Update

16th National Energy Forum

The 16th National Energy Forum was held in Montreal October 24-25, 1994, with the conference theme 'Trade and Energy in North America.' Hydro Québec served as the host organization and some 200 delegates attended, of whom about 10% were from the US and Mexico.

Mr. George Ashur of Wellington Management of Boston opened the Forum on a positive note by identifying three key ingredients for countries aspiring to greater competitiveness on the world scene: higher productivity; access to abundant resources; and ample deliverable energy. This speaker noted that the North American economy with the NAFTA Agreement in place is strongly endowed in all three requirements, and that economically viable energy supplies have a demonstrated history of increasing economic competitiveness.

The subsequent technical sessions dealt with three prime energy sectors — petroleum, electricity, and natural gas — in the current North American context. With respect to petroleum, Mr. Alain Ferland of Ultramar noted that the recent emphasis has been on improving the efficiency of the entire system, especially at the refinery and local distribution levels. Shrinking markets have been accompanied by a significant decrease in profitability in recent years and thus a gain in efficiency is essential. Mr. T. Boone Pickens of the MESA Partnership foresaw an impressive expansion in the use of natural gas-fueled vehicles in North America. He believes there may be 20 million such vehicles by 2010, which would clearly have a major impact on both the oil and gas sectors in the US, and would reduce the need for oil imports. Mr. Gerard Protti stressed the critical importance of petroleum to Canada's balance of payments, with a positive impact of about $12.7 billion, almost evenly split between oil and natural gas.

In the electrical sector, Mr. John Rowe of New England Electric documented the rapid pace of change in recent years and the unambiguous move towards a customer focus in healthy utilities. John Sheehan of BC Hydro drew attention to the close parallel between the natural gas and electrical power sectors in terms of functional separation into three sub-sectors: production/ generation; pipelining/transmission; and distribution. Given the head start of the natural gas industry, much can be learned from its prior experience. Prof. Atle Midttun of Norway discussed power sector restructuring and open access from the prospective of that country: not surprisingly, he found both winners and losers in the still-evolving changes.

In the natural gas sector, the process of deregulation is well advanced on both sides of the Canada/US border. Mr. Jean-Guy Fredette of the National Energy Board took the view that imperfect markets with imperfect competition are preferable to

perfect regulation. Mr. Nicholas Bush of the US Natural Gas Supply Association envisaged a 25% growth in demand in that country to 708 billion m^3/year (25 Tcf/year) by 2010. Mr. Gerald Doucet of the Canadian Gas Association foresaw an increasing fraction of the North American supply coming from Canada. Mr. Robert Reid of TransCanada Pipelines noted that the pipelining industry is responding to the increased competition that now exists with sophisticated information technologies matched with equally sophisticated marketing practices.

In the concluding inter-sectoral session, Mr. Jacques Prescott of the International Union for the Preservation of Nature challenged environmental organizations to become more realistic, governments to become more open, and the industry to make a firmer commitment to sustainable development. Mr. Vikra Budhraja of Southern California Edison expressed the view that Integrated Resource Planning as imposed by the regulatory authorities is likely to be replaced by market-driven demand-side approaches. He also described his company's proposals for a new power pool in California which would permit open trading in electricity with accessibility to producers throughout the western region. Mr. John Fox described Ontario Hydro's plans to restructure as a prelude to enhanced competitiveness.

Mr. Richard Drouin, Chairman of Hydro-Québec, brought the Forum to a close by highlighting common themes from the 20-some papers presented at the sessions. He identified three key factors that determine the new rules of the economic game: globalization of markets; the new regulatory framework for the industry; and the need to increase protection for the environment. Recognition of these factors has permitted Canada to achieve record levels of energy exports in recent years. For the future, he challenged the North American energy community to provide its know-how and resources to address the problems of developing countries and indeed others throughout the world.

