Update

Turmoil in World Oil Markets and Canadian Developments

The Iraqi invasion of Kuwait in early August 1990, and the subsequent blockade of both countries, has created the third oil shock in the last twenty years. The events of 1974 and 1981 seemed increasingly remote during the oil-surplus years of the late 1980s. However, events of the past year have been an unpleasant reminder of our dependence on energy and our vulnerability to disruptions in the oil market.

In 1989, Iraq produced about 2.8 million barrels per day (Mb/d) and Kuwait 1.6 Mb/d, which together accounted for about 7% of the world's production. Other OPEC producers have additional capacity which may well be sufficient to fill the void now created in the market. Some experts have taken the view that these other producers would increase production only modestly to take advantage of the better markets. At the emergency meeting of OPEC held in late August, 11 of the cartel's 13 members, including Saudi Arabia, the most important OPEC producer, did in fact agree to increase their output.

The Saudis are under some pressure to make up for the lost Iraqi and Kuwaiti production. In 1989, the desert Kingdom produced 5.3 Mb/d. They can raise this figure to about 7.5 to 8.5 Mb/d using their existing facilities. Further increases to 10 Mb/d are possible within the next few years. However, in the event of war disrupting all oil shipments from the gulf, increases from the non-Arab producers like Mexico and Venezuela would not fill the void.

The history of the evolution of Canada's international oil trade may be of interest in this rapidly changing situation. Canada first became a net oil exporter during the years 1969-75, but subsequently retreated to being a net importer. Following the aggressive measures adopted in the National Energy Program of 1980, the nation returned to a surplus position in 1982, where it has remained since. Now it seems only a matter of a few years before it is in overall deficit once again (simple yearly net volume calculations were used here; other methods of computation may lead to slightly different cross-over dates).

Canada's domestic oil production is falling. According to the latest Annual Report of the National Energy Board (NEB), total oil production in 1989 fell 3.5% to 1.65 Mb/d that year. Canada remained a net exporter of 163,000 b/d, but this was a significant reduction from the corresponding figure for the previous year of 258,000 b/d. The reason for this large decrease in exports was a combination of a drop in production and continued growth in domestic demand, with the disposition of crude oil to Canadian refineries up by 1.6% in 1989 (NEB figures). Moreover, Canada tends to export the less valuable heavy oils to the US from the west, while eastern provinces import the more valuable lighter oils from the UK and other suppliers (including some in the Middle East). Though Canada remains a net exporter of oil on an overall basis, it is probably already a net importer of the lighter grades, and this trend is expected to steadily worsen as the years go by.

Higher prices for oil will help to encourage drilling activity, possibly reducing the rate of decline in production of conventional oil from the western sedimentary basin, but it is unlikely the downward trend will be completely reversed. Eastern off-shore prospects, such as the Hibernia field, where development commenced October 9, 1990, will contribute an expected 110,000 b/d.

There may also be more activity in the Alberta oil sands. The Budget of February 20, 1990, withdrew federal support from the

'Other Six Leases Operation' (OSLO) Group, the oil sands surface mining project planned for Northern Alberta with a project design capacity of 70,000 b/d. Nevertheless, the Federal government announced on June 29 that it would contribute up to $45.5 million towards the completion of the conceptual engineering study phase. Aside from the upgrader now being built in Lloydminster (50,000 b/d), there is no other major activity in the oil sands/heavy oil area at the present time. In fact, some international companies have been withdrawing from this field of activity.

On May 4, 1990 the NEB announced its intention to update its regular projections of Canadian energy supply and demand. This new assessment of the Canadian total energy outlook, covering the years 1989 to 2010, has now been delayed due to the pressure of events, and will likely happen in late 1991. Novel features of the forthcoming report will be examinations of the associated emissions of certain greenhouse gases and of the potential for energy conservation in Canada. In the meantime, the NEB invites comments to aid in the preparation of this new assessment which is being prepared in a very different energy situation than that prevailing when the last such report was issued in September 1988.

(Note: Except where specified to the contrary, statistical data is obtained from *BP Statistical Review of World Energy*, June 1990.)

