier's Credit	Signed
Dezhou	Shandong	2 x 350	Coal	HIPDC	Hitachi(?)		Negotiated
Yao Meng	Henan	2 x 300	Coal	MWREP	Belgium	Mixed	Signed
Yao Meng	Henan	2 x 300	Coal	MWREP	---------NOT YET DECIDED------		
Han Zou	Hubei	2 x 300	Coal	MWREP	---------NOT YET DECIDED------		Invitation to bid
Yue Uang	Hunan	2 x 300	Coal	HIPDC	U.K.	Soft	
Sha Jiao	Guangdong	2 x 350	Coal	MWREP	---------NOT YET DECIDED------		
Huangpu	Guangdong	2 x 300	Coal	MWREP	---------NOT YET DECIDED------		
Lai Bin	Guangxi	2 x 125	Coal	MWREP	---------NOT YET DECIDED------		
Jiang You	Sichuan	2 x 350	Coal	CWE(?)	Alsthom	Soft	Negotiable
Luo Huang	Chongqing	2 x 350	Coal	HIPDC	---------NOT YET DECIDED		
Pu Sheng	Shaanxi	2 x 320	Coal	MWREP	Romania	Barter	

Source: Canadian industry - not confirmed by official Chinese sources.

2. CANADIAN INDUSTRY CAPABILITY AND CAPACITY

A. Domestic Market and Prospects 1986 - 2000

Demand for equipment and services for capital projects in the Canadian power industry peaked in 1978 at a total value of $9.8 billion (1985 dollars) and had dropped to 67 per cent of this value by 1984. This contraction is expected to continue until 1994, by which time total investments are projected to be at a level only 50 per cent of those of 1978 in real terms. This drastic decline in total capital expenditures by power utilities across Canada is illustrated in Figure 6.

The fundamental cause of this slump for industry has been a significant reduction in the rate of growth in demand for electrical energy. Prior to the first oil price shock, demand for electrical energy within Canada had grown consistently at an annual rate averaging 6.6 per cent per year (1960 to 1974). This pattern of fairly steady growth changed abruptly when total consumption of electrical energy actually decreased in 1975 and again in 1982. Between 1973 and 1984 the overall annual growth rate averaged 3.7 per cent and is projected by Energy, Mines and Resources (based on power utility forecasts) to decrease further to an annual average of 2.9 per cent for period from 1984 up to the year 2000, (slightly lower than the projected overall rate of economic growth; real GDP increasing by 3.0 per cent annually between 1984 and 2000).

Canada already uses more electrical energy on a per capita basis than all other countries with the exception of Norway. In 1984, for example, 15,283 KWh were produced for each person in Canada. The comparable figure for the USA was only 65 per cent of Canada's, whereas in West Germany and Japan, per capita electrical energy production was 39 per cent and 32 per cent respectively of that of Canada. China, by comparison, produced 363 KWh per capita in 1984, some 2.4 per cent of the Canadian figure.

The prolonged slump in Canadian utility expansion is forcing a profound rationalization throughout the industry. Utilities have reduced their staffs (particularly BC Hydro) and domestic business for consulting engineers has shrunk. Manufacturers of large equipment, particularly generators and turbines, have been particularly hard hit, as have the constructors.

The USA has been a convenient market for some Canadian equipment suppliers but the decline of power sector investments in the USA is even more pronounced than that in Canada, as illustrated in Figure 6. Capital expenditures there peaked at about US $50 billion (1985 prices) in 1982 and are projected to fall to only 35 per cent of that level by 1991. Projected expenditures on generation plant are the worst hit, dropping in 1991 to only 19 per cent of the 1982 peak. This slump will likely fuel protectionist pressures in the USA and make it even more difficult for Canadian exporters to maintain their traditional share of the US market.

On the international scene other OECD countries are also vigourously pursuing exports of electric power equipment, particularly as domestic power system developments in all OECD countries have been slowed by weak economic performance during the late 70's and first half of the 1980's. With the exception of the U.S. and Canadian power sectors, which are relatively open to

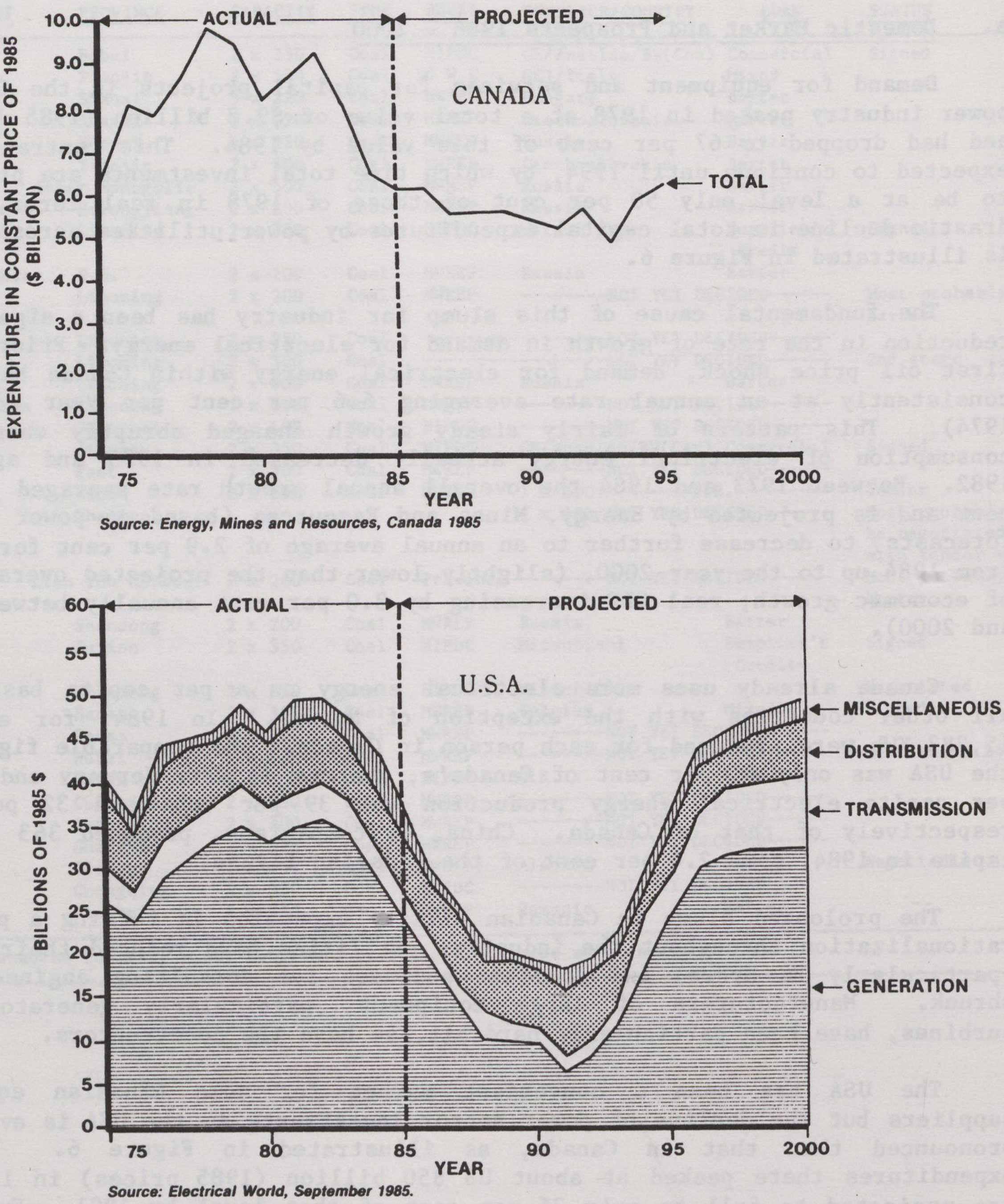

Figure 6
Capital Expenditures by Power Utilities in Canada and U.S.A., 1974-2000.

foreign competition for equipment supply, other OECD countries protect their own electrical industries, effectively closing their internal markets to foreign supply (with only occassional exceptions allowed where domestic producers cannot provide specific types of equipment).

The contraction in capital investments by power utilities in Canada and the USA will have to be reversed eventually because electrical energy consumption in both countries continues to rise, albeit more slowly than in the past. An important strategic issue which faces Canadian power utilities, as well as the firms which supply them with goods and services, is what shape the industry will be in when the turnaround comes in five to ten years from now. While Ontario Hydro has maintained its support for the CANDU reactor and Hydro Quebec offers a preference to Quebec-based manufacturers, a more consistent approach to this issue from the Canadian power utilities, the provincial governments and the federal government appears to be warranted.

A good case can be made for the federal government to support exports of at least selected types of equipment in order to help preserve a strong industrial base in Canada in such an important sector of the national economy. Given a policy for support in export markets and domestic support for R&D activities additional world product mandates may be secured, thus helping to conserve and build upon existing sector strengths.

B. Resources and Experience for Export Market

The Canadian electric power industry can be considered to consist of four components: consulting engineers, equipment manufacturers, constructors, and the electrical utilities who build and operate the projects. Each of these entities has particular strengths which they bring to the sector. Many power sector organizations, listed in Annex E made presentations to the Task Force on their perspectives on China.

Consulting engineers, are independent service organizations that provide a variety of services to the power utilities, and have been very active internationally for several decades. At the March, 1986 meeting of the Canadian Electrical Association it was reported that 13 Canadian consultants worked on a total of 113 power projects in 42 different countries during 1985. Canadian consultants are very adaptable organizationally, configuring themselves so as to be able to bring the necessary disciplines to bear on any particular project. Some of the larger firms have most of the engineering skills available from within their own organization to handle any level of project development.

Canadian electrical equipment manufacturers produce a broad range of items necessary for the generation, transmission and distribution of electrical power. These include generators, hydraulic turbines, steam boilers, transformers, switchgear and electric cable. Canada has a manufacturing history for this class of equipment that goes back to the turn of the century when electricity first came into industrial use. Where Canadian requirements have been unique, the domestic manufacturers have developed specific equipment to satisfy them. In this way, Canadian strengths have developed in particular product areas such as hydraulic generation and long distance transmission systems.

Many of the larger manufacturers in Canada are branch plants of international organizations with headquarters elsewhere. In the past, this structure has prevented some Canadian firms from bidding against their parent firms on work in other countries unless tied Canadian financing was being provided. In recent years, however, several Canadian firms have been granted marketing independence and/or world product mandates so that they can develop long-term plans to pursue international opportunities from Canada.

Babcock & Wilcox Canada, for example, formed an International Division to discharge worldwide responsibiity for directing the marketing and sales for steam generating equipment on all the company's overseas projects. In the past 35 years, Babcock & Wilcox Canada has exported products to 30 different countries. In the past 18 months the firm reports issuing bids from Canada on $ 1.5 billion of projects.

Canadian General Electric has several world product mandates within the GE organization: for hydraulic turbines and hydroelectric generators; CANDU nuclear fuel and fuelling machines; static exciters; high voltage bus ducts; and large electric motors.

Westinghouse Canada has received world product mandates for gas turbines and gas turbine generator sets (up to 42 MW); steam turbines and steam turbine-generator sets (up to 60 MW); static exciters; and electrical distribution equipment.

Other Canadian firms have obtained mandates from their parents for more specialized lines: ASEA for current transformers over 300 KV and Cegelec for metal clad switchgear (to 36 kV). Federal Pioneer, as a Canadian company, has developed its own technology for large power transformers.

The current output of the Canadian industrial electrical equipment sector is about $3 billion per year. The lighter industrial products portion of the sector is operating at an estimated 80 per cent capacity, however, the heavier products portion, i.e. those sold mainly to electrical utilities, is currently operating at only an estimated 40 per cent of capacity.

Canadian construction companies are usually engaged by Canadian electric power utilities to build virtually all of their generating plants and most of their major transmission systems. As well, they are frequently engaged to build lower voltage distribution systems. Usually a Canadian utility will act as its own prime contractor for a major project, purchasing all of the equipment directly from the manufacturers. The constructor is engaged to build the civil works and install that equipment which does not require erection by the supplier.

The logistics of providing heavy constuction equipment supplies and labour to remote sites and the building of major facilities under harsh climatic conditions have placed heavy demands on the capabilities and adaptability of Canadian constructors of hydroelectric developments. The rigorous Canadian environment demands a high degree of skills in project planning and scheduling to achieve the desired results in a minimum of time and at a competitive cost.

The methods and techniques which have been employed to construct the civil works for major domestic energy projects have been successfully applied by Canadian contractors to comparable developments in other countries.

Canadian electrical utilities are organized on a provincial basis. In 1984, they employed some 74,000 people, had assets of $82 billion and annual revenues of $14 billion. The total generating capacity of the Canadian electrical system was 95,530 MW at the end of 1984 (58 per cent hydro, 31 per cent conventional thermal and 10 per cent nuclear, as shown in Figure 1). The aggregate Canadian electrical system is the fourth largest in the world, exceeded in capacity only by those of the U.S.A., U.S.S.R. and Japan.

In the past, Canadian electrical utilities have made their technical and management expertise available to their counterparts in more than 40 developing countries, frequently as part of a CIDA-financed technical assistance package. The decline in Canadian system load growth over the past few years has resulted in a surplus of engineering manpower in the larger utilities. In an effort to maintain a broad range of specialized engineering skills within their organizations, these utilities have become much more active in searching for opportunities outside of Canada where their excess engineering capacity can be suitably employed. To facilitate their efforts, Hydro Quebec and B.C. Hydro each have wholly-owned international consulting companies. (B.C. Hydro International has recently announced that it will no longer market independently, but is available to support Canadian engineering consultants working outside of Canada and to continue its involvement in ongoing assignments, including several in China). Ontario Hydro and Manitoba Hydro have also set up new business development groups within their organizations which are dedicated to searching for opportunities abroad.

The breadth of experience available in the Canadian electrical utilities is perhaps best demonstrated by reference to a few pioneering projects, as follows:

- The 10,000 MW La Grande hydro generating complex recently completed by Hydro Quebec.
- The coal burning 4,000 MW Nanticoke Thermal Station built and operated by Ontario Hydro on Lake Erie. This is the largest conventional thermal station in North America.
- The 735 kV transmission system from Churchill Falls developed by Hydro Quebec and operated successfully for over 15 years.
- The ± 460 kV high voltage direct current transmission system from the Nelson River hydro complex to Winnipeg built by Manitoba Hydro and in operation for over 10 years.
- The 500 kV transmission systems installed and operated by B.C. Hydro and Ontario Hydro.
- The 5,000 MW underground powerhouse at Churchill Falls in Labrador.

- The back-to-back DC interconnector station at Eel River built and operated by Hydro Quebec to provide for asynchronous power transfer to the New Brunswick Power Corporation.

- The large CANDU nuclear generating stations designed, built and operated by Ontario Hydro at Pickering (8 x 540 MW) and at Bruce (4 x 791 MW plus 4 x 880 MW - final two 880 MW units to be commissioned in 1987 and 1989).

CAPSEP stands for Canadian Power Systems Export Promotion, a committee formed in 1984 to focus export efforts by the power industry. CAPSEP includes representatives of the four major associations of the industry:

- Association of Consulting Engineers of Canada (ACEC)
- Canadian Construction Association (CCA)
- Canadian Electrical Association (CEA)
- Electrical and Electronic Manufacturers Association of Canada (EEMAC)

CAPSEP has worked hard with key organizations in the industry to focus attention on export opportunities offshore. In May of 1985 CAPSEP organized a national seminar on the subject in Ottawa, and has coordinated the production of a high quality brochure (published in 1986), which explains Canadian competence in power systems to potential overseas clients.

CAPSEP has proposed an approach under which Canadian consortia could be organized to attempt to take significant power projects "off the market". Each consortium, by offering to develop a project preparation plan, would seek to secure for Canada the financing and execution of the complete project. CAPSEP is seeking federal government support to fund such project preparation plans and assist the Canadian power industry to penetrate specific markets through negotiated turnkey projects. Discussion of this CAPSEP proposal is currently proceeding with the federal government.

C. <u>Previous Experience and Activities in China</u>

Canadian shipments of electrical equipment and services to China have been spotty and relatively modest, reaching $ 7.4 million in 1984. However, sales have been increasing. Table 2.1 lists eight Canadian organizations which have successfully competed and won more than $ 230 million of work in the power sector in China up to the first quarter of 1986.

The Canadian government, through CIDA and External Affairs, has been actively supporting firms providing technical assistance and studies in the power sector. Eleven such projects have been financed since 1981 for a total of $ 11.8 million, as outlined in Table 2.2.

Of this total, some $ 7.5 million is being provided through CIDA's bilateral program directed to sophisticated areas of power technology transfer and will serve to expose MWREP to a broad spectrum of Canadian power utility technologies and experience.

Table 2.1

RECENT SUCCESSFUL CANADIAN EXPORTERS IN CHINA POWER MARKET

Company	Approximate Value of Contracts ($ million)	Sources of Finance	Products	Contract Period	Remarks
Babcock & Wilcox Canada	203.0	EDC	Boilers for 2x350 MW thermal power plants	1986-1988	Consortium led by General Electric of USA won two contracts totalling over $ 500 million for turnkey erection of two coal-fired power plants. Eleven consortia in international competition.
ASEA Inc.	10.0	EDC	Instrument Transformers	1984-1985	Includes contract for 500 kV substation, bid under Canadian Commercial Corporation. Two other contracts from parent firm.
Trench Electric	9.0	China; World Bank; EDC	Transmission line reactors, line traps and capacitive voltage transformers	1982-1986	First visit in 1981 under PEMD, assisted by active agents. Technology assistance agreement negotiated - most sales through German marketing officer
Timberland Equipment	8.0	China; World Bank; Commercial Banks	Conductor stringing equipment	1978-1986	Contracts in each year since 1978. Well established in China market.
Westinghouse Canada	7.0	Cash	Steam turbine assemblies for boiler feed drives	1985	
Cegelec	4.5	EDC	500 kV SF6 circuit breakers	1984-1985	Initial contract for 500 kV substation, bid under Canadian Commercial Corporation.
Canadian General Electric	0.7	China	Two static exciters for Gezhouba hydro generators	1985-1986	
B.C. Hydro	0.5	World Bank	Review of designs and specifications for 500 kV transmission line	1985-1986	Consulting assignment for East China Power Bureau on Second World Bank power project (Xuzhou to Shanghai transmission line)

Note: These contracts were won without financing from CIDA or External Affairs
Source: Information from Canadian exporters

Studies worth $ 3 million funded by External Affairs and CIDA/INC relate to activities stemming from the November 1984 and October 1985 Memoranda of Understanding between the Government of Canada and MWREP covering cooperation in project investigations identified as priority concerns by China. It is anticipated that official support for these studies will place Canadian consultants and suppliers in good positions for securing future contracts as these projects move into development and on other projects as Chinese authorities become more familiar with Canadian capabilities and technologies.

Two bidding exercises have been particularly significant for Canadian equipment suppliers in China, one for 500 kV sub-station equipment and the other for thermal generating stations.

In 1984 MWREP invited Canada to bid on a package of sub-station equipment worth some $ 30 million for 500 kV transmission lines. The equipment package included power transformers, shunt reactors, high voltage switchgear, instrument transformers and control equipment. The Canadian Commercial Corporation helped six manufacturers to bid for the equipment as a Canadian consortium. The Chinese found the prices to be generally high. During subsequent negotiations which occurred on an individual basis, two consortium members, CEGELEC and ASEA Inc., were able to secure some $ 10 million of contracts.

The remaining four suppliers of transformers and control equipment were assessed by the Chinese to be high in price when viewed against world competition. As far as can be determined, the three power transformer suppliers have not returned to the Chinese market. ASEA Inc. made another successful small bid for high voltage instrument transformers. However, when a larger requirement was tendered even though ASEA reduced its unit price

Table 2.2

CANADIAN GOVERNMENT FUNDING COMMITMENTS AND EXPENDITURES FOR POWER PROJECTS IN CHINA[1/]

Project Description	Canadian Executing Agency	Chinese Client Agency	Funding ($'000)	Implementation Period	Remarks
A. CIDA Bilateral Program					
1. Electric Power Research Project	B.C. Hydro	MWREP Electric Power Research Institute	7,450.0	1985-1987	Four other power utility research organizations cooperate to provide the best available Canadian expertise.
B. CIDA Industrial Cooperation Program					
1. Zhao Ping Hydro Project - Pre-Feasibility Study (Gui River in Guangxi Province)	CIPM	Guangdong Bureau of Electric Industry	160.0	1981-1982	Small provincial project (72 MW) which has not proceeded to implementation because of lack of support from central government.
2. Gezhouba-Shanghai HVDC Transmission Study	Teshmont Consultants	MWREP - ZEPDI/YVPO	250.0	1983-1985	Consultant paid further $ 450,000 by client for additional services.
3. Qehe Yan Water Control Project - Feasibility Report (Hubei Province)	Hydro Quebec International and CIPM	Yangtze Valley Planning Office	445.0	1985	Capacity 1,200 MW. Prospects identified for Canadian equipment and services valued at $ 345 million, for which concessional financing being sought.
4. Northwest China Microwave Communication System - Project Definition Study	B.C. Hydro	Northwest Power Administration Bureau	231.8	1985-1986	Study of communications systems for transmission system.
5. Lijiang Water Control Project (Guangxi Province)	Tecsult International	Guilin Travel and Tourism Corporation	193.0	1985	Project's primary objective is to increase minimum flows. Power component about 40 MW. Study also financed by Quebec Government ($ 100,000). Implementation would cost about $ 200 million, of which $ 70 million could be Canadian content.
6. Three Gorges Water Control Project - Preliminary Investigations	CIPM-Yangtze Joint Venture	Yangtze Valley Planning office	1,300.0	1985-1986	Additional financing of $ 300,000 by External. Four discrete tasks due for completion by July, 1986.
Sub-Total Industrial Cooperation Program			2,579.8		
C. External Affairs					
1. Longtan Hydro Project - Design Study (Guangxi Province)	CIPM-Yangtze Joint Venture	Changsha Hydropower Survey and Design	612.0	1985-1986	Very large hydro project (some 5,000 MW) whose implementation is not expected to commence until after 1990.
2. Three Gorges Water Control Project - Preliminary Investigations	CIPM-Yangtze Joint Venture	Yangtze Valley Planning Office	300.0	1985-1986	In conjunction with funding of $ 1.3 million from CIDA INC program.
3. Review of Investment Opportuntinites in Power Sector Development	R.L. Walker & Partners	(Reviewed with MWREP and YVPO)	42.0	1985-1986	Study completed in January/86 in conjunction with Niagara Consulting Services.
4. Three Gorges Hydro Project - Model of Hydraulic Turbine	Canadian General Electric	MWREP	300.0	To be determined	Financing offer not yet accepted, pending decision of final reservoir level for project.
Sub-total, External Affairs			1,254.0		
TOTAL			$11.8 million		

1/ Excluding PEMB grants, trade and technical mission exchanges and CIDA project preparation missions.

substantially for reasons of volume the Japanese were well below their bid price.

The contract won by Cegelec has led to the acquisition from its parent organization of HVDC technology for the fabrication of gas insulated breakers and the creation by the firm of new laboratory facilities in Canada. Exploitation of this new technology is projected by the firm to require the creation and maintenance of at least 40 new jobs.

Another major bidding opportunity arose in 1985 when the Huaneng International Power Development Corporation (a separate enterprise of MWREP) invited bids, on a turnkey basis, for 8 coal-fired thermal generating units (350 MW each) to be constructed at four separate power plants. Eleven groups were invited to tender, including an all Canadian consortium (Monenco consultants with Combustion Engineering Canada, Brown Boveri Howden and AMCA International) and a consortium led by General Electric of U.S.A. which included Babcock & Wilcox Canada and Ansaldo from Italy. Bids were submitted in July, 1985 after only five weeks. The Canadian consortium prices were quite high (reportedly due, at least in part, to the short bid preparation period), but the GE consortium was awarded a contract worth over $ 500 million for four units in two stations. This resulted in a sub-contract for Babcock & Wilcox Canada worth $ 203 million, by far the largest contract won by any Canadian firm in the power sector in China.

The Huaneng Corporation has recently advised that procurement on a similar turnkey basis will proceed during 1986 for the following thermal projects.

1) Shanghai - 2 x 600 MW
2) Chongqing - 2 x 350 MW (Sichuan Province)
3) Yueyang - 2 x 350 MW (Hunan Province)

Frequently Canadian manufacturers do not bid on World Bank financed projects because of anticipated competition from European and Japanese suppliers. However, for the World Bank financed Second Power Project in China the Canadian Commercial Corporation offered to coordinate a package of 500 kV transmission equipment. Tenderers on the earlier 500 kV equipment package were not interested but several other firms were and a tender was made for three of the items being purchased. The Canadian firms were short-listed for one of the items but were not successful. For the other two items, one firm bid through a European supplier as well and was successful, while the remaining item was won by a Chinese supplier at a very low price. A firm that already had good exposure in China chose to bid its telecommunications equipment directly rather than through CCC.

On the Lubuge hydroelectric project, also financed by the World Bank, two Canadian firms bid directly to the Chinese purchasing agency as they already had good exposure there. CAE Electronics Ltd., is on the short list for the powerhouse control system, having presented a bid of some $ 5 million. The other firm, Timberland Equipment Ltd., feel that they are very close to a contract award valued at $ 1 million for transmission line stringing equipment. In an earlier tender for electromechanical equipment, Canadian General Electric Co. Ltd. did not respond as they had difficulties obtaining definitive specifications from the Chinese. When they ultimately found that plant automation equipment, which they were not prepared to provide at that time, was included in the bid package they declined to bid.

A few firms that are active in world markets have established themselves successfully in China. One of the most successful of these is Timberland Equipment Ltd., a medium size Canadian supplier of transmission line stringing equipment. Timberland has been selling equipment in China since the late 1970's. On average, they obtain from \$ 1/2 to \$ 1 million per year for parts and new equipment. In 1980, they received a \$ 3 million order which has been their largest there to date. In 1984, two equipment packages were shipped, one to Shanxi province and the other to the Beijing area worth \$ 1 million in total. In 1985, the firm received an order for \$ 1.6 million in connection with the World Bank-financed second power project. This was bid direct through their agent. They view China as one of their best export markets and will continue to pursue it vigorously.

Trench Electric, a more recent entrant into the Chinese market, has been most successful by providing components to a European supplier of HVDC sub-station equipment. The particular HVDC system involved was engineered by Teshmont Consultants of Winnipeg.

Canadian General Electric Co. Ltd. (CGE) has been awarded a contract for the supply of two static exciters for the Phase II power house of the Gezhouba project on the Yangtze River. The contract for about \$ 0.7 million was signed in September 1985. The remaining twelve static exciters for the Gezhouba II power house will be of domestic Chinese manufacture to an obsolete design. The Chinese have made reference to CGE possibly supplying static exciters for the Baishan and Tong Jiezi projects and the likelihood of a request for a technology transfer as well. The company has been pursuing a contract for hydraulic turbine model studies for the Three Gorges project. However, the model study has been delayed pending a final decision by the Chinese on full supply level for the project. Recently, CGE has been asked to provide a technical proposal for the Shuikou hydro generation project (7x200 MW).

D. Canadian Strengths, Weaknesses and Competitiveness

The Canadian electrical utilities and the consulting firms that serve them have developed design expertise for large hydraulic and thermal generating plants and EHV transmission systems and the management competence to execute large and complex projects, often at remote sites. The electrical equipment manufacturers have, in several instances, developed hardware that permitted the realization of these unique Canadian projects. Generally speaking, Canadian manufacturers are most adept at providing larger size highly engineered equipment of high quality, often in the mid to high price range. Because of the small Canadian market and the minimum size of plant for efficient operation, Canadian manufacturers have developed methods that permit a wide flexibility of manufacture, i.e. they have learned how to produce several different product lines efficiently in the same plant.

The electrical utilities have gained a great deal of experience in the design and operation of advanced EHV transmission systems, large hydro and thermal generation projects, and the efficient management and maintenance of these systems.

The Canadian power industry also has some serious weaknesses. As a consequence of the major utilities traditionally acting as their own prime contractors, perhaps the most obvious is the lack of experience in large turnkey projects within the private sector. Until recently, there was a lack of mutual support between the consultants, utilities and the manufacturers within Canada and abroad. This is now improving in foreign markets where there is increasing cooperation among Canadian interests. It is only recently that larger foreign-owned Canadian firms would consider working together on projects outside of Canada, partly from uncertainty as to the potential for action under the anti-combines legislation, and partly because, as branch-plant operations, they were constrained in their freedom to compete against their parent organization for work outside of Canada.

An overriding weakness for Canadian firms in foreign markets has been a lack of concessional financing facilities for power projects, such as are available to competitors from a number of OECD countries.

Canada is a relatively open market and Canadian equipment suppliers are under pressure from imports from other developed countries (and in some cases from newly industrialized countries) whose markets are closed to Canadian products in the heavy electrical sector. In this situation, Canadian firms have tended to become competitive in products that are volume insensitive, i.e. in highly engineered products where they tend to lead the world in technology and have full control of the technology.

Canadian manufacturers tend to be uncompetitive in world terms in those items which are volume sensitive such as distribution transformers and associated distribution equipment. They are also uncompetitive in the manufacture of products where the technology is mature and widely known such as medium size and lower voltage power transformers.

Canadian manufacturers cannot be competitive where they must purchase the technology or do not have available to them the latest technology and must depend on foreign sources for a major portion of unit components. Examples of these situations are: large steam turbine generators and steam turbines, gas-insulated switchgear, air blast circut breakers, low voltage generator breakers, and HVDC thyristor valves and related equipment.

E. Economic Impact in Canada of Sector Exports

Productivity in the electrical products manufacturing sector is estimated by DRIE at about \$ 100,000 per person per year, or about 10 person years of labour per million dollars of equipment produced. There is also the indirect labour and induced labour in the material and parts supplier organizations and support service organizations. EDC uses a multiplier of 3.7 in the electrical power equipment sector. Thus a total of some 37 years of labour are estimated to be generated per million dollars of Canadian content exported in the hydro generating machinery and thermal power plant equipment sectors.

Confirmation of the above, through a comparative analysis of current data for the Gehe Yan hydro project against an equivalent coal-fired thermal installation, was provided by CIPM. This indicates 10.1 person years per \$1 million in value of exports (turbines, generators, spillway and intake gates) for hydro development vs. 9.75 person years per \$1 million (for thermal plants including the boiler-island and turbine generation plant and powerhouse structural steel). It may be noted that the above person years are the direct labour content and do not include economic multiplier effects.

Slightly different figures have been produced by the Canadian power industry, suggesting that the employment impact of equipment exported for thermal generating projects is greater than for hydroelectric generating stations, as illustrated by the data in Table. 2.3.

Table 2.3

EMPLOYMENT IMPACT OF TURNKEY GENERATION

Item	Hydro Power Station	Termal Power Station
Description	500/600 MEGAWATT In an underground power house	840 MEGAWATT Coal-fired Units
Cost of Project	$ 1,200 million	$ 830 million
Export Value	$ 500 million	$ 570 million
Employment Benefit	18,000 Person Years	26,000 Person Years
Employment Per $ 1 million of exports	36 Person Years	46 Person Years

Source: CAPSEP Proposal to Government For A Programme to Increase Exports: January, 1986

The major portion of the heavy electrical equipment industry in Canada is located in Ontario and Quebec. One of five major power transformer plants is located in Manitoba while the other provinces have practically no heavy electrical equipment manufacture.

F. Prospective Impacts of Future Exports from China

It is unlikely that there will be any significant export of heavy electrical products from China for the next decade for two reasons:

i) It will require more than the existing manufacturing capacity in China to meet the demands for equipment to satisfy their planned system growth.

ii) China does not have at this time the newer technologies in the heavy electrical sector but will be using its buying leverage to obtain them as part of purchase packages.

With the acquisition of more modern technology and the growth of domestic production capacity driven by domestic requirements, the Chinese market may be gradually closed to foreign suppliers. It will then be a short step for Chinese manufacturers to enter world markets where their low wage rates and a continued need to earn hard currencies will put them into direct competition with Canadian manufacturers in third country markets, and in some cases even in the Canadian market.1/

A possible protection against such a situation would be to refrain from licensing our current technology to the Chinese. However, the Chinese are very well informed technically and very astute in identifying world leaders in various technology sectors, so it is likely that such technology would be obtained elsewhere if Canada refused. A second approach could be to license the Chinese for sale only in their domestic market or in other specified markets. Such an approach, however, may not be acceptable to the Chinese. Canadian General Electric has already had experience with Brazil and report that this market is becoming closed to its complete product line because of earlier licensing within that market.

A small Canadian manufacturer, FL Electromechanical, a producer of spacer dampers for high voltage transmission lines, met its own technology in China (thought to have inadvertently become available to the Chinese). The result is that FL Electromechanical is being under bid by a considerable margin in the Chinese market by a domestic producer.

All aspects considered, it is very difficult to assess the benefits of licensing technology, particularly over the long term. It seems likely that by about the end of this century, the Chinese heavy electrical manufacturing sector could be in a position to start exporting signficant amounts of technologically advanced products into world markets. This circumstance points out the need for a solid and continuing R & D base in the Canadian electrical industry, something that until recent years has not occurred because of dependence on foreign parents for advanced technology.

1/ Hydraulic turbines supplied from Japan for the Nipawin hydroelectric project in Saskatchewan were originally cast in China.

3. COMPETITIVE CONSIDERATIONS RE CANADIAN EXPORTS

Commercial relationships between Canada and China have improved substantively in the decade since the purge of the Gang of Four, in 1976. However, there has been relatively little business transacted in the power sector, although several projects have become active in recent years, as explained in Section 2C. Accordingly Chinese perspectives on the Canadian power industry, and conversely the perspectives of the Canadian power industry about the China market, are still in the formative stage.

A. Chinese Perspectives on Canadian Industry

Missions of Chinese experts made trips to many countries in the period from 1978 to 1981 for the purpose of determining the state of international technology in the power sector. In this same period Canadian power organizations made several trips to China to explain Canadian competence in the field, including a 1979 mission on hydroelectric power technology which was organized by Industry, Trade and Commerce and hosted by MWREP.

When CIDA sent its first programming misssion to China in May, 1982 it had already been determined in principle that the power sector would be one of the the areas of concentration for development assistance. Chinese power planners met by that CIDA mission made it clear that China had decided to seek Canadian assistance principally in two areas in which they believed Canada was a world leader: large hydroelectric generating projects and extra high voltage (EHV) transmission systems. The concentration by CIDA since that time on projects of these types reflects the priorities expressed by China.

Over the past several years, Chinese authorities have become reasonably familiar with Canadian capabilities in the power sector, primarily in the hydro power and transmission fields. Several missions and high level visits to and from China since 1982 have focussed Chinese attention on Canada's hydro capabilities. (see Annex A).

During her two week visit to Canada in October, 1985, the Chinese Minister of Water Resources and Electrical Power, Madame Qian, outlined to Canadian Ministers the guidelines that MWREP uses to assess foreign participation in electrical power projects. An appreciation of her perspectives on five particular points can be helpful.

Of primary concern was quality, and here, in Madame Qian's opinion, the quality of Canadian goods and services is world class.

The second concern was price, and she stated that Canada has been too expensive.

Concern over cost was also reflected in the third criteria which centred on the terms and conditions of financing. Madame Qian was of the opinion Canadian terms for loans and credits were not soft enough.

The fourth item on Madame Qian's list was the willingness to transfer technology. Technical training is a definite priority, however, Madame Qian was unclear whether a willingness to transfer technology would be adequate compensation for a higher price.

The last item on her list focused on the balance of trade between China and the vendor country. The impression given by Madame Qian was that the more equitable the balance, the more predisposed MWREP would be to purchase goods and services. It should be noted here that the balance of trade between Canada and China has been in Canada's favour by a ratio of four to one over the last three years. It seems likely that China will use its import requirements in support of broader foreign exchange objectives in future.

There is no doubt that Canadian technical capabilities are well regarded by China, however, Canadians suppliers have developed a reputation of being too high priced. To some extent, this can be attributed to the rather mixed performance of Canadian manufacturers bidding on the 500 kV substation tender in 1984.

The Chinese also tend to be confused by Canadian manufacturers who bid on some types of equipment and not on others. The Chinese have indicated their clear preference to procure from foreign firms who have developed world class technologies, rather than from their subsidiaries.

The Chinese recognize our ability to develop and operate major hydro projects but wonder whether we can really be competitive.

Canada has been a slow starter. Canadians were focussing their attention on hydro generation, while the Chinese were preparing international tenders for large thermal projects.

The Chinese perception of Canadian capabilities in thermal power was enhanced considerably by Madame Qian's visit during October 1985 when she visited the Nanticoke and Keephills generating stations. These plant tours underlined to the Chinese that Canada was competent in thermal power generation as well as hydropower. Madame Qian noted, however, that the Canadian thermal power sector should familiarize itself with China's needs as well as becoming acquainted with Chinese requirements. In her opinion, Canadian utility standards for thermal plant were "excessive" in terms of Chinese requirements.

It took a considerable amount of effort to convince the Chinese that Babcock & Wilcox was in fact bidding from Canada on the "8 pack" tender for turnkey supply of up to four thermal power stations of July, 1985. The Canadian consortium bid on the same contract regrettably reinforced China's perceptions regarding Canadian prices. However, now that Babcock & Wilcox have been successful, the Chinese are beginning to realize that Canada can be competitive and has something to offer on the thermal side.

B. Canadian Perspective on Chinese Market

Canadian power sector organizations are clearly aware that China represents a vast market, perceived to be the greatest potential export market apart from the USA.

With the continued downturn in the domestic market in Canada, China is of considerable importance to Canada, particularly to Quebec and Ontario where most of the electrical equipment manufacturers are located.

The development of commercial contacts between Canada and China is still somewhat tenuous. Few Canadian organizations have the length of experience, the broad overview and the regular contacts required to understand and appreciate the many structural changes which are underway within China. Most firms clearly appreciate, moreover, that on their own they lack the resources to fully identify all potential opportunities in China and hence to maximize their commercial success. Without exception, the firms contacted by the Task Force expressed a need for support by the Canadian government in one or more forms.

The most successful Canadian firm in terms of the number of contracts won in China is probably Timberland Equipment Limited, which has consistently achieved sales volumes of one to two million dollars each year since 1978. The President of the firm summarized the lessons he has learned about China as follows:

"1. This is not a market where you can expect a premium price for your products. The Chinese are very skilled negotiators, and will extract from your hide every possible discount and advantage. This process has been aggravated somewhat during the 1980's when it has definitely been a buyer's market. So Canadian companies must send their best and be prepared to bargain hard.

2. Go to China with an iron butt. Be prepared to sit through negotiations that take much longer than would be the case in North America. Not only do the Chinese want to get to know the selling Company, its products, and its ability to live up to its claims, but they use delays as a negotiating technique to wear you down and extract additional concessions.

3. The contracts we have signed are generally very straight-forward, easily understandable and do not contain the mountain of terms and conditions found in similar contracts from countries such as India. However, the Chinese expect you to live to the letter of the contract, and generally our experience is they do the same. Payment on time has not been a problem."

Timberland and another Canadian firm with considerable success in China, Trench Electric, are small to medium scale firms with specialty products for whom there are few competitors in Canada or abroad. They can sell directly to Chinese purchasers or to larger foreign contractors who succeed in obtaining work for supplying and erecting major equipment items. Financing has not been a major problem for such specialty contracts. The sourcing of Canadian component equipment through third parties, unfortunately, is not always recognized by Chinese authorities unless specifically drawn to their attention.

Babcock & Wilcox has become the most successful Canadian exporter in dollar terms in China because of their recent bidding success in boilers for two thermal power plants. This firm regards China as the largest market in the world for their plant equipment, and expects to pursue future work in consortia similar to that which was recently successful (led by General Electric of USA and including Ansaldo of Italy). Babcock & Wilcox support the EDC agreement to maintain consensus rates in China but believe Canada should be prepared to offer equivalent concessionary financing if other countries do.

Canadian General Electric has been actively seeking business in China for several years, particularly for hydraulic turbines and generators. Although CGE did not respond in 1984 to the invitation to bid on equipment for the Lubuge hydroelectric project, the company is actively pursuing upcoming hydro projects: Gehe Yan (4 X 300 MW) and Shuikou (7 X 200 MW). CGE reports several lessons learned about the China market, including:

"1. Until recently, bidding processes have been very informal and it is essential to work with the Ministry for two or more years prior to the placement of an order to participate in the development of the specifications.

2. We believe while China is a potential purchaser of power generating equipment, balance of payment difficulties and other considerations will necessitate equipment manufacture in China for major projects and the long term success of Canadian manufacturers will hinge on their capability and ability to transfer their indigenous technology and form joint ventures in China.

3. The strategy of acquiring Western technology is through a process of co-design and co-production of equipment. Therefore, proposals which accommodate this strategy receive preferred attention.

4. MWREP and some of the independent economic zones are not as strongly committed to this strategy and are more heavily influenced by the availability of attractive concessional financing.

5. The development of close personal ties between MWREP and Canadian suppliers will be an important factor in developing successful orders."

Canadian International Project Managers (CIPM) is a consortium of three of Canada's largest consultants, Lavalin, Acres International Ltd., and SNC, and is the consulting organization with the longest involvement in China, dating from its participation at the Canadian Trade Exhibition in Beijing in 1972. Lavalin, one of the partners in CIPM, is easily the most active firm in China, having set up a permanent office in Beijing in 1985 (supported by a PEMD grant). CIPM is active at present in several projects in the power sector. To date CIPM has not been successful in winning any business in China, except five contracts supported by the Canadian government (see Table 2.2 for details), despite having spent some $ 400,000 on marketing costs, net of PEMD grants.1/

In 1982, CIPM submitted a proposal to the World Bank for project preparation activities for the Lubuge and Shuikou hydroelectric projects. Consultants from other countries were awarded these assignments and CIPM

1/ CIPM's utility partners in the CIPM-Yangtze Joint Venture (BC Hydro International and Hydro Quebec International report having spent a further $ 765,000 and $ 1,500,000 respectively on market development in China.

reports that "in both cases, the successful consultants were provided with supplemental funding from their own governments. This permitted them to supply more man-months of engineering services that would be paid for by World Bank funding alone."

There are a number of important lessons which have been learned during recent years concerning commercial sales to China's power industry.

First, the Chinese will purchase on the basis of price and quality to meet their own determination of requirements. The Chinese know what they want and do not necessarily want the most sophisticated plant. Specifications for the recently awarded turnkey thermal project purchases by the Huaneng Corporation are for more basic facilities than have been required by Canadian power utilities. (The all Canadian bid was based on the design of the Keephills project, which Minister Qian had already indicated had much more sophisticated control systems than were considered necessary and appropriate for China at this stage of its development).

Secondly, the Chinese are in a hurry. Once they have decided to procure externally and have received internal authorization they have allowed only very short periods from notification of a tender call to receipt of bids. Thus, it is important for Canadian firms to obtain advance knowledge of upcoming opportunities. Serious exporters must be prepared to react on this basis and learn about the specific requirements likely to be included rather than awaiting an official tender call. This also implies the need to make Canadian suppliers known to Chinese authorities, recognizing that there may be a series of new entitites created for the power sector. The Huaneng International Power Development Corporation was formally created in March of 1985 and issued a tender covering up to four turnkey thermal projects in May, with bid closure on July 1st. Tender evaluation, contract negotiations and formal awards were completed in February/March, 1986 for these projects.

The relative speed with which the Huaneng Corporation as a new enterprise moved to conclude its first orders of major turnkey projects may be expected to be repeated on future tenders. Babcock & Wilcox report they were very impressed with the technical capabilibities of this new corporation in issuing its specifications, evaluating complex technical proposals and in negotiating the technical and financial aspects of turnkey contracts.

Thirdly, persistence is required. The Chinese do a great deal of homework in assessing the capabilities of firms and the technologies likely to be available before initiating formal procurement arrangements. Nevertheless, if satisfied they offer successful competitors repeat opportunities to secure additional business. Timberland has successfully sold transmission stringing equipment into China each year since 1978, but report that the firms first contacts with the power sector in China stemmed from meetings at a trade fair in 1972, which the firm nevertheless pursued on a regular basis until finally called to China in 1978 to negotiate its first contract.

Fourthly, China is inclined to procure from firms which control their technologies and are willing to offer technology transfer. MWREP and power industry officials continue to send missions around the world to ascertain where the technologies they want are available. Hence, Canadian firms must repeatedly demonstrate not only their competence and capacity to supply particular product lines but also the depth of their technologic competence. It is particularly important to recognize that recent changes introduced within MWREP (as in other ministries of the PRC) have led to the rapid promotion of a new generation of officials and retirement (at age 60) of the older cadre of officials who were in place.

Finally, China plays football with the best. In 1982 the CIDA programming mission was asked to consider providing technical assistance to develop the feasibility study of an EHV transmission line from the Tianshengqiao hydro project in northwest Guangxi to deliver power over 1,000 km to Guangzhou. At that time CIDA suggested that it would be necessary to carry out a system planning study for the South China region in order to establish appropriate system parameters for the first 500 kV transmission lines. CIDA also suggested that, if requested, a design review of the proposed two-stage Tianshengqiao development could be provided. MWREP indicated that the design was too far advanced to warrant outside design review. Shortly thereafter it was announced that the US Corps of Engineers would in fact provide design support for the Tianshengqiao project. This was organized by the Corps and Harza Engineering was retained to do the work in 1983 under US trade development funding. At that time it was the understanding that American firms would be given full opportunity to tender for the project. However, in 1984 the Ministry accepted a Japanese offer of cooperation and financing for the lower Tianshengqiao project and construction has since proceeded with heavy Japanese involvement. Nevertheless, tunnel boring equipment was tendered under ICB terms and the equipment supplied from the USA.

C. Experience and Strategies of Other Exporters

Our knowledge of the activities of competing exporters in China is limited. In general, it can be stated that the biggest and most experienced firms in the world are agressively pursuing the China market, and they are spending considerable amounts of money doing so.

The US Bureau of Reclamation has a long history of involvement in the Three Gorges project on the Yangtze River, commencing in the late 1940's. Since normalization of relations between the US and China in 1972, following President Nixon's visit, a protocol agreement between MWREP and the Secretary of the Interior of the US has provided for USBR assistance to the YVPO. Latterly, the USBR has shared the work with a number of individuals drawn from major consulting firms in the private sector. It is understood that the recent cooperation has been largely paid for by MWREP.

The USA continues to press for involvement of its public and private sector in the Three Gorges development. A consortium including the US Bureau of Reclamation, the US Corps of Engineers, the American Consulting Engineers Council and seven consultants, contractors and financial institutions joined together in submitting a proposal for development of the Three Gorges project (July 1985). The USA government has made various offers of assistance to finance implementation of this proposal, none of which appears to have been accepted by the Ministry. Indeed, the CIDA mission in February/March of 1986 were advised that the US proposal had "unacceptable strings" attached.

The US Secretary of Energy visited China in March 1986 and again raised the issue of USA cooperation on this project. The outcome of this latest

American initiative is not known. In discussion between Minister Qian and the President of CIDA in mid-April 1986, the Minister advised that a specific US offer had not been received.

MWREP has also issued a request early in 1985 to the IBRD to provide technical assistance support for the preparation of the bankable feasibility study of the Three Gorges Project and to act as the manager of an international financing consortium to support implementation. The IBRD has in place a technical assistance program (IDA terms) under which it has advised China it would be willing to undertake the feasibility study. (This was in direct competition with Canada's offer to support the preparation of a feasibility study for Three Gorges which had been made in response to an invitation in October 1985 from Minister Qian for Canada to support this work).[1]

From 1949 through to 1960, China relied upon COMECON countries for the supply of heavy electrical equipment and technology transfer to expand and upgrade its power systems. Following the withdrawal of all Soviet experts in 1960, China pursued a course emphasizing internal self reliance, although of necessity continuing to import critical equipment from the USSR and other COMECON countries as well as initiating procurement from Japan and other Western countries.

China's electrical power system was reported upon in China Business in a series of articles in 1980 and 1981. Annex D presents abstracts from this series describing the electrical manufacturing industry which has been developed in China and summarizing the power systems equipment imports from 1949 through 1980.

Since 1982, imports have been increasing rapidly following the State Council decision to assign top priority to expanding China's energy sector, and in particular to electric power system expansion. In this most recent period, Western Europe, Japan and the USA have become major sources of equipment supply.

1/ In July of 1986 MWREP confirmed acceptance of the Canadian offer of assistance and of the proposal by CIPM Yangtze Joint Venture. The IBRD agreed to participate in a project Steering Committee, together with MWREP and CIDA.

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4. POSSIBLE FEDERAL ROLE IN SUPPORTING SECTOR EXPORTS

A. Previous Federal Activities

The Canadian private sector has received various types of support from federal departments and agencies for power sector activities concerning China in the recent past.

External Affairs represents Canada in China and provides the diplomatic umbrella under which Canada's trade relations are conducted. The International Trade side of External Affairs, through its commercial officers in the Canadian Embassy in Beijing and Hong Kong, provides continuing advice on opportunities in China for Canadian exporters and assistance to Canadian firms in establishing contacts with appropriate PRC agencies and officials.

In Ottawa, External Affairs chairs an ad hoc China Working Group. This Working Group provides for the internal coordination of Canada's trade relations with China through regular consultation amongst External Affairs, EDC, CIDA, DRIE, EMR, CCC, and Agriculture Canada.

External Affairs is responsible for the organization and coordination of government sponsored inputs to trade fairs and commercial missions to China.

The Program for Export Market Development (PEMD) of External Affairs has considered a total of 759 applications for China in the past four years and has authorized expenditures totalling $ 7.7 million. A small portion of these approved expenditures have been for firms pursuing business opportunities in the power sector.

CIDA has been active in China since 1982. The energy sector is one of four sectors of concentration of the bilateral program as agreed between CIDA and MOFERT. The initial focus of CIDA's activities in the energy sector was directed by China to its power sector. Projects initiated and under preparation are all of technical assistance nature with emphasis on technology transfer and training. Latterly, CIDA has also become involved in the technology transfer program directed to reservoir management and enhanced recovery in part of the North China basin oil fields.

In the power sector the first bilateral power project, which was initiated early in 1985, provides for all research units of the major Canadian power utilities to assist counterpart research institutes of MWREP to improve their capabilities in applied power systems research. Two other projects are under preparation, one to help improve power system planning in South China and the other to carry out a bankable feasibility study (or investment justification) of the Three Gorges Water Control Project. These three projects have been discussed extensively by the governments of China and Canada and reflect the priorities of both countries for technical cooperation.