The next National Energy Forum will be held at the Palliser Hotel in Calgary June 1-2, 1995 preparatory to the World Energy Congress to be held in Nakuhari (near Tokyo), Japan, October 8-13, 1995. Proceedings of the 16th Forum are available from the Energy Council of Canada at 400-30 Colonnade Road, Nepean, Ontario, K2E 7J6 (Fax: (613) 952-6470). (Contribution from Dr. E.P. Cockshutt.)

Meeting of Energy and Environment Ministers

A federal-provincial meeting of Energy and Environment Ministers was held in Bathurst, NB, November 8, 1994. At this meeting, the Ministers received a *Report on Options for a National Action Program on Climate Change*, agreed to consult with stakeholders to determine the next steps in the national smog action plan, and endorsed a statement of intent to prepare a long-term strategy on acid rain. The 100-page *Options Report* prepared for the meeting proved difficult. It has been clear that the immediate target of stabilizing emissions of greenhouse gases cannot be achieved without changes in policy. The possible measures can be grouped into three classes: voluntary steps; fiscal/economic instruments; and regulatory and command controls. The most controversial proposal was for a 'green tax' of 2¢/litre on gasoline, which was generally poorly received. However, the Parliamentary Committee examining measures to deal with the deficit was not hostile to this proposal. Numerous other options suggested included raising parking fees and reducing parking in downtown areas, charging drivers to use roads, and paying people to scrap old cars.

Since the reporting task force could not reach a consensus on a plan to reach the stabilization goal, Ministers were in effect presented with a menu of options rather than recommendations. At the present time, voluntary measures will continue to be encouraged but Ministers did agree to "proceed with the development of options that will meet Canada's current commitment to stabilize greenhouse gas emissions by the year 2000 and to develop sustainable options to achieve further progress in the reduction of emissions by the year 2005."

Ministers also agreed to develop a National Action Program to be ready for Ministerial approval in February 1995 which will be tabled at the first meeting of the Conference of the Parties to the United Nations Framework Convention on Climate Change scheduled for Berlin in April. In the meantime, Ministers challenged Canadian industry, public organizations and each other to participate in the Voluntary Challenge and Registry Program on Climate

Change as part of the nation's National Action Program. It is clear there is a difficult road ahead if this objective is to be met.

Meeting of the International Committee on Coal Research

In 1993, coal supplied 27.4% of the world's primary commercial energy consumption, behind oil at 40.0% but ahead of natural gas at 22.9%. In Canada that year, with production at 69.0 million tonnes (MT), coal supplied a smaller proportion of the primary energy consumption at 11.8%, with 86.1% of the tonnage used for the generation of electricity of which only 14.8% was derived from coal. Exports of 28.3 MT greatly exceeded imports of 8.4 MT. The world's resources of coal are large and fairly widely distributed. For this reason, and because coal is relatively expensive to transport on land (usually by rail), consumption tends to be local in many countries. China is now the largest producer and consumer followed by the US.

The International Committee on Coal Research (ICCR) was established in 1973, at the time of the first oil crisis, by the coal industries of Western Europe, Canada and the US. It was soon expanded to include Australia, Japan, New Zealand, and South Africa. With the major political changes in recent years, the membership is expected to be enlarged to include members both from developing countries and those in transition to market economies. The purpose of the ICCR is to provide a coordination vehicle for regular exchange of information primarily on coal research policy in parallel with the efforts to encourage international cooperative R&D by such bodies as the International Energy Agency, which was also formed about the same time. The ICCR was to provide an international voice for the industry in the determination of the future course of coal R&D, so much of which is funded one way or another by governments. The institutional reason for the formation of the ICCR arises from the low leverage the coal production industry has on its main customers — the electrical utilities and the steel industry — and on the transportation industry, which may account for a significant fraction of the delivered cost of this fuel. Both of these consuming industries have other choices for fuel, but it is in the interest of the coal industry to maintain these markets.