Unfolding Environmental Agenda

The rapid pace of activity in the environmental field, both internationally and domestically, has continued throughout the year. Nevertheless, President Bush, in his speech to the Conference on Global Change held in Washington April 17-18, 1990, clearly intended to dampen the growing international demand for immediate control measures to deal with emission of greenhouse gases. This cautious position, with its call to wait for the results of further research before passing more legislation, led to differences with both the European Community and elements of his own Administration.

At the Bergen Conference in June, Canada first stated its intention to hold emissions of carbon dioxide to no more than the 1990 level by the year 2000. Though the new Minister of the Environment was appointed immediately after this Conference, the Hon. Robert de Cotret confirmed his support for the statement.

On May 25, 1990, the Science Working Group of the Intergovernmental Panel on Climate Change (IPCC) issued its report with the following major conclusions: the best estimate of global warming places the expected rise in the average temperature at 1°C between 1990 and 2025, and at 3°C by the year 2100. This group also found that the present emissions of carbon dioxide would have to be reduced by at least 60% to stabilize the concentration in the atmosphere at present-day levels. The full report of the IPCC was presented in November to the Second World Climate Conference in Geneva, and to the United Nations where it will serve as the foundation for intergovernmental treaty negotiations. The object is to have a negotiated treaty ready for signing at the 1992 UN Conference on Environment and Development in Brazil. At the Economic Summit held in Houston last June, however, the Americans again doubted the need for immediate target-setting and convinced other participants to set aside their differences on this question.

On the domestic scene, during the period May 23 to June 25, 1990, a series of public consultations were organized by Environment Canada in major centres across the country to provide both individuals and organizations the opportunity to respond to the government's discussion paper *A Framework for Discussion on the Environment* released March 29, 1990. These consultations were probably the most extensive ever held in Canada outside of formal Commissions of Enquiry. There were 41 information sessions involving 6,000 people, and 3,500 attended the 17 two-day meetings whose cost amounted to $6 million (about $ 2.2 million over budget).

On August 13, 1990, Environment Canada released its 137-page *Report on the Green Plan Consultations*, prior to the last two-day meeting held in Ottawa August 20-21, 1990. This document summarizes what was suggested in the country-wide consultations, but no conclusions were drawn as officials stated that no consensus had yet been reached on what steps would be appropriate for immediate action on a wide variety of issues. The final consultation session was attended by about 400 delegates representing environmental groups, universities, most industries and govern-

ments. Some 23 separate study groups were formed from among those attending to review the report, which was based upon 3,000 pages of analysis, much of it critical of government performance.

This whole process has been criticized by some environmental groups as a device for delaying necessary action, but the Minister of the Environment, at the final session of the Ottawa meeting, confirmed his intention to complete the necessary Cabinet-level consultations as a matter of urgency preparatory to announcing new policies in the *Green Plan* to be tabled in the House of Commons. The Minister also made it clear later that a carbon tax is not planned at this time, and that the consultation process would continue after the tabling of the Plan, with changes to be made as appropriate in the light of experience.

In the less complex and economically-sensitive field of the control of chlorofluorocarbons (CFCs), implicated in the destruction of the ozone layer, international agreement seems to be easier to reach. At the London Conference in June, the second meeting of the parties to the Montreal Protocol of 1987, Canada became the first nation to ratify several amendments to the original agreement. Thirteen nations had agreed at London to take all appropriate measures to phase out the use of certain CFCs 'as soon as possible but no later than the year 1997.' The substitute substances will be more expensive than the CFCs now used, and the efficiency of air conditioners and refrigeration equipment will be reduced. The cost of using such equipment will thus increase and more energy will be needed for their operation.

The Canadian offer to establish, in Montreal, the secretariat and information clearing house of a new multilateral fund established to help developing countries meet their obligations to phase out CFCs was accepted. The establishment of the Montreal Protocol Multilateral Fund of $US 240 million (Canada's share: about $10 million) to aid the poorer countries represents an important precedent. Part of this money will be used to transfer the necessary technology to these countries to help them meet defined environmental objectives. The rationale is clear: most developing countries are in the warmer regions of the globe, and could not be expected to deny themselves the benefits of refrigeration equipment when the richer, cooler countries had been responsible for most of the emissions to date.