Assistance to Canadian organizations active in China's power sector has also been provided by the Industrial Cooperation Division of CIDA. Six such projects have been supported, all in response to initiatives of Canadian consulting organizations. Some $ 2.6 million have been committed to these six projects, which are summarized in Table 2.2. The Teshmont assignment on high voltage DC transmission studies resulted in some additional work for that consultant paid for directly by the Chinese client, but none of the other projects have yet generated additional business for Canada. However, several requests for further support by the Canadian government have been generated, as discussed subsequently.

The Export Development Corporation signed a $ 2.0 billion General Financing Protocol with the Bank of China in October, 1984. Contracts with two exporters have so far been financed in the power sector, both for 1984 contracts for the 500 kV substation project. Cegelec and ASEA won contracts worth an aggregate of about $ 10 million for which EDC provided a total of $ 8.2 million of financing.

In February, 1986 the General Electric consortium, including Babcock & Wilcox Canada, signed two contracts worth more than $ 500 million for two coal-fired power plants (two 350 MW units each) near Shanghai and Beijing. The Babcock & Wilcox participation in these contracts is worth approximately $ 200 million and EDC is expecting to finance the Canadian sourced share of equipment and services.

The Canadian Commercial Corporation (CCC) is prepared to serve as the prime contractor in government to government transactions when such government involvement is desirable or essential. In 1984, CCC submitted bids to MWREP on behalf of a consortium of six Canadian firms for 500 kV transmission sub-stations. After the Chinese client (Chinese National Technical Import Corporation) opened the bids, the individual suppliers were invited to Beijing for negotiations and two (Cegelec and ASEA Inc.) were eventually awarded contracts. It was evident that the Chinese authorities preferred to deal directly with the individual firms. CCC has has been actively encouraging Canadian firms to compete in China, particularly on World Bank projects.

B. Anticipated Industry Demands for Federal Assistance

China is potentially one of the world's larger markets for power systems equipment and services in the years ahead, surpassed only by the USA (well known to Canadian exporters). By about 1990 the total annual investments in the China power sector should begin to exceed those in Canada, as discussed earlier in this sector brief. Because of the scale and importance of the China market, at a time when the Canadian power industry is expected to continue contracting because of a shrinking domestic market, Canadian exporters can be expected to seek extensive federal assistance to win future orders in China.

CIPM has recently submitted a request for an additional $250,000 in official support for studies of the Longtan hydro project.

Consultation with the principal Canadian organizations involved in China's power sector has resulted in the identification of several types of potential federal assistance. Each is discussed separately.

Although it is not possible to quantify the amount of future demands for the various types of federal support, it seems obvious that requests for such assistance will escalate in the years ahead as Canadian firms become keener and more competetive in the China market.

1. Market Information

Canadian organizations are aware that the China market is very large and changing rather rapidly as a result of both the economic development and the decentralization processes underway. Obtaining information about future projects in China is difficult for Canadian exporters, in large measure because of the reluctance of Chinese officials to collate and release appropriate information. Canadian government staff are deemed to have better access than the private sector to commercially useful information from Chinese sources and from international agencies such as the World Bank. Also CIDA staff and consultants obtain information which could be of value to the Canadian industry. There is a pronounced need to improve the system of information gathering, analysis and dissemination to potential exporters.

Information of a different sort might be provided by the federal government to help companies dealing with Chinese requirements for countertrade. Several exporters report an increasing trend to countertrade, reflecting foreign exchange limitations in China. The role of the Canadian government in this area would appear to be first to encourage the Chinese authorities to minimize such practices and then to offer general guidance to firms who feel obligated to accept payments in kind as well as in cash.

2. Market Penetration and Client Influencing

Government support, often referred to as seed money, is valuable in helping exporters to examine the China market and make initial contacts. Trade missions and trade fairs in China are judged to be helpful, particularly when focussed on particular segments (technically and/or geographically) in this large and diverse market. PEMD grants are also a useful tool. Most firms value visible government support which enhances their credibility in the eyes of the Chinese clients. Government support in arrangements to host Chinese experts in Canada is also helpful. Such missions, of short or long duration, are educational and apparently very welcome by the Chinese authorities. They can also be useful in improving personal contacts between Canadian and Chinese organizations.

3. Financing of Preliminary Studies

Consultants and many manufacturers emphasize the need to have the Canadian government provide free or highly subsidized studies at the front end of capital projects as an aid to obtaining major contracts in the implementation stage. Bilateral funding of such studies is reportedly common tactic to support competing exporters and is regarded by the Canadian power sector as a necessary entrance fee for obtaining future business. CAPSEP have made specific representations on this matter to government.

The commercial information which can be gained by the Canadian industry in the course of such studies can be very useful, particularly if organized and utilized systematically within Canada. Such studies can also help to sensitize Chinese decision-makers to future opportunities for using Canadian goods and services during the implementation of their projects.

4. Financing of Capital Projects

Canadian exporters have identified three different situations required financing of capital projects by the federal government.

a) Conventional EDC financing at concensus rates
Contracts worth approximately $ 215 million have been won in China by Canadian exporters using the existing EDC line of credit (see Table 2.1). Several exporters in their presentation to the Task Force encouraged the government to try to maintain consensus terms for financing power projects.

b) Concessional financing for specific contracts
Some exporters want the government to provide "credit mixte" financing. A blend of conventional EDC financing and Section 31 funding is suggested, to provide a concessional line of credit which could be actively drawn upon to meet or beat competitive offers for selected contracts. It is claimed that such an approach is necessary to match the tactics of competitors to Canada. Between January 1984 and March 1985, 51 Consensus notifications have been issued covering concessional financing for China from eleven other countries to support contracts in all sectors worth a total of $2,186 million. Ten of these contracts worth $766 million were in the power sector. The recently announced $350 million Section 31 financing facility for China under the current EDC financing protocol will be the principal instrument available to provide concessional financing from Canada.

c) Concessional financing for sole source projects
The approach adopted to sole-source a package of Canadian services and equipment for the Chamera project in India is a model for China favoured by some exporters. This would require a blend of conventional and Section 31 financing by EDC to provide "credit mixte" for an entire small or medium size project, which would then be taken "off the market" by a Canadian consortium. This "Team Canada" approach has been endorsed by CAPSEP, representing the association of manufacturers, utilities, consultants and constructors. CAPSEP members have proposed criteria by which a consortium would be qualified and have suggested that the federal government should recognize and provide exclusive support for the first qualified consortium to request support for a specific project.

Chinese authorities, however, have decided that their provincial power authorities are to be responsible for implementing most small to medium power projects, with little or no support from the central government. Foreign support is to be directed only to the larger class of projects where China wants to gain experience with new technologies or where serious domestic capacity constraints exist at present, as in the case of transmission sub-stations and thermal generating stations. The challenge in adapting the "Team Canada" approach to the Chinese market will be to find projects of appropriate scale and involving technology of interest to the Chinese, as well as being able to demonstrate Canadian price competitiveness.

At this time it appears the most likely candidate project for this approach is Gehe Yan. This 1,200 MW development is considered by Chinese authorities to be a provincial project under the Hubei provincial power bureau. Nevertheless, the Vice Governor of the province was authorized to visit Canada in January 1986 for the express purpose of initiating discussions of bilateral financing of a potential package of Canadian equipment and services for this project worth up to $350 million.

5. Political and Diplomatic Support

All exporters recognize the valuable assistance which can be provided in commercial transactions through support by diplomats and politicians for specific contracts and projects. During her visit to Canada in October, 1985, the Chinese Minister of Electric Power, Madame Qian, explained to Canadian Ministers, that Canadian companies will not be able to sell into the Chinese market without the support of the Canadian government. Such support is requested by Canadian exporters, particularly for large and prestigious projects, but also as a helpful adjunct to marketing efforts.

It should be noted that Minister Qian has stated that MWREP values "country to country" contacts with Canada and wishes to avoid becoming involved in competitive promotions sponsored by our provinces. This perspective needs to be appreciated in Canada and should guide Canadian dealings with MWREP and the provincial and regional power authorities in China.

C. Basic Principles Concerning Federal Support

The next and final section concludes this power sector brief with recommended strategic actions to be taken by the federal government. First, however, the basic principles underlying the recommendations are explained.

1. Federal government resources are limited

The power sector in China will likely surpass the power sector in Canada in terms of total generating capacity and total annual investments within the next five years. The ability of the Canadian government to influence and assist the development of the Chinese power sector is quite limited in terms of the financial resources which can be allocated. The Canadian government needs to adopt policies and programs which ration the use of Canadian resources by according priority to projects which maximize Canadian benefits as well as meeting Chinese objectives. The quantity of resources which can be provided will effectively be maximized, to the benefit of both nations, if criteria for allocating government resources are skillfully developed and applied.

2. Chinese policies and priorities must be respected

The world's most populous sovereign state is ready to cooperate with other nations in the development of its power sector. Canada must continue to recognize that such cooperation can only be provided if it is in accordance with Chinese policies and priorities. MWREP originally sought Canadian assistance primarily in the fields of large hydroelectric projects and long distance high voltage transmission but has now accepted Canada as a competent supplier of thermal power plant. As a friend of China, with considerable experience in the development and operation of all types of power systems, Canada should be ready to offer advice and expertise on a wide range of topics. In the final analysis, however, Canadian support can only be directed to topics and projects acceptable to China.

3. Canadian development and trade objectives can converge in China

The power sector in China, currently in total about the same overall size as that in Canada, is at a much earlier stage in its development. Several decades ago Canada experienced many of the technical issues now facing China and this Canadian experience can be valuable to China. Furthermore knowledgeable Chinese authorities appreciate that Canada has much to offer in terms of technology and management techniques. China has expressed willingness to purchase such expertise, provided that Canada's prices are competitive. In these circumstances Canadian development assistance to China can be designed to suit Chinese requirements while concurrently benefitting and strengthening the Canadian power sector.

4. Canadian industry and government programs for China should be jointly developed and implemented

The Canadian power industry fully appreciates that prospects for commercial success in China are enhanced by government support. Government, on the other hand, cannot initiate any programs in the China power sector without the full support of the Canadian resource base. There is an obvious need, accordingly, for industry and government representatives to coordinate on a continuous and systematic basis to achieve maximum success in China. The China Working Group has been fullfilling a useful role through assisting in coordinating the activities of a number of federal agencies having an interest in China's power sector. Expanding the role of the Working Group to provide for ongoing liaison with the Canadian power sector (as represented by CAPSEP, its constituent organizations and individual members) should be considered.

5. Dynamic conditions require flexible and responsive programs

Events in China are moving rapidly: politically, economically and technologically. The responses by Canadian competitors in the dynamic global environment are changing too. It is imperative that any Canadian strategy for China must be continuously monitored and evaluated with timely revision in response to experience gained in the evolving Chinese marketplace.

6. Government support must be selective

To be effective, government support should be focussed on those Canadian organizations which are committed to succeeding in China and which are competitive internationally. There is no point in offering government support to firms which do not control their own technology, which are not demonstrably competitive in price or which regard China as an opportunistic market to which they will make no long term commitment.

7. Economic benefits to Canada should be maximized

Since federal resources to support power industry activities in China are limited, a major criterion in choosing which activities to support should be to maximize economic benefits for Canada. Employment impacts, contribution to a positive balance of trade and technological developments are the most obvious benefits. Proposals for significant government support should explicitly address the anticipated benefits to Canada.

D. Recommended Strategic Actions in the Power Sector

The following recommendations are based upon the findings of the Working Group. These findings are in turn the product of consultations with key Canadian organizations in the power sector and on analyses of Chinese policies and programs in this sector.

1. CIDA's bilateral program in the power sector should be sustained and should continue to concentrate on technology transfer and training

CIDA's initial bilateral project aims to assist the research capabilities of power utilities across China and is being carried out by Canadian power utilities.

The next project to be supported should be the carrying out of a bankable feasibility study (or, in China's view, an economic justification study) for the Three Gorges water control project. This study, estimated to cost some $8 million and require some 15 to 18 months to complete, would be undertaken by the CIPM-Yangtze Joint Venture which is currently completing certain preliminary design studies for the Yangtze Valley Planning Office.

The announcement on April 3, 1986 that China intends to postpone the implementation of the Three Gorges project is not expected to affect the timing of the proposed study. This announcement is considered to be a tactical move by MWREP to delay announcing a decision to proceed on the project until all necessary studies are complete and full political support for the project has been mobilized within China. CIDA should continue to express its willingness to fund the study in order to confirm Canadian support for the largest hydroelectric project in the world. MWREP has made it clear to CIDA that its highest priority for CIDA support is the proposed study of the Three Gorges Project. Participation in the planning of such a prestigious project would obviously benefit Canada, in China and internationally, and should help the Canadian power industry gain valuable insights about the implementation stage, which could provide procurement opportunities worth many million of dollars. It is not yet certain that China will accept the Canadian offer because of a competing offer from the World Bank.[1]

Another pending project which CIDA should continue to support is power system planning in the South China region. This project, estimated to cost

[1] On June 14, 1986 negotiations between CIDA, MWREP and IBRD concluded with confirmation by MWREP that it wished to accept the CIDA offer to carry out the feasibility study of the Three Gorges. The IBRD will be the leading advisor to MWREP covering project development and will participate in a joint Steering Committee which will oversee the project studies.

about $5 million and require some 36 months to implement, should be agreed as soon as possible. It would be carried out by competent Canadian consultants, who would inevitably become very well informed about the future plans and projects in China's newest regional power grid, connecting the Guangxi and Guangdong power systems in China's southernmost provinces. This region includes the Hongshui River basin in which projects having some 6,000 MW capacity are expected to be built by the year 2000. One of these projects is Longtan, in which the CIPM-Yangtze Joint Venture is currently involved. Canadian participation in this system planning project will provide valuable intelligence about future generation and transmission projects in the important South China region.

2. CIDA through its Industrial Cooperation Division should continue to provide funding for preliminary studies of investment projects

Such starter studies can be useful in generating future business for Canadian firms. However, certain criteria should be met before any future proposals are funded:

a) The proposed project should have already received formal support for international participation by the China's central government. Small projects which are the exclusive responsibility of provincial governments and local authorities are unlikely to be candidates for foreign loans, which must ultimately be approved by the Bank of China. Accordingly, such small projects should not be eligible for CIDA-financed studies as they are unlikely to lead to serious opportunities for Canadian exporters.

b) The proposed project must be in a field where Canadian exporters are well placed to win contracts subsequently, based on Chinese policies and previous sector experience.

c) Firms being awarded such CIDA support must have a track record as serious exporters and be prepared to mount a sustained effort, using their own resources as well as government support, to market their products in China.

d) A Canadian firm requesting federal support for preparatory studies should be required to prepare a confidential report for the federal government on downstream commercial prospects as a part of the study and should be required to provide periodic briefings to federal officials as the work proceeds.

3. Conventional EDC financing should continue to be offered for Canadian exporters in the power sector and concessional financing be made available to meet competitive offers on projects which meet criteria of providing significant economic benefits to Canada.

Less than 8 per cent of the existing $2.0 billion line of credit has so far been committed for power sector exports to China. EDC should continue to support Canadian exporters by providing funds at consensus rates or at concessional rates to match those offered by competitors. Such financing should ensure that serious Canadian exporters with competitively priced products will have opportunities equal to those of exporters from other countries.

4. The government should develop consistent committment criteria for evaluating the economic benefit to Canada of financial support for export programs

Competition for scarce federal resources to support exports to China will likely intensify as more Canadian organizations become active in the market. A realistic way to ration such support is to attempt to maximize the economic benefits to Canada. EDC already has a system in place to measure economic benefits. Similar criteria should be developed so that potential benefits of other forms of export support can be judged in a consistent manner.

5. Canada should offer concessional financing for the implementation of the Gehe Yan water control project

This 1,200 MW hydroelectric plant on a tributary of the Yangtze River is technically and economically feasible, according to a CIDA-supported feasibility study completed in October, 1985 by Hydro Quebec International and CIPM. This study was carried out in cooperation with the Yangtze Valley Planning Office, which is also responsible for the design of the Three Gorges project. Construction of the Gehe Yan project would take 10 years, or 2 years less with modern project management techniques, and can begin as soon as domestic and international financing is approved.

The Gehe Yan project is estimated to cost Rmb 1,583 million ($ 792 million) in mid-1985 prices (excluding price escalation and interest during construction). Canada should be prepared to consider providing equipment and consulting services on a sole source basis, estimated by the consultant to total up to some $350 billion, using credit mixte financing. Potential benefits to Canada include an estimated 3,500 person years of direct employment.

The political and strategic value of offering such technical and financial assistance is very significant for Canada. The Gehe Yan project, which is located within 100 km of the Three Gorges project, could be a showcase of bilateral cooperation while preparations for much larger projects are being finalized.

Although at this time no specific additional thermal project has been requested from Canada, it is anticipated that HIPDC will seek negotiated contracts from some of its projected developments, and such request should receive comparable consideration.

6. Government programs to help exporters penetrate the China market and influence potential clients should be continued

Most Canadian exporters have appreciated and benefitted from existing assistance programs including those for trade fairs, incoming and outgoing trade missions, and the like. Such government-sponsorship and visible support to the Canadian industry also conveys a useful message to the Chinese authorities. Particular emphasis should be placed on educational activities such as seminars and study tours to explain Canadian capabilities and resources to managers in the Chinese power sector, including regional authorities who are increasingly responsible for affecting purchasing decisions. Existing programs may have to be revised periodically, to reflect evaluations of their usefulness by industry and government, but radical changes are not required.

7. The federal government should systematically monitor the Chinese power sector and disseminate its analyses to interested firms in the Canadian power industry

Information concerning sector development policies and specific projects opportunities from a variety of sources - Chinese officials, diplomatic staff, international agencies, consultants and manufacturers - should be systematically gathered and analyzed in order to facilitate development of business strategies by the Canadian power industry and individual firms. Most Canadian organizations agree on the need for better information and agree that federal government support can assist their efforts. Such support, which requires a better overall understanding of the China power sector than exists in any single organization at present, should be provided as a federal government service to improve trade prospects.

Although under ITC sponsorship, Canadian heavy electrical equipment manufacturers were included in trade missions which visited parts of China's power industry in 1972 and 1979, there is no up-to-date appreciation of the capabilities and capacities and China's heavy electrical equipment. The most comprehensive survey available dates from 1980 and is reported in Appendix D. Certain Canadian firms, notably CGE and B&W, have more recent contracts with specific manufacturing enterprises in China. It would, without doubt, benefit Canadian exporters if more up-to-date information on the capabilities and capacities of China's electrical power manufacturing industries could be assembled.

Such market analyses should be constantly updated and disseminated. Serious Canadian exporters, particularly those on government-supported projects, should be expected to contribute to as well as draw from this system. An annual seminar should be organized to bring together leading exporters to China and relevant federal officials, particularly those from External Affairs, CIDA, EDC, EMR, DRIE and CCC.

8. Increased Canadian diplomatic and political support should be focussed on export opportunities in China's power sector

Canadian exporters appreciate the significant impacts which high level and visible promotion of their industry can achieve in China. Ministerial visits to China provided opportunities to promote Canadian interests in specific projects.

9. Canadian industry and government lenders should explore prospects for working with Chinese organizations in third country markets

Canada and China each possess very large power industries and both countries could offer special expertise in the pursuit of export projects in other countries. Canadian consultants, power utilities and manufacturers have several decades of experience in exporting their goods and services, and Canada is a world leader in many technologically advanced aspects of power systems. China, currently modernizing its industry, is highly experienced in labour intensive types of equipment manufacture and construction and its sector organizations are probably well able to adjust to conditions in developing countries. Although China is struggling to meet rapidly increasing demands for power system expansion internally, it is anxious to earn foreign exchange and some parts of its power industry are likely to be interested in export projects.[1/]

The joint interests of both countries could be served if industry leaders from China and Canada were to focus on cooperation in projects in third countries as well as in China. Such increased cooperation, and the prospects of increased exports, could also provide incentives to Canadian organizations for the technology transfer arrangements which China is seeking. Such cooperation outside China would be unlikely to be successful until Canadian and Chinese organizations learn how to work together on domestic projects within China so this cooperation in third countries will probably not take place on a large scale until the intermediate term, perhaps in the 1990's.

1/ A recent example of such joint venture cooperation is reported in Nepal where the Marsyandi hydro project is being constructed under Japanese management using Japanese equipment and a Chinese contractor for the tunnelling and underground powerhouse complex.

KEY DATES OF IMPORTANCE TO CANADIAN INVOLVEMENT IN CHINA'S POWER SECTOR

DECEMBER 1981 -	Establishment of CIDA program for China (Development Cooperation Agreement ratified with Foreign Minister Wu in October 1983).
MAY 1982 -	CIDA programming mission to China; identification of Electric Power Research Project and of need for South China planning studies.
DECEMBER 1983 -	Trade development mission to China led by EDC.
JANUARY 1984 -	Visit to Canada of Premier Zhao Ziyang; request for Canadian cooperation in China's power sector development and particular reference to possible Canadian cooperation for Three Gorges development.
FEBRUARY 1984 -	CIDA preparatory Mission on South China Planning Study; provision of Three Gorges plans and confirmation of tender call for 500 kV substations by MWREP.
APRIL 1984 -	Formation of China Working Group (CWG). The CWG is an ad-hoc informal interdepartmental working group focussing on Canada-China relations chaired by the Department of External Affairs. This group consists of representatives from CIDA, EDC, DRIE, Agriculture Canada, EMR, CCC, as well as other departments according to specific issues.
MAY 1984 -	Canada-China Joint Trade Committee Meeting Beijing
OCTOBER 1984 -	EDC signs $2 billion General Financing Protocol with Bank of China for 4 years.
NOVEMBER 1984 -	Canadian Power Sector Mission to China; signing of first MOU with MWREP; confirmation of financial support for Gehe Yan study;invitation to Mme Qian to visit Canada.
FEBRUARY 1985 -	Three Gorges Power Systems Planning Mission to Canada - led by Wang Defang (who on return to China became President of Huaneng International Power Development Corporation (HIPDC).
FEBRUARY 1985 -	Initiation of CIDA Electric Power Research Project which provides for technical resources of 5 Canadian utilities to assist 6 electric power research institutes of MWREP.
MARCH 1985 -	South China Power Systems Planning Mission to Canada.

MAY 1985 -	CIDA South China Project Definition Mission.
MAY 1985 -	HIPDC tender for "8-pack" turnkey thermal projects.
JULY 1985 -	Visit to Canada of President Li Xiannian; President Li was accompanied by Vice Premier Li Peng who took a special interest in the Canadian power sector.
OCTOBER 1985 -	Visit of Mme Quian Zhengying to Canada; signing of second MOU with MWREP; confirmation of Canadian government financial support for technical studies of Three Gorges and Longtan Projects.
DECEMBER 1985 -	Visit to Canada of Vice Governor of Hubei Province; discussion on Gehe Yan financing and signing of MOU.
FEBRUARY 1986 -	Contract awarded for the 200 MW thermal station - Babcock & Wilcox Canada part of first successful bid to HIPDC.
FEBRUARY 1986 -	CIDA's Planning Mission to China re Three Gorges feasibility study and revision to South China Planning Study.
APRIL 1986 -	Visit to China by Mrs. Catley-Carlson, President of CIDA.
MAY 1986 -	Visit to China of Rt. Hon. Brian Mulroney. Prime Minister of Canada.
JUNE 1986 -	Visit to China by the Hon. J. Kelleher, Minister of State for International Trade.

CHINA - ELECTRIC POWER DEVELOPMENT PROGRAMMES AND PROJECTS IN EARLY 1984

Note: This information provided by World Bank in Energy Sector report of 1985 and updated according to information provided to CIDA by MWREP.

A. MAJOR GENERATION PROJECTS UNDER CONSTRUCTION

Projects	Location	Installed Capacity (MW)	Present Status
1. Hydro Projects			
Gezhouba	Hubei on the Changjiang	2,715	965 MW in operation
Longyanxia	Qinghai on the Huanghe	1,280	
Baishan	Jilin on the Songhuanjing	900 (3x300)	
Ankang	Shaanxi on the Hanshui	800 (4x200)	
Tongjiezi	Sichuan on the Dadu River	600	
Dahua	Guangxi on the Hongshui	400 (4x125)	Civil works completed Equipment under installation (100 MW in operation in 1984)
Dongjiang	Hunan on the Leishui	500 (4x125)	
Wanan	Jiangxi on the Gangjiang	500	
Yantan	Guangxi on the Hongshui	1,100 (5x220) 880	Construction preparation
Tianshengqiao	Guizhou on the Hongshui River	1,080	Construction preparation
Lubuge	Yunnan on the Huangni River	(4x150)	Construction preparation
	Total	10,275	
2. Thermal Projects			
(a) New Stations under Construction			
Datong	Shanxi	1,200	200 MW in operation
Jinzhou	Liaoning	1,200	
Huainan	Jiangsu	1,200	
Guixi	Jiangxi	500	
Zouxian	Shandong	1,200	
Dawukou	Ningxia	400	
Fulaerji	Heilongjiang	1,200	
	Total	6,900	
(b) Stations Being Expanded			
Douhe	Hebei	1,550	800 MW being added
Yuanbaoshan	Nei Monggol	900	600 MW being added
Jianbi	Jiangsu	1,020	600 MW being added
Xuzhou	Jiangsu	1,300	800 MW being added
Qinling	Shaanxi	1,050	800 MW being added
	Total	5,820	3,600 MW being added

B. LARGE-SCALE HYDRO DEVELOPMENT PLANS

Upper Huanghe (Yellow)

From Qinghai to Ningxia, scores of hydroelectric stations are planned with total capacity of 12,600 MW. During the next two decades, seven projects (Longyangxia, Liujiaxia, Heisanxia, Daxia, Gongbuoxia, Jishixia, Laxiwa) with a total installed capacity of 9,000 MW will be constructed. Of the total, 4,000-6,000 MW will be commissioned by 2000. They will supply northwest China and be linked to the power grid supplying Beijing and Tianjin.

Hongshui (Pearl)

A ten project cascade sequence of power developments, totalling 10,900 MW has been planned on the Hongshui River in Guangxi. Up to the present two projects, E'tan (initial capacity 60 MW, ultimate capacity 560 MW) and Dahua (initial capacity 400 MW, ultimate capacity 600 MW) have been commissioned. The Basuo (lower) Tianshengqiao plant (initial capacity 1,080 MW, ultimate capacity 1,240 MW) is under construction, with commissioning expected in 1991. Some 5,000 to 6,000 MW of additional hydro capacity from the 10 cascade sequence is expected to be commissioned before the year 2000. The main supply areas are Guangxi and Guangdong with interconnection to Guizhou planned from the Bapan (upper) Tianshengqiao project (1,080 MW) which is planned to be in service by the mid 1990's.

Middle and Upper Changjiang (Yangtze)

During the next decade, construction will begin on a number of projects (Three Gorges, Wuqiangqi, Gehe Yan, Dongjiang, Wanan, Panshi, Goupitang, Dongfeng, Tongjiezi, Pubugou, Ertan, Baozhuxi and Jinping), with a total installed capacity of 40,000 MW. Some 15,000-22,000 MW of the total are expected to be commissioned before the year 2000.

Middle and Lower Lancang River (Mekong)

Three projects (Manwan, Xiaowang, and Xiajiakou), with a total installed capacity of 6,000 MW, will be started, of which 2,000-3,000 MW will be commissioned by the year 2000 and will supply the Southwest China power grid.

C. THERMAL POWER DEVELOPMENT PROGRAMME

Shanxi Coal and Power Base

Three groups of thermal power plants, with a total output of 20,000-25,000 MW, are being constructed near the coal pits in north, central and southeast Shanxi. They will mainly supply the North and Central China power grids.

Northeast Coal and Power Base

The base comprises three large open pits (Heling, Iming and Yuanbaoshan) producing lignite and a system of thermal power plants with a possible total capacity of 10,000-12,000 MW. They will help supply the Northeast China power grid.

Nei Monggol Coal and Power Base

Two groups of thermal power plants, with a total output of 5,000-10,000 MW, will be constructed at the mine mouths of Junggar and Dongshang. They will mainly supply North China.

Central Coal and Power Base

Two groups of thermal power plants, with a total output of 3,000 MW and 5,000 MW, are being constructed at mining centers in Henan and western Anhui. They will supply Central China.

Northwest Coal and Power Base

Four groups of thermal power plants, with a total output of 5,000-10,000 MW, will be constructed near the Weibei, Shaanbei, Ningxia and Huating coal pits.

Southwest Coal and Power Base

A system of thermal power plants, with a total output of 2,000-3,000 MW, will be constructed near the mining center of Liu-Pan-Sui in Guizhou.

East China Load Center and Port Area Power Plants

Four major thermal projects (Shidongkou, Beilungang, Sunan and Fuzhou) with a total capacity of 8,000-10,000 MW, will be constructed using coal mainly supplied from Shanxi.

Northeast China Load Center and Port Area Power Plants

Three thermal projects (Gaoling, Yingkou and Dalian) with a total capacity of 4,000-8,000 MW.

North China Load and Port Area Power Plants

Five thermal projects (Shalingzhi, Shijingshan, Jixian, Qinhuangdao, Tianjin) with a total capacity of 6,000-10,000 MW.

South China Load Center and Port Area Power Plants

Three thermal projects (Shajiao, Maoming and Liaobing) with a total capacity of 2,000-3,000 MW.

HYDRO PROJECTS OF CURRENT INTEREST TO CANADIAN SUPPLIERS

THREE GORGES WATER CONTROL PROJECT

The proposed Three Gorges Project on the Yangtze River at Sandouping is believed to be the largest single water resource project being studied for implementation anywhere in the world.

In addition to a planned hydropower capacity of 14,820 MW at full development*, the project is multi-purpose by virtue of the flood control benefits resulting from the dam and reservoir created for power development. Due to controlled flow capability, an appreciable benefit would also result from better water transportation on the Yangtze. This latter feature requires construction of suitable ship lift locks at the power plant site.

Chinese flood control and hydroelectric engineers have spent many years studying Yangtze River characteristics in attempts to mitigate frequent disastrous floods in the middle and lower reaches of the river. The proposed dam location is advantageous for flood control purposes. Generated power would also be relatively close to the power short but industrially important Central and East China Regions. Future interties to the South West and North China regions increase the importance of Three Gorges as a key national power development.

Conceptional planning and layouts to achieve the triple objectives of flood control, power production and navigation are well advanced. Site investigation in geology and geotechnics, river hydrology, and general data assembly is available for study. Work has also been done on preliminary site and facility layouts, construction methods, types and sizes of structures and permanent equipment. Switchyards and convertor station equipment plus transmission systems have also reached the preliminary design stage.

Due to the magnitude of the Three Gorges Project and the fierce international competition associated with it, Ministers chose the CIPM-Yangtze Joint Venture, (a consortium consisting of Acres, SNC, Lavalin, Hydro Quebec International and B.C. Hydro) as Canada's vehicle for pursuit of the project. As a result, CIPM-Yangtze Joint Venture has been asked to undertake preliminary investigations of the following aspects of the Three Gorges project:

- the second stage cofferdam;
- the preliminary selection of construction equipment;
- the management and organization of the project;
- the switching and convertor stations.

This preliminary work is expected to be completed by July, 1986. The next stage will be the preparation of a bankable feasibility study. CIPM-Yangtze Joint Venture are pursuing this assignment for which financing from CIDA has been approved.

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* Capacity relating to full supply level (fsl) of 160 m for the reservoir. Final confirmation of design fsl expected by mid-1986.

GEHE YAN WATER CONTROL PROJECT

The Gehe Yan Water Control Project is a multi-purpose development located on the Qingjiang River in the Province of Hubei.

The project combines power generation facilities, to augment the supply of energy to the main regional industrial centres of Wuhan and Yichang, with important flood control and navigation provisions.

Extensive investigations have been carried out at the site over the past 20 years and detailed studies and evaluation of alternatives have also been completed.

All approvals necessary to permit implementation of the project have been obtained on the basis of the previous studies. A feasibility study report compatible with standards of the major international lending agencies was completed (Nov 1985) by the Yangtze Valley Planning Office, in cooperation with CIPM and Hydro Quebec International, in order to facilitate the necessary financing; particularly for procurement of electro-mechanical plant, construction equipment, materials and management and engineering assistance.

The hydroelectric component of the project will have an installed capacity of 1,200 MW and will produce 3,040 GWh of energy annually. The shiplift will be capable of transporting ships of 300 ton capacity around the dam. The provision for flood control storage in the reservoirs will reduce risk of damage to the Jinjiang levee on the Yangtze River in major flood years.

The cost of the project is estimated by the Chinese authorities to total Rmb 2.5 billion (C$ 1.25 billion), including escalation and interest during construction.

The Gehe Yan Water Control Project is considered to be one of the most important development projects in Hubei Province. It has been accorded high priority by the provincial government and is endorsed by the national authorities because of the multi-purpose benefits accruing from the project.

Under the terms of the Agreement, the Canadian consulting group is to "assist the PRC representative in the securing of financing from Canadian sources for the implementation of the Project". The plant and services to be provided under the financing agreement would be restricted to Canadian sources. Hydro Quebec International has presented EDC with a preliminary request to finance Canadian goods and services with a total of $ 345.5 million for this project.

LONGTAN HYDROELECTRIC PROJECT

The Longtan project is located in the Guangxi Autonomous Region on the Hongshui River some 300 km north of the provincial capital Nanning and 10 km upstream from the county seat, Tian.

The Changsha-based Mid-South Design Institute for Hydroelectric Projects is responsible for the planning, design and implementation of this project. This organization has already prepared the overall cascade development for the Hongshui River. Total capacity to be developed on the Hongshui is in the order of 10,900 MW and the Longtan project is the most important hydroelectric development envisaged. Its installed capacity will total some 5,000 MW.

The output generated by the Longtan project will be integrated into the regional grid system in South China.

Site geological investigation started on an intermittent basis in 1956. More detailed work was sanctioned in 1978, leading to formal project acceptance by the Ministry of Water Resources and Electric Power (MWREP) and the Guangxi Regional Government in 1981. Following this formal acceptance, additional site investigations were undertaken and various development concepts examined with a view to establishing project feasibility.

Although a feasibility study of the site development has been completed using concrete gravity structures (which is a relatively costly concept), the Chinese authorities consider that it will be advantageous to utilize Canadian expertise and experience in rockfill dams and underground powerstations in order to accomplish a more economic scheme of development.

CIPM-Yangtze Joint Venture was asked to undertake design studies on the following elements of the project in cooperation with the Mid South Design Institute:

- general layout for rockfill dam and underground powerhouse scheme;
- rockfill dam preliminary design;
- underground powerhouse preliminary design;
- construction planning and scheduling.

The design studies were scheduled for completion in the first half of 1986. The next step would be to arrange financing to implement the project, including the engineering services. Whether or not the Chinese authorities will seek international financing for the project is still unclear. Construction would probably not begin before 1988 at the earliest.

LIJIANG WATER RESOURCES PROJECT

This project, located in the Guangxi Autonomous Region, is a multi-purpose project (flood control, water supply, navigation and power generation), approved by the central government of China to be carried out locally.

Tecsult International Limited and Kwan-CETEC Incorporated, both of Montreal, completed a technical feasibility study in January, 1986 for the Guilin Travel and Tourism Corporation. Financing for the study was provided by CIDA's Industrial Cooperation Programme and the Government of Quebec.

The entire project consists of eight dams, two of which are already completed, and investigation for the location of the other sites has been initiated by the responsible authorities. The total water storage capacity is estimated to be 400 million cu. meters within a catchment area of approximately 2,860 sq. km. mainly located on the upstream of the Lijiang River. Upon completion of the project, navigation on the Lijiang River will be greatly improved i.e. the available draft during the dry period will be increased by 100 per cent. The complete 83 km section of the scenic river route would become navigable throughout the year. The total installed power capacity of these dams is approximately 90 MW with an annual generating capacity of 300 million KWh.

In addition, approximately 100 km of 100 kV line and 75 km of 35 kV line and 75 km of distribution lines within the city of Guilin will be erected. The generation control and transmission systems will be computerized and operated from a central control center located in the city of Guilin.

The project selected by the consultant, following preliminary dicussions with the Guilin project authorities (but not with the local power bureau or the national authorities), would involve costs of $ 68.3 million for equipment and services which could be provided from Canada. The overall cost of the project is not indicated. Whether or not the Guilin authorities and the central government will seek international financing to implement the project is not clear.

CHINA'S POWER INDUSTRY

The following extracts have been taken from a series of articles published in Electric Power Business China published in 1980 and 1981 under the title China Industry Profile.1/

Thermal Power

The first thermal power plant in China was built in 1882. The US built the Shanghai Electric Co. with a generating capacity of 654 kW. It was later reorganized into the Shanghai Power and Electric Co. Several other thermal plants were built by foreign firms, and by 1939, out of total 2.3 billion kWh of electricity produced by foreign-operated thermal power stations, US stations produced 83 per cent; UK and French ones, about 5.5 per cent each; and Japanese stations, 3.5 per cent.

In 1949, when the PRC was established, China had thermal generating capacity amounting to about 1.7 million kW. Over half of that capacity was in the north and northeast.

In 1953-57, the USSR, Czechoslavakia, East Germany, Hungary, Poland, and Romania all helped China build its thermal power industry and supply it with complete installations. This help continued until the USSR withdrew its experts from China in 1960.

Thereafter, the Chinese were on their own, with occasional imports of thermal power equipment from Czechoslovakia, Romania, Japan, and Western Europe. In 1972, the Chinese switched large amounts of capacity from coal to oil and thermal power generation, consuming for that purpose over 20 million tons of oil a year to 1978. In 1979, power plants began to go back to coal.

When the USSR withdrew its experts from China in 1960, Soviet officials declared that, without their help, the Chinese "could never build any high-capacity generating units". Although their withdrawal was costly to the PRC, as power generating equipment supplies came to an end and many projects under construction had to be abandoned, Chinese industry over the years has increased its ability to produce high-capacity generating units. Up-to-date equipment plus know-how imported from Japan and the West, which Chinese factories are licensed to produce (see table), have been key inputs to the expansion of China's power industry.

Power Generating Equipment

Production of thermal power generating equipment is complex, usually large-scale, and demanding great precision in manufacturing and assembling. Before 1949, the electrical engineering industry didn't exist in China, and all power generating equipment was imported. After 1949, efforts were made to

1/ China Industry Profile: Electric Power Business China; issues dated, October 8, October 29, November 12, November 26, December 3 and December 17, 1980, February 11, February 25, March 11, March 26, April 8, and April 22, 1981.

design and produce power-generating equipment. By July 1952, Shanghai managed to turn out the country's first 240 kW steam generator with all the parts domestically manufactured. With the help of Czechoslovak equipment, a generating unit was designed and produced in the municipality in 1954. The unit consisted of a 6,000-kW steam turbine and generator, a boiler capable of supplying 40 tons of superheated steam per hour, and all auxiliary equipment and controls.

USSR contributions to China's thermal power sector were mainly training of workers and managers; utilization of low-quality coal (that formerly was discarded) for power generation; improving boiler efficiency; helping design a 25,000 kW generating unit; and supplying equipment.

On the basis of this Czechoslovak and Soviet help, China by end-1957, was capable of designing power plants with a total capacity of 650,000 kW. Early in 1959, a 50,000 kW high-temperature, high-pressure steam turbine was turned out. It was more than seven meters long and weighed 150 tons. Combined with a 50,000 kW generator and a 230-ton boiler, it was said to create a thermoelectric power generating unit capable of supplying light to a city with a population of five million.

In 1960, a 100,000-kw steam turbogenerator with direct water-cooled stator and rotor was produced in Shanghai. This was followed by the manufacture of a 125,000-kw steam turbogenerator in 1968 and 200,000- and 300,000-kw ones in the 1970s.

In 1980, a 600,000-kw steam turbogenerator is being manufactured. Its production is due to the first electric arc furnace with a designed productive capacity of 75 tons of high-quality alloy steel per heat that has been made by the Xian Transformer Furnace Plant in Shaanxi for production of forged and cast parts. Meanwhile, purchases of 2.5, three, and six-million-kW generating equipment from Japan, France, and Belgium have been reported.

The table on Page 3 lists the PRC's principal plants making equipment for the power generating industry..........

Hydroelectric resources in the world total about 3.8 billion kW. During the past 90 years, resources representing over 130 million kW have been tapped, mainly in North America and Europe. In Asia, Africa, and South America, where these resources are the richest, they have hardly been developed. In China, only 2.5% of this vast potential is being utilized.

Role of Hydro power

More than three quarters of the electricity supplied in the country comes from the thermal sector. Investments in the hydropower sector are only about 20% of those in the thermal sector because, with yearly investments limited, results are more quickly obtained. Hydroelectric resources are so scattered that many industrial cities can now obtain electricity from hydropower

Plants Producing Power Generation Equipment

Plant	Remarks
Heilongjiang	
Harbin Steam Turbine Plant	USSR design and equipment; construction started in March 1956; put into operation in December 1957; 12,000-, 15,000-, 24,000-, 25,000-, 50,000-, and 200,000-kw
Harbin Boiler Plant	Built in 1950s with USSR design and equipment; high- and medium-pressure boilers
Harbin Electric Machinery Plant	Built in 1950s with USSR design and equipment
Jiamusi Electric Machinery Plant	Produces generators, switches, and transformers as well as electric instruments and meters related to power generation
Liaoning	
Shenyang Water Pump Plant	Producing boiler water supply pumps under license from KSB Co of West Germany
Shenyang Transformer Plant	Producing under license from Alsthom-Atlantique of France five-million volt single phase, oil immersed autofotmers and five-million volt current mutual inductors for five-million volt super high-tension transmission lines
Shenyang Heavy Machinery Plant	Producing products of EVT Co of West Germany under license: coal-grinding machines for power plant boilers
Dalian Fluid-drive Machinery Plant	Producing under license Fluid-drive Co of UK 560- to 3,200-kw speed regulating type fluid-drive coupling machines for power plants from 200,000 kw up
Dalian High-Tension Valve Plant	Producing under license Canadian Velan Co of Canada dredging water machines for power plants and other industrial enterprises
Peking	
Peking Heavy Electric Machinery Plant; Peking Boiler Plant; Peking No. 2 General Machinery Plant	Producing 25,000-kw generating units since 1978
Peking Low-Tension Electric Appliance Plant	Producing under license Brown Boverl Co products including small automatic switches and accessories for modern building electric systems and protection installations
Shaanxl	
Xian Electric Capacitor Plant	China's largest; built in 1950s with USSR, Czechoslovak, and East German equipment; 500,000-volt standard capacitors and phase shifting, pulse, thermal, and coupling ones; capacitor type voltage mutual inductors; producing under license McGraw Edison Co of US products for improving power factor in grids and making full use of energy
Xian Transformer Electric Furnace Plant	Producing under license Alsthom-Atlantique 500,000-volt parallel reactors for 500,000-volt super high-tension power transmission lines
Xian High-Tension Electric Porcelain Plant	Producing under license ASEA Co of Sweden high-tension capacitor type sleeves for 200,000- and 500,000-volt high-tension transformers
Hubel	
Wuhan Boiler Plant	USSR and Czechoslovak equipment; commissioned in 1959; producing high temperature, high pressure boilers
Henan	
Pingdingshan High-Tension Switch Plant	Producing under license Merlin-Guerin Co of France hexafluorinated sulfur circuit breakers for high-tension power transmission lines (below 750,000 volt)
Jiangsu	
Nanjing Steam Turbine Plant	Built in 1950s with Czechoslovak and East German equipment; producing 10,000-, 15,000-, 25,000-, 50,000-, and 100,000-kw generating units
Nanjing Electric Porcelain Plant	Producing Smiths Co of the UK spark plugs under license
Wuxi Boiler Plant	Small old enterprise; rebuilt in 1950s with Czechoslovak, East German, and USSR equipment; producing high temperature, high pressure boilers for power plants
Shanghai	
Shanghai Steam Turbine Plant; No. 1 Branch; No. 2 Branch; No. 3 Branch; Shanghai Electric Machinery Plant; Shanghai Boiler Plant; No. 1 Plant; No. 2 Plant	Formed in 1949-52 through merging and reorganization of small enterprises; rebuilt and expanded in 1953-57 with help from more than 40 Czechoslovak experts and their equipment; 300,000 kw set with inner water-cooled stator and rotor; the whole set made up of more than 35,000 pieces of equipment including blower, transformer, computer, and automatic installations
Shanghai Blower Plant	Producing under license TLT Co of West Germany air dispatching and directing machines for large power plant boilers
Zhejiang	
Hangzhou Steam Turbine Plant; Hangzhou Boiler Plant; Xiaoshan Electric Machinery Plant	Built in 1950s with Czechoslovak, East German, and USSR equipment; producing 10,000-, 12,000-, 25,000-, 50,000-, and 100,000-kw generating units

stations. When projects at Sanxia (Three Gorges) on the Yangtze River are constructed, then the country will have to study the problem of transmitting power over a distance of 1,000 km or more.

Construction of hydropower stations can turn the upper reaches of rivers into reservoirs, thereby improving flow in the lower reaches during low-water seasons, aiding navigation. Veteran hydropower experts have urged the government to give priority to the hydropower sector. The People's Daily, however, points out that coal is the primary energy for the country's power industry, not water power or petroleum. Thus, the policy of relying on localities and the masses to build small, medium-sized, and large hydropower stations simultaneously is still the order of the day. In general, large stations with generating sets of 150,000 kW or more are built by the state; construction of medium-sized stations with generating sets of less than 150,000 kW is undertaken by the provincial and prefectural authorities, while stations with generating sets of 10,000 kW and less are built by countries, communes, production brigades, or production teams.

Hydropower's History

The hydropower sector of China's power industry dates back to 1910 when the government asked a German firm to design, build, and equip the Shilongao Hydropower Station, 40 km west of Kunming in Yunnan. Two 720-kW sets were installed and put into operation in 1912. Thereafter, small hydropower stations were also built in other parts of the country, but most of them were tiny with a generating capacity of 15 or 18 kW, and their total capacity up to 1936 came to only 1,560 kW. The aggregate capacity of the country's hydropower stations built in that 26-year period was only 3,000 kW.

After the Sino-Japanese War, more than 30 small hydropower stations with a total capacity of about 10,000 kW were built in Sichuan, Yunnan, and Fujian provinces. Under Japanese occupation, a number of hydropower stations were built, but is was not until 1940 that the Fengman Hydropower Station, with a designed capacity of 563,000 kw, was built. Units with a total capacity of only 130,000 kW were installed, and these along with others were looted by Soviet troops in the winter of 1945. Part of the dam at Fengman was blown up in the subsequent civil war..................

Generation Equipment

Following construction of key medium and large hydropower stations as well as numerous small ones, China now has the expertise to design and manufacture water turbines and generators. However, technical aid from Japan and the West will still be needed for construction of those of larger capacity on major rivers.

Duplication of foreign models in the early 1950s has gradually built up China's hydropower generating equipment industry. Some 100 plants throughout China annually produce 83 varieties of water turbines and more than 120 kinds of generators, all for small hydropower stations. The turbines can accommodate a range of water heads from two to 400 meters; the generator capacities are in the 12 kW to 10,000 kW range. The small-sized power generating equipment made in the PRC generally is of two types, vertical and horizontal. Usually, the turbine is directly coupled to the generator or sometimes belted for generators below 150 kW in capacity. Component parts of turbines are made for use in noncorrosive water with low sand content. This is incompatible with reality because rivers and streams in the country are notorious for high sand (in fact, silt) content. A guide-vane wheel of solid construction and sensitive control therefore has to be used to regulate the water flow rate to meet with different turbine loads.

For small vertical and horizontal power sets, automatic speed governors attached with automatic air supply devices can be adopted at the site or by remote control. The valves are of three types: butterfly, spherical, and sluice and gate. The butterfly valve is suitable for a medium-head power set; the spherical one, for a high-head power set; and the sluice and gate one, for small power sets. Switchboards are of two types: static cubicle and truck. For switchboards up to 500 volts, the air circuit breaker is used as the main switch while the low oil content switch is employed for switchboards over 500 volts.

On the whole, small water turbine generating sets produced in the country are too big for remote mountain villages, island fishing hamlets, border outposts, road maintenance stations, and mountain villages, island fishing hamlets, border outposts, road maintenance stations, and mountain weather and hydrological stations with limited water resources. Since 1972, mini equipment, similar to ordinary water turbine generating equipment in theory and structure but much simpler without speed-governor installation, ranging from 0.6 kW to 12 kW, has been designed and manufactured in many areas of the country.

Since, however, almost all provinces, municipalities, and autonomous regions have built their own high-tension electric apparatus plants turning out low-oil-content circuit breakers, compressed air circuit breakers, sulfur hexafluoride circuit breakers, vacuum switches, hard gas circuit breakers, etc.

In long distance transmission, various kinds of step-up transformers are installed at power plants and hydropower stations to raise the generator outlet voltage to a suitable level for transmitting the high voltage. Step-down transformers and distribution transformers are installed at the load centers to convert high-voltage power supply into low-voltage power supply for direct use.

The Shenyang Transformer Plant in Liaoning has recently produced the country's first 500-kV transformer. In addition to manufacturing this 200-ton transformer, the plant is reportedly designing a 750-kV transformer. More advanced is direct current power transmission. The Shanghai Rectifier Plant has turned out the country's first 30,000-kv power transmission equipment, which will enhance long distance transmission in interconnected AC systems.