Typically at ICCR meetings, a summary of notable current activities is presented by each of the member countries together with an assessment of significant demonstration projects. The interests of the ICCR span the range of coal activities from mining and preparation through to utilization and conversion.

It may be fairly said that great technical progress has been made over the period the ICCR has been in operation. The major issue has come to be the protection of the environment, not only in production, but especially in the generation of electricity. It is now established that the conversion of coal to transportation fuel can act as a ceiling on the price of oil, but the exact value of this threshold is a matter of controversy: perhaps between $US 35-45/bbl as compared to the present price of about $US 18/bbl. Only recently, a major advance was announced by the Pennsylvania State University where it has been discovered that the addition of water leads to improvements in coal conversion efficiency in these processes. Nevertheless, coal is currently converted to transportation fuel in only one country, South Africa, where production from three plants is in the order of 16,000 m^3 (100,000 bbl)/day. With the exception of the outstanding problem of the possible need to limit CO_2 emissions to the atmosphere, the new technologies will permit coal to make a growing contribution to the world's energy supply at reasonable prices for very many years with acceptable environmental consequences.

The next meeting of the ICCR will be in Alberta in September, 1997, at the time of the national Coal Conference. A limited number of copies of the document *Status of Coal R&D in Canada 1994* compiled by G.T. Page, Alberta Coal Development Advisor and Honourary Member of the ICCR, may be obtained from Dr. D.A. Reeve at CANMET, 555 Booth Street, Ottawa, Ontario, K1A 0G1 (Fax: (613) 995-9584).

Changes at the IEA

Ambassador Y. Sato (Japan) is the Chairman of the Governing Board of the Agency and Mr. Robert Priddle (UK) has been appointed Executive Director succeeding Frau Helga Steeg (Ger.). The Standing Group on Long-term Co-operation is Chaired by Mr. S. Donnelly (US) with Dr. R.G. Skinner (Can.)

Director of the Long-Term Office. The Standing Group on the Oil Market is Chaired by Mr. M. Cleland (Can.) and the Standing Group on Emergency Questions is Chaired by Dr. H.E. Leyser (Ger.) with Mr. T. Taniguchi Director of Oil Markets and of Emergency Response. The Committee on Non-Member Countries is Chaired by Ambassador A. Walther (Nor.) with Mr. G. Caruso Director of Non-Member Countries. Mr. C. Mandil (France) is the Chairman of the Committee on Energy Research and Technology (CERT) and Dr. H.J. Koch is now Director of Energy Research and Development. Professor Mel Kliman (Can.), formerly Director of the McMaster Institute of Energy Studies, is now attached to the IEA R&D activity.

Hon. Don Johnston (Can.) will shortly be assuming his new duties as the Director-General of the OECD host organization.

Norway First to Sequester CO_2

Though an important oil and gas producing country, Norway has been at the forefront of those concerned with the greenhouse gas problem. The present Prime Minister, Gro Harlem Bruntland, Chaired the UN World Commission for the Environment and Development whose report *Our Common Future*, released in 1987, gave the expression 'sustainable development' common currency. Norway is among the few countries to impose an explicit carbon tax on a large part of its emissions which, in 1994, ranges from $US 56-178 per tonne of carbon depending on fuel and application. The present aim is to limit total CO_2 emissions at the 1989 level by 2000 but, unless more effective measures are adopted, it now appears these emissions will increase some 13% over this period.

The offshore oil and natural gas sector is responsible for 22% of the Norwegian CO_2 emissions and much of the increase from 1989 to date. It has thus been decided to sequester the CO_2 that must be removed from the raw gas from the Sleipner West Field (which contains up to 9.5% CO_2) to comply with gas sales specifications of 2.5% CO_2. The CO_2 is separated from the high-pressure gas by utilizing an amine solution of MDEA. Normal practice would be to release the captured CO_2 to the atmosphere, which at this installation would amount to about one million tonnes of CO_2 per year. Instead, after examining other techniques for disposal, such as application to the enhanced recovery of oil, it has been decided to inject this gas into an aquifer 250m thick located 800m under the sea bed near a neighbouring platform in the Sleipner East Field. The extra investment required is in the order of $US 50-60 million and the field, with its injection scheme, is scheduled to begin operation in 1996.