It remains to be seen whether the establishment of a CFC fund will be a precedent for the much more complicated problem of carbon dioxide control. Some of the circumstances are similar: the richer countries have been responsible for most of the emissions of this important greenhouse gas which accounts for about 50% of the anticipated global warming, and several of the poorer countries have important resources of fossil fuels which may be the only significant natural resources available in several important cases (coal in China and India; oil and gas in several countries outside the rich producers in the Middle East). In this much more difficult situation, the transfer of funds to establish the technologies needed to permit a new departure in the energy field in the developing world would be on a much larger, even daunting scale. Were it actually decided to limit carbon dioxide emissions on a global basis, the only alternative to such a large transfer of funds would seem to be the development of energy technologies which do not emit this gas and whose costs are comparable to those in use today.

There was also significant progress in the control of emissions causing acid rain. The two branches of the US Congress, each having passed the necessary legislation, completed work on the new Clean Air Act on October 27, 1990. With the formal signing by President Bush on November 15, 1990, the door has been opened to further international cooperation in this field.

Negotiations between Canada and the US began in late August with the aim of arriving at an Air Quality Accord. It was agreed this Accord should provide the two countries with a practical and effective instrument to deal with shared problems of transboundary air pollutants, and that priority would be given to emissions of sulphur dioxide and nitrogen oxides. The Accord, now expected to be signed later this year or early next, also provides a framework for dealing with such issues as the establishment of goals, consultation and exchange of information, the coordination of research and monitoring activities, and the like.

Second World Climate Conference Ends without Setting Targets

The Second World Climate Conference, held in Geneva October 29 to November 7, 1990, had as its objectives the creation of an awareness of the economic impact on climate; an assessment of the current state of knowledge on the

global issues of climate change and greenhouse gases; and the requirements for future scientific activity and implications for public policy. The Scientific/Technical part of the Conference took place from October 29-November 3 to receive and discuss the report of the Intergovernmental Panel on Climate Change (IPCC), to recommend strategies for responding to climate change, and to plan the future activities of the World Climate Program. The IPCC report concluded that reductions of emissions of carbon dioxide of some 60% were required to stabilize the atmosphere at current levels. At the Conference, summaries and recommendations were issued on 12 topical areas including energy (J. Goldemberg of Brazil, Chairman) and the World Climate Program (J.P. Bruce of Canada, Chairman).

These sessions were followed by meetings at the Ministerial level on November 6-7 where an opportunity was provided (i) to consider follow-up actions on the IPCC report in an effort to identify elements that could form the basis for negotiation of a world climate convention; (ii) to consider the special needs of developing countries; and (iii) to consider specific goals for enhancing inter-governmental co-operation.

Environment Minister Robert de Cotret represented Canada and announced the contribution of $1 million to a new international fund (to be known as the "Special Fund for Atmospheric and Climate Studies") for the detection of global warming and other changes to the earth's atmosphere, the largest single contribution to this fund of some $22 million to date. The Minister also confirmed that Canada is committed, as a first step, to a program to stabilize emissions of carbon dioxide and other greenhouse gases (those not controlled by the Montreal Protocol) to 1990 levels by the year 2000.

Despite a general agreement on the potential seriousness of the situation, it was not possible to get a consensus to set specific targets for the reduction of the emissions concerned, due mainly to the opposition of the US, the USSR, and Saudi Arabia. Nevertheless, Ministers announced the start of negotiations on a "Framework Convention on Climate Change" which will begin in Washington in February 1991 preparatory to the UN "Conference on Environment and Development" in Brazil in 1992. At the latter Conference it is still the objective to reach agreement to set specific goals and timetables for reduction of emissions.

In these meetings, one hears that carbon dioxide emissions must be reduced soon, and energy is seen as the major culprit. The question is now 'How much?' and 'How soon?'. A major issue is how the developing countries, who view the environment in economic terms, will respond. Informed observers believe the world is heading for a bruising international clash over targets for setting carbon dioxide emissions and many are pessimistic about the outcome of these negotiations. Nevertheless, it took 15 years to negotiate the Law of the Sea and nearly that length of time to reach agreement to protect the ozone layer. But agreement was reached eventually. Canadians will play a prominent role in these discussions over the next two years and the energy sector will await the outcome with more than considerable interest.