PRC Producers of Large- and Medium-Scale Power Generation Equipment

Plant	Products
Heilongjiang	
Harbin Electric Machinery	• 50,000-kw water turbine generator • 50,000-kw low water head water turbine generator • Xinanjiang model 72,500-kw water turbine generator • Model HL662-LJ-410 water turbine generator: water head, 73 meters; flow volume, 118 cu meters per second; designed capacity 76,500 kw; rated speed, 150 rpm; outlet height, +1.5 meters; actual operation —0.27 meters • Yunfang model 100,000-kw water turbine generator: turbine rotor poured and cast alloy steel; generator main shaft driven by the turbine, a 60-ton piece of alloy steel • 200,000-kw water turbine generator • 225,000-kw water turbine generator • 300,000-kw water turbine generator consisting of more than 50,000 parts and complete automatic control with a single signal for off-and-on operation; total weight: over 2,000 tons, of which the largest component weighs 650 tons; water-cooled stator and rotor no heavier than the 225,000-kw set
Liaoning	
Shenyang Electric Machinery	50,000-kw, 210,000-kw, and, 300,000-kw water turbine generators
Shenyang Heavy Duty Machine Building	Rotors for water turbine generators, such as rotors for 300,000-kw generators; each three meters high, 5.5 meters in diameter, and weighing 110 tons; manufacture began 1978
Shenyang Heavy Machinery	• Francis water turbine runner with maximum of six meters; made of carbon steel and low alloy steel • Kaplan water turbine blades with gross weight up to 42 tons; made of carbon steel and low alloy or stainless steel
Tianjin	
Tianjin Power	Types: turbular, axial flow, Francis, diagonal flow, and water pumping-energy storing water turbine generators
Shanxi	
Xian Electric Machinery	3,000-, 10,000-, 12,000-, 15,000- and 50,000-kw water turbine generators
Sichuan	
Chengdu Dongfang Electric Machinery	• 50,000- and 100,000-kw water turbine generators • Danjiangkou model 150,000-kw water turbine generator with two shafts more than one meter in diameter and some eight meters long • 170,000-kw low water head, adjustable blade water turbine generator: a 27-meter maximum designed head weighing 400 tons; rotor diameter measures 11.3 meters and four blades weigh 35 tons; being installed at Gezhouba Hydropower Station; second generator being produced
Hunan	
Xiangtan Electric	10,000-, 12,000-, 15,000-, and 50,000-kw water turbine generators
Shanghai	
Shanghai Electric Machinery	60,000-kw water turbine generator
Fujian	
Nanping Electric Machinery	10,000-, 12,000-, and 15,000-kw water turbine generators

Cables and Wires

The three types of power cables used in the PRC are oil-immersed paper insulated, rubber insulated, and PVC insulated. Oil-immersed-paper insulated cables are widely used in engineering projects due to their high voltage endurance (with working voltage up to 66-kV), good heat resistance, and long utilization limit (30-40 years). These cables also have drawbacks, however. Their bending radius cannot be too small; in laying the minimum temperature must not be lower than 0°C or they must be preheated; after laying the levels of the two ends can differ only slightly because the immersion agent inside the cable is fluidic. Oil accumulated at the lower end will then produce static voltage, swell up, and puncture while the higher end will lose oil and become dry, damaging the insulated paper.

The working voltage of oil-immersed-paper insulated cables is rated into 1, 3, 6, 10, 20, and 35 kv. Conductor cores are made of copper or aluminum with cross sections graded into 2.5, 4, 6, 10, 16, 25, 35, 50, 70, 95, 120, 150, 185, 240, 300, 400, 500, 625, and 800 sq. mm.

Control cables are used for conduction of current in distribution equipment, instruments and meter connection, relay protection and appliance control. The running voltage is low, below AC 500 volts or DC 1,000 volts. Since the load is intermittent, conductor core cross sections are small, 1.5 to 10 sq. mm. They are all multicore cables with cores ranging from 4 to 37 sq. mm.

China produces several types of electric wire resistant to acids, alkalis, weather, earthquakes, and chemical reaction, with a voltage range from 250 to 440 volts.

Major Wire Cable Plants

Harbin Electric Wire (Heilongjiang) - Small, old enterprise built and expanded 1953-57 with Soviet equipment; products: braided wires, fuse wires, hookup wires, ground wires, open wires, twisted wires, covered wires, house service wires, shielding wires, S-wires, flat aluminum wires, bare copper wires, plastic insulated wires, guys, phase wires, triple core wires, distribution wires, control wires, etc.

Shenyang Electric Wire and Cable (Liaoning) - Old enterprise set up in 1936; reconstruction and expansion started in 1953 and put into operation in 1956 with over 1,000 pieces of automatic and push-button East German and Soviet equipment; the country's biggest; products include a wide variety of wire and cables.

Peking Electric Wire - Products: single core insulated wires, single core insultated and sheathed wires, double core insulated wires, various kinds of PVC wires.

Shanghai Electric Cable - Czechoslovak equipment and technology.

Shanghai First Electric Wire

Shanghai Second Electric Wire

Shangai Third Electric Wire - Forty-nine private electric wire factories merged to form Shanghai Electric Wire Plant in 1951-55 with Czechoslovak equipment and technology; reorganized into three plants in 1966.

China's Purchases

Over the years, China's imports and exports of electric power industry equipment have undergone changes. During the 1950s, under Western embargo, China had no choice but to rely on the USSR and Eastern Europe for power equipment supplies. In the early 1950s, complete sets of generation equipment and cables were the main items of electric power-related trade between the PRC and the USSR. Although the deterioration in political relations reduced trade turnover between the two, and China's overall imports from the West and Japan began to grow during the 1960s, purchases of such items as boilers, turbines, transformers, and electric wire continued at a low level.

In May 1972, China and the USSR signed a supplementary long-term trade agreement under which the USSR would supply seven turbogenerators with a total capacity of 700,000 kW. This was in addition to the usual annual agreement under which the USSR had already delivered four turbogenerators during the year. This pattern of importing Soviet power equipment continued until 1979. In 1980, however, China appears to have removed power equipment from its list of USSR imports, probably in part due to its access to sophisticated power generation equipment and know-how from around the world.

Between 1953 and 1962, China imported a large volume of power generating sets and related equipment from Bulgaria, Czechoslovakia, East Germany, Hungary, and Romania. In 1959-62, East Germany alone supplied the Chinese with complete sets of equipment for 32 power plants and one set of turbines. After 1962, trade fell off.

In 1966, Bulgaria sold the PRC complete sets of equipment for 28 hydropower stations. Poland in 1967 provided China with a power plant. Periodically since 1970, China has turned to Czechoslovakia, East Germany, Hungary, and Romania for power equipment supplies.

Recent key imports from the West and Japan

In 1965, West Germany sold China power generating machinery worth US$ 2.02 million. The Dutch in the early 1960s had made some consistent sales of electric power machinery and switchgear.

In 1972, Japan's Hitachi sold China electric machinery valued at US$ 26.3 million. In 1973, two French firms, Alsthom-Atlantique and

Creusot-Loire won an agreement to build two hydropower stations in China worth US$ 11 million.

In 1973, China also ordered two power generating units, each with a capacity of 320,000 kW for the Dagang Power Plant in Tianjin. These orders, valued at US$ 79 million, were placed with CIE of Italy.

In 1975, two Swedish firms, ASEA and Karlstads Mekaniska Werkstad won a contract worth US$ 7 million for generators and turbines. Four years later, ASEA received an order for US$ 20 million worth of equipment for three electric power substations in central China.

Two years later China purchased from Hitachi and Shinnihon Trading Co. four steam turbine generating units with a total capacity of 750,000 kW for installation at the Tangshan Douhe Power Plant in Hebei. Then in 1978, Mitsubishi Heavy Industries and Mitsubishi Electric won orders for two power generating units, each with a capacity of 350,000 kW. The equipment, worth slightly less than US$ 200 million, was destined for the Baoshan iron and steel complex. Although the future of the beleaguered complex remains under a cloud, the power generation stations continue to be built.

In 1978, West Germany's Siemens sold a computer system for use in the Hanzhou Steam Turbine Plant in Zhejiang. The cost of the system - for technical calculations, project design work, order processing, and manufacturing control - is estimated at US$ 700,000. The sale was closely connected to a license agreement concluded between the turbine plant and the Siemens Wesel Turbine Plant in early 1976.

In 1979, China bought a 600,000-kW power plant and 500-kv equipment for a transmission line between Wuhan in Hubei and Pingdingshan as well as related equipment for the transmission line from Sweden and Japan. These purchases were followed by a contract worth some US$ 10 million concluded with the UK's Babcock Product Engineering for 12 coal pulverization mills and an auxiliary plant for the first stage of China's plan to convert power plants from oil and coal firing. Related to this was another contract signed with the UK's Laurence Scott and Electromotors of Norwich for 24 electric motors for similar converting. Toward the end of 1979, Czechoslovakia sold a power generating plant said to be worth US$200 million to the PRC.

Since the US National Exhibition in November 1980 coincided with a round of heavy budget-cutting in the PRC's economic readjustment, exhibitors sold only US$ 114,000 worth of power generating equipment.....

<u>China's exports</u>

China's exports of power equipment take the form of aid. The Chinese in May 1967 agreed to supply Nepal with a hydropower plant. The Sun Koshi Hydropower Station went into operation in November 1972 and has a generating capacity of 10,500 kW. The plant is 50 miles east of Kathmandu, about 15 miles from the Kodari checkpoint on the Sino-Nepalese frontier, and connected to Lhasa, Tibet, by a modern all-weather highway.....

The Bouenza Hydropower Station, 186 miles from Brazzaville in the Congo, has an initial capacity of 80,000 kW. This Chinese-financed project with a dam on the Bouenza River is able to supply electricity to five towns in the western part of the country through high-tension lines and transformers.

One of eight power plants financed by a Chinese government loan in Ethiopia went into operation in Woldya, northern Wollo province, in July 1978. The cost of this plant is US$ 133,000. Others are being built.....

CANADIAN POWER SECTOR ORGANIZATIONS MAKING PRESENTATION

Organization	Written Brief	Verbal Presentation
Acres International Ltd.	X	
Alcan Wire and Cable	X	X
Babcock & Wilcox Canada	X	X
B.C. Hydro	X	
Canada Wire International	X	
Canadian General Electric	X	X
Canadian International Construction Consortium	X	X
Atlas-Gest International Ltd.		
BG Checo International Ltd.		
Fizpatrick Construction Ltd.		
The Foundation Company of Canada Ltd.		
Janin Construction Ltd.		
Pitts Engineering Construction		
Sintra Inc.		
Canadian International Project Managers	X	X
Acres		
Lavalin		
SNC		
CIPM-Yangtze Joint Venture includes CIPM plus		
Hydro Quebec International		
BC Hydro		
Canadian Thermal Power Consortium for China	X	X
AMCA International Ltd. (Dominion Bridge)		
Brown Boveri Howden		
Combustion Engineering Canada Inc.		
Monenco		
CP Coal Engineers	X	
Federal Pioneer Ltd.	X	
Hydro Quebec International	X	X
Lavalin International	X	X
Manitoba Hydro	X	
Monenco Consultants Ltd.	X	X
Monenco Transmission Consortium	X	X
Manitoba Hydro		
Monenco		
Ontario Hydro		
Teshmont		
Ontario Hydro	X	
SNC International Ltd.	X	X
Sogex International Ltd.	X	X
Marine Industries Ltd.		
Cegelec Industries Ltd.		
BG Checo International Ltd.		
Tecsult International Ltd.	X	X
Timberland Equipment Ltd.	X	X
Westinghouse Canada Inc.	X	

Note: Verbal presentations to the Task Force took place in Canadian Export Association Offices in Ottawa during week of March 24-27, 1986.

APPENDIX B

TASK FORCE ON CHINA POWER SECTOR

SECTOR BRIEF

FOR

THE AGRICULTURE SECTOR

Working Group Members:

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July, 1986

EXECUTIVE SUMMARY

1. OPPORTUNITIES IN CHINA

- China farms only 7% of the world's arable land and yet is now essentially self-sufficient in food production and feeds 22% of the world's population.
- China's cultivated area will not increase and therefore the emphasis will continue to be on increases in productivity per unit area.
- Food processing, storage and distribution is a bottleneck for further economic development in China and this is where significant investment is required.

2. CANADIAN INDUSTRY CAPABILITY AND CAPACITY

- Canadian agriculture is highly dependent on the international market place, with grains and oilseeds dominating sales.
- The agricultural sector comprises small and medium-sized companies which provide a variety of services and commodities.
- The outcome of Canadian-U.S. free trade discussions and the upcoming GATT negotiations will have a major impact on the future viability and competitiveness of Canadian agriculture.
- Past experience shows it requires several years for a net financial return from an investment in China. The long-term view is optimistic, however.

3. COMPETITIVE CONSIDERATIONS RE CANADIAN EXPORTS

- The opportunity for Canada lies in helping China develop its food processing and livestock industries.
- Canadian exports to China will be dependent on China's economic growth and her ability to earn foreign exchange.
- Canada should assist China in developing its feed and oilseed processing industry in order that feed grains and canola will be used domestically in China; third markets such as Japan may then be preserved for Canadian exports.

4. POSSIBLE FEDERAL ROLE IN SUPPORTING SECTOR EXPORTS

- Faced with an apparent long-term decline in Chinese purchases of wheat, Canada may wish to implement an integrated program of export support for other commodities such as feed grains and/or canola oil.

- The federal government should encourage the rapid development of Chinese livestock, feed milling, oilseed processing, malting and brewing industries through joint ventures and technical assistance.

5. ANTICIPATED FINANCIAL REQUIREMENTS

- Given the perceived opportunities in Chinese agriculture and recognizing Canadian capabilities, it is anticipated that $32M, over a three to five year period, will be required to finance Canadian private sector marketing initiatives in China. This includes bid support on commercial tendering, support for the sale of Canadian technology, development cooperation projects and market development. Priority should be given to the following eight areas:

  Genetic improvements
  Marketing
  Processing, especially rapeseed
  Dairy production and processing
  Resource-poor areas
  Grain storage and distribution
  Swine production and management
  Fertilizer (potash) use and distribution

  Financial support is also required to improve the means to assemble and distribute information on market opportunities in China, with particular reference to the eight priority areas designated above.

AGRICULTURE SECTOR BRIEF

TABLE OF CONTENTS

ABBREVIATIONS

ATEC	Agro-technical Extension Centre
CAAS	Chinese Academy of Agricultural Sciences
CGSP	Credit Grains Sales Program
CIDA	Canadian International Development Agency
CIGI	Canadian International Grains Institute
CLEA	Canadian Livestock Exporters Association
CWB	Canadian Wheat Board
EDC	Export Development Corporation
GATT	General Agreement on Trade and Tariffs
JAC	Joint Agricultural Committee
MFERT	Ministry of Foreign Economic Relations and Trade
MOA	Ministry of Agriculture, Animal Husbandry and Fishery
MOU	Memorandum of Understanding
PAMI	Prairie Agricultural Machinery Institute
PEMD	Program for Export Market Development
PRC	Peoples Republic of China
PRS	Production Responsibility System
TA	Technical Assistance

1. OPPORTUNITIES IN CHINA

A. Sector Organization and Responsibilities

The Ministry of Agriculture, Animal Husbandry and Fishery (MOA) is the main Chinese agency for agricultural development with significant additional input from the Ministry of Education, the Chinese Academy of Agricultural Sciences (CAAS), the State Planning Commission and, for foreign aid, the Ministry of Foreign Economic Relations and Trade (MFERT).

Policy changes since 1979 have terminated the communal system of farming. Instead, state-owned land has been divided and leased out to facilitate farming by individual households. Under the Production Responsibility System (PRS), households may negotiate a contract with the government for their production. Output in excess of the contract quota can be sold on the open market. This system, together with "sideline" enterprises, has promoted personal freedom and incentives and resulted in increased production, rural income and prosperity. This personal freedom has also resulted in some costs such as alleged corruption.

MOA has overall responsibility for production and research within an eight-tier hierarchical structure of the nation, provinces, counties, divisions, zones, townships, villages and farm families. Research, the responsibility of CAAS (within MOA), is done at 390 institutions and 49 provincial institutes. Agricultural education is provided at 85 colleges and universities for about 100,000 students. Agricultural extension services are being decentralized to service 200 million production units through 23,000 agro-technical extension centres (ATEC). Large state farms remain in existence but increasingly are being sub-divided to farm families under PRS.

B. Past Sector Developments and Trends

Agriculture in China which started in the 4th century BC along the Yellow river, has evolved to the point that, today, it supports 22% of the world's population from only 7% of the world's arable land. To feed a population increasing by 10 million annually, agricultural continues to be China's main priority for modernization and development. Only a tenth of China's total land is cultivated but almost half this area is irrigated. Any increase in arable land is unlikely. Therefore emphasis has been, and will continue to be, on increases in productivity per unit area.

Mainly due to rural economic reforms, crop production increases, at 7% per annum since 1980, have been spectacular. Primarily due to yield increase, annual grain production is now close to 400 million tonnes.

Rural incomes have increased by more than two-fold since 1979. The Chinese average daily dietary intake of 2,700 KCals surpasses the level of many middle-income countries. However, regional disparities and transportation problems continue to influence food distribution and intake. The daily protein consumption derived from animal sources is well below the average for developing countries.

Eighty-five percent of China's fertilizer consumption, mainly nitrogen, is produced domestically. Application rates have doubled between 1977 and 1981, supplemented by widespread use of organic manure.

Chinese agriculture is heavily crop-oriented. To meet production and income targets, grain supply in 2000 will have to increase by 50% (at 2.2% per annum) over the 1980-82 level. If government objectives are to be met, a third of this volume, compared to a tenth now, will be needed for livestock feed. Substantial increases in soybean, corn and rapeseed will be needed to provide sufficient energy and protein feeds for the expected increase in animal production. Food processing, storage and distribution is a bottleneck for further economic development in China.

C. Anticipated Sector Investments 1986-2000

State investment in agriculture is expected to be no more than Cdn $2.0 to 2.5 billion annually. According to the World Bank, this represents only 20% to 25% of the total annual required investment and thus it will be heavily supplemented by investment from the private sector. The State Council estimates that the entire rural economy will require a cumulative Cdn $0.5 to 0.7 trillion in investment funds by the year 2000.

External finance from all foreign sources totalled about Cdn $1.7 billion for the 1979 to 1984 period with the initial expectation that this investment will increase at 5% annually during the 7th Five Year Plan. To absorb foreign capital most effectively, MOA has identified guidelines. Investment should:

- be geared to the target of doubling the value of agricultural output by the year 2000 by accelerated modernization of production.
- readjust the rural production pattern away from the concentration on grain.
- promote an integrated trade/industry/agriculture production structure.
- be based on the economic viability of individual projects.

In general and compared to other sectors, data on long-term investment levels in agriculture are not available for two reasons. First, the absence of clearly defined and costed "mega-projects" in agriculture, and, second, the expectation that state investment in this sector will decline in parallel with the expected, and broadly-based, increase in investment derived from the PRS-driven private sector.

D. Major Projects of Interest to Canada

The 7th Five Year Plan has identified eight program areas, at least five of which have relevance to Canada, in terms of our experience and capabilities. They are, in possible order of priority: 1) the importation and 2) the propagation of agricultural technology, for use in the open cities, 3) the processing of agricultural and sideline products, 4) the development of dairy products, and 5) agricultural exploitation of barren and backward areas.

The three other program areas identified are in fresh-water fish farming, treatment of red and yellow soils and agricultural development of Xinjiang Province. The World Bank will be providing support in these areas, amongst others.

Although specific details of planned projects are not yet available, a general assessment of areas of interest to Canada, within the five areas delineated above, is as follows:

1 & 2. Agricultural technology: particularly in terms of a) genetic improvement and b) marketing, market infra-structure and grading.

(a) Genetic improvement of animals and crops: quality up-grading of animals will be needed to meet the ambitious consumption targets set for meat and dairy products. Opportunities for the export of animal semen may increase and develop further with exportation of live animals and embryos. In poultry, Canada's broiler chicken reputation is well known and competitive internationally. Similarly, improved high-yielding varieties of crops, especially feed grains, will be required.

(b) Marketing: national income and food consumption are expected to rise substantially by the year 2000, leading to a more varied diet and the quality of produce having greater importance.

Further development of the individual household system could engender the evolution of co-operatives or groups responsible for the collective bulk-buying of inputs, and a more organized marketing system. In these areas and in grading, market infra-structure and quality control of produce, Canada has considerable expertise and experience.

3. Processing: the livestock sector's share is expected to almost double from 15% to 25% of Gross Value of Agricultural Output (GVAO) by 2000. In addition, demand for more varied and better quality produce is expected to increase with higher family income. Specific opportunities can be foreseen in the processing of feedgrain, oilseeds (especially rapeseed), meat, fruits and vegetables.

   Targets for animal production increases will not be met unless sufficient protein-rich animal feed is available. This will necessitate the establishment of feed grain mills, probably through joint ventures associated with the provision of technical assistance in feed formulation and nutrition. Canadian oilseed technology, in particular rapeseed processing (for edible oil and oilseed cake) may require matching credit.

   Increased meat consumption will inevitably require improved processing technology for beef, pigs, and poultry; areas in which Canada has considerable expertise. Storage and processing of vegetables (including potatoes) and fruits is needed to reduce present levels of wastage, to extend the season, also to increase and to diversify supplies for domestic and export markets.

4. Dairy product initiatives are described above in relation to the export of Holstein cattle (as semen and live animals) and, to a lesser extent, under processing.

5. Barren and backward areas in China are characterized as having limited resources, in particular poor quality soil. Twenty-three million hectares of cultivated land are estimated to require drainage to reduce waterlogging and salinity. Canada has expertise, applied nationally and abroad, in land surveying technology and in large-scale drainage improvement projects to enhance productivity.

6. Wheat and fertilizer are two areas where Canada has had consistent exports to China. Wheat exports may be expected to continue, but at lower and more unpredictable levels than in the past. Investments are unlikely to be allocated to develop China's limited potash sources. Therefore, exports of potassium fertilizers will continue to be required. Some project opportunities may be foreseen in these two areas in the bulk handling and distribution of cereals (and feed grains) and fertilizers.

2. CANADIAN INDUSTRY CAPABILITY AND CAPACITY

A. Domestic Market and Prospects, 1986-2000

Given the relatively small domestic market, the growth of Canadian agriculture to the year 2000 will be highly dependent on export opportunities. In international food markets, demand is not expected to outstrip supply and the long-term trend in real commodity prices will be down. The challenge for Canadian agriculture is therefore to continually increase efficiency and lower production costs. Government policy, at the same time, should encourage the further development of Canadian agriculture so that it will be better able to compete in world markets. Two important policy issues for domestic agriculture are the Canadian-U.S. free trade discussions and the up-coming new round of G.A.T.T. negotiations. Unless the reduction of agricultural trade barriers is vigorously pursued in these trade talks, the future commercial viability of Canadian agriculture is threatened.

B. Resources and Experiences for Export Markets

About 75-80% of wheat production and 35-45% of barley production is exported and lesser amounts of the other feed grains. Approximately one half of the canola crop is exported, mainly as seed, with the remainder as oil and meal.

Exports of grains and oilseeds represent 70% of total value of agricultural exports. The major export markets for wheat are the USSR, China, Japan, the U.K. and Brazil. For barley they are the USSR and Japan. The major market for canola is Japan.

About 8% of beef and veal production is exported and pork exports currently are about 20% of production. Canada currently has a surplus in its production of hogs and pork and, therefore, is in a significant positive net trade position.

Exports in the regulated commodities (dairy, eggs, and poultry) are quite low because of non-competitive prices. There is, however, a base of breeding stock for chicken, turkey and eggs that is exported worldwide.

It is difficult to obtain accurate figures on domestic dairy cattle sales, however, it is estimated that these sales exceed $300 million per year. Exports of dairy breeding stock, both commercial and pedigree, exceeded $51 million in 1984 to 23 different countries.

Bovine semen exports exceeded $12.4 million in 1984 to some 40 different countries. Semen exports are now a major component of the AI industry and revenues from export sales now account for 33% of total industry sales.

In terms of livestock, semen and seed quality, producer groups or associations have been formed i.e. Canadian Livestock Exporters Association (CLEA), Semex, Canadian Seed Traders Association (CSTA), and the Canadian Seed Growers Association (CSGA). Support of such associations is advocated, thereby to facilitate an entry into the Chinese market.

C. Previous Experience and Activities in China

The provincial and federal governments have conducted numerous missions to China and have tried to provide the necessary impetus to support private sector activities in China. Agriculture Canada recently finalized the negotiation of a Joint Agricultural Committee (J.A.C.) using as its corner stone the Memorandum of Understanding signed in 1980.

This J.A.C. focuses on sectors which the Chinese authorities wish to develop. It also provides an indication of sectoral priorities for development as expressed by the Chinese MOA.

Representatives from a number of Canadian firms have travelled to China to give seminars and participate in various agricultural fairs to present Canadian product technologies and equipment.

On the whole, Canadian firms are well received. There is nevertheless an important role for the Canadian government to play in supporting Canadian exporters to access decision makers of this bureaucratic and economically-centralized country. One example is the persistence required which, in fact, resulted in an animal quarantine agreement for the importation of livestock, thus providing a potential entry point for Canadian livestock.

Canada is an exporter of wheat and barley, rapeseed oil, cattle hides, and tallow to China. Canadian firms have also been successful in exporting dairy semen and cattle. The Chinese are mainly interested in joint ventures for the purpose of producing commodities for the export market and thus generating an inflow of hard currency.

The attached Table III outlines past and projected export sales to China based upon the best available data. The scope and timing of anticipated declining sales of wheat are quite uncertain, however, the overall trend will be negative.

The Canadian cooperative model presents itself as a good vehicle to establish a domestic infrastructure in China. The Chinese view the Canadian co-op as an alternative to their existing structure and Canada might use this medium to develop a co-op to co-op trade.

D. Canadian Strengths, Weaknesses and Competitiveness

A major strength of Canadian agriculture is the low cost of production it enjoys for crops such as wheat, barley and rapeseed. These crops are also of high quality. Livestock production is another strength due to both a large land base and surplus feed grains. This is where Canada's comparative advantage lies. The major weaknesses are the inability of the industry effectively to diversify its production base and its relatively high degree of dependence on the international market place. Canadian agriculture would be very competitive if there were free international trade in agricultural products. Government policies in the EEC, the U.S. and Japan result in unfair trade practices and pose a major threat to the viability of Canadian agriculture.

E. Economic Impact in Canada of Sector Exports

Contribution to Employment. The agri-food industries employed 1.62 million people or accounted for 14.7% of total Canadian employment. In other words, one Canadian job in seven is provided by the agri-food sector.

Contribution to Trade. Canadian agricultural exports in 1984 amounted to $10.306 billion, which was 9.4% of all Canadian exports and 2.4% of Canadian GNP.

Contribution to Foreign Exchange Earnings. In 1984 net agricultural trade was $4.2 billion. In other words, agriculture is a large earner of foreign exchange.

F. Prospective Domestic Impacts of Future Chinese Exports

China has demonstrated a will to bring its production capacity into the 20th Century in the areas of swine and dairy production as well as in the areas of cereals and oilseeds. With time China will be able to export various commodities on a competitive basis with Canada.

Of course this situation occurs continuously with any developing country. What Canada must realize is that, if we do not export the elements which will constitute the base of a country's agricultural development, others will. Furthermore, economic growth in China will expand its opportunities for international trade with Canada. There is room for further Canadian imports of agricultural as well industrial products from China.

There are other strategies which possibly should be employed by Canada. For instance, Canada could assist China in building rapeseed crushing facilities. This would provide needed oil and meal for the domestic Chinese market and minimize the incentive for them to export raw rapeseed to Japan. Presently, China is exporting corn to Japan only because of inadequate transportation and feed processing facilities in China.

D. Canadian Strengths, Weaknesses, and Competitiveness

A major strength of Canadian agriculture is the low cost of production of export grain crops such as wheat, barley and rapeseed. These crops are also of high quality. Livestock production is another strength due to both a large land base and surplus feed grains. This is where Canada's comparative advantage lies. The major weaknesses are the inability of the industry effectively to diversify its production base and its relatively high degree of dependence on the international market place. Canadian agriculture would be very competitive if there were free international trade in agricultural products. Government policies in the EEC, the U.S. and Japan result in unfair trade practices and pose a major threat to the viability of Canadian agriculture.

E. Economic Impact in Canada of Sector Exports

Contribution to Employment: The agri-food industries employed 1.62 million people or approximately 14.5% of total Canadian employment. In other words, one Canadian job in seven is provided by the agri-food sector.

Contribution to Trade: Canadian agricultural exports in 1984 amounted to $10.376 billion, which was 9.4% of all Canadian exports and 2.4% of Canadian GDP.

Contribution to Foreign Exchange Earnings: In 1984 net agricultural trade was $4.1 billion. In other words, agriculture is a large source of foreign exchange earnings.

F. Prospective Benefits to Canada of Chinese Sector Growth

China has demonstrated a will to build its production capacity into the 21st Century in the areas of grain and dairy production as well as in the areas of cereals and oilseeds. This will enable China to export and compete with other exporters, including Canada.

Of course this situation occurs continuously with any developing country. What Canada must realize is that, if we do not export the elements which will constitute the base of a country's agricultural development, others will. Furthermore, economic growth in China will expand the opportunities for exportation from Canada. There is room for further Canadian exports of agricultural as well as industrial products to China.

There are other examples which indicate possible export opportunities for Canada. For instance, China could assist Canada in building improved crushing facilities. This would provide oilseed oil and meal for the domestic market, and would enable them to utilize rather than export raw material to Japan. Exports to China is expanding also because of inadequate transportation and feed/processing facilities in China.

3. COMPETITIVE CONSIDERATIONS RE CANADIAN EXPORTS

A. Chinese Perspective on Canadian Industry

China, we believe, has a high regard for Canadian agricultural technology. Beginning in the early 1970's through participation in trade shows and a very modest exchange of agricultural missions, China came to recognize Canadian leadership and expertise in animal genetics and associated technology, livestock production, seed production, grassland management and soil conservation, oilseed processing, and farm equipment.

A much more intense level of exchange began in the early 1980's which reinforced these technological areas of Canadian industry. Fruit and vegetable storage, food irradiation, dairy processing, food processing and packaging were also identified as areas offering potential for Canadian industry.

Due to agronomic and climatic similarities between northern China and Canada, particularly Western Canada, China views Canadian agricultural technology as playing a key role in developing China's northern provinces. This is particularly relevant to livestock production, grassland management and soil conservation, crop production and the seed industry.

B. Canadian Perspectives on Chinese Markets

There now appears to be a realistic view by Canadian firms of their strengths and weaknesses in relation to conducting business in China. In sectors where Canada has world class technology such as animal genetics, dairy, beef, swine and poultry, oilseed processing, canola production, pedigreed seed production and grassland management as examples, our technological strength will permit Canadian firms to be successful.

Canadian firms realize the priority that China has placed on agriculture and the success that is being achieved. China has become self- sufficient in grain production, although it still imports grain into Southern China and exports it from the north. Imports will decline and Canadian sales decrease. China is presently a net exporter of coarse grains. However, these exports are only expected to be a temporary phenomenon.

The opportunity for Canada lies in helping China develop its livestock industry. Canadian firms are in an excellent competitive position due to a) technology, b) health regulations, and c) past business relationships. Increased production from grasslands and the development of a manufactured feed industry will be required. Canada has technology and is competitive in grassland rehabilitation, forage seed production, and dryland farming. Opportunities for our compound feed industry exist particularly in engineering and consulting services and in equipment. Oilseed processing is another area where Canada is highly competitive. Food processing, grain handling and transportation, fruit and vegetable storage, and food irradiation also offer possibilities.

C. Prospects of future Chinese exports in competition with Canadian industry

There is uncertainty about the issue of whether China will become a competitor to Canada in agriculture and food exports, utilizing our technology to become highly competitive. Oilseed production and processing technology, where we have world leadership in Canada, is cited as an example. Pork production is another. Canola oil and pork from China could threaten Canadian markets in Japan; China would have a price advantage due to labour and transportation costs and, using the latest technology, comparable quality to our own. Alternatively, since Japan protects the value-added commodity (e.g. pork, canola oil) and imports the raw input (e.g. feed grains, canola), Chinese processed products may be excluded from Japan.

D. Previous Patterns and Experience of Other Exporters

We believe China has allocated areas for development according to foreign countries' agronomic and climate conditions, i.e. Canada in the north, Australia in the south, the U.S. probably in all areas and Europe mainly in the north. Canada has expertise in large-scale prairie agriculture, Australia in both large-scale dryland farming and tropical agriculture, and Europe has expertise in smaller-scale, intensive farming which utilizes smaller equipment. The Americans are advanced in many areas, but concentrate mainly on large-scale farming. Their size and past political differences with China may prove to be a disadvantage although it is hard to estimate how much a disadvantage this will be.

Australia is viewed in a similar light as Canada - politically neutral, small firms with selected technological strength. Perhaps, marketing and financial strength are less than those of Canadian firms. Australian firms specialize in irrigation consulting services, seed production and grassland management and livestock production.

Firms all face the long slow market development process that is required to be successful in China. Only firms with considerable will and financial strength will be successful by sustaining the effort required to finally achieve success. American firms because of their size are able to sustain their efforts probably better than firms from most competitor countries. Other factors as noted however may be to their disadvantage.

E. Perceived Strategies of Competitors to Canada

It is clear that financing will be a major component of marketing strategies which are devised for China. China is viewed as a new marketing frontier, perhaps as the Middle East was in the early and mid-1970's. Competition will be keen for Canada. Unlike the Middle East however, financing is an added element.

Among Canada's competitors, Australian firms are unlikely to be any better placed than Canadian firms in the financial part of their marketing strategies. It is uncertain what strengths European firms have in financing or what support they receive from their national treasuries. American firms are perceived to be the ones who are able to offer the best financial terms.

E. Perceived Strategies of Competitors to Canada

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4. POSSIBLE FEDERAL ROLE IN SUPPORTING SECTOR EXPORTS

A. Anticipated Industry Demands for Assistance

The opportunities identified in China for the Canadian agricultural sector fall into several distinct categories.

1) sale of basic commodities, particularly wheat
2) sale of genetic materials
3) sale of production technology (hardware)
   a) primary production
   b) food/feed processing
4) sale of agri-food services and infrastructure elements
   a) consulting services
   b) handling/storage/transportation
   c) marketing

The anticipated demand for market development assistance for these types of perceived opportunities could be substantial compared to the level of sales likely to be achieved.

Table 1 summarizes the current extent of these demands, indicates the current costs and likely future trends. Table 2 summarizes the main mechanisms in place to support market development activity.

Our agricultural trade with China has been dominated in the past twenty-years by steady and substantial sales of wheat. Faced with an increasingly difficult and uncertain environment in the Chinese wheat market Canada may wish to implement an integrated program of export support to the agricultural sector to offset possible declines in wheat sales with increased sales of feed grains or other commodities particularly those from western Canada. The existing Agriculture Canada marketing strategy for China together with the Canadian Wheat Board's (CWB) ongoing sales program and credit support through the Credit Grain Sales Program (CGSP) and the Export Development Corporations (EDC) new credit matching program for bulk agricultural products could be the basis for an integrated program.

Besides wheat and flour, several other commodities are sold on a spot basis to the PRC (i.e. milk powder, barley, hides, tallow and rapeseed oil) but it is not at all clear whether or not such sales can be assisted beyond the use of the new EDC medium-term credit facility put in place on January 1, 1986. Increased demands for credit assistance are anticipated as the trade becomes aware of this facility and credit competition becomes more of a factor in selling to China.

Market development efforts for value added products and services face a major obstacle - the PRC's policy of self-sufficiency to minimize foreign exchange expenditures. Yet these are areas where opportunities for growth in sales exists. Only firms with long-term commitments to the Chinese market and a demonstrated ability to function in China should be considered for on-going support. Much greater use of institutional contacts in the agri-food sector will be needed to provide relatively low-cost means of monitoring developments in China and focusing limited market development resources on worthwhile projects.

B. Recommended Federal Strategy

1. Bulk Commodities

a) No additional assistance for wheat sales beyond that now in place is recommended, other than continued use of Canadian International Grains Institute (CIGI) to assist training of Chinese end-user personnel (millers, bakers, etc.). Increased effort should be made to sell feed grains, malting barley and canola products through technical support and competitive credit terms.

b) Emphasis on EDC credit facility for non-CWB commodities as appropriate.

c) Encouragement of rapid development of Chinese livestock, feed milling, oilseed processing, malting and brewing industries through joint ventures, technical assistance i.e POS Pilot Plant, etc. and marketing assistance - to generate demand for feed grains, malting barley, etc. (CIDA Industrial Cooperation Program could be an appropriate tool).

d) Encouragement of "commodity cooperators" as vehicles to promote increased acceptance and use of Canadian agricultural commodities. These are industry associations or consortia which pool efforts to provide long-term market development support.

2. Genetic Materials

a) Emphasis on technical sales efforts aimed at PRC state institutions/farms whereby increased productivity inherent in better genetic material can be realized through the purchase of "tailored", comprehensive management packages. Close cooperation between Departments of Agriculture, the Record of Performance system, seed associations, universities and breeders will be essential.

b) PEMD/PPP support only for above approach.

3. <u>Production Technology</u>

   Again technical support (e.g. through organizations such as the Prairie Agricultural Machinery Institute - (PAMI) to PRC agri-food sector should be emphasized, building on existing formal (PAMI) links (MOU on Technical Cooperation, etc.) but involving more participation by commercial organizations with a demonstrated stake in developing sector exports to PRC or through "commodity cooperators".

4. <u>Services/Infrastructure</u>

   As for 3 above but linked to effort on the part of the Canadian Government to assist China in adapting and marketing selected lines of their products to Canada (particularly products no longer manufactured here or indgenous to China). The goal is to build marketing links which would genuinely assist the acceleration of two-way trade. This approach would also assist in meeting Chinese sensibilities regarding their unfavourable balance of trade with Canada. Only firms and organizations (i.e co-operatives) capable of such undertakings would be eligible for additional financial support.

   Increased efforts should be made to place more Canadian personnel as project managers for major development projects in order to increase China's awareness of Canadian suppliers.

5. SUMMARY CONCLUSIONS

Eight sub-sectors are identified as priorities in terms of mutual benefit to China and Canada. They represent specific Canadian capabilities in relation to perceived future opportunities in Chinese agriculture. They are as follows:

Genetic improvements (livestock and crops)
Marketing
Processing of rapeseed, meat, vegetables and fruit
Dairy production and processing
Grain storage and distribution
Development of resource-poor areas
Integrated swine production and management
Fertilizer (potash) use and distribution

In these areas, financial support may be required for bid support on commercial tendering, support for the sale of Canadian technology, development co-operation projects and market development.

In addition to these areas, common to all of them, is information. The assembly exchange and retrieval of information, at federal and provincial levels and for companies in the private sector, is perceived to be the key element in the future development of Canada's agricultural activities in China. 1/ To provide such an information system, for example through the provision of office facilities in Beijing and improved support services in Canada, an estimated amount of $7.25 M is included in the list below. The activities would provide effective and timely support for selected initiatives, in the eight priority areas, from the private sector, as identified below, during a three to five year period until 1991.

Information and, infra-structure

	$M	
Agricultural consulting team (3 yrs)	3.0	
Agriculture Canada MOU (5 yrs)	1.0	
University support (5 yrs)	1.0	
Agricultural sector office, Beijing (3 yrs)	0.75	
Provincial support (5 yrs)	0.5	
Agricultural lecture series (4 yrs)	0.5	
Information gathering (5 yrs)	0.5	
		7.25

1/ Based on the conclusions and recommendations of the strategic seminar "Meeting China's Agri-business Challenge" held in April 1986. This meeting was attended by federal and provincial government representatives together with private sector companies with experience in China. The seminar's private sector participants are listed in Annex 1.

1. Food and crop processing

	$M	
Food irradiation	2.5	
Canola processing (4 yrs)	2.0	
Agricultural crop processing (5 yrs)	1.5	
Storage equipment	0.5	
		6.5

2. Dairy development

	$M	
Cattle, facilities and equipment	2.5	
Animal health training (5 yrs)	1.0	
Dairy development project(s)	0.75	
		4.25

3. Genetic transfer of animal and crop germplasm

	$M	
Poultry development (5 yrs)	3.0	
Animal genetics: TA and training (2 yrs)	0.2	
Crop genetic resources	0.2	
		3.4

4. Swine development

	$M	
Development of "model" integrated swine production facility (5 yrs)	3.0	
		3.0

5. Development of resource-deficient areas

	$M	
Grassland/drainage (4 yrs)	2.3	
Jiangsu agro-metereological project (3 yrs)	0.2	
		2.5

6. Grain storage and handling

	$M	
Cereal storage, handling and distribution (5 yrs)	1.5	
Agricultural transportation study (4 yrs)	0.75	
		2.25

7. Fertilizer

	$M	
Fertilizer supply, development and distribution especially of potash and sulphur (4 yrs)	2.0	
		2.0

8. Marketing

	$M	
Marketing, produce grading and co-operatives (3 yrs)	0.75	
		0.75
TOTAL		$ 31.9M

These estimates do not include initiatives to be identified under the EDC fund of $350 M to provide mixed credit to entrepreneurial companies in all sectors marketing their products or services in China. However, it is envisaged that the major thrust of these initiatives, in the agricultural sector, would complement and correspond with the eight specific areas identified above.

TABLE 1 - ANTICIPATED INDUSTRY DEMANDS

Product Area	Current Efforts	Costs to Government	Anticipated Demand
1. Basic commodities ° CWB grains	Sales of $500 million LTA has not been renewed for wheat. Line of credit is in place	($600M LOC)[1] CWB Sales Program	Possible use of LOC
	Spot sales of barley	CWB Sales Program	Use of Credit Grain Sales Program
° Non CWB grains, etc.	Spot sales of canola, milk powder, tallow, hides (approx. $10-15 M)	Some PEMD[2] support, Canadian Dairy Commission	Increased requests for PEMD type support and EDC export credit
2. Genetic materials	Numerous breed associations, Canadian Seed Trade Assoc., etc. have ongoing sales efforts sometimes linked to major development projects	PEMD PPP[3] CIDA EDC Agriculture Canada	Increased requests for support for long-term development projects, increased use of EDC support
3. Production technology ° primary	Sales efforts by wide range of companies often working through trading houses	PEMD PPP EDC CIDA Agriculture Canada	Increased requests for sustained, demonstration type sales efforts
° processing	Sales efforts by companies bidding on World Bank funded projects	PEMD PPP EDC CIDA	Increased requests for EDC or concessional credit to expand "toeholds" now held in such areas as seed cleaning plants, oilseed processing, etc.

TABLE 1 - ANTICIPATED INDUSTRY DEMANDS

- 2 -

Product Area	Current Efforts	Costs to Government	Anticipated Demand
Services/infrastructure	Heavy efforts by consulting companies to pursue World Bank projects	PEMD PPP CIDA Agriculture Canada	Areas of greatest potential requests for on-going support

1 (LOC) Line of Credit (Currently not utilized)
2 (PEMD) Program for Export Market Development
3 (PPP) Promotional Projects Program

TABLE 2 - EXECUTING SUPPORTING MECHANISMS

Product Area	Finding Mechanisms	Promotional Mechanisms	Payback
1. Basic commodities	Credit Grain Sales Program	-	High
° CWB grains	-	CWB Sales Program	High
	-	CIGI	Medium
	-	"Commodity Co-operators"	Unknown
° Non CWB grains, milk powder, tallow, canola products, hides, etc.	EDC Medium Term Credit Facility (matching only)	-	Potentially High
	PPP/PEMB	CIGI	Meidum
	-	POS	Low/Medium
	-	"Commodity Co-operators"	Unknown
2. Genetic material	PPP/PEMD	-	High
	-	ROP Program	High
	-	"Commodity Co-operators"	Unknown
	CIDA	-	Medium
	EDC	-	Medium
3. Production technology	CIDA	-	Medium
° primary	PPP/PEMD	-	Medium
	-	Demonstration farms	Unknown
	-	Training of PRC agronomists	Unknown
	-	PAMI	Unknown
	-	Technical Cooperation	Low
° processing	PP/PEMD	-	Low
	-	Joint ventures	Medium
	CIDA Industrial Coop. Program	-	Medium

TABLE 2 - EXECUTING SUPPORTING MECHANISMS

- 2 -

Product Area	Finding Mechanisms	Promotional Mechanisms	Payback
4. Services/infrastructure			
° consulting	PPP/PEMD	-	High
	CIDA Industrial Coop. Program	-	Medium
° handling/ transportation	PPP/PEMD	-	Medium
	EDC	-	Medium
° marketing	PP/PPEMD	-	Medium
	-	Joint ventures	Unknown

TABLE 3 - PAST AND PROSPECTIVE EXPORT SALES[1]
TO CHINA-AGRICULTURE

	AVERAGE ANNUAL EXPORTS ($ MILLION YEAR)			
	RECENT PAST 1983-85[2]	PROSPECTS IN FUTURE YEARS[3] 1990	1995	2000
COMMODITIES	688	400	450	490
SERVICES	2	4	6	9
EQUIPMENT	6	8	10	15
FERTILIZER[4]	64	90	110	130
TOTAL	760	502	576	644

1) projections estimated by working group based upon best available data.

2) past export sales based upon data from Statistics Canada and/or industry.

3) wheat and flour comprise 98% of 1983-85 commodity exports. Wheat and flour exports are expected to continue to decline at a modest rate. Exports of other commodities/products such as livestock will increase.

4) potash mainly.

ANNEX 1 AG-CHINA 86 SEMINAR, PRIVATE SECTOR PARTICIPANTS

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APPENDIX C

TASK FORCE ON CHINA POWER SECTOR

SECTOR BRIEF

FOR

THE FORESTRY SECTOR

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June, 1986

CHINA
FORESTRY SECTOR REVIEW 1986

EXECUTIVE SUMMARY

OPPORTUNITIES

* Mutually beneficial exchange
  - improved conservation and productivity of scarce PRC forest resources
  - modernization and expansion of key PRC sectors of housing, communication and education, packaging for exports
  - new joint technology development in northern forest management, wood and fibre utilization papers and printing

* Continued export sales of Canadian forest products
  - current value over Can $200 million per annum
  - potential by 1990 - $400 million;
    by 1995 - $800 million
    by 2000 - $1,600 million
  - includes pulps, papers, lumber, panels, components

* Continued export sales of Canadian expert services and equipment
  - current value - no estimate available
  - potential by 1990 - $20 million;
    by 1995 - $30 million;
    by 2000 - $50 million
  - includes forest protection and management; transportation technology
  - wood products technology; pulp/paper/packaging technology (extraction, primary manufacturing, finishing and end-use technologies)

CANADIAN CAPABILITY

* To work with China in forestry sector
  - being developed in CIDA/Ministry of Forests projects in forest fire control and northern forest management, IDRC forestry research projects, and CDS cooperation/exchanges

  - Provincial governments of B.C., Alberta, Quebec, and Ontario involved

  - DRIE has participated in and sponsored missions, expositions in paper products, packaging

  - Canadian forest industry providing technical training through exchanges/special placements; also studying joint ventures

  - Consultants and equipment suppliers have attempted to develop long run bona fide relationships with most relevant PRC agencies. CIDA Industrial Cooperation programme has assisted firms to make contacts, do feasibility studies

* To export forest products and services competitively

  - current and historic world export leader in lumber, newsprint, market pulps; total annual value of forest product exports $15 billion in 1985

  - current leader in export sales of forest products to PRC

  - traditional world leader in provision of forest sector technical services in international market; domestic industry capital investment $1.5 - $2.0 billion/annum in recent years

COMPETITIVE CONSIDERATIONS

* Asian markets for forest products, services and supplies are fiercely competitive; Chinese are expert shoppers

* Chinese are creditworthy

* Most suppliers from other nations receive credit/subsidy assistance

* Chinese are determined to modernize and increase domestic capacity in forest products manufacture

* Chinese capacity to export forest products will be limited - new industries could use Canadian primary and finished forest products in increasing quantities well into 21st century

ELEMENTS OF A FEDERAL ROLE

* Expand existing trade contacts

  - expand forestry sector specialists within trade officer complement in Beijing

  - expand COMDP programme with special projects as required

* Expand technical cooperation in the forestry sector

  - expand CIDA bilateral forestry cooperation programmes through discussions with relevant PRC agencies. Possibilities include forestry education and training, pulp/paper industry planning, wood products standards, codes, methods

  - expand exchanges between MoF China and MoF Canada, and International Development Research Centre forest research cooperation

* Review terms/conditions of EDC Line of Credit to PRC

  - review the possibility of introducing concessional financing similar to that offered by some of the most effective exporters of goods and services

* Review methods available for integrated feasibility study and financing of equipment purchases for joint ventures in the forest industry

* Develop a Canada-China forestry sector strategy in three parts: forest management, wood products, pulp and paper products with coordination by a planning committee

FORESTRY SECTOR BRIEF

TABLE OF CONTENTS

SECTOR BRIEF - FORESTRY

1. OPPORTUNITIES IN FORESTRY - FORESTRY SECTOR

A. FORESTRY SECTOR ORGANIZATION AND RESPONSIBILITIES

Forest Management

The most important agent of forestry in the People's Republic of China (PRC) is the Ministry of Forestry (MoF). The Ministry has line responsibility through the State Agriculture Commission to the State Council for mangement of national forests. In each province, national forests are administered by provincial and local forestry bureaux receiving technical guidance from MoF. In addition MoF has jurisdiction over the Academy of Forest Science and six major forestry colleges.

The bulk of the state forests are remote natural forests in the northeast hill regions, south central mountains, Hunan Island and the Himalayan plateau and hills of the far southwest. Heilongjiang Province, on the northeast frontier with Siberia has a semi-autonomous provincial forest administration. These largely coniferous forests of the Northeast produce as much as one half of the industrial wood of the nation.

The forests owned and managed by rural communes are usually more closely integrated with agriculture and other activities of each community. In densely populated districts, trees/forests are mostly man-made, important shelterbelt, watershed, food/fodder, fuelwood and local building uses. In many communes in forested zones revenue from forest products makes up half or more of total local income. MoF and local forestry bureaux provide technical guidance to communal and farm forest managers. MoF also has established significant state forest plantation estates in various regions.

Total harvest of industrial roundwood is about 70 million cubic metres, with about 50 million cubic metres coming from the national forests. Although this is less than half the industrial harvest of Canada, the total roundwood harvest in China is over 200 million cubic metres with the balance being made up of fuelwood and local building materials. This rate of harvest exceeds the growing capacity of current forested area. The PRC badly needs improved forest management and accelerated plantation programmes to meet its needs for wood and fibre products in future.

Increased privatization in forest management is currently being accomplished through a range of new policy initiatives. These new initiatives could provide significant economic stimulus to the sector (improved pricing). They could also provide enhanced soil and water conservation through establishment of household and communal forests in the most densely populated zones (household ownership).

Wood Products Industry

MoF also plays an important role in the lumber and panel production of the PRC. The Ministry runs over 200 sawmills, plus over 200 panel mills scattered throughout the nation. MoF is the main agency of wood products research. In addition, other Ministries, local authorities, communes and state farms also operate small sawmills. Reliable output data is not available, but it is estimated that 40% of total industrial wood harvest usually emerges as sawnwood. Many small mills are associated with wood using enterprises (for example, the Ministry of Light Industries runs over 2000 furniture plants, most of which have an associated small sawmill).

MoF has developed and borrowed fibre and particleboard technology for many years, and there are now 240 fibreboard mills with a total capacity of over 500 thousand tonnes per annum (TPA) and particleboard mills with over 300 thousand TPA capacity. MoF also controls the largest plywood mills in China. There are many smaller mills and blockboard mills associated with wood using industries.

No operational information is available regarding privatization of the wood products industry. However many communal state farm and other mills are likely to gain increased autonomy from state wood supply and product purchasing channels.