A paper on this first-ever planned sequestering operation was presented at the Second International Conference on Carbon Dioxide Removal which was held at Kyoto, Japan, in October of 1994. (It is interesting that this same technology — disposal in water aquifers — was selected for the Natuna gas field located in deep water off the Indonesian Coast where the natural gas is also very high in CO_2 content. It was announced in November of 1994 that the Exxon Group and the Indonesian national oil company Pertamina have reached an agreement to proceed with the large-scale production of liquefied natural gas from this field.) In the event of an urgent need to substantially reduce CO_2 emissions, it would be technically feasible, and a logical next step, to reform the natural gas produced on the platform to allow the capture and sequestering of all the carbon associated with the natural gas so as to produce hydrogen, which could be piped ashore. (Source: *Greenhouse Issues*, August 1994)

IEA Workshop of the Energy Technology Systems Analysis Project

The Energy Technology Systems Analysis Project (ETSAP) was established in 1976 during the early days of the research and development activities of the International Energy Agency to aid in the difficult task of setting priorities for research in the energy technology field. The work relies primarily upon the use of the MARKAL (Market Allocation) linear programming model developed at Brookhaven National Laboratory in the US, which is one of the principal models employed by the US Department of Energy in its national studies. In Canada, separate MARKAL models have been developed for Quebec, Ontario, Alberta and, more recently, Saskatchewan (See *ESR* 5:3:241-42). The current IEA/ETSAP studies are managed by

the Netherlands Energy Research Foundation at Petten with participation from 11 IEA countries, including Canada, and the Commission of the European Community. There are now also a number of outreach studies involving both the countries in transition and developing nations.

The current three-year Annex IV Implementing Agreement focuses on the control of greenhouse gases, especially CO_2. It included steps to widen the circle of MARKAL users to non-IEA countries, and to take advantage of a new generation of personal computers. An out-of-pocket expenditure in the order of $25,000 is all that is required to get started with MARKAL, particularly now that the MARKAL Users Support System (MUSS) is available. The report *National Energy Options for Reducing Carbon Dioxide Emissions (Volume 1)* came available early this year.

An ETSAP Workshop, which was held in Banff in September and was attended by some 45 delegates from both IEA and non-IEA nations, focused on the use of MARKAL-based studies to address the greenhouse gas problem. In addition to a number of papers devoted to improving the methodology, national studies were reported by a number of countries including Belgium, Estonia, and Taiwan.

Professor Alan S. Manne of Stanford University dealt with the linkage of the MARKAL model to macroeconomic models of the energy economy. In addition, he made a notable presentation on work-in-progress dealing with Pareto-optimal decisions under uncertainty as applied to the greenhouse gas problem using the dictum 'act then learn.'

As has become the custom in ETSAP Workshops, one session was devoted to what might be termed 'national papers.' Dr. Henry Hengeveld presented an update on the science of global warming, Prof. John Robinson of the University of British Columbia reported on the work of the Intergovernmental Panel on Climate Change Working Group III, of which he is co-chairman of the writing team, Anthony E. Reinsch, Vice-President of the Canadian Energy Research Institute, spoke on the de-linking of crude oil and petroleum product pricing and consumer demand, and Dr. J.H. Walsh made a presentation on the application of energy maps to individual industrial sectors.