Senate Committee Report on Petro-Canada

The Senate Committee of Energy and Natural Resources, chaired by Senator Daniel Hays of Calgary, tabled its 133-page report on Petro-Canada in June. This committee had spent much of the preceding year examining the past and future role of the federal Crown Corporation. Copies of this report may be obtained from the Clerk of the Committee, Line Gravel, The Senate of Canada, Ottawa.

Petro-Canada's operations were reviewed from two perspectives — as a business investment (in a detailed comparison with Imperial Oil and Shell Canada), and as an instrument of public policy. From a financial viewpoint, the Committee acknowledged that Petro-Canada's management 'has done a remarkable job in creating a large competitive, fully integrated petroleum company from an idea in less that 15 years.' However, when assessed by standard financial tests, the Committee found that 'Petro-Canada has not only provided its shareholder, the federal government, with poorer rates of return on investment, it has done so while placing its shareholder at greater financial risk than have Imperial and Shell when creditor efficiency tests are considered.'

As an instrument of public policy, the Committee concluded that some of the policy functions that Petro-Canada had exercised prior to the change in government in 1984 had been of value to Canada. Notably, the Committee argued that Petro-Canada has a continuing role to play in the areas of energy security, selected aspects

of energy R & D, and foreign aid (through its wholly-owned subsidiary Petro-Canada International Assistance Corporation).

Nevertheless, the committee was disturbed by the manner in which Petro-Canada has contributed to the rationalization of the downstream refining and marketing aspects of the industry and concluded that future acquisitions should not be driven by a policy of Canadianizing the industry. The Committee also directed a fundamental criticism at the government due to its failure to complete the 'Energy Options' process, and so present Canadians with a comprehensive, long-term view of federal energy policy. Important decisions, the Committee held, such as the privatization of Petro-Canada and federal support for such projects as the Hibernia off-shore oil field, should be made within the context of such a stated policy. The Committee intends to review the 'Energy Options' process in the near future, particularly those aspects dealing with the management of energy demand and the protection of the environment, but now in a very different energy environment.

In the Budget of February 20, 1990, the government announced its intention to privatize Petro-Canada by selling shares to the public in stages. The increases in the price of oil due to the third oil shock may assist in this process.

Health Hazards from Low Frequency Electromagnetic Fields

An extensive and valuable article reviewing the possible health hazards from low frequency electromagnetic fields has appeared in the August issue of the IEEE publication *Spectrum*. The article surveys this new health concern which is plaguing electrical utilities in both Canada and the US. Such aspects as biological effects, societal reverberations, and the management of risks are considered. Though most experts were sceptical of claims that power-frequency electrical and magnetic fields could affect biological systems at commonly encountered levels, mounting experimental evidence has led many to accept that some effects do occur. Investigators are now actively seeking explanations. The review goes on to discuss the main research underway in this area, including some efforts in Canada. In the opinion of most experts, the principal public health problem involving such risks is likely to arise from exposure to the electrical distribution system, building wiring and selected appliances, rather than from the transmission system. In the latter case, however, there are a number of precautionary measures that might be applied, including such obvious options as using broader rights-of-way and restricting adjacent land use.

There is a need to help the public keep this understandably emotional issue in perspective. A popular consensus seems to be emerging that electrical equipment poses a serious, if yet poorly understood, threat to our health. Nevertheless, taken in perspective, studies to date indicate that the effects are very small. Clearly, the need at present is for more research to determine the significance of these effects as a public health issue.

As an indication of the growing concern in this area, a major out-of-court settlement was made in August 1990 to an aircraft worker in the US, the first such award known. He had a rare form of terminal leukemia, which he claimed was due to excessive exposure to low-frequency radiation on his job, though no liability in this respect was admitted by his employer. In general, however, it is very difficult to provide evidence to support a negative position when the phenomenon involved has such small effects. In this respect, the situation in this emerging field is somewhat similar to that faced by the nuclear power industry in developing safe systems for the disposal of radioactive waste materials.

The US Environmental Protection Agency (EPA) is scheduled to release a major report on this subject late in 1990.

Source: IEEE Spectrum, August issue, 1990.