International purchases and sales of all commodities are overseen through the Ministry of Foreign and Economic Relations and Trade (MFERT) which controls the Chinese International Trading and Imports Corporation (CITIC). The operational log and lumber import organization is the China National Native Produce and Animal By-products Import Export Corporation (TUHSU).

Sawmill equipment is supplied by the National Forest Machinery and Equipment Corporation which also governs imports of sawmill equipment.

Pulp and Paper Products

The key agency in paper production is the Ministry of Light Industries. Wood fibre is largely provided by MoF, but domestic wood provides only about 20% of total PRC pulp furnish. Over 60% is provided from non-wood sources (grasses, bamboo, agriculture wastes). There are over 2000 pulp/paper mills in China, with only about 30 having annual capacity over 30 thousand TPA.

Many of the smaller mills are owned by communes, cities, state farms and other local authorities. Utilization of forests wastes and of wood product mill wastes is generally not well integarted with pulp/paper production. Institutional control plays a significant role in this weakness of the forestry sector (fibre supply and manufacture are behind separate walls). The fragmented structure and scattered economic location of the industry are also key problems.

The national packaging corporation plays a central role in material selection, production and marketing of containers and packaging.

Changes in pricing policies and freeing of timber quotas could engender significant changes in industry structure in selected regions.

B. PAST SECTOR DEVELOPMENTS AND PRESENT NEEDS

Status and Trends of Forest Resources

China has one of the most diverse forest estates of any nation. Chinese forests run from the latitude of Prince Albert, Sask. in the northeast to the equivalant of the Yucatan peninsula in the south, and from the slopes of Mt. Everest to sea level. This great natural resource wealth has been degraded to the point of ecological peril in some regions and is economically degraded overall.

Since the most extensive remaining forest is in the most remote regions, the intensity of the human pressure on the accessible forest is easy to imagine. Demand for fuelwood, fodder, and local building products exceeds local tree/forest capacity in most provinces. This leads to continuing erosion of the productivity of the local landscape, including agricultural areas.

In fact, "defensive forestry" against erosion and against the desert which forms the western boundary of the populated plains has been a major preoccupation of PRC forest policy. A "great green wall" of shelter belts is to be established over 5000 kilometres by 2000 A.D. In the past, the spasmodic inputs to reforestation programme of the Great Leap Forward (1958-60) and the Grand Proletarian Revolution (1966-76) led to high failure rates and local disenchantment with forestry in many regions. Ownership of planted trees became disputed between households, collectives and the state. Illegal felling has been a major problem at times.

Over all, the outlook for the accessible timber balance is that China will have acute domestic shortages in relation to needs for at least a quarter of a century. The better the economy performs, the worse the problem will become in this period (new trees cannot be grown in time).

However, with appropriate forest management, the long term outlook for timber production in China is promising. With incentive driven application of China's available manpower and appropriate technical forestry and conservation methods, the PRC could become one of the leading timber producers of the world in the next century. However domestic consumption may still not be satisfied without forest product imports by that time.

Production and Consumption of Wood Products

The medium-large units of the sawmill industry are quite efficient in utilization. They derive a high proportion of end product from each log through labour intensive handling and resawing. The bulk of wastewood and sawdust is utilized in various panel boards, or as fuel. Most equipment is of domestic origin and can be maintained in local facilities. However, many technical refinments are possible to gain increased productivity and higher net values. "Business management skills" as opposed to production management skills are usually scarce.

Industry location and log transportation has been a perennial problem. Modernization of the sawmilling industry will involve a combination of building a few new mills close to significant blocks of forest, and gradually modernizing selected complexes. In spite of a national abundance of labour, often the remote forest industries do not have a surplus and relatively capital intensive methods are appropriate. The many thousands of small wood working furniture and cabinetry shops (most of which saw some roundwood) also presents significant opportunities for modernization.

The wood based panel industry is made of up larger units generally located in concert with sawmill complexes to provide residuals. Much of the current panel technology has been imported by the PRC and copied/adapted in various machinery supply bureaux. The PRC does not yet have a flakeboard mill, which represents the most promising current technology. In all panel mills environment control, including those important to worker safety (e.g. venting of formaldehyde), are in need of improvement.

Good data on wood products consumption is difficult to obtain. However all evidence points to a truly immense timber trade. One recent study estimated that the 1984 PRC consumption of wood products in housing was equivalent in total to US wood use for the same purpose and double the comparable annual consumption in Japan.

If housing plans are achieved in 1990 under similar conditions, the Chinese demand for wood in housing will exceed that of the US. The ultimate scope of this market is important to Canada as the largest lumber exporter in the world. According to 1984 PRC documents, the actual wood consumption in housing was four times greater than that allowed in the plan. Even without considering fuelwood needs, the accessible PRC forests cannot yield such volumes on a sustained basis. Imports of sawlogs and lumber have been growing rapidly since 1978.

Production and Consumption of Paper Products

The PRC has about 2400 papermills, with an annual output of about 7.5 million tonnes. About 50 mills in Canada produce this volume.

The pulp and paper industry in China in 1986 is in general an inefficient industry, constraining important parts of the economy and yielding serious pollution side-effects. The main furnish for over 2000 mills producing 5-15 tonnes per day each is agricultural straw and other grasses/bamboo. Low quality printing and writing papers are the usual final product.

Only about 30 mills in the PRC produce over 30,000 TPA of pulp/paper. These mills, particularly the larger wood based mills, offer the best short run prospects for modernization and expansion of paper production. Almost every mill is an individual case, with varying options for upgrading/expansion, depending on fibre availability, its current technology and systems and its designated markets.

Per capita consumption of paper products has been growing in recent years, but is still only 7 kg per capita each year (world average 40 kg: US 300 kg). Consumption is constrained by production capacity and import restraint. Paper consumption is also constrained by regulations governing printing and publication. The current plan goal calls for self-sufficiency at about 13 kg per capita of consumption by 2000.

This goal for production increase is ambitious in terms of domestic fibre and domestic equipment supply. However the estimate for consumption would only be feasible with draconian controls on consumers and industries, assuming even reasonable economic growth. The propsects for rising fibre and paper imports appear favourable. Further loosening of economic constraints could lead to very rapid increases in paper consumption with the resultant gains in communication, education and efficient movement of goods to market (including export goods).

C. PROPOSED SECTOR INVESTMENTS TO 2000 A.D.

Forest Establishment and Management

PRC proposed targets for afforestation, together with normal reforestation requirements of current logging, would require an economic investment of about 40 billion Yuan ($24 billion) between 1985 and 2000 A.D. Investment for protection and tending are additional. Even if adjustments are made for the fact that surplus labour can often be used in reforestation roles, the total economic investment is huge.

Past plantation problems and failures have been very costly. Wide scope exists for mutually rewarding cooperation and exchange in forestry technology between China and Canada.

Wood Products Industry

No direct estimate of the likely investment level in wood products manufacture is available. However the main mover in the industry will be the rate of investment in housing. Plans currently call for a 22% increase in the annual constructed floorspace between 1984 and 1990. A further 31% rise is planned in annual construction by 2000. In rough scale, the portion of the industry concerned with housing (that is, no furniture, industrial, or other uses) will be about 20% larger than present Canadian lumber industry by 1990, and about 50% larger than the same standard by 2000. The industry will be in need of significant modernization as it grows. Many significant opportunities will be created for Canadian suppliers of wood harvesting and transport equipment, manufacturing equipment, waste control and energy saving equipment, and related supplies.

Paper Products

To reach planned targets of 11 million tonnes per annum of paper and paperboard output by 1990, 700 thousand TPA of new paper making machinery will be needed each year. Current capacity of China's 45 paper machinery factories is about 550 thousand TPA-worth and 1985 production has been estimated at 350 thousand TPA of equipment.

From 1990 to 2000 (assuming consumption is constrained) the annual requirement for new paper output will be close to one-half million tonnes, or apparently in line with domestic equipment capacity. However the gross data masks some significant problems, and opportunities.

Most domestic machinery produces only narrow width paper which limits the range of product possibilities. Domestic machinery can be speeded up through imported controls and other improvements. The severe domestic shortage of long fibre, high quality pulps will inhibit production of many needed paper products/grades. Improvement of the packaging industry is of high priority in domestic and export marketing.

Excellent prospects exists for Canadian participation in equipment supply, in long run supply of quality fibre and selected paper products, and in related technical services.

D. MAJOR PROJECTS OF COMMERCIAL INTEREST TO CANADA

Many potential projects exist for economic cooperation between Canada and the PRC in forestry sector development. The role of the government of Canada is more important in transactions with the PRC than in "commercial" trade with many other countries. Therefore most of the commercial opportunities outlined below involve the Government of Canada in varying degrees and through various instruments.

Forest Management Projects

1. Forestry Development Project - World Bank

In support of PRC programmes to develop forest resources the project would accelerate afforestation and improve management and harvesting techniques on state forest farms in three states, and develop selected wood processing facilities.

Client: Ministry of Forestry and State Bureaux

Budget: Foreign Exchange US$ 38 million
Total Project: US$ 135 million

2. Forestry Development Project - CIDA

In discussions of the Canada-China Cooperation Programme in forestry development, important projects were proposed in education/training to speed sector development and modernization. These projects were deferred to high priority projects in forest fire control and resource management, but the opportunities remain.

Client: MoF and Heilongjiang Forestry Bureau (HFB)

Budget: The estimated cost of an effective cooperation project in forestry education/training is Can $10 million foreign exchange

Total Project: $30 million

3. EDC Line of Credit Utilization in Forest Management

Although no specific projects have been defined, possibilities include aircraft for fire detection and control, communication equipment, logging/transport equipment, container nursery technology/equipment/supplies, forestry technical services.

Budget: Potential forest mangement uses of LOC - $50 million

Wood Products Industry Projects

1. Wood Products Development Project - CIDA

Commercial investigation and CIDA discussions with MoF have indicated a strong need for development of standards for sizes, codes and use and other technical standards for wood products in major uses, especially housing.

Client: Multi-agency, including MoF, housing agencies, Purchasing Directorate

Budget: Estimated budget for a technical assistance project to help the PRC develop standards and codes for wood products in use: $15 million over 5 years. The project would include wood engineers, architects, suppliers, and proceed gradually on a mutual agreed agenda of products.

2. EDC Line of Credit Utilization in Wood Products Industry

No specific projects have been defined, but likely clients include MoF and Heilongjiang Forestry Bureau. Ultimately the market could include communes, local enterprises, and smaller factories. Equipment possibilities include flakeboard, oriented strandboard, sawmills and related equipment, plywood mills, drying, manufacturing and waste burning equipment. There are some prospects for used equipment sale.

Budget: Potential LOC utilization in wood products -
$50 million MoF and HFB - $25 million other local industries

Pulp and Paper Industry Projects

1. Nanning Pulp/Paper Complex

The PRC proposes greenfield development of a 200,000 TPA newsprint complex in south China. Canadian engineers are currently in the final stages of negotiation for feasibility and design work through to a turnkey complex.

Client: Ministry of Light Industries

Budget: Not known - likely $10-20 million in planning/engineering

2. EDC Line of Credit Utilization in Pulp and Paper Industry

No defined projects; but Nanning and other smaller project could use a wide array of Canadian equipment, supplies and services. Pulp, newsprint, paper making, recycling, chemical recovery, energy saving, pollution control equipment, and many others could be supplied and are needed in PRC modernization programmes.

Budget: Potential LOC utilization in pulp and paper industry - $150 million

3. Pulp and Paper Planning Project - CIDA

As discussed between MFERT, MLI and CIDA in 1981, this sector has enormous problems of transition and expansion in the next decade. Canada could provide needed technical cooperation through MLI or other planning agencies to help develop the most productive path for the sector. Modernization and offshore buying exercises are fragmented at present. The fibre utilization strategy is not clear.

Client: Ministry of Light Industries

Budget: Estimated cost of project, $5 million over 5 years

2. CANADIAN FORESTRY SECTOR CAPABILITIES

A. DOMESTIC MARKET AND PROSPECTS TO 2000 A.D.

Forest Management/Raw Material Supply

Canada is entering a new era in forest management. Over a century of accelerating exploitation of native forest resources is being replaced by a period of consolidation, conservation, and where appropriate, significant reinvestment in the creation of man-made forests. Each provincial forest estate has a slightly different version of the problem, but the native forest becomes more difficult to access and generally of slightly lower quality each year.

However, Canada has not yet reached the full economic potential of the forestry sector. Both additional volume and increased value are achieveable. With appropriate investments in processing technology and forest management, a national timber harvest of 25-50% higher than the present level could be supported indefinitely.

Domestic markets use only about 30% of Canadian forestry sector outputs. Forest product exports from Canada can continue to grow, with improved forest management. The National Forestry Congress of April 1986 will address these and other issues (Right Hon. Brian Mulroney, Honorary Chairman and Moderator of the Trade Session).

Wood Products

Expected growth in domestic consumption of wood products ranges from about 1% per annum (lumber) to over 3% (wood based panels, mainly flakeboard and OSB) over the next 15 years. Lumber shipments to the US have been at record levels in recent years.

In general, there is excess lumber capacity in North America, excellent raw material supply, and significant continental incentive and opportunity to seek improved access to off-shore markets - both traditional (Japan, EEC) and new (China).

Wood based panels are the most domestic-market-oriented of major Canadian forest products. Over 70% of production goes to domestic uses. However, the industry has played a lead role in the development of new panel systems which have export potential (flakeboard, OSB). One new product developed in Canada is a reconstituted wood beam system whereby "timbers" of any size can be formed using oriented strands of wood with adhesives. The product is being featured in beams at selected Expo '86 pavilions.

Pulp and Paper Products

Consumption of high quality pulps in domestic paper production is expected to rise at about 4% per annum to 2000. Newsprint, the heaviest export item, is expected to grow at about 2% per annum. Substantial, but lesser, Canadian capacity exists in packaging papers and boards, and specialty converted papers.

The Canadian industry is competent to maintain competitive supply of pulp, newsprint and fine papers for export and domestic markets at well above current levels.

B. EXPORT MARKET EXPERIENCE AND PROSPECTS

Forest Products - General

Forest products form Canada's most important export line. The net total trade balance of this sector is roughly equivalent to the total contribution of the farm/food products, fish, iron, steel and non-ferous metals, coal, crude petroleum, and transportation/automotive equipment <u>combined</u>. Canada accounts for about 25% of world forest products trade. The recent value of Canadian exports has been roughly double that of the nearest competitor, Sweden. World growth in consumption of forest to 2000 has been forecast by FAO as follows:

Paper and paper board	- 75%
Wood based panels	- 55%
Lumber	- 25%

It will be impossible for Canada to maintain its world market share, due both to resource constraints, and to rising competition from other regions. However, the largest industry in Canada faces excellent propsects to increase the volume and value (further manufacture) of its shipments to 2000.

Wood Products

Canada does not export significant quantities of logs. Traditional practices, and government regulations limit roundwood exports, to maintain domestic manufacturing employment. The PRC would like to import large volumes of roundwood from Canada. This may become an important element of forest product trade discussions.

Canada is the world's largest lumber exporter, accounting for about 40% of world trade in this commodity in the 1980's. Annual value is over $3 billion. The major market is in US housing construction, but innovative multi-firm marketing agencies were founded on the west coast of Canada in the 1920's to effectively reach off-shore markets. These organizations have expanded, and currently own ships, and port facilities in important markets. The Cooperative Market Development Programme (COMDP) jointly sponsored by the industry, provincial governments and DRIE, has been utilized by this industry to develop UK, European, and Japanese markets for timber frame technology. Softwood plywood and other panels play an increasing role in the off-shore marketing strategy of the Canadian industry.

Pulp and Paper Markets

Canada accounts for two-thirds of world newsprint trade with sales of about \$4 billion annually. World demand is projected to grow by 55% to 2000 A.D. Consumption of high quality grades of wood pulp (bleached kraft or equivalent) is expected to double in the same period. Canadian export sales of about \$4 billion amount to nearly one-half of world exports of these commodities.

Other paper products make up a relatively small fraction of exports, but industry plans for the future include increased capacity to export finished paper products.

Forest Industry Equipment

Canadian firms manufacture logging and transportation equipment, sawmill, dry kiln and finishing equipment, plywood and other panel equipment, and a full set of supporting supplies.

With the possible exception of paper converting equipment, Canadian suppliers can supply individual equipment items for total turnkey projects in pulp/paper development. Exports account for about 50% of total value of shipments of Canadian manufacturers of pulp and paper machinery.

Forest Sector Engineering and Other Services

Several Canadian firms are among the world leaders in providing the full range of forest sector services, from sivliculture to mill design/ construction, production management and marketing. Canadian expertise and technology is among the best in the world, from remote sensing and forest inventory to mill engineering and electronics. A large number of small firms provides a full spectrum of specialized services. Many have gained wide international experience through industry development projects and international agency projects (CIDA, World Bank, Asian Development Bank, FAO/UNDP, USAID, SIDA).

Public forest management is a highly developed field of public administration in Canada. Forest law and regulations, industrial licences and agreements, and commissions of inquiry have played an important role in the development of each Canadian province. One of the dominant public roles in Canada has been that of forest protection - from fire and from pests. Much of the relevant expertise and experience is of value to other nations and has been exported in the past.

C. EXPERIENCE IN CHINA

Forest Management

Canadian foresters and scientists have been visiting the PRC on technical exchange missions since 1984 through contact between the Canadian Forestry Service and the Ministry of Forestry in Beijing. A Memorandum of Understanding was signed by these two national agencies in 1982.

IDRC has developed several forestry research projects in China since 1982 through the Academy of Forestry (MoF) and its regional institutes (total Canadian contribution about $1 million).

CIDA has developed a forestry cooperation programme with the Ministry of Forests and the Heilongjiang Forestry Bureau. Agreed priorities for the programme are:

1. Improved protection of valuable forest resources

2. Improved productivity of forest management

3. Modernize selected harvesting and wood products operations

Ontario Ministry of Natural Resources is manageing a CIDA-financed forest fire control project in Jiagedaqi Forestry Bureau (far northeast near USSR). B.C. consultants are manageing an integrated forest management project in Langxiang Forestry Bureau of Heilongjiang province. Total CIDA contribution to both projects is about $16 million.

Other projects were proposed, for follow-up later, in forestry education/training, wood products industry modernization, and pulp/paper industry planning/modernization.

The governments of British Columbia and Alberta have been maintaining a programme of contacts and exchanges in forestry with the PRC.

Wood Products

Canada is currently the leading source of PRC lumber imports. B.C. wood product marketing firms have led a successful campaign to link sales of lumber to sales of logs. In 1984 Canadian exports of logs to China were worth $57 million, while lumber exports were worth $37 million. This is the best ratio of manufactured products to raw materials of any major supplier. Further expansion of sales of manufactured wood products should be feasible.

Pulp and Paper Products

Canadian companies, mainly from B.C., began exporting wood fibre products to China in 1971. Industry executives have been active on tours, and within the Canada-China Trade Council. Canada now supplies over 300,000 tonnes per annum to the PRC (nearly one-half current pulp imports). Four paper mills in China have been designated as exclusive users of Canadian pulps to maintain consistent production quality for special papers.

In 1985 shipments of newsprint from CPPA companies to the PRC were nearly 200,000 tonnes. All these sales were on a straight commercial basis.

Agencies of the Ministry of Light Industries have explored joint ventures in pulp/paper production with several Canadian firms. The objective would be to invest in Canada, obtain major training gains, and link Canadian supplies of high quality fibre to specific PRC paper making units. Several options are still being considered by both sides.

Forestry Sector Services

Canadian firms pursued some of the earliest western contacts with the PRC forest industry. Several firms employ full time representation or maintain extensive on-going contacts with various units of the PRC industry. Two way missions have been carried out in fire control, pest control, genetics, forest inventory, harvesting/transport, sawmilling and panel production, small pulp mill improvement, major pulp mill modernization, marketing of specialized equipment, forest policy/administration, and other fields of specialty.

The Industrial Cooperation Programme of CIDA has assisted Canadian firms in study missions and more detailed feasibility studies for several PRC Agencies.

Machinery and Equipment

The Chinese market has proven difficult to penetrate for Canadian equipment suppliers. The level of marketing effort has ranged from high to very low, with little apparent difference in outcome. All major firms have welcomed Chinese delegations to their factories in Canada, and most have been to trade fairs and/or sales missions in China. Significant constraints to sales have included:

- financial arrangements in relation to competing nations
- total package arrangements, including services are not well developed by Canada
- difficulties (recognized by both sides) maintaining individual/isolated pieces of equipment - a strategy is required

- concern with patents and the PRC record on internal replication
- policy dicta regarding equipment imports within the PRC
- inexperience in world price/quality ranges by PRC agencies.

Some of these problems/constraints have been easing in recent developments. Individual firms find it very hard to keep abreast of current events in the PRC.

D. STRENGTHS AND WEAKNESSES IN SECTOR TRADE WITH CHINA

Some of the most important uncertainties in forecasting forest products trade with China are external to the sector:

- currency fluctuations (both)
- performance of the PRC economy under liberalization/modernization
- PRC ability to export to Canada and others (earn foreign exchange)
- priority of building products and pulp/paper products in PRC imports

In general, the prospects appear good. In spite of a growing tropical presence in all forest product markets, and the ever present USSR potential, the Canadian industry should be able to maintain its level of export shipments and grow moderately in volume (faster in value) well into the 21st century.

Canadian strengths in the PRC market include: good access across the Pacific, quality product lines in both wood and fibre products, strong firms experienced in off-shore trading and a full spectrum of backup services, technology and equipment.

The weakest link in Canadian forest sector exports may be financial. Several other countries seem to be able to offer better terms, particularly for imported equipment and services. Arrangements for bundling Canadian services with Canadian equipment also are less well developed than in some other countries (Finland, Japan, Fed. Rep. of Germany).

E. ECONOMIC IMPACT IN CANADA OF SECTOR EXPORTS

The regional sourcing of shipments to China has broadened in the past few years. British Columbia dominates the log/lumber trade for resource and geographic reasons. About two-thirds of current shipments of Canadian pulp and paper to China also come from B.C. The second province of origin is Newfoundland with about 17% of the value of pulp and paper trade in 1984. New Brunswick, Quebec, and Ontario each shipped about 5% and a small share came from Manitoba.

Direct employment per dollar of sales varies widely between forest products. Logging and silviculture are relatively labour intensive, pulp/paper making require more capital and technology per unit of output. General estimates indicate that six person years of employment are created by each $1 million of export sales of pulp/paper products (excluding woodlands operations). In sawmills, employment per unit of sales is higher with 18 to 20 person years generated per $1 million of export sales. Fully manufactured products in both wood and fibre generate much higher employment per unit of sales.

The majority of Canadian forest industry equipment is manufactured in Ontario, Quebec and British Columbia, with minor suppliers in every province. Approximately 18 person years of employment are generated per $1 million of equipment exports.

The major centres of the forestry sector service industry are Vancouver and Montreal. Specialized services are available from many other centres across the country. Using international project rules of thumb, each $1 million of export service contracts yields 6 to 12 person years of employment.

It should be noted that the above employment estimates are direct employment only. Multipliers for basic industries like forestry are likely over two in Canada. That is, each forestry sector job supports/creates at least two other jobs. In total the forestry sector accounts for roughly 1 million jobs in Canada, directly and indirectly.

F. CHINESE PROSPECTS FOR EXPORTING FOREST PRODUCTS

Ultimately China could be one of the world's leading forestry giants, ranking the with USA, USSR and Canada. However, by that time its domestic market will still absorb more than it can produce in the main Canadian product lines. In the meantime, prospects for Chinese exports of forest products are negligible.

China has a competent equipment industry and a history of duplicating equipment from other nations for internal use. In the long run, the PRC will want to manufacture virtually a full spectrum of forestry sector equipment. Eventually they could become exporters of particular machinery and equipment lines. However their current needs for modernization and expansion are so great that the prospects of export seems unlikely for over a decade.

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The majority of Canadian forest industry equipment is manufactured in Ontario, Quebec and British Columbia, with minor suppliers in every province. Approximately 15 person years of employment are generated per $1 million of equipment exports.

The major centres of the forestry sector service industry are Vancouver and Montreal. Specialized services are available from many other centres across the country. Using international project rules of thumb, each $1 million of export service contracts yields 8 to 12 person years of employment.

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3. COMPETITIVE CONSIDERATIONS IN THE CHINESE MARKET

A. CHINESE PERSPECTIVES ON CANADA

Forest Products

PRC buying agents are familiar with the quality of product and delivery capability of the Canadian industry. Price is usually the main issue, with Chinese buyers attempting to get discounts on current prices, whatever the source or product.

Grades can be an issue in logs and lumber. The west coast lumber industry has long established procedures for delivery-complaint-adjustment if warranted according to accepted practices. New arrangement have had to be developed with PRC agencies. Currently TUHSU maintains grading staff in Vancouver to preselect desired materials. Workable arrangements are being developed over time.

To preserve domestic employment and to collect full log residual products, the PRC prefers log imports to lumber or panel imports. The same general objective pertains to pulp imports as opposed to finished papers, packaging materials and other finished fibre products. However the limited ability to expand domestic capacity in the short run, in relation to the demands/ targets of the growing economy have necessitated import of finished forest products. In fact, many of these imports of manufactured products represent the most economic solution for the PRC economy until domestic wood and fibre supply can be expanded.

Machinery and Services

In purchasing equipment, PRC agencies appear to favour fully integrated packages whereby engineering, machinery and financing are included. The Canadian engineering industry has developed a more independent stance offering technical advice on equipment purchase. However the success rate has not been high in selling this approach in the PRC. The advantages of favourable financing arrangements have tended to outweigh the advantages of completely free equipment selection.

The most serious reported constraint on the PRC side, in importing Canadian equipment, is the absence of concessional financing within EDC Line(s) of Credit.

B. CANADIAN PERSPECTIVES ON CHINA

Forest Products and Trade

PRC buying agents are recognized by the Canadian industry as tough, expert customers with a wide array of alternative sources of supply open to them on the Pacific Rim. In general their payment record is excellent and they seek and nurture long term trading arrangements.

When other markets (USA, Japan, EEC) heat up, some producers are reluctant to meet Chinese prices. Others have been investing in market development by attempting to meet Chinese needs under most conditions. Present volumes are relatively low in relation to industry total exports in all products, except logs. The government of B.C. and of Canada have not permitted large volumes of roundwood exports in this century. Currently log export rules are changing, administered through a new B.C. Timber Export Advisory Committee. Although the new scenario is not entirely clear, it does not provide for large increases.

Marketing

In pulp and paper, all major companies and the CPPA maintain contact with the PRC market. Some companies have developed steady lines of business. DRIE has participated in trade fairs, and organized missions in packaging and other pulp/paper products. The Council of Forest Industries of B.C. regards the PRC as one of the most important prospects for growth in export shipments of wood products. After a strategic review of its marketing programme in China in early 1985, COFI has placed significantly increased resources into PRC market development. This is reflected in the COMDP agreement on wood products marketing recently signed by COFI, federal DRIE and the B.C. Ministries of Industry and Trade. Particular items with good prospects in the PRC include treated plywood for concrete forming, roof sheathing, higher grade tight knot lumber, flooring and sash/door lumber, structural trusses.

Having considered the prospects of a major timber frame system marketing effort, COFI has decided to proceed at the first stages with a partial wood frame system for farm housing which would utilize more native materials in conjunction with North American wood truss roof systems and standard wood frame door and window systems. This approach is in line with the general wishes of the PRC purchasing agencies which do not feel the nation can afford full wood frame housing at this stage.

C. EXPERIENCE/STRATEGIES OF OTHER EXPORTERS

In general other major forestry nations have done less well than Canada in selling forest products to China. Several have done a more effective job of marketing forest industry equipment. The Scandinavian countries, France, and Fed. Rep. of Germany have good machinery and equipment and apparently better total project packages, especially in finance.

One major US supplier (Beloit) has taken an agressive marketing approach and is the current leader of world suppliers to the PRC pulp and paper modernization.

Wood Products

The Western Wood Products Association of the USA is currently sponsoring a timber frame marketing project in China. The main objective is to familiarize parts of the PRC construction sector with North American timber building systems and technology.

Log Exporters

One of the key elements in the Chinese market will be the future availability of roundwood to PRC importers from other sources.

In 1984 log imports of about 10 million cubic metres came 40% from the USA, 30% from Southeast Asia, 15% from the USSR, about 8% from Canada (B.C.) and about 7% from other countries such as Chile, New Zealand, African nations. These nations are also the most likely future suppliers of note. Political considerations and domestic manufacturing objectives, as well as physical supply constraints will likely limit the long run availability of roundwood from each of these sources.

The general conclusion is that although the PRC has access to a wide range of quality log suppliers in 1986, the number, volume and quality of supply is most likely to constrict by 1990. Beyond 2000 tropical plantations may provide new sources of fibre of lower quality than Canadian supply.

4. POSSIBLE FEDERAL ROLE IN SUPPORTING FOREST SECTOR EXPORTS TO CHINA

A. INDUSTRY REQUESTS FOR ASSISTANCE

Several important programmes which aim to enhance connections between China and Canada in the forestry sector are already in place:

- COMDP wood product market development with COFI of B.C.
- marketing and intelligence assistance from External trade officers in Beijing
- External, DRIE and CFS participation and support of forest product trade expositions and missions in China
- support for a Canada-China Trade Council which has initiated important forestry sector contacts
- technical cooperation with MoF through CFS and IDRC
- technical cooperation with MFERT, MoF and MLI through CIDA bilateral forestry projects and CIDA Industrial Cooperation projects

Expansions or realignments of programme suggested in the course of this review include:

. Expansion of the External trade officers role in forest products in China. Dedication of perhaps two officers to this important Canadian product line has been suggested. One of the most important functions of this group is to provide intelligence on Chinese markets and on current developments in Chinese forest management, production and import institutions.

. Develop an integrated forestry sector strategy, including product linkages (e.g. logs and lumber), major new technological transfers (e.g. paper packaging), and improved packaging of engineering services, equipment and financing (EDC).

. Expansion of CIDA bilateral forestry programme to include wood products manufacture and standards in use.

. Expansion of CIDA bilaterial forestry projects to include pulp and paper sector planning in the PRC.

B. RECOMMENDED FEDERAL STRATEGY

1. Criteria for Project Selection

Important criteria for screening project efforts to foster forest products trade with China would include:

. Economic return to Canada. Projects or product lines should be self-financing on a commercial basis in the long term (that is, no long term subsidy). Canadian content should be as high as possible, and degree of manufacture should be as high as possible.

. Contribution to favourable long run relations with China. The Chinese will have little difficulty in selecting the best of our products, services and equipment. There should be no attempt to inject goods or services which are sub-standard in any way, including followup, monitoring and maintenance activities. This is one of the best reasons to attach engineering services to major equipment sales.Cooperation in forest management, although not the highest in direct trade impacts, is very important in Canada-China relations.

. Projects should not damage traditional forestry sector relations. Product or equipment dumping or other activities not countenanced within GATT should be avoided.

. Chinese objectives of technological transfer, training and mutual scientific exchange should be fulfilled to the degree possible, and cultural exchange should be fostered.

2. Elements of a Strategy for the Federal Government

Major elements of a Canadian Government Strategy to foster forest sector trade with China could include:

- Continuation and broadening of existing trade contacts through External/DRIE, COMDP, and Canada China Trade Council
- Continuation and broadening of cooperation in forest management through CIDA bilateral projects, CFS and IDRC contacts, and other professional exchanges. This cooperation is valued highly by both sides, contributes greatly to mutual understanding of forestry sector methods which is useful in ultimate trading.
- Review the competitiveness of EDC Line of Credit financing in relation to other bilateral instruments. While rates and terms are paramount considerations, other factors such as timeliness of response, perceived coordination with suppliers, and other factors may also be important to the Chinese.
- Gradually develop a forest sector strategy for enhancing trade with China. The strategy could be developed in parts, such as forest management, wood products and pulp and paper products, with coordination by a planning committee.

In rough order of priority the following projects are recommended for federal support.

i. Expansion of forest sector presence in External trade in Beijing to two full time officers. A major part of their function should be to gather and disseminate information on new developments in pricing/allocation of forest product manufactures.

ii. Develop a China-Canada forestry strategy to guide developments in technical cooperation and trade. The strategy could be developed in segments and integrated by a planning committee. Composition of the planning committee would include External, CIDA, DRIE, and CFS. Subcommittees would be formed for subsectors or special tasks as required, with the addition of expertise from industry, associations, selected consultants.

iii. Expand the Canada-China Forestry Cooperation Programme currently underway through CIDA bilateral to include product modernization and pulp and paper planning.

This strategy should be in line with Canada's Trade Strategy as developed at the Annual Conference of First Ministers in Halifax, November 1985. To secure and enhance access to the Chinese market, the forestry projects and technical exchanges will play a major role. In addition, if China joins GATT External could initiate direct discussions with the government of the PRC on access to Chinese forest product markets. With a strategy in place, Canada would be able to take advantage of these new opportunities.

In order to improve our trade competitiveness, particularly in equipment and machinery supply, EDC must be able to provide competitive financing. The competitive position of the Canadian industry in quality manufactured forest products is one of strength.

In order to make our marketing more effective, the sector needs a long term effort to develop understanding of Chinese construction methods and the best way to fit Canadian products into those systems. In pulp and paper, the sector needs to keep abreast of what will be a rapidly changing industry in the next decade. Canadian products and processes should be highly competitive in assisting the Chinese to modernize their pulp and paper supply and utilization. To make our marketing of equipment more effective, we need to seek improved systems of bundling engineering, equipment and financing in recognizable packages.

APPENDIX D

TASK FORCE ON CHINA POWER SECTOR

SECTOR BRIEF

FOR

THE MINING SECTOR

Working Group Members:

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July, 1986

THE MINING SECTOR OF CHINA

EXECUTIVE SUMMARY

With a geology somewhat similar to that of Canada, China has a high mineral potential. Although much of the country has not been explored in detail, enough is already known to be able to say that China has extensive mineral resources and has the potential to become a major mineral producer and exporter in the future. This will occur regardless of the level of Canadian cooperation.

China is determined to develop its mineral resources as a vital part of its overall economic development, and considerable progress has already been made. Its mineral sector development is closely interlinked with that of other sectors, such as transport and energy. Government reorganization and policy changes in recent years have indicated a realistic approach to mineral sector development and a willingness to cooperate with the industrialized countries in order to make use of their expertise and experience. Thus, China's mineral sector offers considerable opportunity for those countries and companies with the necessary expertise and experience.

Canada is the world's third largest mineral producer and the world's leading mineral exporter. Furthermore, it is a world leader in many areas of mineral technology and a manufacturer and exporter of equipment covering virtually all facets of the sector. Canada has been the major off-shore supplier of minerals to China, but generally on a spot basis rather than through long-term contracts.

Despite this, direct Canadian involvement in mineral sector development in China has been limited to-date, and lags behind that of its chief competitors, notably the U.S., Japan and some West European countries, which are also interested in securing future supplies of raw materials from China. However, some Canadian mining and manufacturing companies have expressed interest in investing in China and such efforts should be encouraged by the Federal government as they may bring long-term benefits to Canada.

China is eager for assistance to develop its mineral sector and has expressed interest in Canadian mineral technology. Canadian Industry has the capability to provide the desired technology assistance. Within Canada there may be some resistance to Canadian involvement in China's mineral development on the basis that it only facilitates future competition to Canadian producers. However, others see business opportunities which could bring considerable benefit to Canada. Furthermore, it is important to understand that China's mineral development is not dependent on Canada's involvement. Its mineral resources will be developed with or without Canadian participation. The Federal Government should therefore give full consideration to supporting initiatives for Canadian participation in sound projects in China.

As a means of increasing the level of direct Canadian involvement in the development of China mineral sector the following steps are proposed:

1- a detailed review of the mineral sector in China.

2- the creation of an organization from within the existing government/industry structure that will foster Canadian private sector involvement in mineral sector development. The main areas of concentration will be:

i) technical exchanges and technology transfer;
ii) mineral exploration technology and equipment;
iii) investment in gold and base metal mining
iv) upgrading and rehabilitation of small and medium-scale coal operations.

The long range forecast is that Canada should maintain a level of exports at an average of $C300 million per year for commodities decreasing to about $C200 towards the end of the century. While the consumption of base metals and fertilizers will increase with gradual industrialization, the development of local supplies is expected to remain below requirements. With a positive approach towards development of the Chinese mining sector, sales of services and equipment should compensate for the lack of growth and loss of exports of commodities. With market development, such sales are projected to reach a total of $C250 million per year.

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OVERVIEW OF THE MINING SECTOR OF CHINA

INTRODUCTION

For a mineral producing and exporting country like Canada, the question of whether or not to participate directly in the development of mineral resources of other countries and possible future competitors poses a dilemma. Canadian mining companies have demonstrated an interest and capability in investing in viable mineral development projects around the world. Mineral production expansion throughout the world makes use of technology, including Canadian developed technology made available through the supply and service industry.

China is already a large producer of coal, gold, tungsten and bauxite. The country has a huge territory with geological formations that are major supply sources of copper, zinc and tungsten. While much of China's mineral resource is still not well defined, there could be considerable future benefits to Canada in using its extensive mineral sector capability to help China develop her mineral production, keeping in mind that such development will occur regardless of Canadian involvement. The Canadian government should assist the Canadian mining industry in obtaining broad access to opportunities in the fields of equipment supply, metallurgy, mineral processing and mining.

Intelligence on the mining sector of China is limited and more information is required to better define a strategy. A sectoral review with emphasis on areas of mutual interest would serve as a guide to the private sector, and increase the chances of success of their efforts to develop business in China

1. OPPORTUNITIES IN CHINA:

   A- Sector Organization and Responsibilities:

   Administration of minerals and metals in China is the responsibility of the following ministries and institutions:

   - Geology and Mineral Resources
   - Metallurgical Industry
     (China National Nonferrous Metals Corp.)
   - Nuclear Industry
   - Coal Industry
   - Petroleum Industry
   - Chemical Industry
   - Building Materials Industry
   - Foreign Economic Relations and Trade
   - State Council

   At the time of preparing this report, information was available only on the situation of the non-ferrous metals industry was available. It is likely that each ministry has a similar structure to that shown in Table 1, the complexity of which can be evaluated by comparison.

Partly as a result of its huge territory, each province, autonomous region and commune has vied to become self-sustaining by developing its own industrial base. This has resulted in the creation of a complex structure, such as that for the non-ferrous metals industry, published in China Newsletter No. 54 and shown in Table I, and has caused considerable overlap and competition between the Central and regional governments.

However, it should be noted that while the Government of China has announced broad measures to decentralize much of the decision-making process to the provinces, autonomous regions and cities, the mineral industry is specifically excluded from these measures, and the decision-making with regard to mineral sector projects remains with the central government.

Central state-run enterprises tend to be larger than the provincial or communal industries. The highly decentralized industrial base has created internal protectionist barriers to inter-provincial trade, somewhat similar to certain practices in Canada.

If the Government of China organizational plan becomes fully implemented, the Ministry of Foreign Economic Relations and Trade will no longer be involved in decision making in the producing sector, but would concentrate on formulating guidelines, policies and regulations, issuance of trade licences and preparation of quality specifications for trade items. It is very important to note that the State Council has the overall responsibility for the final approval of projects, in authorizing the expenditures and investments, joint ventures and financing conditions. Such approval is required for projects to be put on the priority list, which then guarantees that budgets have been approved.

B- <u>Past Sector Development and Present Needs:</u>

In terms of total production, in 1983 China succeeded in raising herself to be the sixth largest producer of nonferrous metals in the world. China's aim is to double the production of most minerals during the seventh five-year plan (1986-1990), in accordance with the established objective of increasing exports and meeting internal requirements.

Statistics for the production imports and exports of minerals and metals for the period 1982-84 are given in Tables 3-6 in Annex 1. Figures in parentheses represent corresponding data for Canada. While China is a large country, known to have a large and varied mineral resource endowment, it has a small per capita use of metals. However, if all assumptions of economic growth are valid, overall production capacity will have difficulty in satisfying domestic needs.

Iron and Steel

In 1984 China was the world's fourth largest producer of steel. China has some major iron and steel enterprises, plus 1075 medium and small scale iron and steel enterprises, of which 25 are classified as independent key mines and 56 as key enterprises. Technology dates back 20-30 years with difficulties common to industries in China of high energy inefficiencies, lack of flexibility in equipment sizing and poor transportation infrastructure.

Although the mines are largely integrated with the local steel plants, iron ores are generally low grade of concentration types similar to those existing in Canadian operations. The presence of rare-earths in several iron ore deposits may create difficulties in the metallurgical process, as even fractional quantities of some rare earths have major effects on the properties of steel. Japan is involved with Chinese research institutions and a producer, in the development of production and processing of rare earths metals.

The role of the whole iron and steel industry may require further study in view of the fact that China imports considerable quantities of iron ore from Australia, and steel from unidentified sources. The Chinese have recently made investments in a steel complex in Brazil and a joint venture for the development of an iron ore project in Australia may well indicate that difficulties are being experienced in developing indigenous sources of iron ore.

Coal

China has huge proven coal reserves and ranks second in the world, after the U.S.A., with production reaching 790 million tons in 1985. By comparison Canada's annual coal production is of the order of 60 million tons. China's coal is produced from 1,834 collieries, including a few large scale open pit mines and many smaller scale open pit and underground operations. The Ministry of Coal Industry controls 580 of the mines grouped under 84 Coal Mine Administrations or Coal Industry Companies. The remaining mines are run by the state through local governments at the provincial, country or prefecture level, or as collective townships and village enterprises.

Between 1965 and 1979, coal production grew at an average rate of almost 30 million tons per year and by about 45 million tons in 1982-84. In order to meet objectives of 1200 million tons for the year 2000, under the most optimistic assumptions of economic growth, an annual average increase of 30-40 million tons would be required. The increased production is equivalent to nearly 15 times the annual production of the recently announced Occidental Petroleum Corp. This one project will require an estimated investment of US$650 million. Presently, smaller mines produce 48% of the total coal production.

Coal transportation is the single most important item of freight of Chinese railways. The development of coal is interlinked with the development of transportation and the supply of electricity, and involves negotiations amongst the responsible ministries. Equipment for coal mines uses state-imposed design norms, which seriously hamper the flexibility necessary to adjust to local conditions.

It is expected that the majority (75%) of new collieries will be by underground methods, as most new seams are too deep for open pit operations, Future equipment requirements will change accordingly. Nevertheless, open pit coal mining, in which Canadian companies have considerable technological expertise, will continue to expand in China, and will provide the major part of Chinese production for the foreseeable future. Environmental impact seems likely to become a subject of serious concern with the increasing utilization of coal.

Several Canadian companies have recently shown an interest in joint venture opportunities and in developing consulting services in China.

Aluminum

China has large reserves of bauxite with a production in 1984 of 880 thousand tons of alumina and 460 thousand tons of aluminum metal. Nevertheless, consumption of aluminum exceeded production by over 250 thousand tons for that year.

Canada is present in China's aluminum industry, and should keep pace with the industrial growth of the country. Activities include several phases from ore extraction and processing to the metal fabrication.

China, through the CNNC has recently made an equity purchase in an Australian aluminium production facility.

Gold

China ranks in fourth position in the world as a gold producer, immediately after Canada. Gold production is a top priority for the Chinese who have expressed strong interest in attracting Canadian expertise. 50% of its gold is produced in state-operated large gold mines and the remainder in mines run by local governments or collective organizations and by individuals. Total employment is estimated to number around 40,000.

China has shown a strong interest in the Canadian capability for gold mining. Canadian firms have successfully carried out gold projects and are actively negotiating other potential assignments.

Tungsten

China is the world's most important producer of tungsten and practically dictates the price on the international market. Moreover, large high grade reserves exist, permitting increased production whenever the market will absorb it.

Base Metals

The three common metals, copper, zinc and lead, are grouped under this heading, as they tend to be found in the same areas. The reserves of these metals will permit China to eventually attain self-sufficiency. Several development projects are reported on stream, however the availability of financing may be a major constraint. China has been a net importer of copper and zinc in the last few years, but in an erratic fashion, trying to take advantage of the low prices of the spot market. More recently, some buying seems to have been done directly with the producers.

Canadian interest in copper and zinc in China has developed slowly, when major producers were invited to participate in a copper smelter and the up-grading of a zinc processing plant. This is reported to have resulted from several visits to Canada by the Chinese who were studying the Canadian technology.

Fertilizers

China is a large importer of potash, nitrogeneous fertilizers, as well as some phosphate. The Ministry of Chemical Industry targets unofficially a total nutrient production of 30 million tons for the year 2000. To reach the unofficial target of 17.1 million tons in 1990 would represent annual growth rates slightly above 2% for nitrogen, 6% for phosphorus and 25% for potassium. The production capacity for nitrogen is fully developed, but the resources of phosphate and potassium are not easily accessible and occur in two different areas. For both phosphorus (phosphate rock) and potassium (potash), it would appear that the target production for the year 2000 would require priority being given to these commodities and mastery of new technology.

Specifically regarding potash, the target consumption demand for the year 2000 would represent a six-fold increase over 1984 consumption. This growth is unlikely to be achieved through domestic (Chinese) production. Currently, virtually all potash used in China is imported (from Canada) and this situation is likely to continue. It is expected that the Chinese domestic production will be able to supply only 20% of their consumption by the year 2000.

Nickel

Reports are incomplete on nickel production, but nickel in China comes from a few small scale mines. Much current Chinese nickel production reportedly uses Canadian-based extraction and processing technology, which the Chinese may have obtained from foreign literature reviews, and visits to technical operations outside China.

A large ore complex in the central part (Gansu province) reportedly compares well with the Sudbury basin reserves, with similar expectations for future production. Considering the long lead time (8-10 years) to develop integrated nickel projects, the timing could be excellent for early Canadian involvement with technology transfer, joint venture and eventually marketing agreements. Although the world nickel market is presently in a serious over supply situation and likely to remain so until the mid-nineties, it might still be in the economic interest of China to develop its own supply from domestic reserves.

Mineral Exploration

During the past five years, the Ministry of Geology and Mineral Resources has mapped 2.7 million square km. using aeromagnetic surveying, 1.2 million square km. was subjected to geochemical sampling and 430,000 square km. of remote sensing.

Mineral exploration is a field of expertise in which Canada is considered to be amongst the world leaders. Canada is practically the only supplier of some instrumentation.

China has drafted a law on the use and protection of the country's mineral resources, including prospecting and exploration data, geological studies, and the management and conservation of the country's resources.

C- Expected Projects of Potential Commercial Interest to Canada

During the sixth five-year plan covering the years 1981-1985, 890 projects were to be completed, 169 of which are considered key projects by the State Planning Commission. Sixty of the key projects were for coal production development or up-grading, increasing production of oil and power generation capacity. Thirty-three involved raw material production or processing.

The China National Nonferrous Minerals and Metals Industry Corporation (CNNC), which reports directly to the Chinese Central Government, is seeking extensive cooperation with foreign firms for compensation trade, joint venture, co-designing, co-manufacturing and co-production. At the present time there are 18 projects in the non-ferrous metal industry open for negotiations, 8 of these are new projects, the remainder being for the modernization or expansion of existing facilities. The new projects are:

- A plant producing 300,000 tonnes/y of alumina;
- A lead-zinc mine with a capacity of 60,000 tonnes/y of ore;
- The Chingmenshan copper mine with a capacity of 500,000 t/y of ore;
- The Jishuimen tin-lead-zinc mine producing 1200 t/y of lead, 110 t/y of zinc and 220 t/y of tin;
- An aluminium fabricating plant in Beijing with a production of 50,000 t/y;
- A copper mine with a capacity of 1.5 million t/y (probably of ore) in southwest China;
- A beryllium oxide plant with a capacity of 100 t/y;
- A magnesium-titanium plant in northwest China.

As part of a more general plan, the main development orientation of the non-ferrous metals industry would use the following guidelines.

1. Renovation of 45 preferred facilities by 1990, including 22 mines, 19 smelting and processing projects and 4 machinery repair projects.
2. Construction of large-scale plants for the production of aluminium, lead, zinc and copper.
3. Establishment of four technology development centres to strengthen economic and technical information;
4. Inventory of resources and verification of reserves.

China's mineral industry accounts for about 33% of the country's gross value of industrial production. The distribution by sub-sector in 1984 was: metallurgical industry 9%, coal 3%, chemical 12%, building materials 4%, and petroleum 5%.

A list of projects involving the participation of foreign countries is given in Annex 2.

2. CANADIAN MINERAL INDUSTRY - CAPABILITY AND CAPACITY

A. Domestic market and prospects, 1986-2000

The Canadian mining industry is the third largest in the world, after those in the U.S.A. and the U.S.S.R., and Canada is the leading minerals and metals exporting nation in the world. Canadian minerals and metals production in 1984 totalled approximately $20 billion. Minerals and metals are a major staple in the Canadian economy and they contribute significantly to our international standing. Moreover, the mining of these resources has historically contributed to regional development and expanded infrastructure in many of Canada's remote areas. In 1985, the Canadian mining industry spent approximately $1.2 billion, including $486 million for equipment, of which only $90 million was spent on Canadian equipment. In the same year, Canadian mining equipment manufacturers achieved exports of $232 million.