A limited number of compilations of the papers presented are being bound together. These, as well as copies of the *National Options Volume 1* (Executive Summary or full Report), can be obtained (or borrowed) from Dr. J.G Hollins, Chairman of the ETSAP Annex 1V Activity at Environment Canada, Ottawa, Ontario, K1B 3J5. To receive the regular *IEA/ETSAP Newsletter*, contact the Netherlands Energy Research Foundation, P.O. Box 1, 1755 ZG Petten, The Netherlands (Fax: +31-2246-3338).

New Reports

1994 Update of Canada's Energy Outlook

In October, Natural Resources Canada released the *1994 Update of Canada's Energy Outlook*. This 47-page report (including appendix tables) is the second in an annual series, the objective of which is to provide an outlook for energy demand, supply, and related greenhouse gas emissions until 2020. Though the report is not presented as an official projection of the federal government or the Department, it does provide a current reference scenario to be used as input to the development of a National Action Program to achieve Canada's climate change objectives. This Program is being undertaken under the auspices of the National Air Issues Coordinating Mechanism (NAICM), a joint Federal-Provincial organization established in 1992. Nevertheless, the *Update* is also useful for the study of other energy issues as it gives a consistent and integrated view of Canada's energy future together with details of the assumptions and data employed.

A useful comparison is made with the framework assumptions of the report of the previous year: there is a revised macroeconomic projection reflecting a much lower exchange rate and higher economic growth to 2000, but lower growth thereafter; lower world oil prices (by about $US 2/bbl); more modest projections of the needs of the transportation sector; and the premature shutdown of Unit 2 at the Bruce 'A' Generating Station of Ontario Hydro. Referenced comparisons are made to other well-known projections of a variety of important parameters in the energy field. As far as emissions of CO_2 are concerned, there is a slight increase in estimated emissions in 2000 as compared to that reported previously, but there are substantial declines thereafter. Emissions of this gas are 76 million tonnes lower in 2020 than in the estimate published last year. The report notes, however, in the absence of policy changes, that greenhouse gas emissions

generally will continue to increase throughout the period and that further policy initiatives will be required to attain the announced goal of stabilization by the year 2000.

The Reference Scenario is provided in 23 pages of tables in the appendices which provides the data on a regional basis. Copies of the 1994 *Update of Canada's Energy Outlook* (catalogued as ISBN 0-662-22625-9) may be obtained from the Economic and Financial Analysis Sector of Natural Resources Canada at 580 Booth Street, Ottawa, Ontario K1A 0E4 (Fax: (613) 996-7837).

Report on Market Failures in Achieving Higher Energy Efficiency

The question of whether market failures impede the adoption of more efficient practices in the consumption of energy has long been contentious. At one extreme is the 'get-the-price-right school' — generally economists — who believe that market failures do not exist in that there must be a transaction cost of some kind preventing the adoption of superior practices where such barriers have been found. At the other extreme are those — generally technologists — who believe substantial additional economic benefits are in fact possible with little or no net cost to the economy. A recent 39-page report published by authors from Lawrence Berkeley Laboratory and Oak Ridge National Laboratory in the US entitled *Energy Efficiency, Market Failures, and Government Policy*, by Mark D. Levine *et al.*, is a useful and succinct contribution to what has become known at the 'energy efficiency gap.' This paper presents a framework for evaluating engineering-economic evidence on the diffusion of energy efficiency improvements using concrete specific examples. The four cases evaluated within this framework are: (1) standard core-coil versus efficient core-coil commercial fluorescent ballasts; (2) high-efficiency versus low-efficiency refrigerators/freezers; (3) Energy Star Computers; and (4) standby power in colour televisions. The report concludes that market imperfections do indeed exist and it goes on to consider the appropriate policies to deal with them. Though this study comes down on one side of this long-standing argument, it is refreshingly free of the usual cant so often encountered when this subject is debated. Copies may be obtained from The Energy and Environment Division of Lawrence Berkeley Laboratory, Berkeley, California, US 94720 (Report No. LBL-35376).

