COST PICTURE

"I have not attempted in these few minutes to tell you anything of the design of the station. However, you may be interested in the cost picture. In 1959, we estimated the total capital expenditure at $81 million, including a contingency allowance of $8 million. To date, we have paid for or committed items corresponding to 70 per cent of the direct costs. Actual costs are running 5 per cent below estimate without infringement on the contingency allowance. Devaluation of the Canadian dollar has added about $1.5 million to the job, but this has been offset by a lower than predicted rate of escalation.

"The initial charge of fuel has been purchased in Canada at a firm price of $29.50 a pound UO_2. Our latest estimates of fuel burn-up in Douglas Point are within our earlier predictions and, with an overall station efficiency of 29.1 per cent, the unit fuel cost may be calculated as 1.1 mills a kilowatt hour.

PROBABLE LINES OF DEVELOPMENT

"Ideas of concepts for power reactors are very abundant. Any of some hundreds or even thousands of nuclear engineer-physicists could, by a few weeks' work, come up with a proposal that would have merit and be different, and some few might be original and extremely good.

"On the other hand, it takes some thousands of man-years, all directed to the development and design of a single reactor, to bring it to fruition.

"Even after coming to fruition, economic competition or even some mischance may stop further progress and, in retrospect, it may be realized that a significant fraction of those thousands of man-years was wasted labour.

"A good case may be made for limiting the development of power-reactor types throughout the world to a relatively small number - perhaps a dozen. Producing new reactors is not an end in itself; the objective is abundant and low-cost power to enable civilization to pursue its objectives, such as raising the standard of living of all people of the world or exploring the moon or hopefully keeping away from war.

"Putting this perspective on power-reactor development, we in Canada find ourselves in the position that we believe we have ahieved by thousands of man-years of co-operative effort by AECL, by Canadian industry and by Canadian utilities a very satisfactory power-reactor design in NPD and CANDU. For the last few years we have, therefore, been trying to assess whether this design would survive the economic competition and escape serious setbacks. In every detail of design, we sought a second string to our bow to guard against setbacks; we continue to seek improvements and, in the overall design, look for any ideas that may contribute to cost reduction so that a promising selection of these may be developed as an extension of our work. We do not expect to take more than one or two such developments very far, and we have devised means of reviewing and assessing the prospects in order to be satisfied when one or another line ought to be stopped.

"We have put into operation a formal review procedure to evaluate the competition between our alternative developments, knowing that we have limited resources and hopeful that our choice of a development route will be the right one.

"The competing systems of immediate concern have a common base: they are all heavy-water moderated pressure-tube systems and all must be capable of operation with natural uranium. The proponents of any system may claim advantages from enrichment if such advantages exist with no credit for spent fuel.

"The systems at present under detailed analysis are:

1. pressurized heavy-water cooled, with or without boiling;
2. organic-liquid cooled;
3. fog cooled, light water, direct cycle;
4. steam generating or boiling light water, direct cycle.

"These systems are being compared in the 450 MWe size, with an additional study being done on the CANDU type at 750 MWe.

"The most obvious line of immediate development is to increase the size of units. We regard the 200 MWe capacity, such as Douglas Point, as the smallest size of economic unit in a well developed economy. We are therefore very interested in larger units and see no obstacle in sizes up to 1000 MWe. Even increasing from 200 to 300 MWe and designing for a two-unit station shows substantial reduction in both capital cost a kilowatt and unit-energy cost.

"The evaluation programme, comparing the four systems, will be producing results next year and before the end of the year we will concentrate our effort on a much narrower band. If one type should show significant superiority for both the short and long term application, we could conceivably limit our future major effort to a single system.

"The only conclusion of the relative merits we can draw today is that they are all strong contenders.

ROLE OF CANADIAN-TYPE PLANT

"We in Canada are, of course, convinced, that, under certain conditions, such as those found in the public utility in Ontario, the CANDU type of nuclear plant is unsurpassed at present. We recognize that these particular conditions do not necessarily apply in other areas of the world, and this is particularly so in the United States.

"Enriched-fuel systems seem to naturally fit many applications in the U.S. Many of the utilities are privately owned, which can only result in higher annual charges for capital invested and enriched nuclear plants are generally lower in capital cost a kilowatt than natural-uranium plants. Enrichment is readily available within the national boundaries at very attractive prices. Chemical reprocessing facilities for handling irradiated fuel already exist with their fission-product disposal facilities. A market is assured for the plutonium contained in the spent fuel, even though the price may not be guaranteed. Under these conditions, even if nuclear fuel is transferred to private ownership, firm plans may be made with full knowledge and expectation that