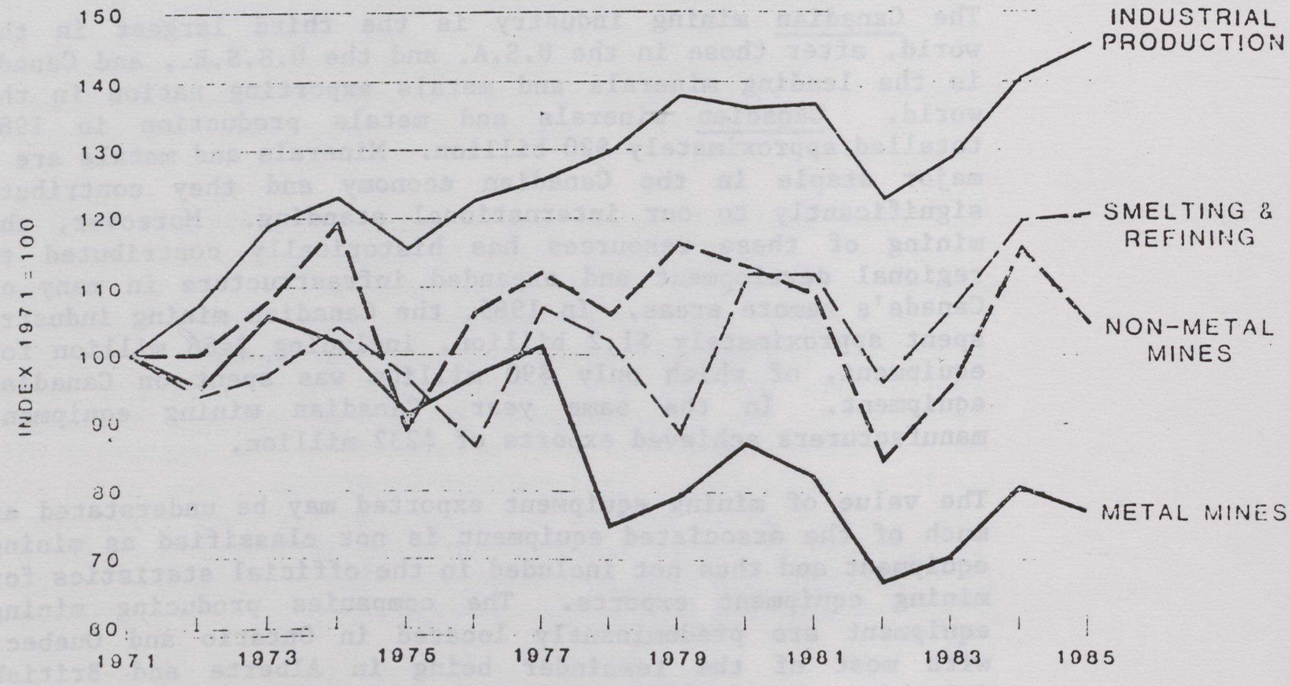
The value of mining equipment exported may be understated as much of the associated equipment is not classified as mining equipment and thus not included in the official statistics for mining equipment exports. The companies producing mining equipment are predominantly located in Ontario and Quebec, with most of the remainder being in Alberta and British Columbia. Engineering companies specializing in mining are, on the whole, equally distributed between Ontario, Quebec, Alberta and British Columbia.

The Canadian mining industry was developed as an exporting industry and continues to serve the world market. Canadian domestic consumption of minerals and metals accounts for only about 20% of our production. Discussion of markets and prospects for the Canadian mineral industry must therefore address the world wide situation.

While Western economies have emerged from the recent recession and minerals and metals demand is now increasing, substantial worldwide excess minerals and metals production capacity exists, and as a result prices remain low. Canadian mineral producers continue to be among the lowest cost in the world, due at least in part to dramatic improvements in productivity achieved over the past few years. Although commodity prices and revenues remain low, Canadian mineral production on a quantity basis is near historic highs.

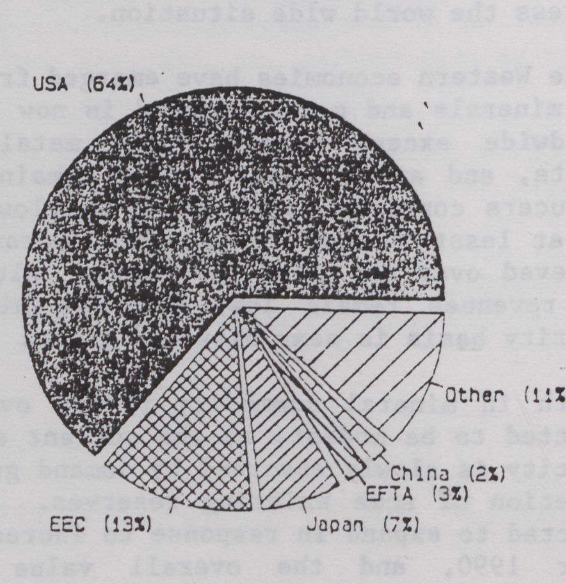
Growth in mineral commodity prices over the next decade is expected to be modest, as the current excess world production capacity is slowly absorbed by demand growth combined with the depletion of some existing reserves. Canadian production is expected to expand in response to increased demand, especially after 1990, and the overall value of Canadian mineral production has been projected to achieve a real annual growth

INDEXES OF GROSS DOMESTIC PRODUCT IN 1971 PRICES



SOURCE: STATISTICS CANADA

CANADIAN EXPORTS OF NON-FUEL MINERALS (CRUDE & SEMI-FABRICATED) TO MAJOR WORLD MARKETS, 1984



16 BILLION DOLLARS (CAN.)

ce: World Trade in Minerals Database System (WTMS).

of 4.3% through to 1995, incorporating increases both in production quantities (1.6%) and commodities values (2.7%). Capital expenditures in new mineral and metal production operations in Canada over this period are projected at $8 billion, most of which will come after 1990. Capital expenditures on maintenance and equipment will also be needed to maintain existing production operations in Canada. Although almost all equipment is available from Canadian sources, the trend is for a declining share of equipment for Canadian mines to be obtained from Canadian suppliers.

B. Resources and experience for export markets

Canada is the leading minerals and metals exporting nation in the world. Traditionally about 80% of Canadian mineral production has been exported, totalling approximately $16 billion in 1984 and representing about 15% of Canada's total trade. Canadian companies produce more than 60 different minerals and metals and are leading producers on a world scale for several major minerals. Canada is also an importer of some minerals, with imports totalling about $10 billion, resulting in a net minerals trade surplus of $6 billion in 1984.

The main customers for Canadian minerals and metals exports have traditionally been the developed market economies, principally the U.S.A. (64%), the EEC (13%) and Japan (7%). Smaller but still significant mineral sales, especially in the fertilizer group minerals (potash and sulphur), are being made to less developed and newly industrializing countries. In general, however, Canada has been only moderately successful in accessing the growing demand for raw materials in the newly industrializing nation markets, with China having been perhaps the exception. Since 1980, Canada has been the largest supplier of minerals to China, with sales having peaked at $400 million in 1983 (about 2% of Canada's mineral exports).

In addition to commodity exports, the Canadian mineral industry has an established record of investing in development of mineral production overseas, particularly in less developed countries. Most Canadian mineral producers have willingly exported production technology developed in Canada to overseas operations, both to those in which they have an equity interest and also on a fee basis.

The associated service industries, both engineering and equipment, also have active overseas efforts. In 1985, 72% of Canadian manufactured equipment was exported for a value of $232 million, up from $67 million in 1975.

C. Previous experience and activities in China

Although having substantial announced reserves of many minerals, China has an underdeveloped mining industry and is a net importer of minerals and metals. Canada has been China's largest foreign supplier of minerals and metals over the past five year, with sales in excess of $350 million in 1984, down slightly from a peak of $400 million in 1983.

The principal Canadian minerals and metals exports to China have been the major nonferrous metals (copper, aluminum and zinc) and the fertilizer minerals (potash and sulphur). It is important to note that the Chinese market is very competitive, and most of the sales have been made only on a spot basis, often through third party brokers taking advantage of the currently depressed prices of many commodities. The Chinese have not been willing to enter into even short term purchase contracts which would offer some market security to Canadian producers. The Chinese prefer to buy commodities on the open market at the best spot price.

Also, the Canadian mineral industry has welcomed Chinese visitors to our operations and, with Canadian expertise, has facilitated the upgrading of Chinese mineral production technology. Many of the more modern minerals and metals production facilities in China have incorporated significant Canadian technological development and, in some cases, Canadian equipment. In the past few years, the service arms of Canadian mineral producers and other consulting groups have begun to more actively seek fee assignments in the Chinese mineral industry. There have been some successes in this field, particularly by groups having strong mineral production ties in Canada. Several Canadian mineral companies are also now pursuing equity opportunities in China, which have in part developed out of previous technological contacts. Canpotex, with CIDA assistance, has mounted a major fertilizer demonstration program in China, directed at improving Chinese agricultural yields through increased application of fertilizers.

However, the Canadian mineral equipment industry has had limited success with sales to China, when consideration is given to the size of the market and the achievements of competing countries.

China has launched a major effort of exploration and delineation of its mineral resources. Following a series of exchange visits between geologists from China and the Geological Survey of Canada (GSC), a Memorandum of Understanding was signed between the Chinese Ministry of Geology and Mineral Resources and the GSC, providing for cooperation on the basis of equality and mutual benefit. Continuation of the exchange visits by geological scientists from China and Canada under this MOU is expected to foster further cooperation involving Canadian mineral exploration companies and suppliers.

D. Canadian strengths, weaknesses and competitiveness

The Canadian mineral industry is very competitive in world markets. Our producers have maintained their position in the low-to-average overall cost range among producers of most major minerals and metals around the world. This has been achieved during the recent recession by implementing radical cost reduction measures. Some producers report achievement of cost reductions in the order of 30% to 40% over the past five years. Canadian producers and exporters are particularly well placed on a production cost basis in nonferrous metals (aluminum, nickel, lead, zinc, silver, gold, uranium and copper) and fertilizer minerals (potash and sulphur) as demonstrated by the return to high production and export levels in Canada, in spite of the depressed prices currently prevailing in international markets. These minerals and metals offer our prime opportunities for the continued development of exports.

The Canadian mineral industry is also recognized as a major innovator in exploration, production and processing methods. Most of the larger Canadian companies are very active in these areas and have successfully transferred this technology overseas. The same large metals companies are the principal source of technology for the development of mining of metallurgical equipment in Canada.

E. Economic impact in Canada of sector exports

As a major component of Canada's economic base, the minerals and metals sector in 1984 accounted for approximately 4 per cent of Gross Domestic Product, based on value added, with production to the semi-fabricated stage totalling $20 billion. Total mining sector exports were $16 billion in 1984 and contributed on average 15 to 20 per cent of the total value of Canadian exports of goods and services. Direct employment in the industry totals some 145,000 with approximately 175 Canadian communities throughout Canada dependent on mining for their livelihood. If a multiplier of 3.5 is applied, it means that roughly 500,000 Canadian-jobs are dependent on the minerals and metals sector. It should also be noted that mineral products account for 50 per cent of Canada's inland freight.

3. COMPETITIVE CONSIDERATIONS RE CANADIAN EXPORTS

A. Chinese Perspectives on the Canadian Mineral Industry

From the Chinese perspective, Canada, because of its diversified mining industry, is respected as a supplier of engineering services and some equipment used in mining and metallurgy. However, Canadians have not established a presence in China, either collectively or financially, as strongly as has West Germany, France, U.K. and Japan. Canada's presence in China has been limited by our fragmented approach to the market and relatively rigid financial arrangements, particularly in comparison to the variety of barter and commodity exchanges being offered by West Germany through its very well established trading houses. Significantly, since its diplomatic recognition by Canada, the Government of China has made repeated requests for Canadian participation in the development of the country's mineral resources, albeit usually involving non cash arrangements.

B. Canadian Perspectives on Chinese Market

The Canadian perspective on the China market is that while it is large, it is also a very slow market, and thus limited private sector marketing budgets are being allocated to quicker yielding markets, generally in the USA and occasionally Latin America. Companies that have had successes in China have generally cultivated a project for several years and have made several visits.

In addition, there is a rather strong feeling that the Chinese only intend to copy Canadian plants and products.

It is certain that Chinese minerals and metals will reach international markets, and will do so increasingly in the future. The impact will be further aggravated by the fact that China seeks concessional financing, compensation trade and barter agreements to help finance major projects.

In the metallurgical industry it may be more difficult for Chinese product to reach world markets, as Chinese technology lags considerably behind that of Canada. China's domestic demand is increasing rapidly and currently exceeds domestic production capacity. This would however not preclude some products being marketed to raise hard currencies.

There is the very real prospect of mining equipment from China competing in the international market in the future. There is currently a wide range of essentially consumable mining equipment manufactured in China, but not yet actively offered for sale on the international market. There are at least two probable reasons for this.

1. There is still an under-supply within China and open competition on the international market would inhibit the transfer of technology into China.

2. There are still some quality problems to be solved and the Chinese very shrewdly wish to solve those problems at home without loss of reputation.

As an exporting nation, Canada will soon be facing competition from China in some of our traditional products such as drilling equipment, drill steels and bits. This is because they are mass-produced products with a relatively good profit margin.

The list of projects undertaken by other countries, notably the U.S., Japan and the West European countries, cover almost all minerals (Annex 2). In addition, three countries, Australia, West Germany and France, have agreements related to mineral exploration. Canada has no such agreement.

Other exporters of mining equipment such as West Germany and the U.K. are well established in the China market and are now into joint-venture and technology licensing in China. There have been no apparent problems in terms of co-operation or agreement violation.

Marketing in China by Canada must of necessity offer at least those conditions offered by our European competitors which have two basic components, namely:

1. current technology
2. financing flexibility

A strategy missing either component will have very limited and spotty success. Therefore, one of the necessary strategies for Canada must be flexibility in financial arrangements, in relation to both concessional arrangements for engineering and trade goods exchanges for equipment sales.

The Chinese have in the past been very reluctant to pay for engineering, even in feasibility studies. However, in large projects, engineering is absolutely necessary and in many cases concessional financing arrangements have been created to capture the engineering phase.

Countries competing in the supply of mining services and equipment offer flexible financial arrangements and are joint-venturing equipment designs into China. Canada must therefore be prepared to offer similar arrangements if we are to achieve significant levels of sales, although in certain specific instances China is willing to pay directly for needed technology.

C. Prospective future exports

In accordance with its mandate the Task Force has concentrated on prospects of Canada's electric power sector for further exports in China. Consideration has also been given to the export prospects of other sectors since the potential demands for government assistance should bear some relationship to anticipated levels of future exports.

Some indication of exports of the mining sector products in the recent past and the potential level of exports in future years is provided in Table 2.

i) Commodities: Since Canada has been China's main supplier of minerals and metals over the past five years, it is assumed that the same level of exports will be maintained until the middle of the next decade. This corresponds to the lead time necessary for large mineral projects to start to impact on markets. Also, it is assumed that with expanding industrialization, increased production will not satisfy local requirements. For the latter part of the next decade, the products of new mining development projects and other market factors should reduce the need for imports of minerals and metals and the share of Canada's exports.

ii) Services and Equipment: The Chinese interest in several sub-sectors of the Canadian industry is the basis for considering that the value of services and equipment exported to China can offset the loss of commodity sales. During the period of rapid industrial expansion, it is reasoned that one major project of an approximate value of $200 million may be initiated each year provided funds can be generated. This is indicated to increase progressively with industrial expansion to culminate in the second half of the next decade.

These projections are necessarily speculative, but serve to illustrate a level of exports which might be achieved if China's economy progresses as expected and Canadian exporters are determined, competitive and well supported by programs of the federal government. Such a level of exports will also depend on Canadian willingness to increase imports from China.

4- POSSIBLE FEDERAL ROLE IN SUPPORTING SECTOR EXPORTS

A- Outline of Anticipated Industry Demands for Assistance

A-1 Mining companies

In the Canadian Mining Sector, there are two main groups of corporate producers with respect to the Chinese markets:

i) A small number of medium-to-large companies of international stature with a long history of involvement in activities directly or indirectly dealing with China, its market and industry.

This group of companies has in the past been self-reliant, but with the rapidly increasing complexity of world trade in minerals, they now turn more often to governments for assistance. Furthermore, even these large multinational corporations are still suffering from the heavy debts generated during the last recession and are limited in their ability to consider new investment opportunities. Their main concern today is to stabilize their Canadian operations before expanding internationally.

It is these corporations which often represent the leading edge of Canadian production technology and might be of most interest to the Chinese.

ii) The second group comprises the medium-to-small size corporations including the junior mining companies which represent an important area of activity across Canada. It is characterized by its aggressiveness and enterpreneurship with a minimum number of personnel.

This second group does not have the financial resources or stature to compete on the international scene. Furthermore, the main focus of their attention has been the local environment, where Canadian legislation and tax incentives have allowed them to operate in a favorable climate.

To mobilize these important resources in the international scene would necessitate the formation of consortia with one of the major producers, at least initially, to establish their credibility.

A-2 Service Industry

The service industry was very active and developed in Canada during the rapid mineral sector growth of the 1960's and 1970's, when mining projects were being announced and developed faster than the in-house staff of the major producers could design them. Now that the rate of development has slowed, the future of the service industry may be in doubt, as mining companies revert to reliance on in-house staff, and even to offer their services to others on a fee basis, in competition with the consultants.

This industry depends to a great extent, on government related contracts to survive. However, beyond the nineties, the consulting companies may have to look for turnkey projects in association with producers if they expect to succeed against international competition. Thus, closer links with producers may be necessary for success in competing with major mining companies. Already the major mining companies operate through consulting branches or subsidiaries.

This formula has been used successfully by the Europeans for the past two decades.

B- Recommended Federal Strategy

B-1 Strategy

The mining sector is highly technical and difficult to administer under general programs. Throughout the world, however, the private sector plays a more limited role than in North America, and governmental or para-governmental institutions often desire to deal on a government to government basis. To them, it is an assurance of substance and responsibility should difficulties arise. As an example, Finland works through a company (VTT), either wholly supported by the government or as a mixed enterprise whose role is to enter into agreements with government-owned or run agencies. This state corporation enters into joint venture consortium agreement with the appropriate private firm(s) best qualified to succeed in the projects. Activities of Finnish companies suggest that this approach has been successful in the international market place.

Canada encourages its private sector to become active internationally and it has a multiplicity of financing programs to encourage such efforts. For the international scene, fragmentation should be discouraged since it results in inefficiency and is unlikely to bring the desired results. In practice, all sound corporate structures with adequate sources of financing should be considered, provided the project cost/benefit ratio is within the limits of sound financial investment. In general, few Canadian companies would have the strength to independently undertake projects exceeding capital investments of more than $500 million.

In China's mining sector as with other sectors, concessional financing should be made available only for projects which are demonstrably economically and technically viable, taking into account their overall economic impact. There are many opportunities around the world to make use of the concessional financing available from Canada, and projects should be carefully selected on the basis of projected return to Canada and its mineral industry.

China's mineral deposits are often geologically similar to those of Canada, and China has made no secret of its interest in Canada's mineral technology. However, Canadian companies tend to be frustrated by the long lead times and uncertain financial terms which appear to be almost inevitable in project negotiation in China. The essential role of the Federal government should be to assist in bringing the two sides together and in reducing bureaucratic delays in project approval.

The various Chinese delegations that have visited Canada have provided some identification of their areas of interest relative to corresponding areas of excellence in Canada. Projects in these areas would be worth pursuing in order to optimize the chances of success of interventions and thus make accessible to the Canadian private sector, business opportunities of mutual interest to both countries. These areas are:

1. Technical and scientific fields;
2. Mineral exploration technology and equipment;
3. Mining, processing and smelting of copper, lead and zinc ores, concentrates and metals;
4. Mining and processing of gold ores;
5. Coal mining and processing.

As an overall strategy, the following should be considered:

1. The preparation of a comprehensive mineral sector review to better define the areas of mutual interest, with particular emphasis on the priority areas. Other areas may be considered according to the level of expertise available in Canada or the level of Chinese interest;

2. The creation of functional mechanisms within the existing government/industry structure for the purpose of:

   i) identifying projects of interest to the Canadian private sector which are likely to receive approval by Chinese authorities;

ii) fostering the formation of groups or consortia having a capability base adequate to undertake complex projects;

iii) assisting in the successful conclusion of contracts;

iv) in some cases, acting as financial guarantor for some priority projects.

The role of the Federal Government may imply a certain degree of financial responsibility in certain cases.

TABLE 1 - ORGANIZATION OF THE NONFERROUS INDUSTRY

- State Council
  - Ministry of Metallurgical Industry
    - Nonferrous Metals Department
      - General Planning Office for Nonferrous Metals Smelting
      - China Nonferrous Metals Import-Export Corp.
      - China Nonferrous Metals Industrial Corp.
        - Silver-Nonferrous Metal Corp. (Gansu Province)
        - Shaanxi Jinduipo Molybdenum Corp. (Shaanxi Province)
        - Guangdong Nonferrous Metals Prospecting Corp. (Guangdong Province)
        - Jiangxi Copper Corp. (Jiangxi Province)
        - Guangxi Prospecting Corp. (Guangxi Zhuang Autonomous Region)
        - Beijing Nonferrous Metals Industrial Corp. (Beijing)
        - Yunnan Tin Corp. (Yunnan Province)
        - Jinchuan Gold Corp. (Gansu Province)
        - Shenyang Corp. (Liaoning Province)
        - Nanning Corp. (Guangxi Zhuang Autonomous Region)
        - Directly-administered enterprises (236, of which 132 are production companies)
      - China Nonferrous Metals International Engineering Corp.
      - China Huaxing Tungsten Corp.
  - (Directly administered organizations)
    - State Administration for the Nonferrous
      - China Association for the Nonferrous Metals Processing Industry
    - National Committee on Mineral Reserves

(NOTE: The names given here are literal translation from the Chinese; variants are possible)

(From: China Newsletter No. 54)

TABLE 2

PAST AND PROSPECTIVE EXPORT SALES TO CHINA					
	AVERAGE ANNUAL EXPORTS ($ MILLION/YEAR)				
SECTOR	RECENT PAST 1983-1985	PROSPECTS IN FUTURE 1990	1995	2000	REMARKS
MINING					
Commodities (excluding potash)	300	300	300	200	Some mining equipment may be included in automotive and industrial equipment.
Services	N/A	25	50	50	
Equipment	10	75	150	200	
TOTAL OF MINING SECTOR	310	400	500	450	

TABLE 3

CHINA PRODUCTION OF SELECTED METALS
(Canadian Production)

	1982	1983	1984
1- Copper (Thousands of short tons)			
Mine Production	192.9 (675.2)	192.9 (719.9)	220.0 (785.3)
Smelter Production	226.0 (414.2)	215.0 (427.6)	235.0 (485.0)
Consumption	440.9 (174.8)	451.9 (215.2)	470.8 (254.7)
2- Lead (Thousands of short tons)			
Mine Production	176.4 (376.1)	176.4 (277.2)	187.0 (343.2)
Refined Production	192.9 (263.3)	215.0 (266.7)	215.0 (260.4)
Consumption	237.0 (102.9)	242.5 (103.5)	242.5 (127.1)
3- Zinc (Thousands of short tons)			
Mine Production	176.4 (1,310.8)	187.0 (1,179.2)	187.0 (1,338.9)
Refined Production	182.0 (564.2)	193.0 (680.2)	193.0 (752.9)
Consumption	286.6 (132.7)	330.7 (159.2)	331.0 (160.8)
4- Aluminium (Thousands of short tons)			
Production of bauxite	2,149.5 (--)	2,094.4 (--)	2,100.0 (--)
Production of alumina	881.8 (1,241.9)	881.8 (1,229.8)	881.8 (1,240.8)
Production of aluminium	407.9 (1,179.4)	440.9 (1,202.9)	460.0 (1,347.0)
Consumption	639.3 (251.9)	683.4 (325.2)	639.0 (325.2)
5- Molybdenum (Thousands of short tons) Production	4,400.0 (36,290.0)	4,409.0 (22,474.0)	4,400.0 (23,953.0)
6- Nickel (Thousands of short tons) Production	14.9 (97.6)	16.5 (137.8)	16.5 (192.0)

TABLE 3 (con't)

	1982	1983	1984
7- Antimony (Short tons) Production	13,228.0	14,330.0	13,700.0
	(502.0)	(500.0)	(562.0)
8- Tungsten (Metric tons)			
Mine Production	11,180.0	24,990.0	18,803.0
	(3,580.0)	(300.0)	(3,500.0)
Smelter Production	183.0	65.0	78.0
9- Silver (Short tons)			
Mine Production	77.2	88.2	85.7
	(1,448.0)	(1,319.5)	(1,290.8)
10-Gold (Thousands of troy ounces)			
Mine Production	1,800.0	1,850.0	1,900.0
	(2,081.3)	(2,363.5)	(2,614.4)

Table 4 lists the production of other commodities not included in the non-ferrous metals.

TABLE 4 - CHINA'S MINERAL PRODUCTION (000 t)

	1982	1983	1984
Pig iron	35,510	37,380	39,980
Crude steel	37,160	40,020	43,370
Rolled steel	29,020	30,720	33,710
Ammonia	15,463	16,771	17,000
Calcium carbide	1,675	1,808	1,900
Caustic soda	2,073	2,123	2,230
Cement	95,200	108,250	121,080
Fertilizers:			
Nitrogenous	10,219	11,094	12,260
Phosphatic	2,537	2,666	2,520
Potassic	25	29	40
Salt	16,380	16,130	16,334
Soda ash	1,735	1,793	1,880
Sulphuric acid	8,175	8,696	8,130
Coke	33,110	34,510	36,080
Coal	666,000	715,000	772,000
Crude oil	102,120	106,070	114,530
Natural gas (million m^2)	11,930	12,210	12,400
Mining equipment ($ million)	158	201	230

Tables 5 and 6 give the list of exports and imports for the year 1984. They illustrate China's needs if it is to meet domestic demand, actual and future.

TABLE 5 - CHINA'S MINERAL EXPORTS 1984 (t)

Antimony	16,727
Aluminium products	5,772
Copper products	7,777
Steel products	223,223
Tin	2,736
Tungsten:	
Metal	78
Ore	18,803
Zinc	1,431
Cement	174,119
Salt	1,038,000
Coal	7,212,000
Coke	349,000
Crude oil	20,747,000
Oil products	5,538,000

TABLE 6 - CHINA'S MINERAL IMPORTS 1984 (t)

Aluminium	252,000
Copper	264,000
Iron ore	5,720,000
Steel products	12,036,000
Zinc	225,000
Cement	3,022,000
Potash	851,351
Coal	2,379,000

COOPERATION PROJECTS IN NONFERROUS METALS DEVELOPMENT

FOREIGN PARTNER	TYPE OF COOPERATION	PROJECT	INVESTMENT	CHINESE PARTNER	DETAILS	DATE OF AGREEMENT
Metallgesellschaft AG, Lurgi (West Germany)	Export of plant	Nonferrous metals plant	Several billion DM		Construction of 22 copper, lead and other nonferrous metals plants in several Chinese provinces, and conduction of joint exploration and development of nonferrous metals resources as well as joint sales operations for the products over 15 years	June 1978
Sumitomo Metal Mining, Sumitomo Heavy Industries	Export of plant	Guixi copper smelting plant	About $150 million	Guangxi Mining Corp.	Guixi Copper Smelter, which was established in Spring 1982, is to turn out 90,000 tons of copper billets and 360,000 tons of copper sulfate concentrate anually on the hasis of ore from the Dexing mine	November 1978
Lurgi (West Germany)	Production participation	Development of copper mine	About DM 1.5 billion		A copper mine, probably in Anhui Province, is to be developed by 1985 in a joint project on a products participation basis	December 1978
Fluor Corp. (U.S.)	Development cooperation	Development of Dexing copper mine	About $0.8 billion	Dexing Copper Mining (Jiangxi Province)	Completed in 1983. The world's largest copper mine, with a daily capacity of 193,000 tons of copper ore concentrate	December 1978
Nippon Light Metals	Export of plant	Guizhou aluminum factory	About $0.8 billion	Guizhou Aluminum works (Guizhou Province)	Export of an aluminum plant. Construction work completed in April 1983	December 1978
Charter CJB Mineral Services, Centrust Engineering (U.K.)	Development cooperation		£1 billion		Development project for nonferrous metals	January 1979

COOPERATION PROJECTS IN NONFERROUS METALS DEVELOPMENT

FOREIGN PARTNER	TYPE OF COOPERATION	PROJECT	INVESTMENT	CHINESE PARTNER	DETAILS	DATE OF AGREEMENT
German Government	Exploration cooperation	Exploration of mineral resources in Hunan Province		Chinese Government	A joint Chinese-West German geological research team is due to explore tantalum, niobium and tin resources in Hunan Province. The project is financed by the two countries. West Germany to provide China with experts and part of the necessary equipment. The two countries agreed on a three-year joint geological survey of 2,000 square kilometers in the province	February 1980
French Government	Exploration cooperation	Exploration of mineral resources in Xinjiang		Chinese Government	An accord by French Geological and Mineral Resources Bureau and the Chinese Government. Joint projects centred on exploration of tungsten and chromium resources in Xinjiang. The French side will also train Chinese specialists of a Chinese geological research institute to be established in Beijing	July 1980
Japan International Cooperation Agency, Metal Mining Agency of Japan, Export-Import Bank of Japan	Exploration cooperation	Detailed survey of Anqing cooper mine (Anhui Province)	About Y2 billion	Ministry of Metallurgical Industry	Cooperation through assistance with detailed exploration. 850 meters of drift work and 4,200 meters of boring by July 1985	August 1980
Allis-Chalmers (Canada)	Export of plant	Yingping copper mine in Jiangxi Province			Export of a washing plant for Yingping coppermine, Jiangxi Province	September 1980

COOPERATION PROJECTS IN NONFERROUS METALS DEVELOPMENT

FOREIGN PARTNER	TYPE OF COOPERATION	PROJECT	INVESTMENT	CHINESE PARTNER	DETAILS	DATE OF AGREEMENT
CRA, CSR (Australia)	Exploration cooperation	Exploration of the mineral resources in Hainan Island			Mineral resources exploration on Hainan Island	July 1981
Science and Technology Agency	Exploration cooperation	Beijing Steel Academy		Beijing Steel Academy	Technology for smelting of pig iron including niobium, manganese and phosphorous. Completed in March 1984	June 1981
Wheeling-Pittsburgh Stell (U.S.)	Joint venture	Export of nonferrous metals		China National Metals and Minerals Import-Export Corp.	Establishment of Wheeling Sinometals International Inc. which is to engage in export of iron ore, bauxite, titanium and aluminum from China	May 1982
Furukawa Co.	Technology cooperation				Provision of knowhow for recovery of sulfurous acid from derivatives of nonferrous metals ores	October 1982
Industrial Science and Technology Agency	Technology cooperation			State Economic Commission Academy of Geological Sciences (Mineral Resources Division), Nanjing Geological & Minerals Research Institute	Joint exploration projects for rare metals resources, mainly tungsten	October 1982
Nippon Tungsten	Export of plant (including technology transfer)	Ganzhou tungsten and molybdenum ore plant in Jiangxi Province	About Y260 million	Ganzhou tungsten and molybenum plant in Jiangxi Province	Production plant for tungsten filament; to go into capacity production in 1984; 200 million meters (not clear whether daily, monthly or annually)	February 1983

COOPERATION PROJECTS IN NONFERROUS METALS DEVELOPMENT

FOREIGN PARTNER	TYPE OF COOPERATION	PROJECT	INVESTMENT	CHINESE PARTNER	DETAILS	DATE OF AGREEMENT
Mitsubishi Light Metal Industries, Ryoka Light Metal Industries	Technology cooperation	Qingtongxia Steel Plant in Ningxia Hui Autonomous Region		Qingtongxia Steel Plant in Ningxia Hui Autonomous Region	Transfer of aluminum smelting technology over four years	March 1984
Kobe Steel	Joint venture	Zhuoshen Nonferrous Metal Processing and Equipment Corp. (name of the JV company)	$3 million	China National Nonferrous Metals Industry Corp. (Zhuoxian County aluminum factory)	An engineering firm conducting comprehensive design and construction of aluminum and other nonferrous metals plants. The joint project term expires in 10 years	July 1984
Japax	Development cooperation	Inner Mongolia, Baiyun Iron Mine			Development and utilization of rare metals resources	September 1984
Nippon Light Metals	Export	Aluminum plant in Guizhou Province		Guizhou Aluminum Plant	A total of 71,000 tons of alumina supplied for the year 1984	June 1984
Corona Kogyo	Technology cooperation	Liaoning Yingkou No.3 Radio Factory (audio plant)	About Y300 million	China National Technical Import Corp.	Provision of surface preparation knowhow for aluminum products	October 1984

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FIVE YEAR SUMMARY OF PRINCIPAL CANADIAN EXPORTS TO CHINA, 1981-1985

	1981	1982	1983	1984	1985	Five Year Total	% of Total
	$ million						
Wheat	686.6	736.6	916.9	602.2	445.6	3,387.9	53.1
Aluminium, including Alloys	3.3	190.2	139.1	70.5	98.5	501.6	7.9
Wood Pulp and Similar Pulp	88.5	89.1	118.8	64.5	66.0	426.9	6.7
Fertilizers and Fertilizer Materials	61.6	7.8	59.4	93.1	38.5	260.4	4.1
Copper and Alloys	-	-	135.2	67.6	40.9	243.7	3.8
Newsprint	37.3	10.5	5.4	26.2	98.7	178.1	2.8
Synthetic Rubber and Plastic Materials	33.6	49.4	15.8	23.8	65.4	188.0	3.0
Zinc, including Alloys	-	20.3	45.3	47.7	46.5	159.8	2.5
Sulphur	28.1	41.4	24.1	28.1	30.0	151.7	2.4
Crude Wood Products	0.8	19.5	32.5	57.1	26.5	136.4	2.1
Lumber, Softwood	4.2	9.1	39.4	32.5	30.0	114.9	1.8
Hard Spring Wheat Flour	-	-	6.3	31.6	12.8	50.7	0.8
Plate, Sheet and Strip, Steel	4.8	26.9	6.5	0.9	0.1	39.2	0.6
Paper Board	5.0	1.4	4.5	12.1	13.4	36.4	0.6
Barley	15.3	0.3	14.9	4.5	-	35.0	0.6
Other Motor Vehicles	-	-	2.7	-	26.3	29.0	0.5
Textile and Related Fibres	5.1	4.0	6.2	1.5	11.6	28.4	0.4
Organic Chemicals	1.0	1.3	0.3	6.7	17.3	26.6	0.4
Other Telecommunications and Related Equipment	1.0	1.4	0.6	3.7	19.8	16.6	0.4
Aircraft complete with Engines	-	-	-	-	16.4	16.4	0.3
Electric Lighting and Distribution Equipment	0.4	-	-	0.9	10.0	11.3	0.2
Sub-total	976.6	1,209.2	1,573.9	1,175.5	1,114.3	6,048.9	94.7
Miscellaneous	41.0	18.7	33.3	96.6	14.5	355.2	5.3
TOTAL	1,017.6	1,227.9	1,607.2	1,236.5	1,259.3	6,384.1	100.0
By Category							
Live animals	0.7	-	-	-	-	0.7	0.01
Food, feed, beverages and tobacco	709.8	739.1	938.6	640.3	464.4	3,492.2	54.7
Crude materials, inedible	34.1	68.8	77.0	135.1	110.5	425.0	6.7
Fabricated materials, inedible	255.1	413.3	579.1	465.0	530.2	2,242.7	35.1
End products, inedible	17.7	6.5	12.5	26.1	152.2	215.0	3.4
Other	-	0.2	-	5.6	1.7	7.5	0.1
TOTAL	1,017.6	1,227.9	1,607.2	1,272.1	1,259.3	6,384.1	100.0

Source: Statistics Canada

FIVE YEAR SUMMARY OF PRINCIPAL CANADIAN IMPORTS FROM CHINA, 1981-1985

	1981	1982	1983	1984	1985	Five Year Total	% of Total
	$ million						
Outerwear, except knitted	36.2	38.5	56.0	80.9	78.3	289.9	20.6
House furnishings	27.2	24.9	29.8	28.4	25.1	135.4	9.6
Miscellaneous apparel and apparel accessories	14.7	16.0	21.1	29.2	46.3	127.3	9.0
Outerwear, knitted	7.4	12.9	22.0	40.3	34.6	117.2	8.3
Broad woven fabrics, cotton	17.0	13.5	13.7	19.5	25.7	89.4	6.3
Miscellaneous vegetables and vegetable preparation	9.8	14.8	16.0	17.4	24.7	82.7	5.9
Other vegetables and vegetable preparations	9.8	14.8	15.9	17.4	24.7	82.6	5.9
Broad woven fabrics, mixed fibres	11.6	11.3	12.4	18.6	22.9	76.8	5.5
Other fresh vegetables	9.7	10.6	12.7	10.7	13.7	57.9	4.1
Nuts, except oil nuts	9.7	10.6	12.7	10.7	13.7	57.4	4.1
Miscellaneous Oil Seeds, oil nuts, oil kernels	32.8	3.2	2.0	7.4	0.9	47.1	3.3
Kitchen utensils, cutlery, tableware	6.0	7.0	5.0	6.0	6.0	30.0	2.1
Footwear	5.5	5.3	4.4	3.8	5.3	24.3	17.3
Organic chemicals	3.0	4.1	4.8	5.3	5.1	22.3	1.6
Games, toys and childrens vehicles	0.6	0.8	1.1	1.7	17.7	21.9	1.6
Other end products, inedible	2.5	2.5	2.8	3.6	8.6	20.0	1.4
Other personal household goods	2.2	2.0	1.7	2.7	7.9	16.5	1.2
Other basic hardware	-	-	2.3	7.4	2.9	12.6	0.9
Alumiunium ores, conc. and scrap	-	0.4	0.9	5.6	5.3	12.2	0.9
Fish and marine animals	-	-	1.0	1.9	6.1	9.0	0.6
Sub-total	205.7	194.0	238.3	318.5	375.5	1,332.0	94.6
Miscellaneous	14.3	9.7	7.5	17.0	28.0	76.5	5.4
TOTAL	220.0	203.7	245.8	335.5	403.5	1,406.5	100.0
By Category							
Food, feed, beverages and tobacco	26.2	32.8	35.3	36.6	54.7	185.6	13.2
Crude materials, inedible	34.1	4.3	4.7	13.9	11.7	68.7	48.8
Fabricated materials, inedible	45.6	42.6	44.2	66.2	79.4	278.2	19.8
End products, inedible	110.4	119.3	156.6	213.0	250.7	850.0	60.4
Other	3.7	4.7	5.0	3.8	7.0	24.2	1.7
TOTAL	220.0	203.7	245.8	333.5	403.5	1,406.5	100.0

Source: Statistics Canada

APPENDIX E

TASK FORCE ON CHINA POWER SECTOR

SECTOR BRIEF

FOR

THE OIL AND GAS SECTOR

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June, 1986

EXECUTIVE SUMMARY

RESERVES

China possesses sufficient established recoverable reserves to be of interest to the multinational oil companies. Current estimates are as follows:

Oil Onshore	-	1984 estimates place recoverable reserves at around 40 billion barrels.
Oil Offshore	-	Estimates vary widely but recoverable reserves are expected to be substantial.
Gas	-	The latest estimates hover around 31 trillion cubic feet although this is based on limited exploration.

PRIORITY

Foreign exchange earned through the export of oil and petroleum products represents 20 to 25% of all foreign exchange earned (approximately US $ 4.7 billion). This figure is expected to decline in light of the recent dramatic downturn in oil prices; however the Chinese are insulated to a degree as 60% of their exports go to Japan on long-term contracts. The remaining 40% will continue to be vulnerable to world market fluctuations.

Oil also contributes extensively to domestic industrial growth.

The exploration, development, production, refining and transportation of oil and gas will continue to remain a priority and because the industry generates foreign exchange, it will continue to have access to foreign currency to fund these activities.

CAPABILITIES

China has extensive manufacturing capability for oilfield equipment although much of it is based on out-dated technology. As well, China is the second largest refiner in Asia. There are, however, considerable gaps in services, management, training and equipment.

OPPORTUNITIES FOR CANADA

The Canadian "oil patch" is considered to be world-class technically and internationally competitive. Many of the problems facing China have been solved in the Canadian context. These include long distance transportation, heavy oil recovery, sour gas processing, difficult reservoir management, harsh environmental conditions, etc.

RECOMMENDATIONS

Canadian efforts to participate in the Chinese oil and gas sector would benefit from the stepping up of standard trade promotion activities.

We recommend the federal government address the following issues:

1. Improving access to timely information concerning project priorities, letting of concessions, and appropriate Ministry and oilfield contacts.

2. Increase the reporting and analysis from the post on energy policy development. For example, tracking the onshore contracting process, the establishment of the National Natural Gas Corporation, etc.

3. Facilitate the coordination of services provided by various federal departments, and if possible, the provinces.

4. Increase the Canadian presence in the Chinese oil and gas sector.

5. Review program assistance available to the Canadian private sector for its initiatives in China with a view to providing a more focussed and tightly targeted approach.

OIL AND GAS SECTOR BRIEF

TABLE OF CONTENTS

1. OPPORTUNITIES IN CHINA

A. SECTOR ORGANIZATION AND RESPONSIBILITIES

A.1 Overview of Production and Resources

Oil was first discovered in China in the early 1990's, but by the late 1940's production only amounted to 120,000 tonnes a year. The breakthrough came in 1959 with the discovery of the Daquing Oilfield in Heilongjiang Province. Since then other oil and gas producing areas have been developed, and production in 1984 was a record 114 million tonnes of oil (about 2.3 million barrels per day) and 12 billion cubic metres of gas. The targets for 1990 are 150 million tonnes of oil (5% increase per year) and 20 billion cubic metres of gas (9% increase per year). For the year 2000, the targets are 200 million tonnes of oil and 25 billion cubic metres of gas.

Currently oil provides about 20% of China's commercial energy requirements while gas provides only 3%. Coal is the dominant energy source meeting 70% of requirements with hydropower supplying the remainder. The recoverable reserves of oil onshore in China have been estimated at 5.5 million tonnes (40 billion barrels) by international experts. New in-place reserves on land amounting to 6 billion barrels were verified in 1983 and 1984 as a result of increased investment and the introduction of foreign technology. Gas reserves have not been explored in detail and the level of reserves is uncertain with most estimates in the 30 trillion cubic foot range. However, the gas pipeline network is being developed and more attention is being given to gas as an important part of China's energy supply.

In order to meet the production targets for the year 2000, operations at existing fields need to be improved and exploration and development of new fields must be increased. Production from the major onshore oil fields has peaked and current efforts are designed to maintain production levels through enhanced recovery schemes, infill drilling, and installation of modern equipment. This is likely to be effective for the next five years but it is essential that more fields be brought on stream if targets are to be met. Some recent discoveries offer encouragement. For natural gas, the target production level of 25 billion cubic metres for the year 2000 should not be difficult to reach. In its recent report, the World Bank suggests that gas production could reach 35-40 billion cubic metres in 2000.

A.2 Policy and Objectives for Onshore Petroleum

China is focussing resources on development of onshore petroleum for several reasons. Among these are the failure to find commercially exploitable offshore oilfields and the realization that hydroelectricity and coal resources cannot be developed fast enough to meet short and medium term energy demands. China also wishes to maintain its exports of crude oil and refined products which currently represent about 20-25% of foreign exchange earnings.

The major onshore fields have reached maturity and the focus of activity is enhanced recovery and increased exploration in the peripheral areas. At Daqing, China's largest field, these efforts have resulted in a stabilization of production at just over one million barrels per day or half of total production in the country. The field was expected to start declining in the mid-1980's but current forecasts indicate that this level can be maintained until 1990. Similar efforts are underway at the other major fields in Eastern China. At the same time exploration is increasing in frontier areas and the substantial heavy oil reserves are being developed.

The Ministry of Petroleum Industry (MPI) recognizes the problems associated with the onshore fields and is addressing them. One of these is the bureaucratic management system and the over-centralized decision-making process. To overcome this, the oil administrations (see next section) are being given more authority. The problems of underinvestment and obsolete equipment are being addressed by increasing spending on exploration and development, and by importing equipment. Problems such as falling well productivity and increased water cuts are more difficult to address but MPI is trying to upgrade its technical and professional capabilities through the use of foreign technologies.

The current low price for crude oil will affect China's foreign exchange earnings. However, China is insulated from the full effect by the fact that 60% of its exports are covered by various long-term agreements (mainly with Japan) extending until 1990. Oil that is exported to Singapore, however, is vulnerable to world prices and subject to wide price fluctuations.

A.3 Institutional Structure

The onshore oil and gas industries are the responsibility of the Ministry of Geology and Mineral Resources (MGMR) and the Ministry of Petroleum Industry (MPI). MGMR is responsible for geologic and seismic surveys for resource location and recently has become more aggressive in exploratory drilling. MPI is responsible for exploration, development, production and transportation of oil and gas. Both Ministries have associated companies and research institutes. The basic structure of the two Ministries is shown in the following charts taken from the China Business Review (January - February 1985). It is worth noting that the Geological Survey of Canada signed a Memorandum of Understanding with MGMR and cooperation in petroleum geology is one area of focus.

Actual oilfield operations are managed through 15 regional Oilfield Administrations or Management Bureaus. MPI provides coordination and planning at the national level and allocates the investment, foreign exchange, and other resources needed to fulfill plans. The China Petroleum Planning and Engineering Institute (CPPEI) provides research and engineering capabiity to MPI and to the Oilfield Administrations but each regional administration also has its own research institute for geology and engineering. Each administration also has drilling, service, operating, construction and other branches, some of which are further broken down to field level units.

Recently, MPI indicated to a delegation from Japan's Natural Gas Mining Association that a national gas corporation would be established. MPI requested assistance in developing natural gas in China. This new corporation would also have responsibility for gas pipeline projects.

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Minister: Sun Daguang
1st Vice-Minister: Zhu Xuen
Vice-Ministers: Xia Guozhi
Wen Jiabao
Advisor: Zhang Tongyu

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DEPARTMENTS

- EDUCATION
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- CHEMICAL ENGINEERING
  Miao Shuping
- FOREIGN AFFAIRS
  Yang Zhiling
- GEOLOGIC PLANNING
  Wang Bingkun
- GEOLOGIC AND MINERAL RESOURCES
  *Chen Yuquan**
  *Zhou Weiping**
- GEOPHYSICAL AND GEOCHEMICAL PROSPECTING
  Lin Xuefeng
- HYDROLOGY AND ENGINEERING GEOLOGY
  Zhang Hongren
- MINERAL EXPLORATION ENGINEERING
  Guo Zhenxi
- PETROLEUM EXPLORATION SURVEY
  Xu Baoren
- SUPPLIES
  Jiang Ping
  *Bin Zhaoji**

NATIONAL COMPANIES AND MAJOR RESEARCH INSTITUTES

- CHINA GEOEXPLORATION AND DRILLING ENGINEERING COMPANY

  Guangzhou Marine Geologic Exploration Company

  Shanghai Geoexploration and Drilling Company
- GEOLOGY EXPLORATION, ENGINEERING, AND EQUIPMENT MANUFACTURING COMPANY
- RESEARCH INSTITUTES

  Geologic Remote Sensing Center

  Institute of Exploration Techniques

  Institute of Application of Computer Techniques

  Geology and Mineral Resources (including 7 institutes specializing in specific regions or historical periods)

* Deputy Director

SOURCES: The National Council's Beijing office; US Geological Survey; and National Council files.
Chart prepared by David Denny.

MINISTRY OF PETROLEUM INDUSTRY ORGANIZATIONS AND PERSONNEL INVOLVED IN ON LAND ACTIVITIES

Minister: Tang Ke
Vice-Ministers: Zhao Zongnai
Li Jing
Li Tianxiang

Address:
Liu Pu Kang
Beijing, PRC

DEPARTMENTS

- **FOREIGN AFFAIRS**
  Dou Bingwen
  Liaison: *Tang Zongmei*
  General Research: *Hu Nairen*
  Science & Technology: *Yang Jing'an*
  Imports: *Wu Xunyue*
- **GEOLOGIC EXPLORATION**
  Zhai Guangming
  Physical Surveying: *Pan Shuqi*
  Logging: *Lu Dawei*
- **OIL FIELD DEVELOPMENT**
  *Tan Wenbin, Zheng Hao**
  Technology
  Engineering
  Production
- **DRILLING**
  Chang Hongfa
  *Wang Guanqing**
  *Li Rongzao**
- **PLANNING**
  Zhou Qingzu
  *Cai Shusheng**
- **SUPPLIES**
  Chen Zexuan
  *Zhang Delu.**
- **EQUIPMENT MANUFACTURING**
  Xia Peiqing
- **TRANSPORTATION AND MARKETING**
  Sun Yanzhen
- **CAPITAL CONSTRUCTION**
- **FINANCE**
  Hu Hanbing
- **PERSONNEL AND EDUCATION**
  Chen Hongfa
- **PIPELINE BUREAU****
  Zhu Hongchang

NATIONAL COMPANIES AND RESEARCH INSTITUTES

- **CHINA NATIONAL OIL AND GAS EXPLORATION AND DEVELOPMENT COMPANY**
  President: *Li Tianxiang*
  Vice Presidents: *Dou Bingwen, Li Yuan, Li Xianglu, Fu Zhida*
  Advisor: *Zhang Wenbin*
  Procurement Department: *Wu Xunyue*
- **CHINA NATURAL GAS EXPLORATION AND DEVELOPMENT COMPANY**
  General Manager: *Wang Jingxing*
  Deputy General Manager: *Li Zhaoren*
- **CHINA PETROLEUM ENGINEERING AND CONSTRUCTION COMPANY**
  General Manager: *Shan Yongfu*
- **CHINA SHALLOW SEAS COMPANY**
  General Manager: *Ma Jixiang*
- **PETROLEUM SCIENTIFIC AND INTELLIGENCE RESEARCH INSTITUTE**
  Director: *Hu Jianyi*
- **PETROLEUM EXPLORATION AND DEVELOPMENT RESEARCH INSTITUTE**
  Director: *Hu Xiangyao*

OIL FIELDS WITH DEPARTMENT-LEVEL STATUS

- **DAGANG**
- **DAQING**
  Li Yugeng
- **JIANGHAN**
- **KARAMAY**
  Zhang Yi
- **LIAOHE**
- **RENQIU**
  Hu Liangcai
- **SHENGLI**
  Zhu Wenke
- **SICHUAN**
- **YUMEN**
- **ZHONGYUAN**
  Hu Xiaoyun

* Deputy Department Directors
** located at Langfang in Hebei.
SOURCES: National Council's Beijing office; Foreign Commercial Service, US Embassy in Beijing; National Council files; World Bank reports, and comments by company officials.
Chart prepared by David Denny.

A.4 The Offshore Petroleum Sector

Prior to 1979, China undertook all offshore exploration and development on its own. Thereafter, foreign companies were invited to perform geophysical and seismic work in offshore areas. Initially, China negotiated participation agreements with foreign oil companies but in 1982 regulations were promulgated allowing them to participate in exploring the offshore basins. Contracts signed under these regulations placed the cost and risk of exploration investments on the foreign company. If a commercial field is discovered, the foreign company and the China National Offshore Oil Corporation (CNOOC) will invest jointly in its development. MPI is designated by law as the "competent authority" in charge of the exploration of offshore petroleum resources in cooperation with foreign enterprises". CNOOC is assigned the role of an executive/business agent working with the foreign contractors on a day-to-day basis. A number of agreements are in place with exploration drilling underway. To date no major oil discoveries have been made. A second round of leasing was completed in late 1985 and, while firms remain optimistic about finding oil, expectations on timing and size of discoveries have been toned down. ARCO has discovered a large gas field off Hainan Island and studies of the development options are underway. PetroCanada is a partner in a consortium headed by BP Petroleum which holds offshore petroleum agreements in China.