Energy Issue of the *Scientific American*

The September 1990 issue (Vol. 263 No. 3) of the *Scientific American* was devoted to energy and related environmental topics under the rubric 'Energy for Planet Earth'. The eleven major articles survey nearly all aspects of the present energy dilemma from several points of view, and together they constitute an invaluable guide to the many complex issues now arising at the energy/environment interface. Especially noteworthy was the contribution from A.K.N. Reddy (India) and José Goldemberg (Brazil) entitled *Energy for the Developing World* which reviewed their previous well-known efforts in this field of ever greater importance.

The Storage of Radioactive Waste Material

The long-term storage of radioactive wastes from nuclear power reactors and other nuclear activities continues to be a critical issue facing policymakers and the utility industry. At the present time, wet pools and (soon) dry casks will be used at reactor sites in Canada. But at some point in the future more permanent repositories will have to be found. The accompanying chart (Table 1), taken from the July issue of the IEEE *Spectrum*, provides a useful guide to the situation in several major western nations including Canada.

Table 1: Storage of Commercial Spent Fuel and High-Level Waste in Nine Countries

Country	Nuclear capacity (GW) (% of electricity generated)[a]	# of reactors[a]	Reprocessing (where)	Interim storage			Institutional responsibility[g]	Repository schedule
				Locations	Methods	Duration		
Canada	12.2 (15.6%)	18	No[b]	Reactor sites	Wet pools, perhaps dry casks[d] at Pickering, Ont	>50yrs	Utilities	>2010
France	52.6 (74.6%)	55	Yes	Reactor sites Reprocessing Plants	Wet pools SF-wet pools HLW-dry vaults	~ 1yr ~ 2yrs >20yrs	EDF Cogema	>2010
Germany	22.7 (34.3%)	24	Yes (Ger,Fr,UK)	Reactor sites Independent facility[c] (Gorleben, Ahaus)	Wet pools SF-dry casks[e] HLW-dry casks[e]	3-10yrs Undecided 10yrs	Utilities Utilities (through BLG)	~2008
Japan	29.3 (27.8%)	39	Yes (Fr,Ja,UK)	Reactor sites Reprocessing Plants	SF-wet pools[e] SF-wet pools HLW-undecided	2-3yrs ~ 4yrs 30-50yrs	Utilities Utilities (through JNFS)	>2030
Spain	7.54 (38.4%)	10	No	Reactor sites Independent facility	Wet pools Pools and/or dry cask[f]	40yrs 40yrs	Utilities Government corporation (Enresa)	~2020
Sweden	9.82 (45.1%)	12	No	Reactor sites Independent facility (CLAB)	Wet pools Wet pools	~ 1yr 15-40yrs	Utilities Utilities (through SKB)	>2020
Switzerland	2.95 (41.6%)	5	Yes (Fr,UK)	Reactor sites Independent facility	Wet pools SF, HLW - dry casks[e]	<12yrs ~ 40yrs	Utilities Utilities	>2025
UK	11.2 (21.7%)	39	Yes	Reactor sites Independent facility for for AGR fuel Reprocessing plant	Wet pools SF-dry vault SF-wet pools HLW-dry storage	~ 1yr Undecided Few >50yrs	Utilities Utilities BNFL	>2040
USA	98.3 (19.1%)	110	No	Reactor sites	Wet pools, dry modules	Undecided	Utilities	>2003

KEY
AGR = advanced gas-cooled reactor
BLG = subsidiary of DWK, which is owned by FRG Nuclear Utilities
BNFL = British Nuclear Fuels PLC
CLAB = central storage for spent fuel
Cogema = Compagnie Générale des Matières Nucléaires
EDF = Electricité de France
Enresea = Empresa Nacional de Residuos Radiactivos SA
HLW = High level wastes storage facility
JNFS = Japan Nuclear Fuel Services Company
SF = spent fuel
SKB = Svensk Kambranslehantering AB

[a] As of Dec. 31, 1989.
[b] No decision about future reprocessing has been made.
[c] A storage facility that does not affect the safety of a nuclear-power or fuel reprocessing plant.
[d] Transportable storage casks are being investigated for buffer storage.
[e] Transportable storage casks have been selected for storage facility.
[f] Transportable storage casks are under development as the favoured storage technology.
[g] May be private, government, or joint industry-government entities.

