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ENERGY AND CLIMATE CHANGE

Recognizing the fundamentally important contribution of energy use to the well-being of society, both nationally and internationally, as well as its impact on the earth's climate, governments and industry must cooperate without delay to develop and put into practice integrated energy and climate policies.

It is now widely recognized that one of Nature's most powerful systems regulates the temperature of the Earth's surface. The underlying phenomenon of this system is commonly referred to as the "greenhouse effect". Some of the "greenhouse gases" (GHGs) that are responsible for this effect occur naturally; they are, principally, water vapour, carbon dioxide, methane and nitrous oxide. They allow highly penetrating, incoming solar radiation to pass through the Earth's atmosphere and to impinge upon the Earth's surface. However, they reflect back to the Earth most of the less penetrating outgoing infrared radiation from the Earth's surface and the lower atmosphere. This natural process keeps the Earth's surface temperature about 33ºC warmer than it would be otherwise. Additional GHGs are produced by human (anthropogenic) activity; these include the four naturally occurring gases and also hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride. This additional contribution exacerbates the greenhouse effect; the full extent of the effect is still under debate.

During the 1980s and 1990s, national and international discussions regarding the need for the development of sustainable energy policies were broadened to include the need for sustainable climate policies, as a result of the global warming trend that was believed to be occurring, together with other, sometimes severe, climate changes.

Controversy over the root causes of these phenomena and their possible consequences arose, in part, because of an ongoing debate in scientific circles about the relative contributions of the rapidly increasing concentrations of greenhouse gases and other pollutants in the atmosphere from industrial sources on the one hand and naturally occurring climate variability on the other hand. The periodicity of glaciations and the short-term interactive effects of the sun and of the most abundant greenhouse gas, water vapour, are often cited as significant factors in causing naturally occurring climate variability.

The reported increase in the frequency, magnitude and intensity of cyclones that have occurred in both hemispheres during the past ten years and authoritative reports by the World Meteorological Organization and national agencies regarding peak surface temperatures around the world provide striking evidence for the growing belief that whatever the cause, natural or human-induced, global warming and other climate changes are matters of serious concern. The decade of the 1990s was the warmest decade of the millennium and 1998 was the warmest year of the decade.

It was in this context that a Working Group of Academy Fellows was established to examine the evidence for global warming and the role of anthropogenic activities in it, and to suggest future activities of the Academy in this area. In March 2002, the Academy published a report entitled **"Energy and Climate Change – A Canadian Engineering Perspective"**, prepared by the Working Group with editorial and other assistance by interested colleagues. [The report may be read and downloaded at *www.acad-eng-gen.ca*]

The conclusions of the Working Group report were that:

- an international scientific consensus has emerged in light of extensive data recorded and reported during the past 150 years that global warming is occurring;

- the rise in global temperatures began to be perceptible around the beginning of the 20th century and that the trend of rising temperatures coincided with the accelerating pace of the Industrial Revolution and the concurrent acceleration in energy consumption rates; and

- there is a strong correlation between the concentration of carbon dioxide in the atmosphere and the average surface temperature of the earth as shown from the analysis of ice core samples taken in Antarctica over the past century. (Although the concentrations of methane and nitrous oxide in the atmosphere have also increased in parallel with that of carbon dioxide, their absolute concentrations are less than that of carbon dioxide by factors of 100 and 1,000 respectively. Thus, interest has centered on carbon dioxide from industrial, commercial and private sources.)

Energy is one of the most important drivers of national economies, and therefore of the well-being of societies. Quality-adjusted life expectancy has increased in those societies, which have enjoyed rising incomes and energy use, and is thus a convincing indicator of this relationship.

As Canada moves forward into the next millennium, it is imperative that governmental and industrial initiatives be pursued in close cooperation for the purpose of developing integrated sustainable energy and climate policies and practices.

These policies must:

- recognize the fundamentally important contribution of energy, both production and consumption, to the well-being of society nationally and internationally;

- address and examine in a balanced, impartial, and scientifically and technically correct manner, the entire spectrum of energy sources and currencies available to Canada to ensure that the actions taken to achieve the objectives of the two policies are mutually reinforcing; and

- continue to demonstrate that Canada is an active supporter of international efforts to improve the economic and social well-being and security of all members of the world community who adhere to the objectives and principles of the United Nations.

Conclusion:

The Canadian Academy of Engineering may wish to join with other responsible organizations, and encourage the federal government to put into place integrated sustainable energy and climate policies. Such policies could well be a model for other countries in both the developed and the developing world.

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