Introduction

In fifty years Canada's energy system will be radically different. We foresee a system based upon electricity and hydrogen as the major energy carriers or currencies, with only minimal and selected use of hydrocarbons (crude oil, natural gas and coal) as fuels. Electric power will be generated in several ways, with the hydrogen produced primarily through the electrolysis of water. Drawing upon the sun's radiation and to a lesser extent upon the Earth's heat flow, our society will be able to satisfy much of its need for the low-grade thermal energy used in space and water heating and for industrial heat.

Our reasons for believing that Canada's energy system should be directed away from hydrocarbons in the long term are two-fold: first to counter the otherwise formidable environmental problems we see arising in the next century, especially if coal becomes a principal element in our energy supply; and second to preserve crude oil, natural gas and coal for such non-energy uses as the production of petrochemicals.

The Committee is troubled by past failures to anticipate many of the environmental consequences of exploiting various forms of energy. We wish to see this impact considered much more carefully in the future. Our lack of enthusiasm for coal as a principal supplier of energy in the next century, for example, arises directly from such environmental concern. We recognize of course that no new energy source or technology is completely environmentally benign but some can be preferred over others, and environmental impact should be one of the prime considerations in setting priorities.

We realize that Canada does not have the resources to pursue all avenues of alternative energy investigation, and that results can be diluted by attempting too much. But given the uncertainties inherent in any course of action, the Committee wishes to see Canada's energy options kept as broad as possible. Priorities in the alternative energy field will have to be assigned on the best estimates of today, and there are few energy sources and technologies which we would want to see totally ignored in this country.

In reviewing energy prospects, we cannot consider Canada in isolation from developments in other parts of the world. Global population now exceeds four billion and is expected to surpass six billion by the year 2000. It has been observed that anyone with a present life expectancy of 50 years may live to see a world inhabited by 10 billion people. Sustaining those numbers and improving the human condition beyond the abysmal state characterizing substantial regions of the world today will require a much expanded use of energy in developing countries.

Energy conservation (with conservation referring to both frugal and more efficient use) is a fundamentally important strategy which should carry forward far into the future. In fact, the Committee considers that restraining growth in energy demand will offer the best return in managing Canada's energy affairs throughout the remainder of this century at least. Many of the new technologies which we consider in this Report promise significant energy-conserving benefits. In the longer run, conservation becomes built in to our system and increasing efficiencies in energy use become more difficult and costly to achieve. At some point energy supply reasserts itself as the foremost concern in an expanding system.

Turning to other energy options, Canada should exploit biomass (carbon-containing material of plant and animal origin not including fossil fuels) as rapidly as is feasible, subject to certain reservations. Forest or cellulosic biomass will assume an important position in Canada's changing energy system, especially in the provision of transportation fuels. Thereafter, although biomass will continue to be a substantial provider of energy, we foresee its *relative* importance declining for environmental reasons and because of increasing pressure on the Earth's land base to feed the world's burgeoning population. Thus the Committee views biomass energy as playing its most significant role over the next few decades.

Geothermal energy, the natural heat of the Earth, is a more enigmatic player in the energy game. In this century geothermal energy will have little impact on Canada's energy affairs. In the next century, the potential of this energy form hinges on the success of new approaches to its exploitation, something which is dif-