Progress in the Field of Electric Vehicles

A World Electric Vehicle Association was formed at the forthcoming 10th International Electric Vehicle Symposium held in Hong Kong, December 3-5, 1990. Canada is represented in these international activities by the Electrical Vehicle Association of Canada. It is timely to note the significant progress now being made in this field, coming as it does at a time of upheaval in oil supply and growing concern over emissions from conventional vehicles in many regions of the world. Cities such as Los Angeles, Denver, Phoenix, Mexico City and Athens, to name only a few of the worst cases, are experiencing major difficulties in meeting clean air standards. Although overall air quality has been improving in Canada of late, according to the annual reports of Environment Canada, there are problems with excessive levels of ground-level ozone in southern Ontario and Quebec, and in the Vancouver region. A successful electric vehicle for town use in congested areas would be of great importance, not only from an environmental point of view, but, given that Canada is well endowed with electrical sources, also for energy policy.

Superior batteries are required before there will be extensive use of electrical vehicles. The conventional lead acid batteries used in present vehicles have a restricted range (typically not more than 100 km) and their life is limited to 33-50 thousand km of typical motoring. But there have been a number of announcements of advances in the field. The General Motors *Impact* vehicle, introduced as a prototype earlier this year, proved capable of reaching 160 km/hr and accelerating to 100 km/hr in a little over eight seconds, with a range of up to 200 km at more normal speeds. To achieve this performance this vehicle is propelled by a pack of 32 advanced-design batteries connected to provide 320 volts. However, the batteries weigh just under 400 kg and take two to six hours to recharge. There have also been advances in the design of the vehicles themselves, with regenerative braking installed on some models to recover energy.

The legislation planned in California for the early 21st Century envisages the use of many electric vehicles in the State's metropolitan areas, and this need is providing a major impetus for the current developments. Canadian university efforts have centred on electrochemical studies, while industry has concentrated on sodium/sulphur, aluminum/air, and methanol systems. Of these, only the sodium/sulphur system (both very light elements) is a true battery, in that the energy would be recharged from the electrical distribution network, but the cell must be operated at about 300oC. However, this system promises to store up to four times as much energy as lead batteries, size-for-size.

The aluminum cell consumes this light metal (whose production requires much electricity), which is then replenished as needed. In the Canadian system, the aluminum cell works in conjunction with a conventional lead acid battery to improve the performance of the vehicle. In the methanol fuel-cell case, the electrical energy to power the vehicle is produced by reacting hydrogen derived from the methanol with the oxygen of the air to produce water.

Hydro Quebec announced on October 22nd that it was joining forces with the Yuasa Battery Company of Osaka to develop a new generation of batteries based upon solid-polymer electrolytes. The utility has spent $10 million over the past 10 years developing this technology. A new joint venture called ACEP Inc. has been formed by the two organizations with the intention of spending $6 million during the first three years, and another $10 million on the first plant. The new company holds over 100 patents in electric and batteries technology.

It is too early to say which of these, or a number of other battery systems in development around the world, will prove superior, but what can be said with some certainty is that there will be more electric vehicles in the future.

Sources: Financial Times of London (July 27, 1990); Electric Propulsion, publication of the Electric Vehicle Association of Canada.

Conference Reports

IAEE North American Conference in Ottawa

For the first time, the International Association for Energy Economics (IAEE) has held its Annual North American Conference in Canada under the rubric 'Energy Supply/Demand Balances: Options and Costs.' There were about 80 presentations during the three day meeting, including a poster session which covered the entire spectrum of interest in this field. Many of the papers were published in a Proceedings volume prepared for the meeting, copies of which may be obtained

from the Association's offices (1101 Fourteenth St. NW, Suite 1100, Washington, D.C. 20005).

Canadians have been active in the affairs of the Association. J.P. Prince of the Energy Resources Conservation Board in Alberta was General Conference Co-Chairman and André Plourde of the University of Ottawa was Conference Program Chairman. Leonard Waverman of the University of Toronto serves as editor of the *Energy Journal*, the IAEE's main publication, and G.C. Watkins of DataMetrics in Calgary is President-elect.