CNOOC was created in February, 1982 to oversee all work relating to offshore exploration and development. CNOOC is responsible for inviting and evaluating bids and entering into offshore petroleum agreements with foreign oil companies. To do this, it designed "The Model Contract" approved by MPI. It has 30 articles, 4 annexes and a total of 120 pages. This Model provides the framework for cooperation between CNOOC and foreign contractors.

For implementing petroleum contracts and contracts for the construction of offshore installation and facilities, CNOOC has established four regional subsidiary corporations. In addition, CNOOC has set up six specialized companies for logging, geophysical services, navigation, offshore drilling, etc., in joint venture with foreign companies. Further, as of September 1983, Petrochemical Corporation of China has been created and all industries using petroleum products or natural gas as feed stock have been transferred to this Corporation. In addition, all refineries with a capacity of over 1 million tonnes have come under the management of this Corporation. This Corporation is independent of MOPI and reports directly to the State Council.

B. PAST SECTOR DEVELOPMENTS AND PRESENT NEEDS

B.1 Past Developments

As noted in Section A.1, China's oil production increased dramatically in the late 1950's and early 1960's. Before then, production (and exploration) was mainly in the northwest with oil shale accounting for 50,000 tonnes of the 120,000 tonnes of oil production in 1950. The shift in focus to North and northeast China lead to discovery of the Daqing, Shengli, and Dagang fields with production reaching 11.3 million tons in 1965. Further development of these fields and other discoveries increased production to 106 million tonnes in 1979 and to 114.5 million tonnes in 1984. China currently exports about 10% of its production as crude oil or refined products. The foreign exchange earned (about US $4.7 billion in 1985) is 20-25% of the total hard currency earnings. See the attached map for the location of the major sedimentary basins in China.

Natural gas is produced in association with oil and from non-associated reservoirs in almost equal amounts. The gas production was 12.4 billion cubic metres (bcm) in 1984, higher than 1982 and 1983 but below the peak of 14.5 bcm produced in 1979. About 5.3 bcm of gas were produced from non-associated reservoirs in Sichuan basin in 1984. Two recent discoveries of gas indicate that the potential is quite high. In eastern Zhongyuan, preliminary reserves estimates are as high as 100 bcm while the Arco discovery off Hainan Island may have reserves of 280 bcm.

China has refinery capacity of about 2.1 million barrels per day (100 million tonnes per year) with 40 to 50 industrial-scale refineries. This makes China the second largest refiner in Asia after Japan. There are an unspecified number of smaller refineries serving local markets. The China Petrochemical Corporation (SINOPEC), created in 1983, controls 95% of petroleum refining and most petrochemical production based on liquid hydrocarbons. The Ministry of Chemical Industry has 2.5 million tonnes per year of petroleum refining capacity, and responsibility for petrochemical plants using natural gas and coal as feedstocks.

B.2 Present Needs and Sector Constraints

The exploration effort in China has been relatively limited from the standpoint of the level of effort and the practices and equipment used. Most exploration is undertaken near existing oilfields leaving large areas unexplored. Recently China has modernized most of its seismic crews and has acquired computer equipment for processing. However, the average output of 200-400 km per crew per year for the 30 Chinese crews is about one-quarter of that for the 22 foreign crews in the country.

Drilling equipment is outdated and operated inefficiently. Most of the 700 rigs are light to medium rigs with capacity of less then 3000 metres. The rigs are not sufficiently mobile and time is wasted on moving, rig-up and tear-down activities. Effective drilling time (rotating bit time) is about 30-35% of total rig time, about half of international standards.

Production practices are very basic with water injection being used almost universally although not all reservoirs can be effectively drained using this technique. Hydraulic fracturing is also common but indiscriminate use can cause reservoir problems. Reservoir management programs are lacking and reservoir computer models are not extensively used.

MOPI is planning to improve exploration effectivenes by updating its equipment and practices. Changes in production techniques are not evident yet although the CIDA Technical Cooperation Project will address production problems in two fields which are typical of the North China Basin. One is a gas-condensate field, the other a waxy crude oilfield. (See Section 2.C for a description.)

The sectoral organization has created some problems. Communication is poor between the Petroleum Administration Bureaux and equipment is not transferred to areas where it can be used effectively. The World Bank has recently suggested that these regional groups be given more autonomy in managing exploration and production activities including contracting for services from domestic or foreign suppliers.

Transport of crude oil is primarily by pipeline with products moving by rail. Studies are underway for petroleum product pipelines to relieve congestion on some rail lines. For natural gas development, a more extensive pipeline network is needed. Costs for pipelines from hydrocarbon reserves that may be discovered in the western basin are an important element in development decisions.

The current strategy for oil is to acquire more sophisticated equipment and technology. Also, legislation is being considered to permit international oil companies to explore in certain onshore areas. It appears that the "Model Contract" approach used in the offshore areas will be abandoned in favour of bilateral negotiations. Full implications have yet to be felt as only one onshore exploration contract, with an Australian firm, has been signed. A Canadian firm is reported to be close to an agreement. Although equipment upgrading is important, especially for exploration and drilling in remote and geologically complex areas, improved management of reservoirs is essential to maximize recovery rates. This will require laboratories and services for applied research as well as better training programs for field personnel.

For natural gas, the primary problem is the lack of a systematic evaluation of reserves, production capability, and market potential. In order to achieve the lowest cost of gas, it will be necessary to perform this study and establish a long-term investment plan which would include exploration, development, gas processing, and transport and distribution facilities. CNOOC is currently conducting such a study in Southern China to determine the best options for developing the reserves off Hainan Island.

In the refining sector, the problems relate to the characteristics of the crude oil and the quality control for production. Most Chinese crudes are heavy and have a high wax content. Primary yields of light products are low and asphalt production is also low. Secondary refining (cracking) is necessary to produce the required yield of light products. Most refinery equipment is manufactured in China although temperature and pressure conditions in cracking operations require imported equipment from USA, Japan, or Western Europe. In the next 15 years, refineries will be more concentrated to permit better quality control for end products. Instrumentation wil need to be improved and transport sytsems expanded. Decisions regarding further secondary processing will have to be made in light of such factors as increased trade of petroleum products, higher demand for distillates, substitutability of coal and fuel oil, and relative prices of various energy sources.

C. ANTICIPATED SECTOR INVESTMENTS, 1986-2000

The World Bank estimates that annual investment requirements for exploration and development of oil and gas reserves will average Y 6-8 billion for the next 15 years. Under the Sixth Five-Year Plan, the annual average was Y 3.1 billion of which 70% was for development and 30% for exploration. Equipment, material, and service imports might require US $15-20 billion over the same period. In the refinery sub-sector, the World Bank did not give a total investment requirement estimate but stated that additional cracking capacity to meet distillate demand would cost about US $ 15 billion between 1986 and 2000 unless crude oil characteristics change. No estimate was made of the requirements for pipelines and distribution systems.

D. MAJOR PROJECTS OF COMMERCIAL INTEREST TO CANADA

Identifying major projects in the oil and gas sector is difficult since, to a large extent, the size of a project depends on the success of an exploration program. In addition, development of an oil or gas field consists of a series of activities and components most of which are service intensive (e.g. drilling, cementing, logging, testing, treating, and completing wells). Capital intensive projects are gas treating facilities (especially for sour gas), pipelines, and refineries.

The breakdown of the costs in the World Bank's Karamay Petroleum Project demonstrates the nature of such investments. Of the total project cost of US $ 753.5 million, foreign costs are US $ 273.3 million (36%). Of this amount, seismic surveys, data processing and well drilling account for US $ 164 million while imported equipment is only US $ 27 million (10% of foreign costs).

In a general sense, regions where large investments will occur can be identified. To transport offshore gas from Hainan Island to markets in Southern China will require a 1000 km pipeline costing about US $ 1 billion. CNOOC will be responsible for this investment. Field development costs are not available. They will be borne by Arco and CNOOC. To develop the known gas resources, investment will be required in Sichuan Province, including gas treating plants. Pipelines will be required in the region. Additions to pipeline systems are also underway in the North China Basin. Investment in developing the heavy oil deposits at Karamay will continue during the period.

These three areas -- gas processing, pipelines, and heavy oil -- are of great interest to Canadian companies which have the proven capability to implement large projects of a similar nature.

2. CANADIAN PETROLEUM AND ASSOCIATED INDUSTRY CAPABILITY AND CAPACITY

A. DOMESTIC MARKET AND PROSPECTS

The importance of petroleum in Canada's economy is illustrated by the fact that four petroleum companies are ranked among the nation's thirteen largest corporations. During the current decade, 24% of industrial income (excluding financial industries) in Canada has been accrued by the petroleum industry. Oil and gas industry revenue was \$ 64 billion in 1984 and exports of petroleum and petroleum products provided \$ 11.4 billion worth of foreign exchange while imports cost \$ 4.9 billion. Cash expenditures of the Canadian petroleum industry are shown in Table 1 attached.

Because of climate, geographical and geological conditions, Canada has developed world-leading expertise in providing petroleum-related goods and services for offshore, severe cold, synthetic oil, heavy oil (bitumen), sour gas, permafrost and conventional conditions. Much of this expertise has direct relevance for China where conditions are similar to those in Canada.

A.1 The Petroleum Exploration and Production Industry

The term "petroleum company" generally denotes a company that explores for, and/or produces conventional oil, non-conventional oil (oilsand, heavy oil), and/or natural gas. Canada has hundreds of exploration and production companies, while in the downstream stages of refining and marketing, the number of active companies is more limited.

(i) Oil

There are over 1,000 Canadian exploration companies which, in 1984, spent \$ 4.8 billion exploring for petroleum in Canada. About two-thirds of this exploration was conducted by Canadian-controlled companies, a proportion which has been increasing through the 1980's as a result of government incentives. Pan Canadian, Norcen, Petro Can, Gulf, Canterra, Bow Valley, Home, Husky and Dome are among the large Canadian-owned explorers and most of these have had some exposure to China.

Some 80% of Canadian oil production comes from Alberta and 13% from Saskatchewan. The vast majority of oil production is conventional crude oil, though non-conventional oil from oilsands, and heavy-oil deposits in Alberta and Saskatchewan, are providing an increasing amount of production. As estimated, recoverable reserves of these non-conventional deposits are perhaps a thousand times greater than Canada's remaining reserves of conventional crude oil, this will obviously be a future area of high production activity. Canada ranks 17th in the world in crude oil reserves and 9th in conventional crude oil production.

The exploration, production, service, consulting and transportation activities associated with the frontier areas in Canada are world-scale and involve the latest technologies. These are relevant to China because of climate, logistical, geographical, and geological similarities.

TABLE 1

Cash Expenditures of the Canadian Petroleum Industry

1984
($ million)

	Provinces	Arctic	Offshore	Canada
Exploration				
Geol. & Geophys.	566	99	92	757
Drilling	1,363	933	1,302	3,598
Land Acquis., rent	1,044	4	-	1,049
	2,973	1,036	1,394	5,403
Development				
Drilling	1,319	30	-	1,349
Field Equip.	845	49	-	894
Enhanced Recovery	234	28	-	262
Nat. Gas Plants	215	-	-	215
	2,613	107	-	2,720
Operating				
Wells	2,573	14	-	2,587
Nat. Gas Plants	632			632
	3,205	14	-	3,219
TOTAL	8,791	1,157	1,394	11,342

Note: The cash expenditure figure of $11.3 billion does not include royalty payments of $6.7 billion.

As a result of recent changes in Canadian energy policy, increased activity is anticipated in those areas where oil can be explored for and produced at costs justified by the world markets. The recent drastic decline in oil prices, combined with the general levelling of prices which has occurred since 1981, has made frontier and other non-conventional oil exploration increasingly uncompetitive, though it has been actively maintained because of the continuance of Petroleum-Incentive Payments. These, however, are scheduled to expire in 1987. Traditionally when the domestic market goes flat, Canadian companies turn to the international arena. The oil patch is no exception and opportunities to export both goods and services are now actively being pursued.

(ii) Natural Gas

Canadian production of natural gas is in the order of 200 million cubic metres per day, of which one-third is exported to the US. The five largest natural gas producers in Canada are Dome, Shell, Petro-Canada, Amoco, and Pan Canadian, and the 25 largest producers account for 70% of daily natural gas production. Ninety per cent of Canadian production comes from Alberta and 9% from British Columbia. Current production of natural gas is far below the level that Canada could produce. An estimated 10,000 developed gas wells in western Canada have been capped pending improved domestic and export market growth.

A.2 The Petroleum Processing Industry

There are currently 13 companies operating some 30 processing refineries in Canada. Canadian crude oil refining capacity is currently around 300 thousand cubic metres per day (compared to 2.5 million cubic metres per day in the US). Canadian refining production includes everything from asphalt to turbine fuel. Ten of the refineries provide feedback to the petrochemical and fertilizer industries which then turn this feedstock into materials such as ethylene, polystyrene, polyvinyl chloride, methanol, and fertilizer. (In western Canada, natural gas and gas liquids are the primary feedstocks for petrochemical and fertilizer plants.)

Canada currently has excess refining capacity.

A.3 The Pipeline Industry

Being the second-largest country in the world, it is not surprising that Canada has world-leading expertise in the petroleum pipeline industry. Over 200,000 kilometres of oil, oil products, and gas pipelines crisscross Canada and this amount is growing daily as natural gas pipeline projects in British Columbia, Alberta, Saskatchewan, Quebec and the Maritimes progress. In view of Canada's huge reserves of natural gas, most recent pipeline construction has been for gas.

The Canadian pipeline industry is dominated by four companies with two of these, Trans Canada Pipelines and Nova Corporation, both having an interest in China. Stelco and Ipsco are two of their major pipe suppliers.

A.4 Petroleum Project Engineering Consulting Industry

Canada's expertise in energy-related project engineering is among the best in the world, with companies such as Lavalin, Monenco and SNC being most prominent in the downstream aspects of the petroleum industry. The Association of Consulting Engineers of Canada (ACEC) 1984 directory lists 56 companies as having specialized expertise in the oil and gas pipeline industry, 45 in the petroleum production industry, 24 in the refining and processing industry, and a further 20 in the oil shale and tarsand extraction and processing industries. Few petroleum engineering firms are members of ACEC and this is especially true for those firms providing services for the exploration, production, and reservoir engineering aspects. Firms such as Sproule Associates, Teknica, and D&S Petroleum Consultants and Tri-Ocean Engineering are not members although they have strong capabilities and are active internationally. Generally, these companies offer services ranging from economic and financial studies, project-design and procurement, to construction management, quality control, training, and process evaluation. The Canadian firms are especially well known for expertise in the fields of reservoir engineering, petrophysics, facility design and computer software.

Historically, Canadian engineering expertise in the oil and gas processing has been below that which existed in other energy-related areas. Although firms have been designing field processing facilities for many years, prior to 1980, Canadian engineering firms had engineered no refineries. However, in recent years, Canadian engineering expertise in these areas has grown in line with the increased presence of Canadian-controlled companies in the refining, processing, and petrochemical industry.

A.5 Petroleum Equipment and Services Industry

(i) Equipment

The demand for oilfield equipment is obviously related to activity levels in the petroleum industry. Figures on exploration and production expenditures, rig counts, and metrage drilled, provide a good indication of future activity in the equipment and services industry. Canadian companies which survived the 1982-83 recession in this industry underwent considerable rationalization and are considered to now be in a much more competitive position than prior to the recession. However, despite some recovery during the past year, the equipment industry is still only operating at 50% capacity, with almost half of its present production dedicated to export markets.

The Canadian petroleum equipment industry has progressed from having virtually no manufacturing presence 20 years ago, to presently supplying half of the Canadian market in addition to the exports. This growth to an industry of over 300 companies has been accomplished largely without the benefit of tariffs as over 70% of imports enter Canada duty-free.

The bulk of the industry is located in Alberta. The most recent survey of the Petroleum Services Association of Canada reported excess inventory of 36%, excess manufacturing capacity of 50%, and excess manpower of 15%. Employment per company ranges from 5-200. While the relatively small company-size increases flexibility and assists the industry in adapting to its cyclical nature, many of the smaller firms often lack both the financial and human resources to carry out R&D and promotional export programs.

ii) Services

The service industry includes companies which provide services related to logging, diving, drilling, cementing, mud logging, testing, seismic interpreting, surveying, etc. Canadian expertise is high in virtually all of these areas.

B. EXPORT MARKET EXPERIENCE

Canada exports about a quarter of its oil production and a third of its gas production and is the largest supplier of gas, and second largest supplier of oil, to the United States. Pipeline consulting services are exported primarily through the international consulting arms of Nova and Trans Canada Pipelines. Processing, refining, petrochemical, and pipeline engineering expertise is exported through many engineering consulting firms. Various specialty service skills are being exported in increasing amounts by drilling contractors such as Challenger International and Bawden Drilling.

B.1 Pipeline Industry Exports

Exports from Canada in the areas of pipeline engineering, design, and construction supervision generally involve Novacorp International, Petrotech Lavalin, SNC, Canuck Engineering and other consulting engineering firms. Novacorp International has been successful in China at securing pipeline engineering contracts.

B.2 Consulting Industry Exports

Canadian consulting engineers generated $ 1.7 billion in revenues in 1984, of which $ 340 million (20%) came from foreign sources. This ranks Canada fourth in the world in engineering consulting exports, behind the US, UK and France.

In addition to pipeline activities, Canadian engineering consulting firms have gained considerable international experience in other petroleum-related areas. For example, a Trinidad refinery site study, a Scotland underground oil storage study, a Venezuelan heavy oil development, a Chilean oil terminal project, an Alaskan exploration platform, and many reserve evaluations and drilling plans, are among the services exported in 1984. These exports have been financed through various means including private sector oil companies, foreign government purchases, international financial institution funding, and national oil companies.

B.3 Petroleum Equipment and Service Exports

Ironically Canadian companies often have more success achieving export sales than domestic sales because of the geographic concentration of the Canadian market, the minimal tariff protection provided to domestic production, the foreign-domination of the domestic client industries, and the foreign dumping and predatory pricing actions which combine to make the Canadian industry an open and attractive market for foreign companies. This type of domestic climate does, however, foster an internationally competitive product. Dreco, Dyer, and Stream-Flo Industries are among some of the larger exporters of petroleum equipment.

While statistics are not available to describe Canadian exports of petroleum services, a number of companies do operate in this area. Some of these, such as Nova and Lavalin have been mentioned in previous sections which overlap into the "service" area. Companies such as Bow Valley, Westburne Drilling, Bawden Drilling, and Challenger International Services Ltd. are active internationally in providing drilling services. Fracmaster and Nowsco are active in exporting well-fracturing services and Caproco in corrosion prevention services. Seismic reservoir delineation and analysis services are offered internationally by D and S, Teknica and Willowglen Systems. Geological mapping services have been sold abroad by firms such as Sproule Associates. Tri-Ocean Engineering and CanOcean (a subsidiary of Novacorp) have designed and supervised construction of offshore production and drilling facilities in the North Sea and other areas.

C. PREVIOUS EXPERIENCE IN CHINA

Canadian exports of petroleum equipment to China were $ 57,000 in 1981 and $ 223,000 in 1982. More recent data is not available through Statistics Canada, however, Alberta government officials estimate that $ 77 million worth of petroleum goods and services were exported to China from Alberta in 1985 and that this figure may grow by 50% in 1986. As estimated, $ 44 million of these exports are in petroleum services and the remaining $ 29 million in equipment. The post in Beijing has estimated that $ 60 million worth of petroleum industry products and technology was exported from Canada to China in 1984.

Major sales to the Chinese market during 1985 included $ 19 million contract by Dyer Equipment of Calgary to supply ten mobile oil well servicing units, and a contract by Novatel, a subsidiary of Nova Corporation, to build the first mobile telephone system in China. While not classified as petroleum equipment, the latter was developed by Novatel to meet the requirements of the remote oil industries in Canada. In early 1985, Novacorp International Consulting won a contract to provide engineering design for two pipelines (a 240 mile gas pipeline and a 155 mile oil pipeline) in China, marking a first time that a Canadian company has been contracted to do onland pipeline engineering design in China. Husky Oil, controlled by Nova, recently won a World Bank contract to do a heavy oil study in China. Nova Corporation has also sold some petrochemicals to the Chinese. Drill Systems of Calgary recently joined the list with the sale of one CSR 1000 reverse circulation mineral drilling rig valued at US $ 575,000.

In the petroleum exploration industry, Petro Canada and Ranger Oil have joined a BP-led consortium bidding on concessions to drill offshore in the South China Sea.

The rapidly increasing presence of Canada in the Chinese petroleum market is further indicated by the fact that some 25 Alberta companies participated in a March, 1986 petroleum show in Beijing. In October, 1986, DRIE will be leading a mission of approximately ten companies to the Karamay, Liaohe, and Shengli oilfields in China. This mission will focus on heavy oil technologies. Chinese officials from the Liaohe oilfield visited Canada in March, 1985.

In addition to these activities CIDA is implementing a Technical Cooperation Project which involves feasibility studies for two separate fields near Beijing. The $6 million project will provide consulting services, training for Chinese specialists in China and Canada, and equipment necessary for testing and data gathering. One field in the Renqui area south of Beijing produces crude oil with a high wax content and the objective is to evaluate alternate production methods which can reduce energy consumption and improve recoveries. The second project is in the Dagang area southeast of Tianjin and involves production from a gas-condensate reservoir. The field is currently experiencing declines in production of gas and liquids and the study will assess means for arresting this decline. Both studies will be used as models for developing similar fields. The project is scheduled for completion by 1989/90.

D. CANADIAN INDUSTRY STRENGTHS AND WEAKNESSES

D.1 Strengths

The Canadian petroleum industry excells in areas pertaining to our hostile environment, difficult geology, inaccessibility of many petroleum regions, and long distances.

For ease, some 15 of these strengths are identified and listed below.

1. All of the "front-end" areas associated with petroleum development. These include reservoir engineering, resource planning, seismic data acquisition and interpretation, and field delineation.

2. Heavy oil production, gathering, pumping, separating, and coalescing.

3. All services required in the development of an oil and gas well. These include fracturing, workover, acidizing, and cementing.

4. Slant-hole drilling and other drilling techniques.

5. All facets of onshore pipelines including pipeline engineering and construction, flow monitoring and controlling, pumping and compressor stations, and pipeline construction equipment such as welders, trenchers, and pipelayers.

6. Oilfield processing equipment such as separators, heaters, treaters, and dehydrators.

7. Gas and oil gathering and treating systems where sour or wet gas is dried, stabilized, sweetened, etc.

8. All-terrain-vehicles such as the tracked and wheeled vehicles produced by Canadian Foremost.

9. The use of compressed natural gas both domestically and in vehicles, and the terminalling, distribution, and conversion of this fuel.

10. Gas distribution systems and networks and the engineering and computerization associated with these systems.

11. All sulphur technologies, such as those developed to extract, process, store, and re-use the high amounts of sulphur which exist in much of our natural gas.

12. All environmental issues related to the development and exploitation of hydrocarbons. Canada has very advanced legislation and technology to maintain a clean, yet developed, petroleum industry.

13. Petroleum industry research facilities. These public and private facilities keep us at the forefront of technology in sulphur, heavy oil, exploration techniques, reservoir delineation, and many other areas.

14. Canadian petroleum industry training schools provide world-class instruction in technical areas such as drilling, welding, exploration, and production. Well-known among these schools are the Southern Alberta Institute of Technology (SAIT), the Northern Alberta Institute of Technology (NAIT), and the Alberta Drilling School.

15. Because of our distances and inaccessible areas, Canada has developed excellent communication systems to facilitate development in the frontier areas. Remote telephone systems, satellite communication, weather stations, and small thermo-electric generators are four inter-related areas of expertise pertinent to the petroleum industry.

D.2 Weaknesses

Most of Canada's areas of weakness are described as such because we do not have the capability to cover entire product ranges and because Canada's oilfields are an area of such high world competition. Most areas of weakness are related to petroleum industry equipment rather than services, and they include:

- Highly specialized well-logging services such as those provided by Schlumberger, and associated equipment.

- Underwater pipeline expertise.

- Liquifying of natural gas and the engineering of large LNG plants.

- High pressure blow-out preventers, sub-surface oil well pumping machinery, and some large pipeline valves. These are areas of high imports as Canadian capability does not cover the entire range of these markets.

E. ECONOMIC IMPACT IN CANADA OF PETROLEUM INDUSTRY EXPORTS

The statistics cited in this section are, by their nature, subjective.

A study by the Independent Petroleum Association of Canada indicated that a $ 1 billion expenditure on conventional oil and gas would create 30,000 person years of employment. A 1984 study by the Canadian Petroleum Association indicated that a 20% reduction in taxes would provide the petroleum industry with $ 70 billion in extra investment dollars between 1984-92 which in turn would generate 300,000 jobs by 1992.

The Export Development Corporation maintains certain statistics known as "employment coefficients" which are of relevance to the equipment and service industries. In the oil, gas, and petrochemical equipment industry, it is estimated that $ 1 million of Canadian content in 1986, is projected to create 46 person-years of employment.* Of this, 29 person-years, directly or indirectly, stem from the Canadian content, while 17 are induced through economic multipliers. In the Engineering and Trading Services industry, 67 person-years of employment (58 direct and indirect, 9 induced) would result from $ 1 million worth of Canadian content. This figure applies to general services, not necessarily those soley associated with the petroleum industry.

Using these figures one may approximate that 4,200 jobs were induced by Alberta's estimated 1985 exports of $ 73 million worth of goods and services to China.

* The power plant equipment coefficient is 49 person-years.

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3. COMPETITIVE CONSIDERATIONS RE CANADIAN EXPORTS

A. CHINESE PERSPECTIVES ON CANADIAN INDUSTRY

The Canadian industry is viewed by the Chinese as technologically advanced but expensive in general. However, there are certain areas where Canada is viewed as a leader. Some of these are long-distance pipelines (particularly control systems), sour gas processing, heavy-oil development, production monitoring and control systems, and equipment and services for remote areas. The Chinese also view Canada as a source of US technology.

In recent years there have been many delegations of Chinese personnel in the petroleum sector who have visited Canadian organizations. (One firm had 16 official visits to its Calgary office between January and August 1985). This is leading to a stronger understanding of Canadian capabilities and practices in the sector. The incoming traffic is also an indication that some Canadian firms have been actively marketing their services and equipment in China with varying degrees of success.

B. CANADIAN PERSPECTIVES ON THE CHINESE MARKETS

In 1985, exports of goods and services in the petroleum sector were about $ 77 million from Alberta-based companies.

The general impresson of the Canadian "oil patch" is that the market in China for Canadian goods and services is very large but that firm orders or contracts take a long time to develop. According to most of the firms contacted in an informal telephone survey, it is important to have Chinese managers and technical specialists visit Canada to observe equipment in operation or to learn how various techniques are applied. There is currently a strong demand in China for modern technology but there are few trained people who know how to apply it to field situations.

The Chinese market is not seen as one where small, inexperienced firms can learn how to do business internationally. Communications are difficult, contacting the correct authorities takes time, and understanding the applicable laws and practices is essential. Firms wishing to do business in China must be willing to absorb costs in China and in Canada, particularly for training programs in Canadian offices for Chinese technical specialists. For the service sector (engineering consultants and other services such as seismic or well services), one key to being considered for projects is the ability to source financing for pre-feasibility studies or technology demonstration.

Canadian firms also view the Chinese petroleum sector as one where Canadian independent oil and gas exploration companies could be successful if they were permitted to explore onshore. Geological conditions in China suggest there are many small reservoirs to be discovered and the experience in western Canada has been that smaller firms are more successful at this type of exploration than larger companies. The Geological Survey of Canada confirms this interpretation and is particularly keen to cooperate with the Chinese.

The firms questioned do not see project financing as a major problem. In the petroleum sector, the foreign exchange is provided if the project can be shown to be a priority. One firm did suggest that this may change for capital intensive projects such as the gas pipeline from the Hainan Island offshore discovery. It should also be noted that several international banks are actively involved in providing commercial project financing in China.

Chinese imports of equipment and services in the oil and gas sector have grown significantly in recent years and exceeded US $1.0 billion in 1985. Exports from Canada were 5-6% of that amount. Given a sustained effort by Canadian exporters this percentage can be increased to 10%. Based on annual imports in the range of US $2 billion, as foreseen by the World Bank, Canadian sales of petroleum sector services and equipment could reach $150 million by 1990, $200 million by 1995 and $250 million by 2000.

C. PREVIOUS PATTERNS AND EXPERIENCE OF OTHER EXPORTERS

Data are not available to give a full breakdown of imports by source country. The US and Japan are the two major suppliers and they have targeted China as a desirable market. Japan views China as a major market for obvious regional reasons and a large portion of its exports to China are based on countertrade. China exports oil to Japan in return for specialty steels and equipment. The US has global strategic reasons for strengthening commercial ties with China as a balance to the influence of the USSR, particularly in light of the recent thaw in relations between China and the USSR. In 1985, exports of equipment alone from the US amounted to over US $ 200 million. Other countries actively pursuing the petroleum sector in China are the UK, France, and Norway.

The import of oilfield services has increased in recent years and the attached chart from the China Business Review (Jan.-Feb. 1985) illustrates the type of services and the source country. This list is not complete.

D. PERCEIVED STRATEGIES OF COMPETITORS

The feedback from Canadian firms indicates that competitors to Canada are following the strategy of providing financing for feasibility studies so that firms can be in line for projects. It was also noted that firms wishing to sell equipment are often willing to donate one unit or use a unit to demonstrate a technology without charge in order to secure orders. There is also a suspicion of under-pricing on a first order in order to gain access to the market.

The French and Norwegian governments have financed consultants who have provided advice to MPI on how to restructure the industry, including advice on regulations and exploration/production agreements. This strategy is also being used by the Americans with regard to onshore exploration regulations. The US Department of Commerce sponsored a seminar on contracting in November 1985. It was well received by MPI and the China National Oil Development Corporation (CNODC) which has exclusive jurisdiction over onshore development with foreign companies. This high-level contact is viewed by Canadian industry as being effective.

SALES OF FOREIGN OIL FIELD SERVICES

Foreign company	Technical service	End user
American Cyanamid (US), Mitsui Toatsu Chemical (Japan)	polyacrylamide enhanced oil recovery treatment	Dagang
Baker Sand Control (US)‡	technical assistance for Shengli Sand Control Research Center	Shengli
Bechtel (US)	reservoir engineering	one Hubei oil field/two Sichuan gas fields
Companie General de Geophysique (France)*	seismic survey	Karamay
Core Laboratories Int'l (US) owned by Litton Industries	laboratory, engineering consulting, and field services	CNOGEDC
Dresser, Magcobar (US)	deep well mud products and services	Zhongyuan
Fluor Corporation (US)*	surface facilities engineering	Daqing
Fluor Corporation (US)	renovation of Tieling--Dalian segment of Daqing–Dalian crude oil pipeline	MOPI's Pipeline Bureau
Forex Neptune (France)* owned by Schlumberger	well drilling and completion	Zhongyuan
Geosource (US)	seismic surveys	Qaidam Basin
G.S.I. (US) owned by Texas Instruments	seismic surveys	Unknown
Hong Kong firm*	oil field safety	Daqing/Zhongyuan
Improved Petroleum Recovery, Inc. (US)*	well drilling and completion	Daqing
Japan National Oil Corporation (Japan)	joint oil and gas exploration	Ordos Basin/Yellow River, Jiangsu
Keplinger Associates (Singapore)*	reservoir engineering	Zhongyuan
Parker Drilling (US)	directional drilling	Shengli
Pool-Intairdrill (US) owned by Enserch	rigging up and directional drilling	Zhongyuan
Schlumberger (Netherlands)	well logging	Zhongyuan
Schlumberger (Netherlands)	analysis of geology and fracture structure of major oil and gas fields	Sichuan Petroleum Administration Bureau
Scientific Software (US)	reservoir engineering	Qaidam Basin
Snam Proggetti (Italy)*	LPG feasibility study	Zhongyuan
Technip Geoproduction, Institut Francais du Petrol, and Elf Aquitaine (France)*	enhanced oil recovery feasibility study	Daqing
Telemedia (US)*	training program for oil field workers	Zhongyuan
Western Geophysical (US)	seismic surveys	Daqing/China Shallow Seas Oil Corporation
Western Geophysical (US)	operation of seismic data processing center at Zhouxian near Beijing	Ministry of Petroleum

* under World Bank loans to China
‡ under UNDP program
SOURCE: National Council files and company officials.
Chart prepared by David Denny.

The firms questioned do not see project financing as a major problem. In the petroleum sector, the foreign exchange is provided if the project can be shown to be a priority. The firms [illegible] that this may change for capital intensive projects such as the gas pipeline from the [illegible] offshore discovery. It should also be noted that several international banks are actively involved in providing [illegible] project financing in China.

Chinese imports of equipment and services in the oil and gas sector have grown [illegible] in recent years and exceeded US $1.0 billion in 1985. Exports from Canada were [illegible] of that amount. Given a sustained effort by Canadian exporters this percentage can be increased to [illegible]. Based on annual imports in the range of US [illegible] billion, as foreseen by the World Bank, Canadian sales of petroleum sector services and equipment could reach [illegible] million by 1990, $200 million by 1995 and $250 million by 2000.

C. PREVIOUS PATTERNS AND EXPERIENCE OF OTHER EXPORTERS

Data are not available to give a full breakdown of imports by source country. The US and Japan are the major suppliers and they have targeted China as a [illegible] market. Japan views China as a major market for obvious regional reasons and a large portion of its exports to China are based on countertrade. China exports oil to Japan in return for [illegible] steels and equipment. The US has global strategic reasons for strengthening commercial ties with China as a balance to the influence of the USSR, particularly in light of the recent improved relations between China and the USSR. In 1985, exports of equipment alone from the US amounted to over US $ [illegible] million. Other countries [illegible] pursuing the petroleum sector business are the UK, France and Norway.

The [illegible] has increased in [illegible] years and the attached list from China Business Review (Jan.-Feb. [illegible]) illustrates the types of services and the source countries. This list is not complete.

D. PREFERRED STRATEGY OF COMPETITORS

The feedback from Canadian firms indicates that competitors to Canada are following the strategy of providing financing for feasibility studies so that they can be in line for projects. It was also noted that firms wishing to sell equipment are often willing to donate one unit or use a unit to demonstrate [illegible] in order to secure orders. There is also a suggestion of [illegible] pricing on [illegible] in order to gain access to the market.

The French and Norwegian governments have financed consultants who have provided [illegible] advice on regulations and [illegible] is also being used [illegible] with regard to [illegible] regulations. The US Department of [illegible] presented a seminar on contracting in November 1985. It was well received by MPI and the China National Oil Development Corporation. [illegible] development with foreign [illegible] high-level [illegible] Canadian industry as well as [illegible].

4. POSSIBLE FEDERAL ROLE IN SUPPORTING SECTOR EXPORTS

(The following discussion relates primarily to the onshore sector since much of the offshore work is handled by multi-national companies.)

A. ANTICIPATED INDUSTRY DEMANDS FOR ASSISTANCE

The informal survey of Canadian firms in the petroleum sector indicates that support should be directed towards the early stages of project identification and marketing efforts. This includes:

i) timely identification of priority projects and support in determining the proper contacts in China;

ii) financing for trade missions and shows in China (see comments below);

iii) assistance in setting up appointments and, when necessary, attending meetings to provide a formal Canadian presence;

iv) financing for Chinese missions to Canada including training programs;

v) financial support for pre-feasibility/feasibility studies and technology demonstration; and,

vi) financial support for establishing a Canadian petroleum presence in China.

Another suggestion was that the federal government support a panel of experts who could advise MPI and other interested organizations in China on such subjects as fiscal and regulatory framework for the petroleum industry, energy policy, and contracting procedures. These experts could be independent of operating oil companies who might be involved in petroleum exploration/ production in China. One objective would be to demonstrate the success of the Canadian industry over the past 30 years and to describe the regulatory climate which allowed the industry to grow.

Of the firms contacted, most said that financing for projects has not been a major problem. However, some expressed the opinion that the availability of competitive financing may be more important in the future because of recent oil price drops, the drawdown in China's reserves of foreign currencies, and an increase in the number of projects requiring foreign exchange.

Industry feedback was also received from 25 oil sector companies who attended the recent (March 13-21, 1986) petroleum show in Beijing. One of their primary recommendations was that trade missions to China be restructured to reduce the amount of travel and to focus on one aspect of the industry. The complaint about past efforts was that because there was diversity among the companies on a given trade mission, there was insufficient time for each company to develop its contracts. These companies also suggested that the geographical emphasis of federal support be shifted from stagnant markets to the three large markets: China, India, and the USSR. These recommendations have been supported by a representative of the Petroleum Services Association of Canada which represents most of the industries supplying the oil and gas sector.

The companies at the show also said that a permanent presence in China is important for closing deals. Another area of concern was the lack of information on forming joint ventures in China.

In addition to requests from the industry, China has made direct requests for assistance under CIDA's bilateral program. The project described in Section 2 resulted from such a request. MPI has recently requested assistance from Canada in establishing a major Petroleum Training Centre in Beijing as part of a larger complex which will include an exhibition centre and a business centre/hotel. MPI has obtained verbal commitments from the major oilfields to provide local funds for the Centre and requires between US $ 8 and US $ 12 million to cover the foreign exchange costs. MPI has not approached other governments and is being encouraged by MFERT to strengthen its relationship with the Canadian petroleum industry. CIDA, on behalf of interested federal departments, funded a recent reconnaissance mission to China which noted the lack of details on the Centre but also "positive interest in support of the concept" from Canadian industry representatives. MPI intends to complete the Centre by mid-1989.

B. RECOMMENDED FEDERAL STRATEGY

Current requests from industry are for support in gaining access to the Chinese market, not in financing exports. Consequently, efforts should be made to meet this need by focussing existing programs such as PEMD, CIDA-INC, and services from External Affairs and DRIE. Because of the complexity of the Chinese market, preferential support should be given to those firms with a demonstrated international capability and reputation. Other firms seeking assistance should be encouraged to associate with larger or more experienced Canadian firms who have complementary goods or expertise to offer, or with foreign firms who have an advantage in the market.

The oil and gas sector in China would benefit from the stepping up of standard trade promotion efforts. There are no extraordinary circumstances imposed by Chinese government policy that must be overcome. The market does not, for example, present Canadian companies with insurmountable tariff or non-tariff barriers. There is no apparent predisposition to purchase from a particular country. In fact, the Chinese pride themselves on their ability to obtain the best international price and resist "tieing" their purchase unless such a purchase brings a lucrative financial package. Concessional financing has not been requested consistently in this sector; however, if the decline in oil prices continues, it is probable that requests for soft financing will become common.

The following recommmendations take into account the industry feedback. Overall objectives are to support the marketing efforts of competitive Canadian companies, to improve the information available on this sector, and to raise the profile of the Canadian petroleum sector in China. One difficulty in implementing some of these recommendations is finding the proper focus within the diverse Canadian petroleum industry and this factor is part of the rationale of Recommendation 4.

Recommendations

1. Existing programs such as PEMD and CIDA Industrial Cooperation should be coordinated in their approach and selection criteria. The services provided by DRIE, CIDA and External Affairs should be consistent with these programs and coordinated with provincial efforts. The geographic emphasis of the programs should be redirected to large potential markets such as China.

2. The Canadian petroleum sector presence in China should be strengthened vis-à-vis the proven Canadian capabilities. Several Canadian firms are considering opening offices in China. We do not recommend financial support for these individual efforts. Rather, we propose that federal support be given to an organization such as the Canada-China Trade Council to expand its offices to include a sector specialist.

3. Because of the large number of companies in this sector and the specialized technical nature of their services or equipment, we recommend that the Embassy staff be strengthened by adding an officer with petroleum sector experience. His or her tasks would include analysis and regular up-dates of the Chinese oil and gas sector (government policies, up-coming projects, industry contacts) and assistance in reaching specific field-level personnel who would be interested in the particular service or product offered by Canadian companies.

4. An analysis of the Canadian oil and gas sector is necessary in order to match specific sub-sectors or individual firms with specific needs in China. Competitiveness of the industry should be assessed in terms of price, delivery, quality, capacity, service, and expertise. Because of the difficulties and expense of penetrating the Chinese market, support should be directed toward experienced exporters, regardless of their size.

5. Government support for sector initiatives in China should be more visible to the Chinese.

   Chinese industry officials have reported recently that Canadian support for this industry is extremely weak compared with other countries. During interactions with foreign firms, the presence of a government official or a letter of support at the Ministerial level offers a "comfort factor" to the Chinese. Such support should be offered to Canadian firms who request it and who are considered to be capable of servicing the market in China.

6. Existing government-to-government mechanisms should be used more effectively to support private sector initiatives. Coordination and focus should be given to consultations undertaken as a result of Memorandums of Understanding, annual trade consultations, federal participation in international conferences, and Ministerial visits.

7. Trade missions should be focussed at the oil or gas field level in China and be limited to one technical area. Most company officials with some exposure to China have indicated there is a limited use to a "horizontal" mission, and they would prefer to participate in "vertical" missions or receive individual assistance for their marketing efforts.

The planned October mission is based on this concept with firms having heavy oil expertise slated to visit three appropriate oilfields in China.

Annex 1

Oil & Gas Sector Brief
Organizations Contacted

1. NovaCorp International Consulting Ltd.
   Calgary
   W.J. Litvinchuk and J.F. Wong

2. Petro-Canada Resources

3. Teknica Resources Ltd.
   Calgary
   Dr. R.O. Lindseth

4. Canadian Foremost
   Calgary
   J. Nodwell

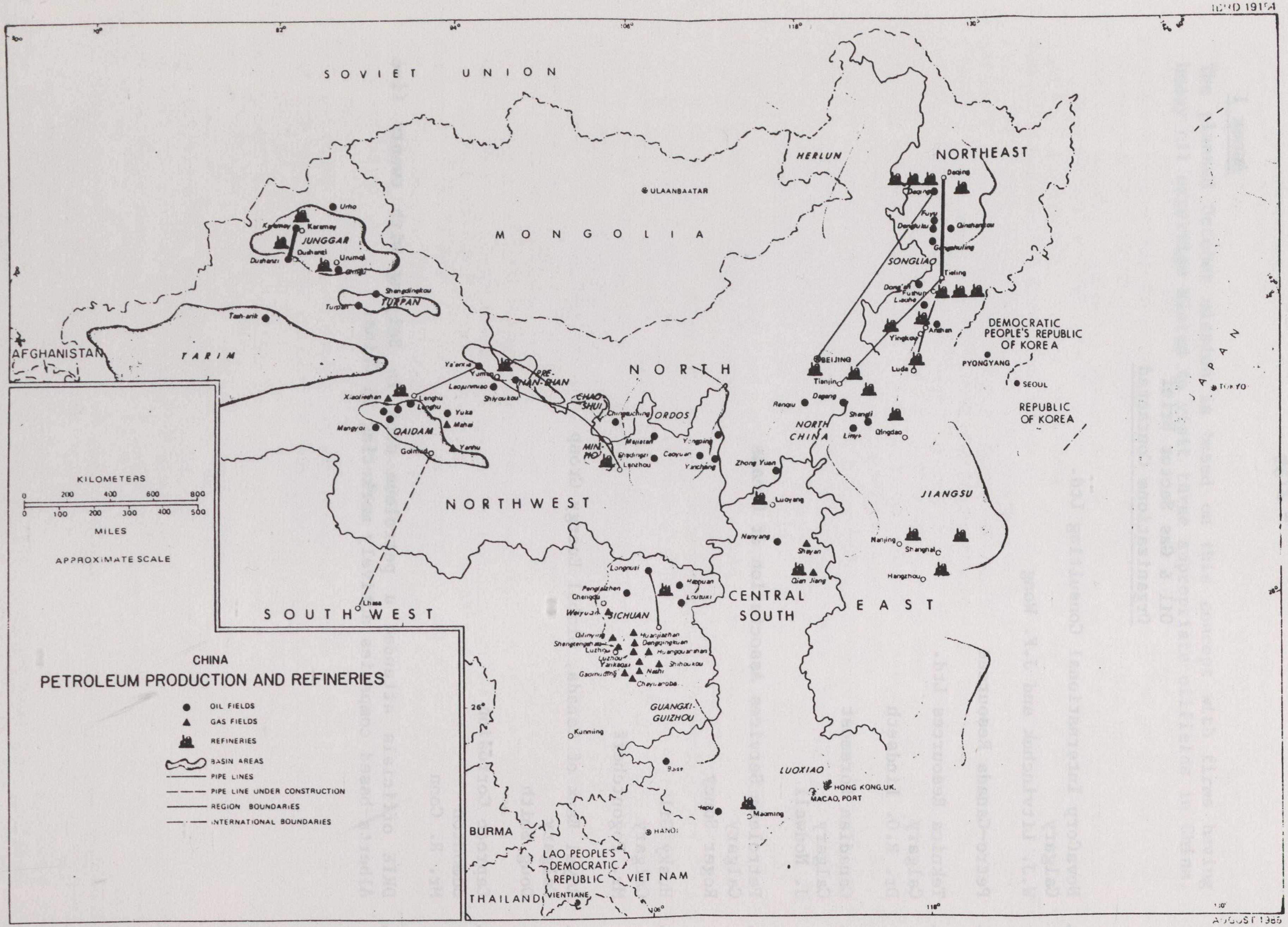
5. Petroleum Services Association of Canada
   Calgary
   Roger Soucy

6. Husky Oil
   Calgary
   Mr. Pogontcheff

7. Royal Bank of Canada, Global Energy Group
   Calgary
   Doug Smith

8. Caproco Corrosion
   Edmonton
   Mr. R. Conn

9. DRIE officials attended a petroleum show in Beijing with twenty five Alberta-based companies actively marketing in China.



SOVIET UNION
MONGOLIA
ULAANBAATAR
NORTHEAST
HERLUN
SONGLIAO
Daqing
Fuyu
Qinghai
Tieling
Fushun
Anshan
Yingkou
Luda
BEIJING
Tianjin
Dagang
Renqiu
Shengli
Qingdao
NORTH CHINA
DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA
PYONGYANG
SEOUL
REPUBLIC OF KOREA
JAPAN
TOKYO
NORTH
ORDOS
Zhong Yuan
Luoyang
JIANGSU
Nanjing
Shanghai
Hangzhou
Nanyang
Qian Jiang
CENTRAL SOUTH
EAST
NORTHWEST
JUNGGAR
Urho
Karamay
Dushanzi
Urumqi
TURPAN
Turpan
Shengdingkou
Tash-arik
TARIM
AFGHANISTAN
Yumen
Lenghu
Mangyai
QAIDAM
Golmud
Lanzhou
Yanchang
SOUTH WEST
Lhasa
Chengdu
SICHUAN
Luzhou
GUANGXI-GUIZHOU
Kunming
LUOXIAO
HONG KONG, U.K.
MACAO, PORT.
Maoming
HANOI
BURMA
LAO PEOPLE'S DEMOCRATIC REPUBLIC
VIET NAM
THAILAND
VIENTIANE
KILOMETERS
0 200 400 600 800
0 100 200 300 400 500
MILES
APPROXIMATE SCALE
CHINA
PETROLEUM PRODUCTION AND REFINERIES
OIL FIELDS
GAS FIELDS
REFINERIES
BASIN AREAS
PIPE LINES
PIPE LINE UNDER CONSTRUCTION
REGION BOUNDARIES
INTERNATIONAL BOUNDARIES
AUGUST 1985

APPENDIX F

TASK FORCE ON CHINA POWER SECTOR

SECTOR BRIEF

FOR

TELECOMMUNICATIONS SECTOR

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EXECUTIVE SUMMARY

In China, responsibility for the manufacture of telecommunications equipment is split between the Ministry of Electronic Industry and the Ministry of Posts and Telecommunications, the latter being responsible for standards. Space activities are controlled by the Ministry of Space Industries and broadcasting by the Ministry of Radio and Television.

Although the importance of communications for social reasons has been acknowledged for 35 years, the importance of communications for economic development has been realized only for the last 5 or 10 years. The telecommunications systems are very limited - the number of telephones per 100 people is 0.5, compared with 80 in Canada. Consequently, China has embarked on a vast program to improve telecommunications - the 1986-1990 Five Year Plan includes C$5 billion to bring the telecommunications sector up-to-date. The plan includes improvements to the public switched network and the domestic satellite communication system, in both of which Canada has considerable expertise and interest. The Chinese are planning, also, to expand their use of remote sensing, an area in which Canada has world-class ability.

The Canadian telecommunications market is expected to grow at a rate of 8% per year and, apart from consumer items, is almost entirely suppled by domestic industry. The rate of growth in the remote sensing area is even higher - about 30% per year.

The telecommunications and remote sensing industries (and the space industry which overlaps both) have demonstrated their ability to compete in the international market, including China.

Chinese telecommunications imports will be about C$1.5 billion per year. The economic impact of success in continuing to penetrate the Chinese market would be great, particularly in Quebec, Ontario and the West. If the projected sales of $50 to $100 million per year by 1990 are achieved, between 500 and 1000 permanent, mainly high technology, jobs would be created in Canada.

These exports will have to be achieved in the face of severe international competition, as have the successes achieved so far, and government support, comparable to that provided to competitors (trade counsellor service, CIDA training funds, EDC export credits) will be required. Increasingly, CIDA and EDC funds will be required to supply "credit mixte" and countertrade will have to be considered to meet the competition.

To provide this support there is a justifiable demand for CIDA funding to the telecommunications sector, within the China program, at a level of C$2 million per year for the next two years, with increases possible in later years.

It is recommended that this level of support be provided to firms meeting criteria outlined in the brief.

TELECOMMUNICATIONS SECTOR BRIEF

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INTRODUCTION

o The Telecommunications Sector covers a very wide range of topics - telecommunications (public and private systems), broadcasting (radio and TV), remote sensing and navigational systems. In the time available it has been possible to give only cursory treatment to some of the topics and it was not possible to treat the question of computer systems - a regrettable gap because areas of special technical interest to the Chinese are computers and micro-electronics. The emphasis has been on what is generally understood by "telecommunications" - the public switched network and private networks - because this is the area with, by far, the largest expenditures and because of its importance in the modernization of China.

o It is worth emphasizing the importance of telecommunications to developing countries. In discussing the role of telecommunications, the report "The Missing Link" (1) says "Telecommunications have often been neglected in favour of other sectors such as agriculture, water and roads. Telecommunications should be regarded as a complement to other investments and an essential component in the development process which can raise productivity and efficiency in other sectors and enhance the quality of life in the developing world." Again "While the benefits of an efficient telecommunications system in individual cases can readily be quantified, the same is not true of the benefits conferred at the national level. While a strong correlation has been established between the number of telephones per capita and economic developoment measured by gross national product, it has not been clear whether investment in telecommunications contributes to economic growth or economic growth leads to investment in telecommunications. That there is a link between the two is however beyond question." An economic model constructed in 1984 indicates that at the early stages of development the primary need is for communication with the principal world centres. The next stage of development entails interaction between the main centres of internal growth and calls for significant investment in transportation and communications. The model also shows that, as these major internal centres develop, the use of telecommunications begins to expand rapidly round them until this newly created local traffic exceeds the traffic between the major centres. China is clearly in the middle of this process. The Chinese are aware that they are lagging. At Chinacom '84, the Minister of Posts and Telecommunications said his country regards telecommunications as one of its strategies for building a modern China. This has not always been so. Since 1949 the political importance of broadcast communications has been well understood. But the importance of communications in economic development has become apparent much more recently. Since 1949, China's annual investment in communications has been 0.8 to 1.0 per cent of the total investment, far below the world average.

