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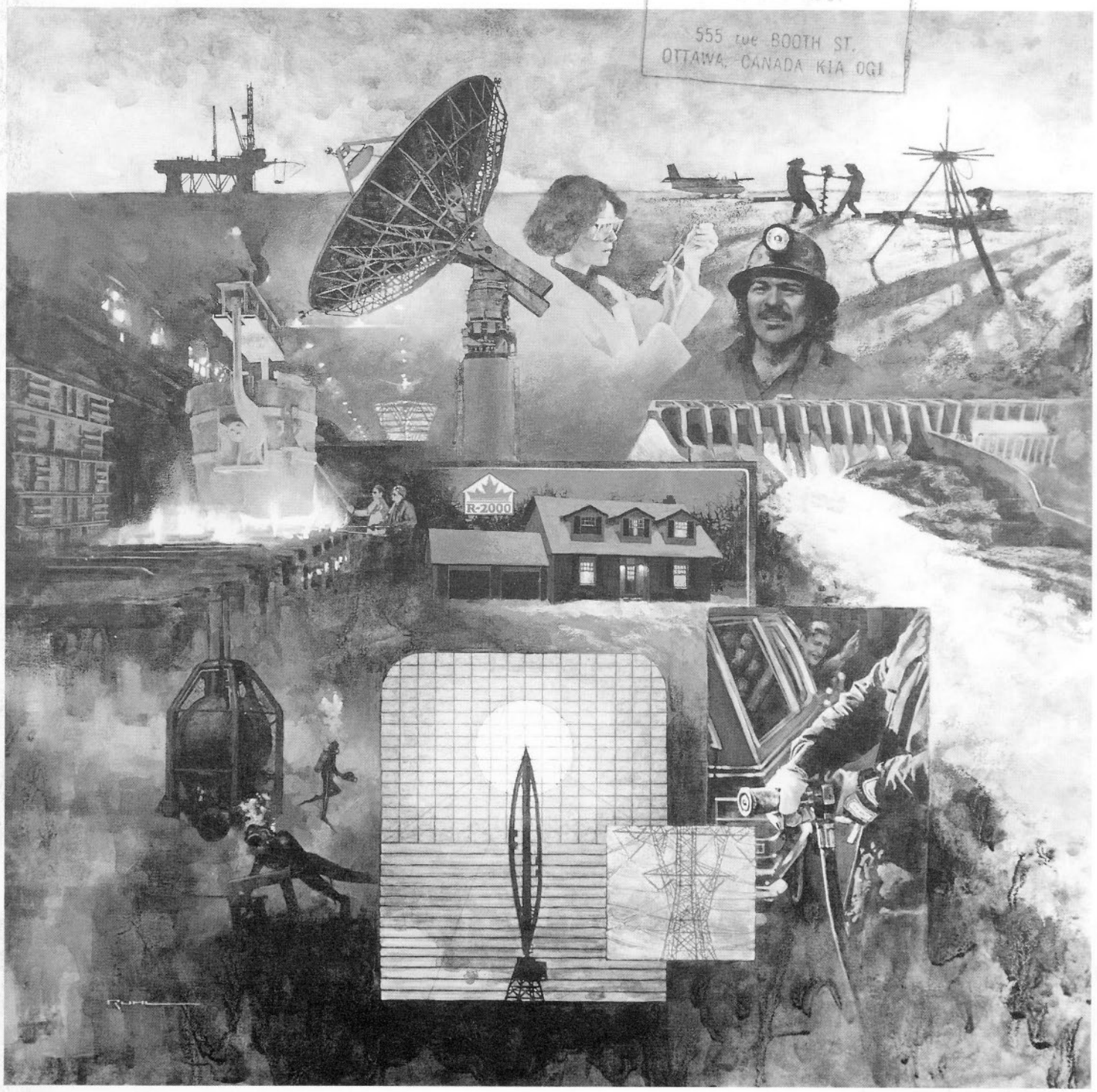
ANNUAL REPORT 1985/1986



Energy, Mines and Resources Canada
Hon. Marcel Masse, Minister

Énergie, Mines et Ressources Canada
L'Hon. Marcel Masse, Ministre

Canada

ENERGY, MINES AND RESOURCES CANADA 1985-1986

LETTER FROM THE MINISTER

Her Excellency the Right Honourable Jeanne Sauvé, P.C., C.C., C.M.M., C.D., D.H.L., D.Sc., L.L.D., D.U., Governor General and Commander-in-Chief of Canada

Your Excellency:

I have the honour to present the Annual Report for the Department of Energy, Mines and Resources for the fiscal year ending March 31, 1986.

I remain Your Excellency's obedient servant.