New Reports from Statistics Canada

Statistics Canada has now released *Human Activity and the Environment 1994*. This reference document, with more than 400 tables, charts, graphs and maps, is an overview of the interrelationships between population growth, resource availability, economic development, and environmental quality. The 221 tables of data are available on disk in Lotus format. (Catalogue # 11-5090XPE, $35 for document and $15 for disks).

In cooperation with the Canadian Council of Ministers of the Environment, Statistics Canada has also released *Databases for Environmental Analysis: Provincial and Territorial Governments* which is a 400-page inventory of regional and local databases. A disk is provided for $75 to aid in the search of the 800 databases included in the document for detailed environmental information in a variety of fields. (Catalogue 11-5290XPE). These publications are available from Statistics Canada, Ottawa, Ontario, K1A 0T6.

Joint IEA/OECD Report

The IEA and OECD have published a scoping study entitled *Energy and Environmental Technologies to Respond to Global Climate Change Concerns*. This 237-page report (plus six Annexes containing reference material) takes as its starting point the proposition that ultimately only improved technologies can deal with the greenhouse gas problem. The stated purpose of the study is to stimulate and help guide a fresh dialogue on how international collaboration may help to accelerate the pace of new technological developments needed to respond to global climate change concerns. The first chapter is a concise overview of the climate change issue and subsequent chapters deal with the main factors influencing the development of technology, the relevant technological options and strategies, an overview of current national and international technological development efforts in this field, and concludes with proposals for enhancing international collaboration in the development of new technologies. This report is different from others on this subject in two important ways: the solution of the problem is regarded as a process of technology development which will have to be modified as time passes; and it applies ideas from the emerging theoretical studies

of technology.

Among its conclusions the report states that "if the current pattern of energy supplies continues, based on the existing fossil fuel infrastructure and reliability of associated technology, then the most attractive areas for technology development to reduce greenhouse gas emissions will be those associated with improvements in energy efficiency of fossil fuel use (in energy production, conversion and end-use), and with greenhouse capture and disposal. If a fundamental shift in energy supply is pursued over time, then nuclear and/or renewable energy technologies could play a very significant role in reducing greenhouse gas emissions." This study is a useful contribution and will be helpful to many people including those seeking a convenient introduction to the field. Copies catalogued as ISBN 92-64-14224-X may be obtained from the OECD at 2, rue André Pascal , 75775 Paris CEDEX 16, France, or from OECD booksellers around the world.

National Energy Board Technical Reports

On December 15, 1994, the National Energy Board released the *Technical Report and Statistical Appendix* for the *Energy Supply* and *Demand Study 1993-2010 Trends and Issues* released the previous July. Copies of these comprehensive technical annexes may be obtained from the Board at 311 Sixth Avenue SW, Calgary, Alberta, T2P 3H2 (Fax: (403) 292-5503).

New Book

Dr. T.E. Ledwell of Natural Resources Canada has written a volume entitled *Physics of the Environment*, with emphasis on global changes due to energy use, compiled from course notes prepared for undergraduate students at Carleton University. This volume (catalogued as 0-88629-714-1), which is available from the university bookstore, provides a rigorous scientific background for most environmental problems encountered in a Canadian energy context. Course aids, such as charts and illustrations, are also available on loan.

Short Notes

• The National Energy Board has announced some senior executive appointments. Mr. Gaétan Caron will become Executive Director and Mr. J. Scott Richardson the Secretary of the Board. The NEB has also established an Electronic Bulletin Board System for certain of its documents. Bulletin board users can obtain news releases and related background information, hearing orders, regulatory agendas, and selected oil and gas statistics in electronic format at no charge in both official languages around the clock (except during data loading and system upgrading activities) by calling (403) 299-2751 in Calgary. A user guide with instructions is available from the Board for reference (address: National Energy Board, 311 Sixth Avenue SW, Calgary, Alberta, T2P 3H2; Fax: (403) 292-5503) and a help line is operational from 9:30 to 10:30 AM Mountain Time during most business days at (403) 299-3919.