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(1). Report of the Independent Commisssion for World-wide Telecommunications Development. ITU December 1984.

Between 1949 and 1982 it was only 1% of that of Japan. While China's industrial production in 1984 was 56 times greater than in 1949, the number of telephones was only 7.4 times as many.

o The cost of the modernization of the Chinese telecommunications system will be, as we shall see, huge. While most developing countries have to purchase much of the equipment they require by using hard currency (a problem compounded by the fact that the system itself generates directly little hard currency), the Chinese are able to build much of the state-of-the-art equipment they require, although most new technology has to be bought abroad. But they do need high levels of capital formation - a problem compounded by the very low charges imposed for the use of the telephone system. Economic liberalization measures announced a couple of years ago now allow MPT's domestic and international bureaux to retain 90% of their profits and foreign exchange earnings (the rest is turned over to the Ministry) to be used, mainly, for equipment upgrading.

o There is no Canada/China MOU specifically relating to telecommunications in spite of past discussions of such a document and the current interest of the post and DOC. Such MOU's, while often appearing as motherhood statements, have proved useful to other countries. MOSST is negotiating a Science and Technology MOU which could be applicable to communications and would certainly be applicable to the communications and remote sensing aspects of the Canadian space program. The MOU has been initialled but not yet signed.

1 OPPORTUNITIES IN CHINA

A Sector Organization and Responsibilities

1.A.1 Communications

Communications (including telephone, telegraph and civilian wireless services) are planned, coordinated and/or operated by the Ministry of Posts and Telecommunications (MPT) which had, in 1982, a budget of about C$1 billion, with capital investment of C$125 million (1.2% of the capital construction budget). Other ministries or agencies (petroleum, civil aviation, railways, electric power, public security) operate specialized communications facilities under MPT regulations. Recent changes of authority ensure that the MPT, while still the authority on communications policy and standards, will eventually operate only the nation-wide network. It will concentrate on providing major long distance telecommunications switching and transmission facilities such as satellites and microwave routes. The provincial governments, major cities and special economic zones will build and administer their own networks to interconnect with the MPT network at major switching centres. Provincial and city administrations will have their own telephone companies, resembling those found in Canada. They will have the autonomy to develop, construct (chosing their own equipment, domestic and foreign-supplied) and operate their own networks at a profit, and will have authority to spend up to $5 million per project without reference to higher authority.
The Peoples Liberation Army (PLA) has its own communications network and some manufacturing capability. Little is known of this activity.

1.A.2 Ministry of Electronic Industries

Most communications equipment required is, as noted above, produced domestically, much of it in the 28 factories reporting to the MPT and over 100 others producing equipment for it, but which are run by the provinces. In addition the Ministry of Electronic Industry has 178 plants (which produced C$10 billion of products in 1984 and which plan to produce, by the year 2000, products valued at C$40 billion) producing telecommunications equipment for which the MPT is the major customer. Other customers include provincial and municipal authorities. All products must meet MPT standards. MEI is the major manufacturer for the user clientele and domestic purchasers.
The MEI is composed of four bureaux and an organization resembling the bureaux:

Bureau of Radar Industries - Navigation, Control, Radio
Bureau of Communications and TV and Broadcasting
Bureau of Computer Industries. This has introduced a new subsidiary organization - the China National Software Co.
Bureau of Devices and Components
China National Electronic Development Corp. which is involved with I.C. circuits, TV tubes etc.

Two major events will shape the MPT and the MEI for the foreseeable future. First, the Government has decreed that all Ministries will release control over their factories and the factory management will become rsponsible for its own planning and management decisions. The MEI retains the policy coordination, regulation and business strategy responsibility, not only for its own factories but also for the electronics factories of other Ministries (which also will be decentralized). The State Council has formed a "Lead Group" from representatives of the MEI and the user Ministries, called the "Electronic Revitalization Group", to coordinate the activities of all the involved Ministries.
Second, the priority of the MEI for the next 5-year plan (1986-1990) will be to build up the microelectronics industry - including R&D components design and manufacturing. The production of capital equipment, which presently accounts for only 10% of the total production, compared to 90% consumer goods production, will be increased to 40% of the total. While this intelligence (July 1985) might indicate a strengthening of the positon of MEI, it was reported at the same time that ground stations for service under the INTELSAT agreement would be built by the MPT.

1.A.3 Ministry of Space Industries

The Ministry of Space Industries is responsible for the experimental space program and will be responsible, when operational satellite communication systems are developed, for the launching and the placing in geo-stationary orbit of the satellites. At that time MPT which is responsible for the ground systems will take over responsibility for the satellites.

1.A.4 Ministry of Radio and Television

Broadcasting is managed by the Ministry of Radio and Television. Radio services originate through the Central Peoples Broadcasting System (in Beijing) and over 150 local stations are run by provincial and municipal governments. TV (including colour since 1973) includes about 40 stations (mostly at provincial level) plus 250 microwave relay stations and over 4000 small rediffusion units.
The China Broadcast Satellite Corporation (CBSC) was created in 1983 to develop the DBS system. It was originally responsible to the Ministry of Radio and Television but has now been moved under the direct supervision of the State Council. It is rumoured that it may lose its charter.

1.A.5 Remote Sensing

Remote Sensing is one of the three areas of technology (the others are microelectronics and biotechnology) in which China wants to develop an indigenous capability. Over 3000 people are now involved in programs costing over C$700 million/year. A large number of organizations in China are involved in Remote Sensing. The following list is extracted from a report by Dr. Robert Ryerson (CCRS) of a visit to China in May/June 1984:

National Remote Sensing Centre (NRSC) - coordination and funding of Remote Sensing R&D and applications development, training and education, conduct of R&D, map production and distribution of remote sensing imagery;
Agricultural University;
Petroleum Institute - exploration and development;
Remote Sensing Application Centre - R&D regarding water resources;
Tsing Hua University - radio-electronics and remote sensing signal processing;
Nanjing Institute of Geography;
Nanjing University, Dept. of Geography - education, R&D.

B Past sector developments and present needs.

1.B.1 Telecommunication Services

Note has already been made of the fact that it is only fairly recently that China has appreciated the connection between good communications service and enhanced economic activity. At present, telephone service is provided in all cities, towns and virtually all 50,000 rural communes, although many rural villages, into which the communes are divided, are still without telephone service. It is important to note that Chinese planners are not concerned with telephones as a consumer service but as important elements of the industrial and administrative infrastructure. At the end of 1983 there were just over five million telephones in service, giving a density of 0.5 telephones per 100 population, and showing a growth rate since 1981 of only 5% per year. Since then the rate of growth has risen to 13%. The density, while greater than that of India, has to be compared with a density of over 50 in Japan and nearly 80 in Canada. To increase the telephone density, the MPT announced, in November 1984, a plan to double the number of telephones to 10 million by 1990 and to increase to 33 million by the year 2000 (giving a density of between 2.5 and 3 for the country as a whole and 25 in the major cities). The cost of this expansion can be estimated by assuming a cost of C$1000 per telephone line and supporting equipment (a low estimate) - leading to a capital investment of $28 billion. In 1985, the 24 provincial centres were linked with automatic and semi-automatic dialling, 15 being served via microwave circuits. Although the landline circuits (2 million km. of pole-carried wire is still the backbone of the national network) are generally overloaded the microwave circuits (150,000 km.) are not used to capacity. Switching uses semi-automatic and automatic crossbar systems, with manual step-by-step still in use in rural areas. Stored program control systems are being introduced into urban areas. Coax cable circuits link Beijing, Shanghai and Hangzhou and link Beijing to Canton via Wuhan. In addition to the radio relay circuits, satellite service is being introduced, the initial service being provided by leased INTELSAT circuits and Spar earth stations. The location of the first four regional stations (Guangzhou, Lhasa, Urumqi and Hohhot) is indicative of Chinese interest in serving remote areas.

It was noted earlier that, in developing countries, it is normal for external communications to grow, initially, more rapidly than domestic service. This has been true of China where, in addition to cable service to Japan and Hong Kong, there are satellite services, via INTELSAT, to Hong Kong, Japan, N. America and Europe. The international service has grown by 30% per year for many years and, by the end of 1984, there were over 750 international circuits in use.
Telegraphic coverage, although hampered until recently by the necessity to code and decode manually the ideographic Chinese characters (automatic de-coding is now possible), is fairly complete with stations in all urban areas down to the county level.

1.B.2 Satellite Communications

Since 1976, China has used INTELSAT for international communications and this satellite service carries 90% of China's international traffic.
For a long time China has planned to use satellites to provide domestic service, especially to remote and rural areas. In 1983, a four-month trial, using an INTELSAT Indian Ocean satellite, led to a decision to lease half an INTELSAT transponder for five years at a cost of US$400,000 per year. This is to provide service, using Spar Aerospace ground equipment, by MPT to four regional capitals and other cities, and by the Ministry of Petroleum to fourteen remote exploration sites. In the meantime, the Chinese Ministry of Space Industries continued to develop a communication satellite. After an unsuccessful launch attempt in January 1984, a satellite with two transponders, was launched into geo-stationary orbit in April 1984. A second satellite, using a shaped-beam antenna to give China-only coverage is to be launched in 1986.
China was a founder member of the International Maritime Satellite Oganization (INMARSAT) and MPT has adopted maritime satellite communications as a corner-stone of its policy to develop the transportation industry. The construction of a "coast" earth station at Beijing is well under way and the installation of ship earth stations is estimated to grow at a rate of 30% per year for the next few years.

1.B.3 Broadcasting

As noted above, broadcasting has been very important in China for the last 35 years. In addition to the 150 radio stations, the importance of TV has grown since the China Central Television Station (CCTS) was founded in 1958. TV is now available in all provincial-level capitals and medium-sized cities. But because of the size and mountainous nature of the country only 50-60% of the population can receive CCTS. This is not only inconvenient but hinders the modernization program which depends on a vast supply of educated people - and the role of TV in education is impressive. The Ministry of Radio and TV intended to build its own broadcasting satellite but, because of the need for haste, decided to purchase a satellite abroad (independently of MPT) with the intent of launching by 1987/88. European and US companies were invited to bid on the 14/12 GHz. satellites with 230 watt transponders and did so. For reasons not fully clear the bidders were abruptly informed in the middle of 1985 that the purchase of the satellites was postponed indefinitely. The problem may have been a shortage of foreign currency or a decision to revert to the 6/4 GHz. band and provide a system with a greatly reduced ground station complement. It is estimated by Canadian industry that, once a DBS satellite capability is available, there may be a market in Institutes, for redistribution, for 30 to 50 thousand units (about C$50 million) over five years.

1.B.4 Remote Sensing

Since its first satellite launch in 1970, China has launched seventeen satellites, of which seven were earth resource satellites to explore China's earth resources, plan land use, investigate the availability of water resources and identify sources of hydro-electric power. Two types of camera are used. One uses a CCD camera transmitting pictures, with 50 metre resolution, to the ground. The other uses visible light high resolution film (giving 10 - 15 metre resolution). After one weeks operation the film capsule is de-orbited and recovered after a parachute landing in central China. The information gathered is said to have contributed greatly to China's economic development.
At the end of 1982, China agreed to buy a Landsat earth station from the US - a turnkey operation costing US$12 million. It is located 100 km. from Beijing and was put into service in 1985.
China, which represents a huge remote sensing market, has indigenous expertise to make full use of equipment and has the capability to develop some.

1.B.5 Navigation

The information determined in the preparation of this brief is limited as it relates only to those areas of the market in which identified Canadian industries are interested.
Air Traffic Control - China is in the process of up-dating its ATC system. It is estimated that there will be a market for surveillance radars as 15 or 16 airports are upgraded over the next five to ten years. ICAO has decided to phase out the present ILS in favour of microwave landing systems. International airports are to be up-graded by 1997 and all other equipped airports by the year 2000. The market is not well defined but might be 150 to 200 equipments at 100 airports by the end of the century.
China is interested in using Loran-C for off-shore work. Four coastal transmitters have been ordered (a total of ten may be required) and one has been installed.

1.B.6 Consulting

As far as is known, there is little demand for consulting services, without specific technology transfer.

C Anticipated Sector Investments

The 7th. 5-Year Plan (1986 -1990) proposes the expenditure of C$5 billion to bring the Telecommunications Sector up-to-date, with emphasis on the importation of technology. There is no reliable figure for the total sector investment but imports of C$5 billion in the next three to five years are likely. (Telecommunications imports were C$1.5 in 1984.)

D Major projects of potential commercial interest to Canada

The very large planned expenditures on telecommunications are spread over a great number of projects, similar to those discussed inpreceeding sections. In general they can be categorized as follows:

Public domestic switched telecommunications network - Local subscriber loops, switches, trunk circuits (microwave, cable, optical fibre, satellite systems), cellular radio.
International network - TDMA
Spectrum management systems
Remote Sensing
Navigation systems

2 CANADIAN INDUSTRY CAPABILITY AND CAPACITY

A Domestic markets and prospects, 1986-2000

2.A.1 Communications

Figure 2 provides the statistics relating to the output of the communications equipment manufacturers over the years 1975 to 1984 - the last year for which data are available. (1) The constancy of the output over the last ten years suggests a mature well established industry with an average annual growth rate of 7% over the years 1982 to 1984. Very little work appears to have been done on projections for future output. However, DOC (using

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(1) As defined by Statistics Canada, Communications Equipment Manufacturing comprises of three areas: (1) Telecommunications equipment manufacturing, including telephony and telegraphy, microwave transmitters and related equipment (2) Electronic parts and components (3) Other Communications and Electronic Equipment including, closed-circuit television equipment, electronic navigational aids and outdoor public address equipment.

A.D.Little and DOC data) has prepared the following projections for the telecommunications market (constant dollars):

	1985 C$B	1990 C$B	Annual Growth Rate (%)
Voice Communications	3.0	4.4	7.9
Data Communications	0.8	1.3	10.1
Satellite & Cable TV	0.13	0.2	8.9
Mobile Radio & Paging	0.4	0.6	8.4
Total	4.4	6.5	8.1

Thus, overall growth rates (in constant dollars) in recent years have been about 7% annually and are projected to be about 8% for the next five years.
It should be noted that the value added in the manufacturing process in the Canadian communications industry is over 60%, compared to a figure of 37% for Canadian manufacturers as a whole.
Telephone service providers rank first with respect to demand for communications equipment and most of the equipment purchased is produced in Canada in Canadian-owned plants, Northern Telecom being the major supplier. While future demand is closely related to the economic climate, new services and technologies play an important role. Furthermore, growth depends heavily on penetration of foreign markets, given the limitations of the domestic market which accounted for only 4% of the potential world market for communications equipment.
The US market is attractive and accessible since the divestiture of AT&T, its network standards are the same as those of Canada and close proximity reduces costs for marketing, transportation and after-sales service. The European market is almost closed to Canadian manufacturers because of the manufacturing giants there and the close relationship between government, telephone companies and manufacturers. The Eastern European market is closed apart from entry through technology transfer and joint manufacturing agreements. The Asian market is large and promises rapid growth but penetration by Canadian manufacturers has been limited. China represents a huge market which continues to prefer local production through joint ventures and licensing agreements.
Although it represents only a small percentage of the whole communications industry the Canadian space industry is of importance because it is a area in which substantial sales have been made to China. In recent years the industry has been growing at more than 50% per year and, in 1983, achieved total sales of about $300 million. The industry is almost entirely Canadian-owned (90% compared to an average of 70% for all non-financial corporations in Canada) and the Canadian value added content is estimated to be 75% - even higher than that of the communications equipment manufacturing sector.

2.A.2 Remote Sensing

While the remote sensing manufacturing industry is small compared to the overall communications equipment manufacturing sector it has been marked by rapid growth and a corresponding rapid growth in exports. Figure 3 shows that industry revenues grew at a compound rate of 30% between 1972 and 1985. Current industry sales are nearly 10% of reported world-wide sales of about C$1.3 billion - sales that are projected, to rise to C$2 billion by 1990 and, perhaps somewhat optimistically, to C$15 billion by the year 2000. The very high Canadian share of world-wide sales attests to the strength of the Canadian industry which has, generally, well-defined market opportunities.
It is interesting to note that, while Government expenditures on communications were, for many years, the dominant feature of Government space expenditures, funding of remote sensing is now larger.

2.A.3 Navigation

In the ATC area the Canadian market is fairly well defined. There appears to be little military market for the next few years. The civilian market was clearly identified with the RAMP program - a $400 million program including 41 radars, of which 17 are primary, to be completed over eight years. No other major program is expected before the year 2000.

B <u>Resources and experience for export markets</u>

For reasons stated above, the domestic market is not large enough to sustain growth in the telecommunication equipment manufacturing industry. For this reason the manufacturers seek, with a good deal of success, to penetrate foreign markets. Over the three most recent years for which statistics are available, the percentage of the output of the telecommunications manufacturing industry that was exported averaged 63%, rising from 50% in 1982 to 78% in 1984.
In the space field most of the revenues are derived from the communications and remote sensing activites and here again the success in exporting is evident. In the space industry as a whole over 70% of the revenue is derived from exports while in remote sensing the percentage has risen from 50% in 1978 to over 65% in 1985.
For remote sensing as a whole the percentage of product exported has been, since 1978, about 40%.

C Previous experience and activities in China

As part of the determination of inputs for this brief an approach was made to telecommunications equipment manufacturing and service companies known to have been interested in the China market or thought likely to be so in the future. The companies contacted are listed in Annex A. No claim is made that the list of companies is complete but it is believed to be representative.

For most companies, sales have been small but four companies had sales in the last three years, totalling between C$50 and C$100 million.

D Canadian strengths, weaknesses and competitiveness

2.D.1 Telecommunications

The overall competitiveness of the Canadian telecommunications equipment manufacturers is indicated by the high percentage of product exported. Over the last three years for which data are available (1982/83/84) the exports have been 50%, 55% and 78%, with an average exportation of 63%.
The greatest strengths have been exhibited in the area of the public switched networks, in radio systems, in space systems and in remote sensing. The major weaknesses have been apparent in the production and sales of consumer products (radio, TV, TVRO stations etc.) and in component manufacture. But it is interesting to note that the one Canadian company capable of selling complete TVRO's is actively pursuing the Chinese market for TVRO receivers.

2.D.2 Space Communications

For the space sector, which overlaps both the communications and remote sensing sectors, exports have averaged over 70% of production. Some have claimed that, in the space sector, Canadian successes have been achieved only because of excessive government support. It is, therefore, worth noting that an OECD study issued in 1983 showed that, of all the major countries pursuing space activities, only in Canada and the UK did industry revenues exceed government support. Furthermore the government expenditures on space, as a function of GNP, were lowest in Canada, apart from Italy.There have been notable successes (particularly the sale of the Brazilsat domestic communication system) and there have been two marked failures - failures not due to inadequacies in product price, quality or delivery. In one the offset package was not competitive; in the other non-commercial considerations appear to have dominated. It is perhaps in this area that a weakness appears. Offset packages for large sales are likely to require government support.

2.D.3 Remote Sensing

The areas of strength in remote sensing are given in Annex C. They occur in the area of hardware (satellite receiving stations, image recorders and analysis systems and radar systems) and in the provision of services (education, image interpreation, and mapping services). Over the last eight years about 45% of the products of the remote sensing industry have been exported.

2.D.4 Countertrade

Countertrade is a generic term encompassing all transactions where a sale to an importer (public or private sector) is conditional upon a reciprocal purchase or undertaking by the exporter. The common forms of countertrade include barter, counterpurchase (which is the most common form of countertrade), advance purchase, offsets, buy-back and bilateral agreements.

The current rapid developments in countertrade have their origin in the ten-fold incease in oil prices which took place between 1973 and 1980. The Western banking system became awash with petro-dollars, many of which were lent to developing countries to finance industrial development projects. By the end of the 1970's these countries started to experience difficulties in meeting their loan-servicing agreements - difficulties enhanced by the dramatic rise in interest rates in the early 1980's. To meet the situation, the concept of countrertrade was developed by the East European nations and copied by the developing countries.

There are no reliable figures on the extent of countertrade - it affects, possibly, 10% of the world's trade. Up to now, Canadian exports have been little affected because;

o the US and other OECD countries dominate the export market for Canadian goods

o food and raw material exports, which predominate in Canada's exports, have not, to date, been subject to countertrade pressures.

Nevertheless, it is estimated that about $600 million of 1984 Canadian exports (about 0.5% of the total Canadian exports) involved some form of countertrade. While these figures are small most of the demands have fallen on a core grouping of Canadian industry sectors, including telecommunications, defence and other high technology products.

From a multilateral policy perspective, Canada has maintained the view that countertrade

o is a regressive trade practice which distorts the multilateral flow of goods and services;

o prejudices the export opportunities of small and medium-sized firms;

o deals inefficiently with the economic and financial constraints it attempts to resolve;

o manifests a regrettable trend to bilateralism; and

o tends to remove trade from the purview of normal GATT disciplines through its lack of transparency.

From a bilateral relations viewpoint, Canada has always made it clear to its trading partners that the Government of Canada will not become directly involved in countertrade deals. It has been the governments position that the initiative and responsibility for entering into countertrade rests with exporters alone.

In addition to countertrade, exporters and the Canadian Government will have to continue to face the fact that soft loans have become common in several export fields, including some in the telecommunications area. Both countertrade and soft loans are likely to be of importance in determining the ability of Canadian firms to compete in the telecommunications market in China.

2.D.5 Investment Environment and Export Financing

Attached, as Annex B, is a brief summary of part of a recent report to DRIE dealing with the investment environment and export financing as they affect the space sub-sector. The conclusions stated in Annex B are believed to be valid for the telecommunications sector as a whole.

E <u>Economic impact in Canada of sector exports</u>

While the effect of exports on the job level in Canadian industry varies with the level of sub-contracting and hence the value-added, it can be stated that, in round numbers, every $1 million of exports generates ten man years in Canadian industry. The distribution of the work-force in the telecommunications equipment manufacturing industry is approximately: Ontario 62%, Quebec 27%, BC 3% and Alberta 3%. Manufacturing is dominated by Northern Telecom whose sales, in 1982, accounted for more than 45% of all Canadian telecommunications shipments. The distribution of the much smaller space sub-sector (mainly communications and remote sensing) is: Quebec 41%, Ontario 39% and the West 20%.

F <u>Prospects of future Chinese exports in competition with Canadian industry</u>

There is no doubt that the Chinese would like to export telecommunications equipment to Canada. An article in the Globe and Mail (17 March 1986) points out that, in the trading partnership between Canada and China, China is a much poorer fit to Canada than Canada is to China - a fact that underlines the present trade balance in Canada's favour. Particularly in the high technology telecommunications sector, in which Canada has an outstanding world-wide reputation, Chinese exports to Canada are a long way off. In the shorter term, Chinese exports to third world countries in competition with all the major telecommunications manufacturers are more likely. Such competition will not be avoided by refusing to help build up the Chinese telecommunications manufacturing capability. Others will do so and, in doing so, will penetrate the very large Chinese domestic market. The best strategy seems, therefore, to be to supply the existing Chinese market by offering the best performance, price and delivery and offering, by technology transfer and joint ventures, to assist the Chinese to build up their own industry.

3 COMPETITIVE CONSIDERATIONS RE CANADIAN EXPORTS

A Chinese perspectives on Canadian industry

The Chinese see Canada as a good and reliable supplier of telecommunications equipment, with proven expertise in the sub-sector. Three of the major reasons for this view are the excellence of the Canadian domestic networks, the Canadian experience in the provision of telecommunications services to rural and remote areas - a field of great interest and importance to the Chinese - and the Canadian successes in the development of remote sensing applications.

B Canadian perspectives on Chinese markets

3.B.1 General considerations

All the manufacturers contacted in the preparation of this brief would echo the views expressd recently by Mr. Ferchat. "Like any other market, China requires research, patience, and above all, dedicated hard work to understand the customer and his needs.... The telecommunications sector is now one of the Chinese market's most promising areas....The Chinese are well aware that several telecommunications manufacturers can provide them with the technology they require. But they are looking for much more. In their modernization program, they are seeking modern telecommunications facilities to support their economic growth, as well as to build up their industry. While they realize that they must import technology, they are determined to become independent of foreign suppliers as soon as possible.They are therefore increasingly looking to technology transfers and joint ventures as a way of doing business. More than that they're looking for "total business" joint ventures. By that I mean they want assistance not only with manufacturing, but also with marketing, sales and service; and any company or organization which hopes to succeed in China must be adaptable enough to take this route." (1)

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(1) Robert A. Ferchat, President, Northern Telecom International Limited. Speech to the First Canadian International China Trade and Investment Conference. Toronto. June 15, 1985.

Mr. Ferchat goes on to outline the basic steps taken by Nortel. The first is to get to know the customer's objectives and getting to know the Chinese customer is not a simple task. It requires a long-term commitment. The second step is to confirm opportunities. What is the real potential? What is it today? What will it be tomorrow? What are the technical and commercial requirements? Are you prepared to meet the demands of counter-trade and buy-back you can expect to receive? The third and fourth steps are to establish the sales channel to be used and to determine the timing. Keeping pace with the customer is the key element here.

"Commitment [is] one of the most, if not the most, vital factors for success in Chinese markets. Here again the Chinese are no different from any other international customer. Before they do business, and especially where complex and expensive products are involved, they want to know that the supplier they will deal with is not in for a quick sale with no after-sales support. They want to be assured that the products they buy will be competitively priced; that they will be supported; that the supplier will ensure the integrity of his products and services; that the supplier is committed to keeping his products at the leading edge of technology through an on-going R&D program. This is particularly true where technology transfers are involved"

Some firms might point out that achievement of some of these requirements presents considerable difficulty for smaller companies. Marketing in China is expensive both because of the remoteness of the market and the need for a long-term approach. It is in helping to overcome these hurdles that government support has been indispensible in the past and is expected to be vital in the future.

Canada does have one advantage over the US in trading with China. Under the Foreign Assistance Act in the US China is not eligble to receive assistance from the Agency for International Development which administrs US bilateral economic assistance programs.

In summary, China represents a large potential market, not greatly different from others, but one in which a long-term marketing effort is required. China is looking for technology transfer and joint venture agreements - a desire reinforced by the shortage of foreign currency that develped in 1985. The costs of developing sales are high due to the long gestation period and the geographical separation. Government support by commercial counsellors, industrial and technology development funding, CIDA funding for training, technology transfer and support of "credit mixte" in cooperation with EDC is essential.

3.B.2 Canadian companies' business perspectives

Many firms, although well aware of the foreign competition they face, believe that, because of their demonstrated excellence and ability to export in a competitive environment, they can make significant penetration into the Chinse market. Annual sales are now about C$25 million per year. Because of the rapidly changing nature of the Chinese market it is difficult to make firm predictions. On the pessimistic assumption of a 15% growth rate, annual sales of C$50 million are likely by 1990, C$100 million by 1995 and C$200 million by the year 2000. That these are somewhat pessimistic assumptions is evident from the fact that sales projections of a few individual companies already exceed the 1990 figure. A more optimistic assumption of a 30% growth rates would lead to sales of C$100 million by 1990, C$200 million by 1995 and C$400 million by the year 2000. The predicted 1990 sales represent about 3 to 6% of the expected Chinese telecommunications imports. To achieve these penetrations all the companies contacted agree that technology transfer and/or joint venture agreements will be essential and that government support in marketing (including provision of training), the provision of export credits and, in some cases, of "credit mixte" will be required.

C <u>Previous patterns and experience of other exporters</u>

There is nothing unique about the competition Canadian telecommunications equipment manufacturers and service providers face in China. Figure 2 shows that Chinese imports in 1984 came primarily from Japan. This dominance is probably caused by their huge sale of consumer goods (radio, TV etc.) - an area in which Canada is not likely to compete to any great extent. In the areas in which Canada is likely to compete Japan, Europe and the US (including the industry giants such as IT&T, AT&T, L.M.Ericsson, NEC and Fujitsu) will provide the opposition.

D <u>Perceived strategies of competitors to Canada</u>

In addition to being willing to provide technology transfer and to take part in joint ventures, at all levels up to the huge BTM/ITT agreement, Canada's international competition appears to be providing soft loans and mixed credits to gain a foothold in the market and garner points over trade rivals. Among the Europeans, France, West Germany, the UK, Belgium and, perhaps, the Netherlands have chosen these mechanisms. Japan is known to have made extensive use of these tactics in other allied areas.

4 POSSIBLE FEDERAL ROLE IN SUPPORTING SECTOR EXPORTS

A Outline of anticipated industry demands for assistance

Apart from EDC financing support, which appears to be available, the demand for CIDA funding appears to fall into three categories. The first consists of large sums for capital expenditures - a request, already made to CIDA, for C$3.7 million to establish a training and servicing facility is the only known example at present. Specific project support, in some cases already requested of CIDA, is likely to require $750,000 to $1 million per year for the next two years. Support is recommended for a number of companies with the cost of exploring markets in China, exhibiting at trade shows and bringing Chinese specialists to see Canadian facilities and for training, in China and in Canada, to a total of about $1.1 million per year. Thus, without allowing for large capital expenditures, such as the proposed training facility mentioned above, there appears to be a justifiable demand for $2.0 million per year for the next two years. It is difficult to estimate the demand after that time but it is likely to continue at the same level or to increase with increasing exports.

B Recommended federal strategy

4.B.1 Criteria for projects and firms

The first criterion for any project is that it must be seen to be of major importance to the Chinese. Although the Chinese appear to have been slow to recognize the importance of telecommunications for economic development (they had for a long time recognized the importance of communications to social development), that importance is now firmly recognized (as shown by the latest five-year plan) so that projects in the telecommunications area are likely to be increasingly of importance to the Chinese authorities. Projects should be chosen in areas where there is undoubted Canadian expertise so that not only will projects be undertaken successfully but that the companies concerned will be in a strong position to exploit the opportunities created by CIDA funding. Again, the Canadian telecommunications industry has a high level of expertise that is recognized world-wide and has demonstrated, as shown by the ratio of exports to manufactures, that it is very capable of exploiting foreign markets.

It is difficult to outline criteria for firms deserving support partly because of the very large spread in the size of companies considered and their need for support. Nevertheless, there are some criteria that are applicable to all firms:

- o they should have a demonstrable reputation for technical excellence;

o they should have demonstrated an understanding of the particular problems of marketing in China;

o they should be willing to invest their own resources in the project on a long-term basis;

o they should have a well-founded plan for exploiting the Chinese market on the successful completion of the project;

o they should be willing to consider technology transfer and joint venture agreements and

o they should be willing to consider arrangements whereby, if a project is successful, some of the government investment should be repaid or re-invested in similar marketing activities.

One criterion affects the government more than the firms. To the extent that one company has achieved, with significant government assistance (and may therefore seen by the Chinese to have been chosen by the Canadian government), a penetration of a particular segment of the Chinese market care should be exercized in the granting of significant assistance to another company to compete in the same market.

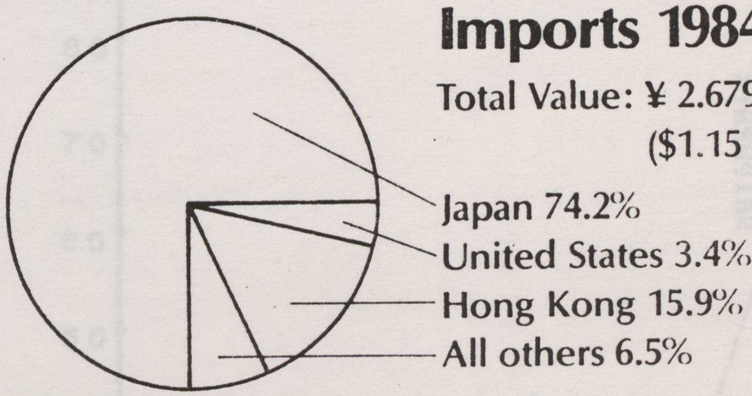
To the extent that the above criteria are valid, firms not meeting them should be discouraged. This is particularly true of those firms that are simply impressed by the size of the Chinese population but have not used what resources they have to research the market in any significant way.

4.B.2 Concessional funding

There is no doubt that, in many cases, concessional funding will have to be negotiated. The extent of the use of soft loans and mixed credits by Canada's competitors has already been noted. Similar procedures by Canada can be justified by the Canadian government when, and only when, significant advantages will accrue to Canadian firms. In considering the need for concessional financing (and in this area the advice of the post can be invaluable) the pay-off to be considered should not be simply the advantages conferred by the contract under discussion but the long-term advantages perceived. In negotiating such concessional funding with the Chinese the advantages to be gained by Canada should, to the greatest extent possible be spelled out. While the Chinese have a reputation for continuing to do business with those with whom they have developed a relationship of mutual trust, it is all too easy to accept uncritically assertions that "if you win this contract you will have the inside track in the future."

China's Telecommunications* Imports 1984

Total Value: ¥ 2.679 billion ($1.15 billion)



*Includes telecommunications and sound recording and reproducing apparatus and equipment.

SOURCE: China's Customs Statistics

FIGURE 1

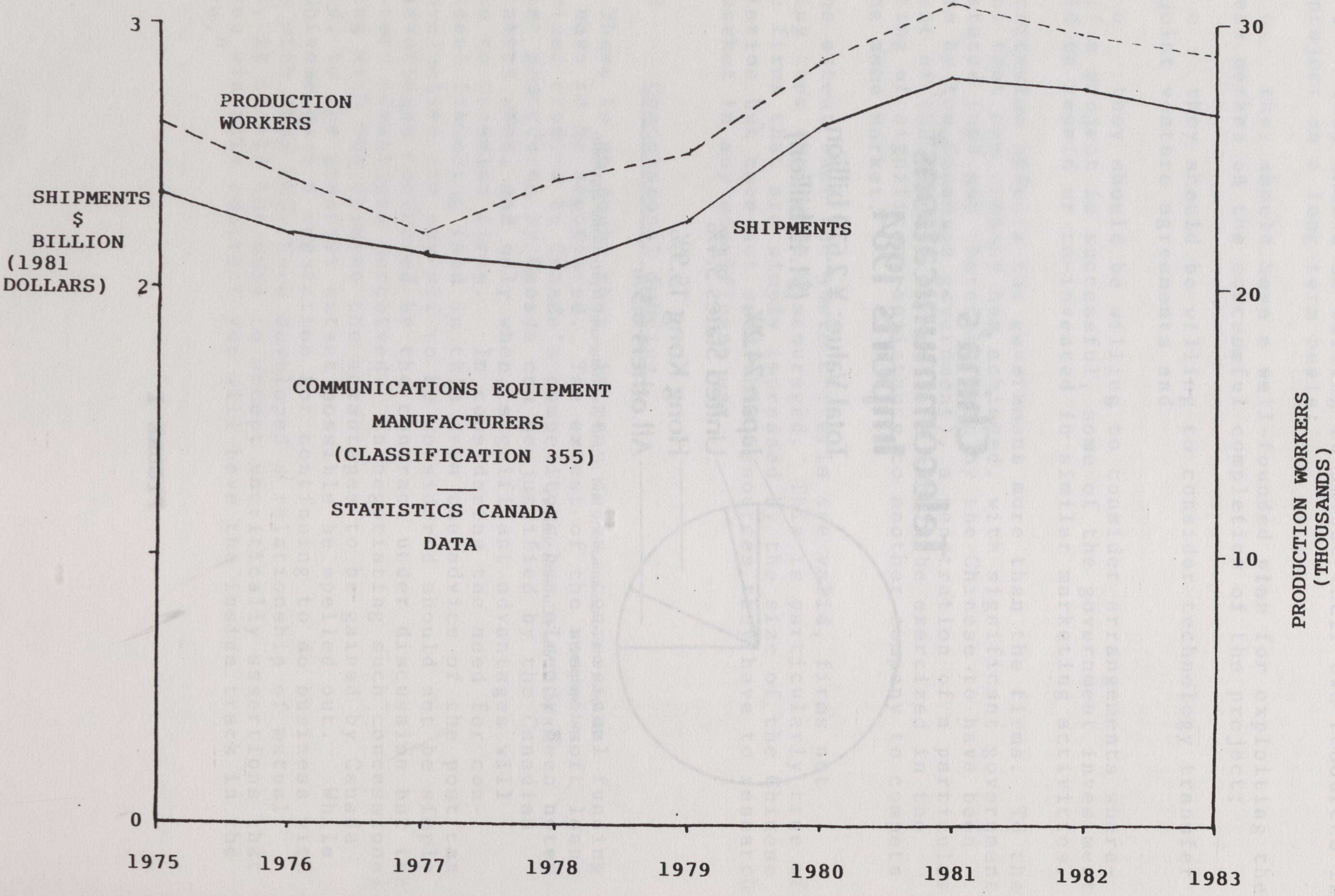

3
2
0
30
20
10
PRODUCTION WORKERS
SHIPMENTS $ BILLION (1981 DOLLARS)
SHIPMENTS
COMMUNICATIONS EQUIPMENT MANUFACTURERS (CLASSIFICATION 355)
STATISTICS CANADA DATA
PRODUCTION WORKERS (THOUSANDS)
1975
1976
1977
1978
1979
1980
1981
1982
1983

FIGURE 2

REMOTE SENSING REVENUES
BY THE CANADIAN PRIVATE SECTOR
($Millions)

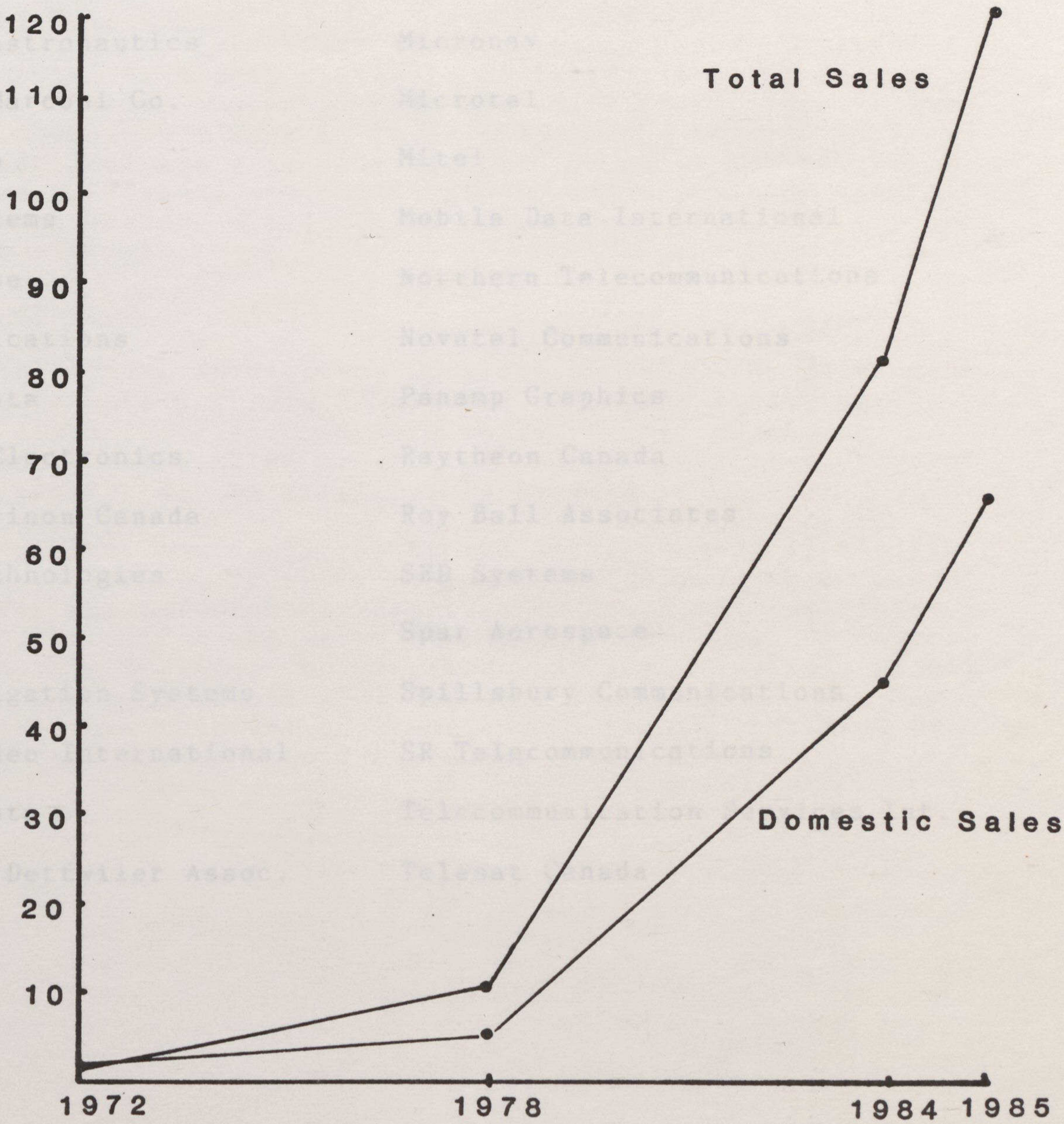


FIGURE 3

ANNEX A

COMPANIES CONTACTED

In connection with the preparation of the this brief the following companies were contacted.

Canadian Astronautics	Micronav
Canadian Marconi Co.	Microtel
Data Radio	Mitel
Dipix Systems	Mobile Data International
Electrohome	Northern Telecommunications
ET Communications	Novatel Communications
Gandalf Data	Panamp Graphics
Glenayre Electronics	Raytheon Canada
Harris Farinon Canada	Roy Ball Associates
Intera Technologies	SED Systems
Internav	Spar Aerospace
Leigh Navigation Systems	Spillsbury Communications
Leitch Video International	SR Telecommunications
Memotec Data	Telecommunication Services Int.
Macdonald Dettwiler Assoc.	Telesat Canada

ANNEX B

FINANCIAL FACTORS AFFECTING INTERNATIONAL COMPETITIVENESS IN THE CANADIAN SPACE INDUSTRY

Extracted from a report to DRIE on the Space Sub-Sector.
Roy M. Dohoo Limited. February 1986.

Investment Environment

The general equity investment environment in Canada is sound. Equity capital is highly available to large established companies. Smaller companies have more difficulty, but availability is improving. Cost is lower than in the last 10-15 years. These conditions are generally expected to exist for the next 5-10 years as long-term economic growth and a positive restructuring of the economy are foreseen. Government deficits are seen as the major risk.

Export financing

Through the Export Development Corporation (EDC) the government continues to make a strong commitment to export financing. Canadian companies should be able to, at least, match the competition. Where sales are to the poorest countries, however, export financing may be difficult to arrange.

Although greater participation by the banks is seen in the field of export financing, there is no reason to believe that Canada will suffer any material disadvantage in competing for space-related contracts on the basis of export financing. Of course this is always dependent on government policy. However, recent indications (the November 1984 economic statement and the May 1985 Budget) are that the government will remain committed to providing competitive export financing assistance.

ANNEX C

AREAS OF WORLD CLASS CANADIAN EXPERTISE IN REMOTE SENSING

Hardware

Satellite Receiving Stations (50%+ of world market)
Digital Image Analysis Systems
- Mini-based (25% of world exports - and growing)
- Micro-based (most efficient software available)

Airborne Radar Systems
- SAR (the best highest resaolution systems)
- SLAR (competitive price and resolution)

Colour Image Recorders (digital to film)
Airborne Solid State Multispectral Scanners
Laser Altimeters (for terrain/forest profiles)
Laser Bathymetry (for coastal hydrographic surveys)

Services

Consulting on Remote Sensing Organization
Education (universities, technician training, short courses)
Image Interpretation and Mapping Services
- Agriculture
- Environmental Analysis
- Exploration Geology
- Forestry
- Ice
- Land Use
- Map Making/Revision
- Route Selection
- Terrain Analysis
- Water Quality

Airborne Photographic Surveys
Airborne Radar Services (the largest most active industry in the world)
Airborne Thermographic Services

Prepared by: User Assistance and Marketing Unit
Canada Centre for Remote Sensing
Energy, Mines & Resources
Ottawa, Ontario

APPENDIX G

TASK FORCE ON CHINA POWER SECTOR

SECTOR BRIEF

FOR

THE TRANSPORTATION SECTOR

Prepared by: L. Nielsen, CIDA
J. Barker, DRIE
E. Cuylits, DRIE
E. Klaesi, CIDA
J. Kritsch, DRIE
H. Shaver, DRIE

June, 1986

CHINA TRANSPORTATION SECTOR BRIEF

EXECUTIVE SUMMARY

At the national level, the sub-sectors of transportation are administered as follows:

Railways - Ministry of Railways
Marine - Ministry of Communications
Roads - Ministry of Communications
Aviation - Civil Aviation Administration

The State Planning Commissions and the State Economic Commissions each having a Transportation Bureau, approve and schedule the investments, influenced by the State Capital Construction Commission.

The needs to modernize transportation in China are enormous, for example: for coal from mine to user, for products between rural and urban areas, for passengers generally, and for handling of imports and exports.

China's annual investment in transportation is estimated to reach $5.0 billion (Can.) until the turn of the century, divided among the transportation sub-sectors, as follows:

- $2.0 billion (Can.) for railways (track, locomotives, wagons and telecommunications)
- $1.0 billion (Can.) for marine (river navigation and port improvements and expansions)
- $1.0 billion (Can.) for roads (widening, paving and extensions)
- $1.0 billion (Can.) for civil aviation and urban transportation

Import financing will generally be limited to foreign currency earning projects, and require foreign company investments in China.

Canadian commercial prospects are greatest in high technology, such as: advanced science, engineering and management, computerization, light rapid transit (ALRT), STOL and jet aircrafts, simulators.

Canadian industry has a potential, in the competitive China market, for sophisticated equipment, such as: railway signalling, telecommunication and yard computerization, coal handling, containerization, bi-level/subway cars, light rapid transit, traffic control, port equipment, special aircrafts.

At the present time, several Canadian firms, which were contacted during the preparation of this sector brief, have contracts, and prospects, worth Federal Government support.

Due to the strong international competition, the negotiation and contract particularities, and the importance of the market, Canadian industries need Government assistance to be more successful in China.

For transportation pre-feasibility studies, the CIDA-INC and the DRIE-PEMD grant funding should be increased to about $500,000 and $1.0 million, respectively, per year, for the Chinese projects.

For feasibility studies, more grant or low interest concessional funding should be made available for those projects statisfying certain criteria, for an estimated budget of $3.0 million per year.

For project implementation, the EDC line-of-credit should be softened by CIDA bilateral grants, for promising projects, in an amount of about $4.0 million per year.

At the request of industry, the diplomatic and commercial support should be increased, by providing one special officer (preferably Chinese speaking)for the transportation sector at the Beijing Embassy and by participating more at Chinese trade fairs and invitations to Canada.

In total, the recommended support for the transportation sector would be about $10 million per year, excluding the EDC line-of-credit. The resulting purchases from China are roughly estimated to be in the range of $30 to 100 million per year for Canadian transport products and services.

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INTRODUCTION

After the cultural revolution, the Chinese gradually adopted an open door policy which called for sharply increased commercial relations with Western countries. They realized their great need for technology, skills and capital equipment, which are necessary to develop their economy and raise standards of living. In spite of the open door policy, there are strong elements within the Chinese power structure which seek to limit China's exposure to the west for ideological reasons. These elements generally identify capitalism with corruption. It is quite possible, in the future, that changes in the power structure, will result in the door being less open, than Western countries would like.

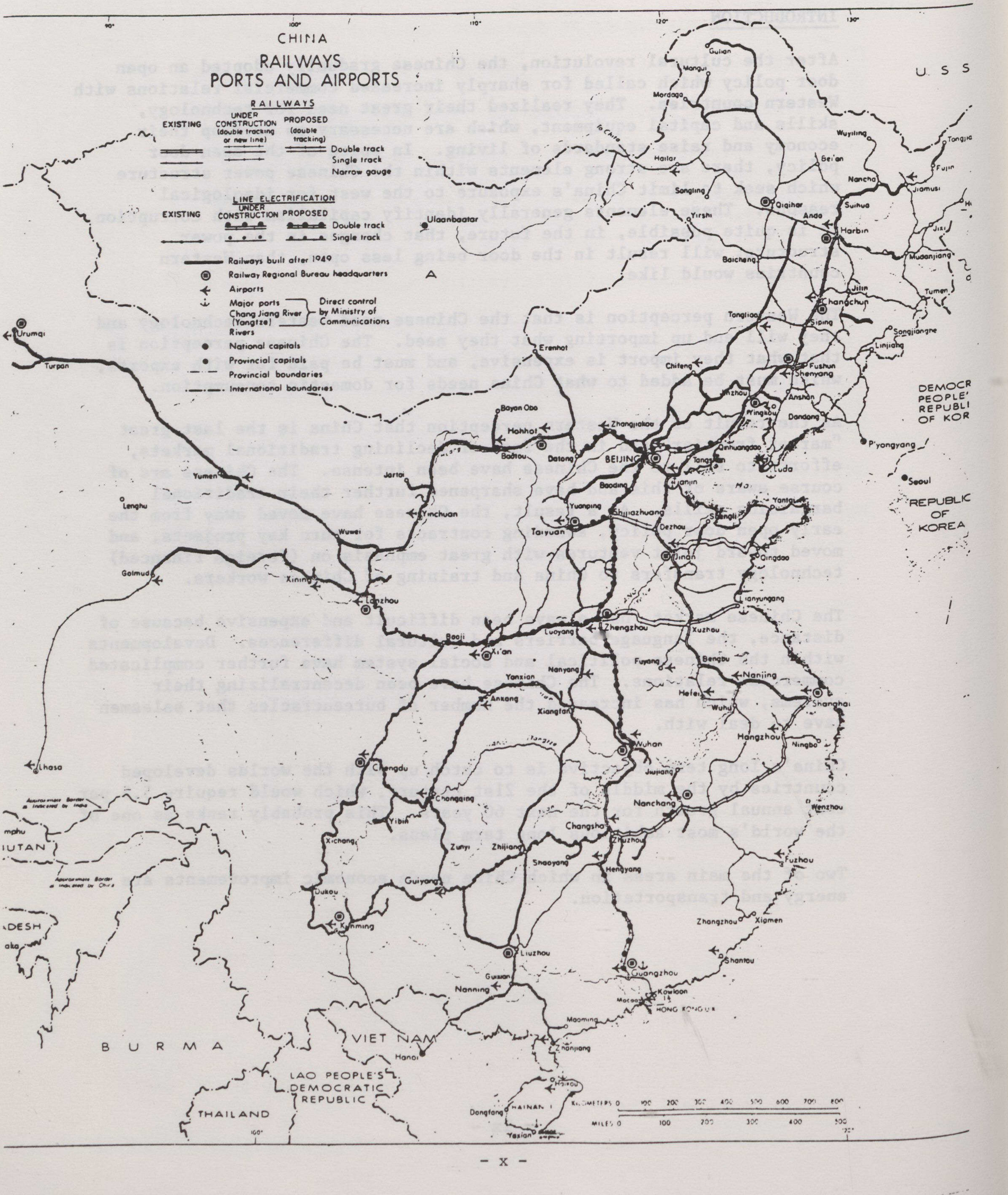
The Western perception is that the Chinese need western technology and they will end up importing what they need. The Chinese perception is that what they import is expensive, and must be paid for with exports, which must be added to what China needs for domestic consumption.