The Ottawa meeting came after two months of turmoil in energy markets following the Iraqi invasion of Kuwait. It was not surprising, therefore, that a few papers from official sources were withdrawn. There were discussions of particular interest dealing with the new situation, notably a special session organized especially to address these issues. The opinions expressed both by the panel and from the floor reflected a very wide variety of views. Especially noteworthy was the contribution from Edward N. Krapels of Energy Security Analysis in Washington, who provided a 'bottom-up' assessment of the oil supply picture with results at variance from the results of the normal 'top-down' procedures of such groups as the International Energy Agency. Peter R. Odell of Erasmus University presented a masterly overview of the European energy situation in a presentation entitled 'Long-term Options for Europe's Energy/Supply Balances.'

Symposium of Parliamentarians, Scientists and Engineers

The Fourth Symposium of Parliamentarians, Scientists and Engineers (COPSE), held in the Parliament Buildings in Ottawa, October 15, 1990, was devoted to 'Energy Policy and the Environment: A Look to the Future.' This group has been established under the auspices of the Royal Society of Canada and the Canadian Academy of Engineering to promote renewed dialogue between scientists, scholars, engineers and the non-scientist parliamentarians, with a view to understanding the process by which knowledge of science contributes to the development of government policy. This meeting, hosted jointly by the Speakers of the Senate and the House of Commons, opened with a luncheon address by Camille Dagenais, President-elect of the Canadian Academy of Engineering, who appealed for a balanced approach to this subject and emphasized that scientists and engineers had a special responsibility to provide responsible information to educate the public.

D.B. Brooks, of the International Development Research Centre and first head of the Office of Energy Conservation in the Department of Energy, Mines and Resources, opened the plenary session with a history of the approaches used to develop energy policy in Canada. At first, new supply was the dominant theme and energy security and regional development were the key issues. By the time of the National Energy Program, announced in 1980, supply and demand were beginning to be treated on a somewhat more equal footing. In the period of deregulation that followed in the middle and late 1980s, the question become primarily one of economics, with the issue how to run the energy system at least cost. The situation is changing once again and now the major issue is sustainable development. Using less energy and using it efficiently always leads to the least environmental damage.

Ralph D. Torrie, of Torrie, Smith and Associates of Ottawa, showed how production from the nation's farms and forests, mines, and other primary industries provides a commodity trading surplus which helps to off-set its growing imports in other fields. It is essential to establish these industries on a sustainable basis for the long-term good of the country. What is required is improved energy productivity. Mr. Torrie showed that the better performance of the Canadian economy from the point of view of energy consumption over the past decades was about one-third due to structural changes in the economy and two-thirds due to greater efficiency in energy use. The greatest gains in energy efficiency were in the housing and vehicle fields where regulation and standards have been important. In areas where higher prices were the sole incentive to higher efficiency, such as in industry generally, the gains were less. Mr. Torrie went on to show that, even with the increasing adoption of efficient technologies, it will still be very difficult to meet the reduction in carbon dioxide emissions being proposed by the Intergovernmental Panel on Climate Change (see above).

The next two speakers, Philipe Crabbe of the Institute for Research on the Environment and the Economy at the University of Ottawa and Danielle Wetherup of the Canadian International Development Agency focused on the problems of developing countries. These countries face three main problems: paying for their growing needs of imported oil; acquiring capital investment for new production facilities, and the growing crisis in the supply of

fuel wood. Mr. Crabbe demonstrated that the fuel wood crisis was largely due to the needs of growing urbanization of the Third World; rural people can usually find sufficient fallen wood to meet their needs. Ms. Wetherup emphasized that economic growth is essential in these countries and the problem is to limit the detrimental effects of economic expansion on the environment.

The dinner speaker, J.P. Bruce of the Canadian Climate Board, spoke on what he termed as the myths surrounding the global warming problem. He stated that scientists were in fact largely in agreement on the consequences of the build-up of greenhouse gases in the atmosphere, though not in every detail; that greater energy consumption was not needed for continued economic growth — the system has steadily become more de-coupled; that the costs of the control of carbon dioxide emissions will not be excessive because of the benefits of greater efficiency; and that the Third World need not consume much more energy while gaining in prosperity.

This meeting is another example of the growing concern Members of Parliament have for energy and related environmental matters. The subject is being reviewed in a major way, which will no doubt be reflected in policies adopted in the near future. International negotiations to deal with global warming problems are scheduled to begin in Washington in February, 1991.