• The Petroleum Monitoring and Energy Statistics Section of Natural Resources Canada reported the net income from total operations of the Canadian petroleum industry rose from a loss of $1.3 billion in 1992 to a profit of $1.6 billion in 1993. The improvement was due to both greater levels of production and higher prices. As a result of improved profits, the industry recorded a 4.4% rate of return on equity in 1993 versus a negative 3.4% in 1992. Both Canadian ownership and control of upstream revenues rose to 49% in 1993, up respectively from 47.4% and 45% in 1992. The industry spent $170 million on 'in-house' research and development activities in 1993, an increase of 7% from the previous year, while work contracted outside the companies amounted to $140 million, up 4% over the same period last year.

• The United Nations Institute for Training and Research (UNITAR) Centre for Heavy Crude and Tar Sands has been re-located to Edmonton from New York, where it had been located since 1980, in recognition of the importance of the oil sands and heavy oil resources of Alberta. Premier Klein and other officials opened the new Edmonton offices on June 16, 1994. The Centre fosters cooperative development of the world's heavy oil and oil sands resources through the exchange of technical information and expertise, particularly for the assistance of energy-deficient countries. Every three years, the Centre coordinates an international conference, the next of which will be in Houston in 1995 where an attendance of 1000 is expected. Helga Petri, long associated with the Alberta Research Council, is the current director.

• Ballard Power Systems Inc. of North Vancouver, BC, following

earlier trials in that province, particularly during the Commonwealth Games in Victoria, demonstrated its 32-foot zero emission bus (with a rated capacity of 20 passengers) in Eastern Canada in October, 1994. The bus is powered by hydrogen consumed in proton exchange membrane (PEM) fuels cells to produce electrical energy. Sufficient hydrogen is stored at 3000 psi in fibreglass-wound aluminum cylinders to provide an operational range of 160 km (100 miles). With advances in this class of fuel cell, the company is proceeding to a full size commercial prototype — a 40-foot transit bus capable of carrying 60 passengers with a range of 403 km (250 miles). A later demonstration model, when equipped with third generation 25 kW fuel cell stacks, will allow the passenger carrying capacity to be increased to 75. If regenerative braking were adopted, the vehicle range can be increased to 565 km (350 miles). This program is supported by the Province of British Columbia, Natural Resources Canada and B.C. Transit.

• Ontario Hydro has announced that Unit 2 at the Bruce A Station on Lake Huron will be closed indefinitely in June 1995 three months earlier than had been planned. The 17-year old reactor has been troubled with cracks in the steam generating boilers. It is possible the reactor will be repaired and returned to service at some later date, but the expenditure required will be in the hundreds of millions of dollars. The electrical generation lost will be replaced by higher than anticipated fossil fuel generation, more non-utility generation, and reduced exports. CO_2 emissions will increase as a consequence. In December, there was a loss-of-coolant accident at the Pickering 'A' Station due to a pipe rupture, and four reactors have been withdrawn from service until repairs can be made.

• The Federal government is giving Ukraine $2.9 million to improve safety at the Chernobyl reactor in a project that will involve Ontario Hydro. Ukraine will pay the utility a licensing fee for the right to manufacture nuclear dry storage containers based on Hydro's design. About 550 of these containers will be built to handle spent radioactive fuel more safely.

• Starting with *Electric Power in Canada 1993* issued by Natural Resources Canada in November of 1994, it is now possible to download (but not read) the more important tables in this publication (and other information provided by NRCan) by electronic means. This may be done through the Internet (es1.es.emr.ca) or by calling directly using a modem to (613) 996-2741 (Modem Settings: 8,N,1,CR,Full Duplex). Systems assistance may be obtained by telephone at (613) 995-2634. Shortly, a wide range of data of interest to the energy field will be accessible from the World-Wide Web using Mosaic at http://es1.es.emr.ca.