As the result of the Western perception that China is the last great "market frontier" and in the face of declining traditional markets, efforts to sell to the Chinese have been intense. The Chinese are of course aware of this and have sharpened further their traditional bargaining skills. As a result, the Chinese have moved away from the early open door policy, awarding contracts for turn key projects, and moved toward joint ventures with great emphasis on (foreign financed) technology transfers to China and training of Chinese workers.

The Chinese market, has always been difficult and expensive because of distance, the language barriers and cultural differences. Developments within the Chinese political and social system have further complicated commercial relations. The Chinese have been decentralizing their systems, which has increased the number of bureaucracies that salesmen have to deal with.

China's long term objective is to catch up with the worlds developed countries by the middle of the 21st century, which would require 5.5 per cent annual growth for the next 60 years. This probably ranks as one of the world's most ambitious long term plans.

Two of the main areas in which China needs economic improvements are energy and transportation.


CHINA
RAILWAYS
PORTS AND AIRPORTS
RAILWAYS
EXISTING
UNDER CONSTRUCTION (double tracking or new line)
PROPOSED (double tracking)
Double track
Single track
Narrow gauge
LINE ELECTRIFICATION
EXISTING
UNDER CONSTRUCTION
PROPOSED
Double track
Single track
Railways built after 1949
Railway Regional Bureau headquarters
Airports
Major ports
Chang Jiang River (Yangtze)
Direct control by Ministry of Communications
Rivers
National capitals
Provincial capitals
Provincial boundaries
International boundaries
U. S. S
DEMOCR PEOPLE' REPUBLI OF KOR
REPUBLIC OF KOREA
BURMA
VIET NAM
LAO PEOPLE'S DEMOCRATIC REPUBLIC
THAILAND
Ulaanbaatar
BEIJING
Harbin
Changchun
Shenyang
Urumqi
Turpan
Lhasa
Golmud
Lanzhou
Xi'an
Chengdu
Chongqing
Kunming
Guiyang
Wuhan
Nanjing
Shanghai
Hangzhou
Fuzhou
Xiamen
Guangzhou
Kowloon
Nanning
Liuzhou
Changsha
Zhengzhou
Jinan
Qingdao
Taiyuan
Hohhot
Datong
Tianjin
Dalian
Seoul
P'yongyang
Hanoi
KILOMETERS 0 100 200 300 400 500 600 700 800
MILES 0 100 200 300 400 500

1. OPPORTUNITIES IN CHINA

1.A Sector Organization and Responsibilities

At the national level, the sub-sectors of transportation are administrated as follows:

RAILWAYS	-	Ministry of Railways (MOR)
MARINE	-	Ministry of Communications (MOC)
ROADS	-	Ministry of Communications (MOC)
AVIATION	-	Civil Aviation Administration (CAAC)

Decision-making in the railways and aviation sub-sectors is highly centralized, whereas in the roads and marine transportation sub-sectors, the role of provincial, county and commune governments and enterprises is very important. Transport decisions are coordinated horizontally among major government agencies, and vertically between the central ministries and the provincial and lower levels of government.

Horizontal coordination seems to take place mainly through approval and scheduling of long-term investments by the State Planning Commission (SPC) and short-term investments by the State Economic Commission (SEC), influenced by the State Capital Construction Commission (SCCC). SPC and SEC each have a transportation bureau with four divisions (railways, road and water transport, telecommunications and administration). Since each has only some 20 to 30 professionals, they have to rely heavily on work done by the three operating ministries and agencies.

An Institute of Comprehensive Transportation was reinstated recently within the SEC, to coordinate the modal viewpoints of the four basic modes of transportation into a sectoral overview. However, there seems to be no national transportation plan and no real pre-investment studies. The Ministries have only "lists of desired projects".

Central coordination seems to result from meetings called by SEC/SPC, at which the concerned Ministries and affected large industries attend, including the Foreign Trade Ministry, if appropriate. Decisions seem to be reached by consensus, rather than by systematic, economic criteria.

1.B Past Transportation Developments and Present Needs

Major progress has been made by China, over the last 30 years, in extending the size of its transport network, improving its capacity, and raising its efficiency. The varied developments have been achieved by great engineering efforts and, after the break with the USSR two decades ago, largely without foreign financial and technical assistance.

The major impediment to China's planned rapid development is the inability to move coal and other commodities to locations where they are required. The rail system is to be expanded, upgraded and reorganized; existing ports are to be refurbished and a number of new ones are to be built; several airports are to be expanded and re-equipped; aircraft and aviation equipment is to be purchased. Improvement of the inadequate highway system is a secondary priority. Modern urban transit is to be developed in several major cities.

1.B.1 Railway Developments

The railway system in China is the major carrier, and has more than doubled in size over the last 30 years, to about 50,000 route-km, almost entirely integrated and technically uniform. Over 8,000 km are double-tracked and close to 2,000 km are electrified.

The rolling stock consists of some 10,000 locomotives (77% steam, 20% diesel and 3% electric), 260,000 freight cars and 15,000 passenger coaches. China is now the third largest rail freight transport country, after the USSR and the USA. While its rail network is the fifth longest in the world, it is still modest in size (about 20% of the USA's, 35% of the Soviet Union's, and 80% of India's) in relation to the size of the country's population and productive area.

The efforts of extending and improving the rail system has involved major engineering achievements, by construction units of the Ministry of Railways, and the Railway Engineering Corps of the armed forces.

Present Needs

The seventh five-year plan (1986-90) will allocate 11% of the national budget to railways. The railway will be increased from its present length of 50,000 km to 60,000 km by 1990, and to 80,000 km by the year 2000. Existing lines will be upgraded by double tracking an additional 2,700 km by 1990, and by the electrification of an additional 4,700 km by 1990. The diesel locomotive fleet will be increased to 30% of the total fleet.

1.B.2 Mass Transit Developments

Tianjin and Beijing have existing subway systems, both developed without foreign assistance until recently, and in need of further expansion.

Present Needs

Several major centres, including Beijing, Shanghai, Wuhan, Tianjin, Chouqqing and Guangzhou, are in various stages of planning modern urban transit systems, both surface and sub-surface. Anshan, Changchun, Dalian and Harbin need new cars for their street tramcar systems.

1.B.3 Marine Developments

Water transport has traditionally been important in China. Inland navigation canals, including the Grand Canal from Beijing to Hangzhou, were started two thousand years ago. Military damages of the 1940s and earlier have been repaired, and over 100,000 km of rivers and canals are navigable. Most rivers are still in their natural state, and only 2,700 km of inland waterways are now navigable in vessels of 1,000 dwt or more.

The Chang Jiang (Yangtzee) River is one of the world's great water arteries (like the Rhine, Mississippi and Danube): it carries ocean-going vessels of up to 10,000 dwt 300 km upstream (Nanjing) and, in highwater seasons, ships up to 5,000 dwt, some 1000 km inland (Wuhan). It also carries some modern push-tow barge trains, and local passenger and freight boats to seven designated foreign trade ports and to terminals controlled by central, provincial and local governments and by production enterprises.

The 15 major ports along China's 18,000 km coastline handled 212 million tons in 1979 (only one third in foreign trade), which was the capacity of its 313 berths, of which 130 are for 10,000 tons or more. Many of these berths were very congested due to technically backward materials-handling equipment. Many smaller ports are under provincial government responsibility and serve only domestic trade.

China's ocean and coastal shipping fleet has expanded at a faster rate, in recent years, than that of any other nation. It is about the fourteenth largest in the world and amounts to about 640 ships, totalling 9 million dwt. China's own shipbuilding industry produced 818,000 tons of civilian steel ships in 1980. China has also built up a dredger fleet of over 500 dredgers and auxiliary vessels, with a combined dredging capacity of 100 million cubic meters, of which part is underutilized.

Present Needs

The 22 coastal, 9 Yangtzee River and 3 Hainan Island ports are to be upgraded. The Chinese are planning to increase port capacity from 300 million to 500 million tons per year by 1990. Many system improvements are needed. Fourteen of the ports will have to be modernized, and the number of large berths will have to be increased from 130 to 200 by 1990. Dockside equipment will be needed, as will training, port management, selected design consultancy, coal and grain handling and container operations. There will also be a need for self-unloading bulk carriers.

1.B.4 Aviation Developments

Civil aviation is still very much under-developed, for example, flights and passengers are about half those in India. The aviation system is being upgraded with capacity and increased service by jet aircraft, more city-pairs are being added to the domestic network, and more cities are being opened to international service. Nevertheless, CAAC has difficulties in keeping up with the growing demand, including the increasing overseas tourists. Regional airlines are now being established.

Present Needs

There seems to be opportunity for Canada to provide China with STOL aircrafts and further Challenger jets, as well as possibly sophisticated training simulators and navigation aids. There is also a potential in developing the air cargo sub-sector.

1.B.5 Road Developments

The network of motorable roads in China increased tenfold from 80,000 km in 1949 to 870,000 km in 1979 and was built, mainly, by provincial, county and commune governments. Capacity and design standards for all roads remain low. Main roads do not permit the fast, direct, heavy truck and bus transport found most places. There is only some 200 km of four-lane intercity highways in China. There is no private automobile ownership, cars are owned by government departments, enterprises and diplomats.

Urban traffic is characterized by an incoherent mixture of all types of motorized and non-motorized vehicles, and the levels of congestion are very high in some areas. Western type traffic control appears very difficult, because signal obedience is low. But strict discipline is a trait of the Chinese, and could be enforced if the signal system is designed correctly.

Present Needs

There exists a need for well designed intercity highways, as well as urban road networks, including modern traffic signalization, in light of China's plans to triple its manufacturing of vehicles by 1990. It is proposed to manufacture 920,000 vehicles per year in 1990, an annual growth rate of 20%. Technology is largely 1950's Russian which requires upgrading and modernizing.

1.C Anticipated Transportation Sector Investments: 1986-2000

China's annual investment in the transportation sector has been small in comparison with other countries. It has averaged \$3.0 billion (Can.), per year, over the last decade, of which about half has been invested on railways and a third on ports, waterways and roads. It has averaged 12% of the total domestic investments, similar to developed economies, but much less than developing countries. It represents some 1.1% of GNP. In future, they plan to invest about 2% of GDP, or $5.0 billion (Can) per year.

At this estimated yearly level, investments in the transportation sector are foreseen, until the year 2000, to total $65.0 billion (Can). Financing would come, in part, from excess revenues already generated by existing transportation systems, such as railways and ports. In the railway sub-sector, for example, the cash generated by net operating revenues, exclusive of major repairs, amounts to over $2.0 billion (Can) per year. New port fees were introduced January 1st, 1986 (C$.85/t) to finance port expansions. For other transport facilities, such as roads, the financing mechanisms need to be developed at all levels of government, like fuel taxes and full user charges, in relation with the benefits procured by the improved facilities.

A shortfall of foreign exchange will, however, persist, and international loan financing is necessary. The World Bank has funded several railway, highway and port projects. China has just joined the Asian Development Bank. Numerous industrial countries are now starting to offer China funding for technology transfer/sale.

One interesting approach by China, to finance its foreign currency costs, is to joint-venture with a foreign industry leader, who will implement new technology and production in China, part of which will be exported by the joint-venture, to pay the foreign costs. However, it also creates a new lower cost competitor.

1.C.1 Railway Investments

China plans to invest about $2.0 billion (Can) annually, or 11% of their national investment budget in the railway sub-sector. An investment of this magnitude could provide, annually, the electrification of 1000 km of single track, the purchase of 200 new locomotives, and the necessary upgrading and partial double tracking of the existing railway system. Improvements would also include passenger stations and rolling stock, some line and signalling modifications, particularly near large cities, and transport and handling equipment for coal and other bulk material.

1.C.2 Marine Investments

China plans to invest about $1.0 billion (Can), annually for the systematic upgrading of the entire river and port system, thus producing high rates of return. Top priorities are given to the development of the Xi Jiang River to permit 1000 t barges between Guangzhou and Nanning, and of the Huai He and the Grand Canal, to facilitate the shipment of coal and ore. The congested ports need better terminal facilities, including equipment for handling containers and bulk materials. New deep-water ports must take advantage of larger ships and lower dredging costs than for estuary ports.

1.C.3 Road Investments

An additional $1.0 billion (Can) is planned to be invested to widen overloaded two lane roads, improve unpaved congested roads, extend low standard rural roads into now inaccessible areas, and to upgrade, add/or replace bridges.

1.C.4 Other Investments

The remaining annual investment of $1.0 billion (Can) will be necessary for improvements in civil aviation, telecommunications and urban transportation.

1.D Major Projects of Potential Commercial Interest to Canadian Transportation Industry

The planned investments in the transportation sector will be spread over a great number of projects, similar to those discussed in preceding sections. In general, application of modern transport technology, in China, has lagged behind development in the rest of the world in a number of areas, and China needs to catch up in the following equipment area:

- locomotives - both electric and diesel-electric
- rail passenger equipment for short distances
- combined ocean-going and inland barges
- materials and bulk handling equipment
- light and heavy diesel-powered trucks
- telecommunications and navigational aids
- management information systems, etc.

Some technology, such as for vehicles, can be acquired abroad. Engineering and management is more a matter of training and exposure through visits by Chinese engineers abroad, and by foreign experts to China.

Studies will probably have to be carried out by chinese research institutes with the assistance of foreign specialists. Some of the most urgent needs are as follows:

- use, distribution and transport of coal
- intermodal allocation of short haul traffic
- motive power planning for railways
- engineering standards for roads and ports
- secondary and tertiary road expansion
- master planning for ports, especially deep-water
- modernization of urban transit and traffic.

Specific projets have been identified by Canadian industries and government representatives as being of particular interest to Canadian industry. Annex 'C' summarizes projects, identified by Canadian industry, for possible future involvements.

2. CANADIAN INDUSTRY CAPABILITY AND CAPACITY

2.A Domestic Market Prospects and Export Experiences

2.A.1 Railway Sub-Sector

The railway industry in Canada is operating in a weakened domestic market. The economy has been depressed over the last several years and rail freight, particularly in Eastern Canada, has been dropping since 1981/82. Sales of rolling stock, i.e. locomotives and wagons, have experienced slow sales, and one builder in each of these industries has ceased production. Bombardier stopped manufacturing complete locomotives in 1984, and Marine Industries indeterminately ceased freight car production in 1985/86.

Locomotives

Domestic locomotive sales in 1985 were 109 units (GM Canada). Average annual production of locomotives has varied over the last several years, as indicated below, including domestic and export figures:

1981-82 locomotives 452 - 151 domestic and 301 export
1983-85 locomotives 302 - 196 domestic and 106 export

Locomotive plant utilization decreased dramatically between 1981 and 1985.

The domestic market for locomotives in Canada is estimated to be 80-100 units/year over the next several years. Now that Bombardier has elected to opt out of locomotive assembling and concentrate on the provision of ALCO spares for existing locomotives around the globe, GMD will likely enjoy a stable, if conservative market here and abroad.

Railway Wagons

In 1985, approximately 3,160 freight cars were produced in the four railway wagon plants located in Ontario, Quebec and Nova Scotia. Total Canadian freight car production has sagged to 25% of production from the boom years of 1974 and 1975, when some 8,963 units and 8,681 units were produced respectively. In 1979, approximately 9,200 wagons were produced, however, production fell to 3,059 units in 1982 and to 1,723 units in 1982.

Although all the freight car manufacturers have bid on overseas orders, Hawker Siddeley has been the most successful in obtaining car orders in Africa and Asia, and is currently following orders in Nigeria, Mali, Saudi Arabia and India. Other manufacturers are National Steel Car, Marine Industries and Procor Ltd.

Domestic freight car orders over the next four years is expected to be as low as 500 units in 1986, 650 units in 1987 and under 1,000 cars in 1988 and 1989. Potential export estimates are also very discouraging for the industry. If overseas orders are less than 500 units each year, the industry overall will likely produce 1,000-1,200 cars annually. The industry will be operating at less than 15% of normal capacity, despite MIL's withdrawal from the freight car market.

2.A.2 Mass Transit Sub-Sector Equipment

The rail transit industry includes those companies which are engaged in the manufacture of rail passenger cars, tramcars and other light rail vehicles. The principal companies are Bombardier Inc., and the Urban Transit Development Corporation.

Bombardier Inc., at its plant in La Pocatiere, has built rubber-tired and steel-wheeled metro cars, commuter and intercity rail cars, and various light rail vehicles. UTDC, in its plants at Kingston and Thunder Bay, have produced steel-wheeled metro cars, tramcars and intercity passenger equipment.

Canada has had a long history of building railway passenger coaches, tramcars and electric trolley buses for domestic consumption. Until recently, it also imported mass transit vehicles. The original cars for Toronto's subway, for example, came from Gloucester Carriage Works in England. Both Edmonton and Calgary opted for European-built Deuwag cars in their light rail systems, and VIA runs a number of Budd self-propelled railcars (inherited from CN and CP), which are of U.S. origin.

However, with the creation of Bombardier's Mass Transit Division and the UTDC, Canada has become not only a significant net exporter of guided mass transit cars, but is capable of supplying all types of domestic vehicle requirements from Canadian sources. The two companies have produced 1,000 units valued at over $220 million since 1967 for the Canadian market.

Of three car builders remaining in North America, two are Canadian. Of over $3.4 billion worth of public transit cars presently on North American order books, over $1.3 billion is shared by Bombardier and UTDC, with over $1 billion of that total in export orders.

Additionally, both companies build intercity rail passenger cars for domestic use.

Between UTDC's orders for "GO" bi-level equipment and Bombardier "VIA" LRC orders, the Canadian industry has produced 500 passenger units valued at over $500 million.

The car builders together employ approximately 2,300 Canadians in manufacturing operations at three locations: La Pocatiere (Quebec), Kingston and Thunder Bay (Ontario). Together, they have a supplier network of over 300 Canadian companies and, for domestic orders, maintain a 90 percent plus CVA. Because of U.S. "Buy America" provisions in U.S. Federal legislation, U.S. orders for urban mass transit fall to a CVA in the magnitude of 40 percent. Nonetheless, fulfillment of U.S. orders currently in process will lead to minimum net Canadian earnings in foreign exchange of $400 million, based on a 40 percent overall CVA.

Rail passenger equipment manufacturing in Canada has, therefore, been a growth industry in a period of overall lacklustre world financial performance.

Prospects for new orders in the immediate future are not optimistic. However, the companies are carrying on a concerted and aggressive marketing effort.

In addition to China, major mass transit opportunities are being pursued in Mexico, Turkey, Greece and Egypt, while a considerable (200 units) requirement is likely to exist for VIA Rail intercity bi-level equipment and another (115) quantity for Amtrack.

Local political considerations have played an overriding role in the allocation of domestic urban vehicle orders. In recent years, the two largest market areas of Quebec and Ontario have placed all significant orders with their provincially located companies despite possible lower prices from the out-of-province competition.

Bombardier has provided 423 units to the Montreal Metro, while UTDC has supplied 574 vehicles to the Toronto Transit Commission, and a total of 288 coaches to the Government of Ontario G.O. System.

In recent year, Bombardier has been the only successful supplier to the domestic intercity passenger coach market, having provided VIA Rail with LRC 200 units between 1979 and 1985. Although there has been little domestic alternative, there promises to be tough competition between UTDC and Bombardier when VIA starts to re-equip its transcontinental fleet. This requirement is likely to be for 200 day coaches, diners, sleepers and day-niters over the next six years.

On the international market scene, the competition is wide open. Except for one occasion (Singapore in 1982) when UTDC and Bombardier were convinced, by financing incentives, to present a joint bid, the two companies compete head to head.

Technology

Canadian companies have developed good technical expertise in rubber and steel-wheeled subway systems, light rail vehicles, commuter car design and construction of medium-speed intercity rail equipment.

In urban transit, Bombardier specializes in building cars of proven design, either under licence to, or by purchase from, established suppliers. Bombardier then customizes and modifies these designs to suit the standards of any particular request for quotation. UTDC has both the capability to operate in a similar manner to Bombardier and also to do original design and development. UTDC's ALRT is an example of a Canadian design.

UTDC is expanding its ability to provide ancillary planning and operating advice. There is, however, a great deal of room for innovation and technology development within mass transit systems where the infrastructure is included.

France, Britain and Japan have developed high-speed rail equipment well beyond the Canadian capability. Canada simply cannot compete in the limited markets where this type of equipment is suitable. However, in areas of medium travel density where high speed cannot be justified, the equipment designed and developed by Bombardier has little worldwide competition.

2.A.3 Marine Sub-Sector

The marine and ocean equipment sub-sectors consist of about 100 Canadian firms, supplying a diversity of products to the shipbuilding industry and the offshore oil and gas sector. Many of the companies operating in this area are internationally competitive and very active in the export market. Chinese offshore oil and gas activities represents a growing market and Canadian companies can offer a diversity of competitively priced, state-of-the-art to the Chinese offshore industry.

2.A.4 Aviation Sub-Sector

Canada has the expertise to provide a complete domestic air system, particularly suited for areas characterized by rough terrain and isolation. Related to the provision of a system, of course, is the appropriate planning, training, construction supervision and equipment.

Past experience has disclosed that a lack of proper maintenance and component supply has often been a problem for those countries which already have moderate air services operating. Canada is capable of supplying, to them, engines and installed equipment for a range of aircraft, airport equipment and air traffic control systems.

Canadian expertise is available from the Government's Department of Transport, individual experts and from a growing group of consulting engineering firms for the development of ground support facilities.

2.A.5 Road Sub-Sector

In the road sub-sector, there is excellent Canadian capability in the supply of on-highway trucks, such as transport vehicles, dump trucks and concrete-mixer trucks, in all gross vehicle weight categories, and heavy off-highway trucks used in construction. There is a limited capacity in the supply of right-hand drive vehicles and four-wheel drive vehicles in the light and medium duty ranges. Through Canada's own needs, industry has developed an important expertise in low ground pressure vehicles. Construction equipment such as road graders, front-end loaders, and other equipment is available with high Canadian content.

On the engineering side, which involves planning and feasibility studies, detailed engineering design and supervision and management of construction, significant success abroad has been achieved by Canadian consulting firms.

Expertise on the institutional aspects and maintenance is also available through provincial highway departments, some consulting firms and individual experts.

Canadian contractors are not presently competitive in the international markets for road and bridge construction, although Canada has supplied numerous bridges overseas for construction using local resources under Canadian supervision.

2.B Previous Experience and Activities in China

As part of the determinations of inputs for this brief, some of the transportation equipment manufacturing and service companies, which are known to have been interested in the China market, were contacted as listed in Annex "A".

2.C Canadian Strengths, Weaknesses and Competitiveness

2.C.1 Railway and Mass Transit Sub-Sectors

Although Canada produces a wide variety of railway rolling stock, the costs may be higher than those in the US due to irregular demand, high transportation and labour costs, shorter production runs, cost of capital and royalties on technology. Given this situation, the Canadian industries relating to railway metal fabrication and freight cars have to try harder to compete in the overseas market and make offers to the Chinese industry who produce similar products.

The industry does have an opportunity in the Chinese market in the higher technology areas. Canada has shown itself to be competitive in engineering and design consultancy, the application of computer technology to railway and transit system operations, and in transit vehicle technology such as the ALRT produced by UTDC. In all these areas the Chinese are interested in obtaining these technologies for application within China and through joint ventures, for export sales. Specifically, Canadian industry sees opportunities in bi-level passenger cars, streetcar technology, roadbed technology, and centralized traffic control systems, and related consultant services.

The proximity of the large U.S. market, and the relative weakness of USA manufacturers in the mass transit sub-sector, has put Canadian companies at an advantage. Canadian companies have experienced a remarkable degree of success in foreign markets, without any overt slanting of government policy, or inordinate levels of program assistance, in their support.

Urban transportation equipment was virtually left untouched by the Tokyo Round of GATT negotiations, as the U.S. refused to reduce its 19 percent tariff, or to bring under the GATT Government Procurement Agreement, the "Buy America" provisions of its Surface Transportation Assistance Act. However, Europe is virtually closed to North American suppliers.

The estimated potential of trade with China, in the railway and mass transit sub-sectors, can be rated, as follows:

<u>Good</u>

. Specialized consulting service
. Computer software - technology transfer
. Light rapid transit (streetcars, ALRT)
. Subways, bi-level passenger coaches
. Telecommunications
. Containerization technology
. Bulk commodity handling technology

<u>Possible</u>

. Locomotives or diesel engines
. Rotary dump wagons or components
. Electrification supplies
. Signalling equipment
. Containerization equipment
. Bulk commodity handling equipment

<u>Not Encouraging</u>

. Railway wagons
. Buses
. Steel rail
. Track maintenance machinery

2.C.2 Marine Sub-Sector

Canadian shipyards are not competitive on an international basis, consequently the Chinese market, especially with the close proximity of Korea and Japan, would not be seen as a potential market for Canadian yards. Exceptions which could occur would be in a narrow range of specialized vessels, such as icebreakers, hydrographic research vessels and some fishing boats. In these cases, Canadian design and operating experience would be the main selling points for constructing these vessels in Canada. In addition, Canadian companies have shown interest in marketing the following in China:

. Cold weather equipment and technology
. Supply boat and rig installed equipment
. Steering control packages
. Hoists, deck machinery, controls
. Safety and rescue equipment
. Drilling packages

The expansion of this list will depend, to some extent, on Chinese internal policy, as well as the number of Canadian companies that can mount the minimum effort, required to market in China.

2.C.3 Aviation Sub-Sector

Canada does have an opportunity to supply certain aircraft i.e. STOL and Challenger jets to China, as well as possibly sophisticated training simulators and navigational aids. There is also a potential for Canadian consultants to provide assistance in the development of groundside facilities, as well as the planning of airside operations.

Price competitiveness remains decisive, i.e. DHC-DASH 7 vs Short 360. Furthermore, on-going sales will require the Canadian supplier to enter into a joint-venture/co-production arrangement with one of the CATIC factories. This does still not guarantee a domestic market for the resulting product, because CAAC/CASC may purchase at better prices from other suppliers.

2.C.4 Road Sub-Sector

Canadian vehicle and construction equipment manufacturers would not be competitive in the Chinese market, especially with the close proximity of Korea and Japan. Exception could occur in the light and heavy diesel-powered trucks and off-road vehicles, specially developed in Canada.

With respect to consulting services, a full range of services from planning, feasibility studies, detailed engineering to management and construction supervision, as well as training in all aspects of policy, organization and operations, could be provided from Canada.

2.D Economic Impact in Canada of Transportation Sector Exports

According to the DRIE input-output model, one million dollars worth of transportation industry export corresponds, on average, to some 36 man-years of Canadian employment, of which 23 man-years are direct and indirect jobs and 13 man-years are induced jobs. This is based on an average of 63% Canadian content. The cost of material and Canadian content varies according to the product.

Based on previous experience, for example, in the railway and mass transit sub-sectors, the economic impacts of export sales are as follows,on average:

Locomotives: 48 man-year/locomotive or

41 man-year/\$1.0 million in value for heavy industry

Railway Wagons: 1 man-year/wagon (\$75,000)

Steel Rail: 1.35 man-year/100 ton of steel

The 35 million dollar (Can.) EDC line of credit invested in China since 1980, corresponds, therefore to roughly 1260 man-years of employment or more than 200 jobs in all industries involved. This should grow considerably in the coming years. For example, the imminent sale of the three Challenger jets and one Dash 7 plane is worth about \$70 million (Can.), or an estimated 2500 man-years of employment. The total EDC line-of-credit, for all sectors, amounts to \$2.0 billion (Can.).

2.E Prospective Domestic Impacts of Future Chinese Exports

The lower labour costs in China, will permit Canadian joint-ventures to produce, under Canadian licence, new products at lower costs than in Canada. This will open up new markets in competition with Asiatic high technology countries (Japan, Korea, Taiwan, Hong Kong, Singapore) for "Canadian technology made in China", new markets in Asia, as well as Africa, Latin America and even Europe. At the same time it could jeopardize industrial jobs in Canada, because the higher-cost products made in Canada could not compete under free trade.

This situation applies particularly to the passenger transit industry (light rapid transit, subway and bi-level trains), which is promising, for Canadians, even in the US market. It cannot be avoided by holding back the technology transfer to China, because if Canadians don't do it, other developed countries will (i.e. USA, Germany, France, UK and Japan). The solution of this dilemma lies in continuous advance in Canadian technology and improvement in productivity.

Since the Canadian joint-venturing industry would make profits in new markets it could not penetrate otherwise, there would be means to achieve advances, if well reinvested. The strategy must, therefore, be to participate aggressively, and judiciously in the Chinese development. "Judiciously" means that if the negotiations are too restricting, a similar product and market development could be achieved by working in other low labor cost countries, such as Thailand, India, albeit with smaller local markets.

3. COMPETITIVE CONSIDERATIONS RE: CANADIAN EXPORTS

3.A Chinese Perspective on Canadian Industry

The Chinese people, generally, have a spontaneous sympathy for Canadians, based on the still remembered image of Dr. Bethune, on the generally compatible political attitudes in international affairs, on the non-colonial history of Canada, and on the trendsetting and timely recognition of China's government by Canada in 1970.

Canadian consultants and manufacturers have established, in recent years, a position of respect in China by using a cooperative attitude without powerplay.

Students from China have been exposed to Canadian science and technology for only a few years, and in small numbers, while they are generously invited to West-Germany, and are quite numerous in France, UK and USA. It should be remembered that the Chinese people in their fifties, who are now in a position of power, have generally been educated in Russia and eastern Europe, while some of their elders, in their sixties, were earlier in western Europe, whereas the younger professionals, who may know Canada, do not yet hold power of decision.

China is very prudent in its development pace, in order to avoid foreign debt and negative balance of payments. It will try to manufacture anything possible, rather than buy foreign products. It will therefore buy one specimen to test, compare and analyze, and then, if satisfied, it will arrange for the licencing to produce in China. If it needs foreign help to install the plants, it will propose a joint-venture contract with the selected foreign industry leader, to assure a successful implementation and operation. This will include the marketing outside China of the new Chinese products, the sale of which will permit to pay back the foreign joint-venturer's equity and profits. This is wise for China, but a challenge to Canadians.

Even foreign exchange loans will be expended preferably on those projects which will earn at least commensurate foreign exchange for repayment. Infrastructure projects will probably not include much foreign participation.

The Chinese argue that the joint-venture production will allow Canadian industries to offer their state-of-the-art products at lower cost on the world-market.

3.B Canadian Perspectives on Chinese Market

It is well known to the Canadian transportation industry, that the Chinese market is potentially vast, but difficult to enter, because of the Chinese reluctance, to borrow money, and to spend foreign currency, and because of the very prudent decision-making process.

Only large firms with substantial means, and small firms with exceptional expertise, can succeed. They all need considerable patience, an effort must be made to understand the Chinese mentality, and a long-term commitment towards follow-up and service.

The firms must be prepared to send Canadians repeatedly to China, and to host numerous Chinese missions to Canada. The use of Chinese speaking Canadians is an asset. The opening of a permanent office in China seems to be of great benefit, but very costly.

No firm will be able to generate rapid profits in China. After long negotiations, the profit will be small, or the payment in hard currency, will be delayed until such currency is hopefully generated by related exports outside China. The Canadian industry must also be adaptable to either barter payment, or long term equity with uncertain returns.

3.C Previous Patterns and Experience of Other Exporters

No documentation, pertaining to the transportation sector, was found on this subject. It is known however, from some Canadian consultants and manufacturers, that their competitors from the USA, Europe and Japan, are aggressively attacking the Chinese market. For example, in the case of locomotive sales, Canadian exporters lost out because the US company insisted on their licencing priority rights and did not allow the Canadians to compete. For many other projects, the financial packages, supported by other governments, are difficult to counter by Canadian firms, under present conditions.

3.D Perceived Strategies of Competitors to Canada

All competitors to the Canadian industries seem to be using a similar approach, as Canada, to markets. However, other countries tend to develop a more unified approach to the market and are making use of country-to-country relationships. Competitive countries also have a more aggressive approach to financing.

3.E Estimate of Probable Exports

In order to help estimate the probable exports in the future, the known past exports in the transportation sector are summarized in Table 2. They total about $4 million in services during the last two years, and some $26 million in equipment since 1982.

The Statistics Canada figures 1981-1985 show $29 million in "other motor vehicles", probably mining equipment, and $16.4 million in aircrafts and engines, which does probably not include Canadair's Challenger. Together, these exports represent less than one percent of the total export to China of some $1,300 million per year, of which more than half was wheat. Imports from China averaged only $300 million/year, which leaves a trade balance very unfavoruoble for future exports to China. Even if all wheat exports were made unnesary by increasing food self-sufficiency in China, Canada will have to import more than today from China in order to encourage further growth of exports to China.

The estimates of probable exports are based on specifically known contracts and prospects for the near future, on some extrapolation and guesstimates. Table 3 summarizes the major services and equipments, firms concerned, values, funds, years and clients. Export subtotals and grand totals are indicated in ranges of million dollars for the target years of 1990, 1995 and 2000.

For the next few years, total yearly exports are estimated between \$30 and \$100 million, and they should be growing hopefully to \$100 - \$175 million towards the year 2000 in the transportation sector.

4. POSSIBLE FEDERAL ROLE IN SUPPORTING TRANSPORTATION SECTOR EXPORTS

4.A. <u>Anticipated Transportation Industry Demands for Assistance</u>

Due to the strong competitive atmosphere, the negotiation and contract particularities and the importance of the market, Canadian industry needs Government assistance to be more successful in China.

Inasmuch as the Chinese are familiar with government control, and understand and respect governmental ways and procedures, the involvement of the Canadian government at the political, diplomatic and commercial levels is implicitely welcomed. This involvement should not only provide governmental guarantees, which are considered safer than private companies, but also contributions to provide more favorable financial conditions.

<u>Administrative Support</u>

The Canadian transportation industries, dealing in China at the present time, have requested that political and diplomatic actions should include:

- Establishment of a Federal Government body, represented by senior government officials from the appropriate Ministries, responsible for supporting Canadian industry efforts in China.

- Promotion of visits to China by Canadian political, diplomatic and technical personnel, and reciprocal visits from China.

- Designation of "sector officers", within the Canadian Embassy in China, with reporting and coordinating functions to be clearly identified to the relevant Chinese bureaucracy and to Canadian industry representatives.

Financial Support

With respect to financial support, Canadian transportation industries contacted, suggested that the Federal Government should provide, as follows:

- Creation of reserves, within current PEMD, CIDA-INC etc. programmes, available for specific sectors of interest in China.

- Creation of a reserve, which would only be available in exceptional circumstances, when the specific sector reserves are not sufficient to provide the needed support.

- Availability of grant financing to undertake feasibility studies, similar to the grant financing available under CIDA-CPPF for pre-feasibility studies or as foreseen for the now cancelled Trade Development Fund, or, at least, on very soft loan basis, as part of the line of credit from EDC to the Bank of China.

- Extension of the "crédit mixte", a combination of EDC soft loan and CIDA grant financing for special projects with high Canadian content and/or potential.

- Training of appropriate Chinese Officials in the workings of Canadian financial institutions, such as EDC, CIDA, banks etc. through conferences and other organized visits.

4.B Recommended Federal Strategy

The Federal Government should provide the type of support requested in Section 4.A to projects and firms which meet the following criteria:

- Projects for which good Canadian technical and managerial capability exists.

- Projects for which Canadian expertise has an advantage over potential competitors.

- Canadian firm(s) which have demonstrated a willingness to assume a share of the risk and have the potential for innovative technical and financial solutions.

- Projects with high probability of penetrating a sector with a major project within a relatively short time-frame.

- High probability of subsequent projects which could increase Canadian participation in the sector.

- Availability of Federal Government financial support for marketing, studies and implementation.

It is recommended that for transportation pre-feasibility studies in China, grant funding should be increased for CIDA Industrial Cooperation from $650,000 over the last three years, to an annual average of $500,000 and the DRIE PEMD funding from $1.0 million over the last few years to an annual average of $1.0 million (total PEMD budget 86/87 just under $30 million).

For feasibility studies, grant or low interest concessional financing should become accessible when the above criteria is met: this could represent $3.0 million per year.

For project implementation, the existing EDC line of credit of $2.0 billion, (of which $35 million has been used to date). However, the terms should be softened in general to reflect overseas financing opportunities, and in promising cases, by CIDA bilateral grant funding, particularly for training and technical assistance components. The China transport sector budget should be an estimated $4.0 million per year.

For diplomatic and commercial support at the Embassy, according to the industry suggestions of one special officer for the transportation sector, would cost approximately $200,000 per year, including expenses and staff support. For Government participation at Chinese trade fairs and invitations to Canada. an additional budget of $1.0 million per year is suggested.

Therefore, the recommended annual financial support, by the Federal Government, to support the Canadian transportation industry efforts in China is estimated to be about $10.0 million exclusive of the EDC line of credit.

The resulting purchases from China are roughly estimated to be in the range of $30 to 100 million per year for Canadian transport products and services.

. Availability of Federal Government financial support for marketing, studies and implementation.

It is recommended that for transportation pre-feasibility studies in China, grant funding should be increased for CIDA Industrial Cooperation from $650,000 over the last three years, to an annual average of $500,000 and the PEMD funding from $1.0 million over the last 6 years to an annual average of $1.0 million (total PEMD budget 86/87 just under $20 million).

For feasibility and engineering, low interest concessional financing should become accessible when the above criteria is met; this could represent $3.0 million per year.

For project implementation, the existing EDC line of credit of $2.0 billion (of which $X million has been utilized to date). However, the terms should be softened to reflect overseas financing competition, and in promoting cases, by CIDA bilateral grant funding, particularly for training and technical assistance components. The China transport sector budget should be an estimated $4.0 million per year.

For diplomatic and commercial support at the Embassy, according to the industry suggestions of one special officer for the transportation sector, would cost approximately $200,000 per year, including expenses and staff support. For Government participation at Chinese trade fairs and delegations to Canada, an additional budget of $1.0 million per year is suggested.

Therefore, the recommended annual financial support, by the Federal Government, to support the Canadian transportation industry efforts in China is estimated to be about $10.0 million exclusive of the EDC line of credit.

The resulting purchases from China are roughly estimated to be in the range of $50 to 100 million per year for Canadian transport products and services.

ANNEX 'A'

COMPANIES AND GOVERNMENT DEPARTMENTS CONTACTED

Companies:

Bombardier Inc. - Montreal
CANAC Consultants Ltd. - Montreal
Canadian Institute of Guided Ground Transport - Kingston
Canadian Pacific Consulting Services Ltd. - Montreal (CPCS)
Champion Road Machinery - Goderich
Delcanda International Limited - Ottawa
General Motors Diesel Division - London
Genstar Marine Limited - Vancouver
International Rail Consultants - Vancouver
Kilborn Limited - Toronto
Lavalin International - Montreal
Montreal Engineering Company Limited - Montreal
Seaspan International Ltd. - Vancouver
H.A. Simons Ltd - Vancouver
Swan Wooster Engineering Co. Ltd. - Vancouver
Sydney Steel Corporation - Sydney
Urban Transportation Development Corporation - Toronto

Government Departments:

Export Development Corporation
External Affairs
Ministry of Transportation and Communications, Ontario
Transport Canada
Transport Canada Development Centre
World Bank

ANNEX 'B'

PREVIOUS INDUSTRY EXPERIENCE IN CHINA

Bombardier Inc.

Negotiated with Chinese Railways for sale of 200 diesel electric locomotives in 1983; however, General Electric of U.S.A. obtained order for 220 locomotives, since electrical technology was controlled by General Electric.

CANAC Consultants Ltd.

Canadian National Railways and China Railways have held exchanges visits since 1975.
In December 1985, they signed an agreement with the Ministry of Railways in China to undertake the pilot installation of a railway yard computer operations system in China.

CANADAIR Ltd.

The sale has been announced recently, valued at over $60 M (CAN), of three Canadair Challenger 601 business jets, by the People's Republic of China through Poly Technologies Inc., the official agency for the Chinese government for the importation of specialized equipment. The first aircraft has been delivered to Innotech Aviation, Montreal, for the installation of the passenger interior and avionics.
Since 1980, the Xian (Sian) aircraft factory in Shaanxi (Shansi) province has been manufacturing the fiberglass water tanks, the tip float pylons, ailerons and various doors for Canadair's CL-215 water bomber. Canadair has been very pleased with the arrangement and quality of workmanship.

Canadian Institute for Guided Ground Transportation

CIGGT has established relations with the Chinese Academy of Railway Sciences for a series of training seminars and a visiting researcher program.

Canadian Pacific Consulting Services Ltd.

CPCS actively pursues negociations with China since 1983 and undertook five studies in the last two years.

Project: Fuzhou - Xiamen Transportation Corridor Study ($210,000)

Description: The Canadian International Development Agency-funded study consisted of a review and analysis of the transportation services and facilities between Fujian's provincial capital, Fuzhou, and the container port and special economic zone at Xiamen, a distance of approximately 300 kilometers. The relative costs and efficiencies of rail, highway, and coastal shipping were evaluated and recommendations made for improvements to transport infrastructure and operations in order to meet future transportation demand. (July-Dec. 1984)

Project: Feasibility Study for Coal Handling System in Yanbei-Datong Area of Shanxi Province ($2,000,000).

Description: CPCS was awarded a contract to investigate alternatives in the design and location of coal storage, handling and loadout facilities for 24 mines in the Yanbei and Datong areas of Shanxi Province. The area currently produces 49 million tonnes per annum, with a target of 67 million tonnes by the year 2000. The coal is to be transported in unit trains to the port of Qinhuangdao, a distance of approximately 650 kilometers. CPCS was responsible for the rail transport component of the study; three other Canadian Pacific companies were responsible for the coal handling aspects. (July1984-May 1985)

Project: South China Power System Planning Project Definition Mission ($43,000).

Description: The Chinese Ministry of Water Resources and Electric Power has requested CIDA's assistance to define an electric power system development plan for the South China Region. CPCS' Chief Electrical Engineer participated in a mission fielded by CIDA to review the available information and prepare a project operating plan. (April-May 1984)

Project: Transportation Study for Coal Mines in Shandong Province ($23,000).

Description: Shell Coal International and China National Coal Development Corporation carried out a feasibility study for a coal mine in Shandong Province. CPCS was responsible for assessment of the rail transportation system serving the mine and port. Consideration was given to the use of dedicated train sets, the merits of joint venture ownership of the rolling stock and the handling of coal in winter conditions. (Jan.-April 85)

Project: Fourth Generation Computer Languages Seminars ($4,200).

Description: CPCS presented three seminars to the Chinese Railways and the Modern Office 85 Exhibition in Beijing and Guangzhou (March 1985) on the following topics:

- the principles of user driven computing;
- computerized railway operations systems; and
- MAPPER, a fourth generation computer language and system used to handle all types of data processing.

In addition to the five projects described, CPCS has a Memorandum of Agreement with China Railway Foreign Service Corporation (CRAFOSCO), part of the Ministry of Railways, to work together on projects worldwide, as appropriate. This Agreement was signed in February 1985.

General Motors Diesel Division

They have tried in the past to penetrate the market, but they were unsuccessfully bidding against General Electric of the U.S.A. who have obtained orders for 420 locomotives in the last two years.

Genstar Marine Limited

Has working agreement with China Ocean Engineering Services Ltd. and Seaspan International Limited. as of May 1985.

de Havilland Canada

de Havilland's marketing activities in China date from the 1972 Canadian Government trade exhibition in Beijing. In the ensuing years, CAAC has purchased nine Twin Otter 20-seat utility aircraft. Current marketing activities with China are focussed on introducing Dash 7 50-seat aircraft into the Civil Aviation Administration of China (CAAC) and United China Airlines (UCA).

In addition to direct marketing activity, de Havilland has been involved in ongoing discussions with the China National Aero-Technology Import & Export Corporation (CATIC) concerning co-operative aerospace development programs generally and in particular the possibility of offset and/or subcontract work being placed in China in conjunction with its future commercial purchases. During 1985 de Havilland hosted a number of Chinese delegations including President Li Xiannian, Vice Premier Li Peng, and Minister Mo Wenxiang of the Ministry of Aviation Industry. Prospects for the sale of three Dash 7 aircraft, valued at $20 M each, are believed imminent.

International Rail Consultants

Exchange visits between China Railway and B.C. Rail since 1984.

Pratt and Whitney Canada

P&WC is in the final stages of executing an assembly and test agreement with China for the PT6A-27 and PT6A-34 engines. The PT6A-27 is currently used on the Chinese Y12 aircraft.

Between 1982 and 1983 P&WC shipped 20 PT6A-27 engines to China. 20 engines were shipped in 1985 and an additional 40 engines will be delivered between 1986 and 1987.

Other business opportunities include:

- a proposal to supply JT15D-5 turbofan engines for a projected military trainer aircraft to be developed by China;
- a proposal to establish a service centre in China for P&WC's engines;

- a proposal to transfer technology to China through the training in Canada of Chinese engineers;
- a proposal to re-engine the Chinese Y7 aircraft using PW100 series of engines; and
- a proposal to provide PT6 engines for agricultural aircraft and Industrial applications.

Seaspan International Ltd.

Has working agreement with China Ocean Engineering Services Ltd. and Genstar Marine Limited, as of May 1985.

Sydney Steel Corporation

Have tried to break into the Chinese market for the sale of rails, but have been unsuccessful against competition from Japan and Korea.

Urban Transportation Development Corporation Ltd.

UTDC and the Xianstang Electrical Manufacturing Works (XEMX), Hunan Province, are in the process of negotiating to establish a joint venture manufacturing facility in China whereby Canadian technology will be transferred to China for the production of light rail vehicles and subway cars.

UTDC and Puzhan Railway Rolling Stock Works (PRRSW) are negotiating an agreement to transfer the technology for the manufacture of bi-level rail vehicles to China. PRRSW is designated, by the Ministry of Railways, to acquire the necessary technology for the bi-level vehicles and to commence production by the end of 1987.

ANNEX 'C'

FUTURE INDUSTRY IDENTIFIED PROSPECTS IN CHINA

B.C Lines

Encourages to follow up on possible joint shipping arrangements with China.

Bombardier Inc.

Company feels that a potential exists for their model 251 plus engine, as the Chinese Railway's requirements are immense for the foreseeable future. Engine could also be used in generator sets and marine applications.

In addition, the company will be following mass transit business opportunities in China.

CAE

Pursuing aviation business in China. specially flight simulators.

CANAC Consultants Ltd.

Potentials exist in areas of railway computer field, field of railway telecommunications, fiber optics, public telecommunications, container transport and container handling facilities.

Canada Steamship Lines

Concluding an agreement for the transfer of self-unloading bulk carrier technology to China.

Canadair

Pursuing aviation business, specially the challenger jet.

Canadian Institute of Guided Ground Transport

The Chinese Academy of Railway Sciences has invited CIGGT to give a seminar series on operations analysis using computer models and track maintenance technology which could lead to sales of maintenance equipment by Canadian suppliers.

Canadian Pacific Consulting Services Ltd.

CPCS is presently awaiting word on Phase II of the Shanxi Province coal handling project - detailed engineering and construction. They understand that the project is presently under consideration by the State Planning Commission; once final approval is received, likely later this spring, they expect to be called to negotiate.

CPCS' main interests are in the areas of unit train technology for bulk commodities and design of intermodal transportation systems for container movement. Other areas being pursued are telecommunications, railway computer applications, and assistance in various areas of railway operations and management.

De Havilland

Pursuing aviation business in China, specially the DASH 7 and STOL planes.

Delcanda International Limited

Proposes to create "Airports Canada Inc.", consisting of sixteen major private sector companies (Acres, Cansult, Delcanda, Giffels, N.D. Lea, Monenco, NAPA, SNC, Stanley, APS, Braaksma, Douserv, Golders, Reinders, Trow and Wallace) with the Ministry of Transport. The intent is to centralize the expertise and make it available worldwide (including China). The legal aspects of including Transport Canada (MOT) in such a group have, however, not been resolved to date.

General Motors Diesel Division

Company is optimistic that future sales of diesel-electrical/electric locomotives are possible.

International Rail Consultants

Prospects for future technical exchange programs and joint venture prospects in foreign countries with China Railways.

Pratt and Whitney

Pursuing aviation business in China, especially jet engines.

Lavalin International

Will be undertaking a preliminary study of a proposed ALRT extension to the Beijing subway system and will attempt to ensure this contract leads to further engineering and possibly project management contracts in Beijing and in other cities. The study being done in conjunction with Metro Canada International Ltd. could also lead to provision of light rail and other transit vehicles. In addition, the firm is pursuing design review work for the port of Dalian.

Ministry of Transportation and Communications, Ontario

Negotiating transfer of technology in road traffic engineering sector, including traffic signalization (computer systems).

Swan Wooster Engineering Co. Ltd.

China planning to modernize fourteen ports and construction of some 200 berths by the year 1990, Swan Wooster are pursuing contracts for design review work financed by World Bank, i.e. Port of Dalian in Northern China and container port at Zhang Jai Gang on the Yangtze River.

Sydney Steel Corporation

Uncompetitive to the Japanese and Koreans; therefore, would need a program of assistance from the Federal Government to be competitive in China.

Urban Transportation Development Corporation

UTDC and XEMW to supply 225 subway cars to the City of Beijing. Bidding on over 200 25-meter aluminum vehicles to the Shanghai Metro. Prospect of 5,000 bi-level vehicles by year 2,000 in co-operation with PRRSW.

Proposing a Master Urban Transportation Study for the City of Chongqing.

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