Twelfth Canadian National Energy Forum

The theme for the Canadian Energy Forum, held in Toronto November 5 - 6, was Sustainable Energy Development in Canada. This topical subject drew about 200 delegates, mainly from the Canadian utilities, other energy companies and the government departments concerned. The Forum was organized by the Canadian Committee for the World Energy Council (CANWEC).

The opening speaker was the Hon. Jake Epp, Minister of Energy, Mines and Resources, who noted that, while there was no consensus on the meaning of sustainable development, a final definition is not needed before taking action. He reiterated the government's policy of aiming at stabilizing emissions of greenhouse gases at the 1990 level in 2000, which he implied would be part of the forthcoming 'green plan'. He acknowledged there would be difficulties in meeting this objective but he stated there were many opportunities to reduce emissions at no net cost to the economy. He saw other opportunities for Canada to become not only a seller of energy, but of the related technologies as well. He stated 'change will come' and that we had to decide whether to be 'followers or leaders'. It is better to be a leader according to the Minister.

The Hon. David Macdonald, Chairperson of the House Standing Committee on the Environment, reviewed the work of his Committee and its recently released interim report. He explained that, based upon the testimony before the Committee, the decision was made to recommend a 20% reduction from 1988 levels in the year 2005. He acknowledged this will be more difficult to reach than the present target of the government, but he argued that it is necessary.

The new Ontario Minister of Energy, the Hon. Jenny Carter, gave a cautious speech, but there was no doubting her interest in the conservation and renewable technologies, especially solar energy.

There were several interesting papers given at the Forum which will appear in the Proceedings to be released from the CANWEC office in Ottawa (Suite 305, 130 Albert Street, Ottawa, Canada K1P 5G4) shortly. E.F. Roots, Science Advisor Emeritus of the Department of the Environment, gave a thoughtful presentation on the complex interactions between energy and the environment in which the world tends to 'use energy to maintain short-term economic gain'. By using an entropic argument, he stated we were caught in a positive feedback loop where we may be tempted to use more and more energy to maintain our present position. Representatives of major utilities, A.R. Holt of Ontario Hydro and L.I. Bell of BC Hydro, outlined the large expenditures now being made on environmental matters and the significant progress that was being made in the field of demand side management. Representatives of the fossil fuels industry, Ian Smyth of the Canadian Petroleum Association and J.D. McFarland of Imperial Oil, made cautionary remarks concerning the costs involved to the economy to meet some of the environmental objectives.

The next meeting of the Forum will be in September of 1991 in Halifax.

Alberta Utility Participates in US Clean Coal Program

A subsidiary of TransAlta Utili-

ties Corporation, TransAlta Resources Investment Corporation has become the first non-US firm to be chosen as prime sponsor of a project under the United States Department of Energy (DOE) Clean Coal Program. The Corporation's LNS (for low NOx and SOx) Burner will be assessed for 21 months at the Southern Illinois Power Co-operative generating station in Marion, Illinois, which burns a high-sulphur coal. In the LNS system crushed coal and limestone are blown with air into a stages combustion apparatus in such a way that most of the sulphur is removed in a slag formed from the ash of the coal. Nitrogen oxides are reduced by careful control of the temperature employed. Costs are expected to be substantially lower than those for other methods of reducing emissions. Of the total project cost of $15.3 million (US), DOE will contribute $6.8 million, TransAlta and other utilities $4.5 million, the Electric Power Research Institute $1 million and the State of Illinois Department of Energy $3 million (all in US dollars).

In Canada, in the clean coal technology field, the New Brunswick Electric Power Commission operates a 20 MW demonstration-scale circulating fluidized bed at Chatham, NB, and the Nova Scotia Power Corporation is building a 160 MW unit of the same technology at Point Aconi in Cape Breton. New Brunswick Power is also installing a 440 MW pulverized coal unit equipped with a limestone flue gas desulphurization (FGD) stage at a cost of $965 million at Belldune in the northern part of the province to operate on the high sulphur coals of that region. It is possible that three more such units will eventually be installed at the same site. Ontario Hydro is spending $2.5 billion to retrofit FGD equipment at several of the coal-burning plants in Ontario. Several utilities and the Coal Association of Canada are examining the prospects for integrated-gasification combined-cycle power generation of the SOx and NOx emissions problem.

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