• Advances continue in the field of photovoltaic electricity generation. It has been announced that a cell developed by Amonix Inc. of Torrance, California, with support from the Electric Power Research Institute, has achieved a record conversion of more that 20% of the incident sunlight into electricity. The new cells employ a novel system for collecting the charge released by the sun's rays. Meanwhile, the Enron Company of the US, a major participant in the natural gas industry, has announced it will build the largest solar power plant in the US in Nevada. The company claims advances in the solar field now make this source of energy competitive. Enron is hoping to build its 100 MW system over 10 years, adding 10 MW/year. The US Environmental Protection Agency is assisting 10 utilities to install 18 kW solar arrays for evaluation.

• An Environmental Impact Statement (EIS) on the *Concept for Disposal of Canada's Nuclear Waste*, prepared by Atomic Energy of Canada Ltd. with the assistance of Ontario Hydro, has now been submitted to the federal environmental assessment panel reviewing the project. Nine months has been allowed for the study of this and related documents, and for the provision of commentary on this proposal for the permanent disposal of nuclear fuel waste in the hard rock of the Canadian shield. A decision will be made later of the scheduling of public hearings. Further information or copies of the *EIS* or its summary may be obtained from the Federal Environmental Assessment Review Office, Hull, Québec, K1A 0H3 (Fax: (819) 994-1469).

• Suncor Inc. has announced a $250 million expansion of its oil sands plant near Fort McMurray in northern Alberta. Output will be increased from its current 10,811 m^3 (68,000 bbls) /day to 12,719 m^3 (80,000 bbl) /day by 1997. Despite the present relatively low oil prices, it is evidently attractive to expand the production of synthetic oil derived from the Athabasca oil sands.

• Ontario Hydro is considering a project involving the modification of cattle feed to reduce bovine flatulence as a way of

reducing the emission of greenhouse gases. A similar study now underway in India, supported by the US Environmental Protection Agency and the Rockefeller Foundation, is one of 32 programs designed to offset greenhouse gas emissions, mainly in Third World countries, being assessed by Ontario Hydro. The utility is searching for an effective project of this type in Ontario, especially as a previous proposal to purchase rainforest in Costa Rica for the same purpose drew heavy criticism.

In the US, two utilities, Niagara Mohawk and Arizona Public Service, announced a study of a scheme whereby pollution credits would be donated (essentially retiring them) and the resulting tax benefit would be used to experiment with reducing emissions in China and Russia, where the costs of equivalent pollution reduction are much less since these nations are at an earlier stage of control.

• The Minister of Natural Resources Canada, the Hon. Anne McLellan, attended the second annual meeting of the Minister's Advisory Council on Industrial Energy Efficiency (MACIEE) on October 20, 1994. Some 20 sectors of the Canadian economy, embracing more than 3000 companies which account for 80% of the nation's total energy use, are represented on the Council which provides a forum for executive-level discussion of energy efficiency policy, planning, and project implementation. MACIEE performs two main functions. First, it provides the Government of Canada with ideas and recommendations from industry for an effective framework of energy efficiency policies and programs. Second, its membership drawn from the ranks of the chief executive officers of major Canadian companies signals the high-level leadership required for the success of a voluntary industry-driven approach.

• Budget cuts were announced in December, 1994, for the US Department of Energy. The Administration now proposes to cancel the Clean Coal Technology program activities.

• In December 1994, the federal government announced a package of incentives to support the ethanol fuel industry by offering potential producers a $70 million line of credit and by extending an existing tax concession until 1997. In addition, new funds will be provided for research into this area including $3.2 million by Agriculture Canada. The purpose of this program is to offer an additional outlet for Canadian corn production and to reduce automotive emissions. Access to these funds will be capped after Canadian production of fuel alcohol reaches 336 million litres, which is approximately 1% of current gasoline consumption in Canada.

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