Marcel Masse
Minister of Energy, Mines and Resources

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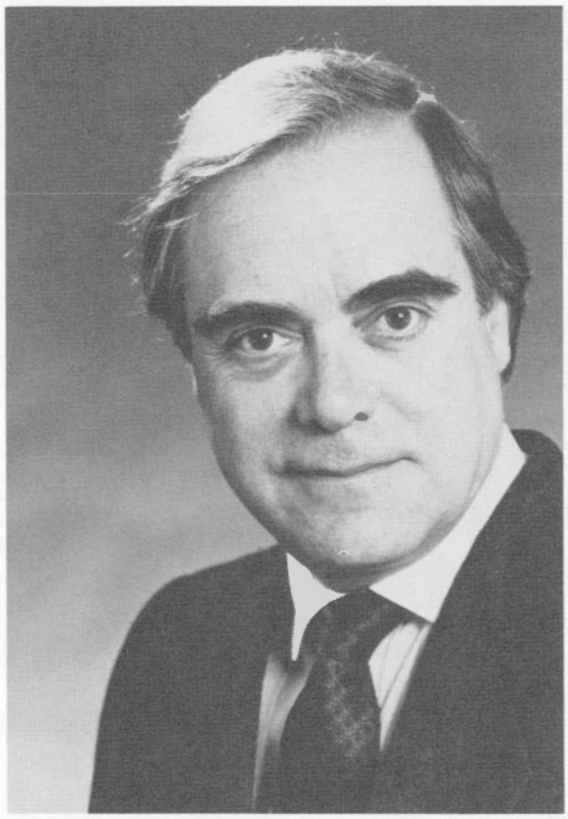


A special message from the Honourable Marcel Masse, Minister of Energy, Mines and Resources

Extraordinary events, particularly in Canada's petroleum sector, turned 1985-86 into one of those signal years that will surely find its special place in history. Much of the credit for the accomplishments made during this year must be directed to my colleague, the Honourable Pat Carney, who was Minister of Energy, Mines and Resources during the period covered by this report.

The implementation of the Western and Atlantic accords and the Agreement on Natural Gas Markets and Prices freed the industry of excessive government regulation. It could now make decisions based on geology and market conditions. The industry and its investors responded to Canada's new energy policy with confidence and enthusiasm. The year 1985 was a record-setting one for our oil and gas sector.

Late in the year, the international price of crude oil began to fall. The repercussions on cashflow, investment and jobs were severe. The Government of Canada and provincial governments began discussing a variety of tax relief measures in recognition of the industry's decreased cashflow. Governments continue to monitor the situation in close consultation with industry.

It was also a significant year for Canada's mineral industry. Energy, Mines and Resources signed mineral development agreements with four provinces. These agreements support many private sector initiatives in our mining sector.

The department was also active in research and development on projects that ranged from the exploration of the ocean floor, and a probe of the earth's tectonic plates, to remote sensing of the earth from outer space. Our purpose: to support industry and researchers in their quest for solutions that will improve the efficiency, productivity and competitive edge of Canada's resource industries.

From cartography to energy-efficient housing, our successes have brought us international recognition and benefited Canadians in every region. And yet, our search for advances in scientific, technological and policy areas must continue . . . it is our nature and our future.

DEPARTMENTAL PROFILE

The Department of Energy, Mines and Resources explores Canada's landmass, manages the research and development of energy- and mineral-related technology, and carries out policies and programs to ensure the equitable development and sound management of Canada's mineral and petroleum resources.

The department employs nearly 5000 persons from coast to coast in three major programs: one covers the field of energy; another deals with matters relating to minerals and earth sciences; the third, administration, provides common services to the department.

ENERGY PROGRAM

The Energy Program pursued its principal objectives of economic growth, energy self-sufficiency and security, enhanced Canadian participation, fair treatment, and a stable planning environment.

The Energy Program consists of two sectors and two administrations: the Energy Policy, Programs and Conservation Sector, and the Energy Commodities Sector; and the Petroleum Incentives Administration and Canada Oil and Gas Lands Administration. The Petroleum Monitoring Agency and the Energy Supplies Allocation Board, both independent advisory bodies, are provided with resources and support by the Energy Policy, Programs and Conservation, and Energy Commodities sectors, respectively.

The activities of the sectors and administrations cover both policy and program functions, including

- adjusting energy policies and programs to achieve principal program objectives;
- ensuring that energy policies and programs are consistent with, and contribute to, broader government objectives and initiatives such as enhanced market access (freer trade), privatization, and the greater efficiency and effectiveness of federal programs;
- monitoring the performance of the petroleum industry, particularly in the current environment of dramatically reduced world crude oil prices, and studying changes which may be required regarding oil and gas pricing, the tax system, new oil supply, oil demand reduction by substitution and conservation, and incentives for Canadianization;
- implementing programs to ensure that petroleum and nonpetroleum resources are developed, and that all energy sources are used and conserved effectively;

Satellite images are computer enhanced at the Canada Centre for Remote Sensing.

- administering policies and programs to ensure the vigorous and responsible development of oil and gas resources on the frontier lands;
- administering policies and programs to increase Canadian ownership and control of the petroleum industry;
- participating actively in the International Energy Agency, and supporting that agency's work towards collective energy security;
- planning policies and programs to ensure equitable distribution of energy supplies in a national emergency; and
- implementing strategies and initiatives to ensure that energy research capabilities are adequate to support broader energy objectives.

MINERALS AND EARTH SCIENCES PROGRAM

The Minerals and Earth Sciences Program develops mineral policies and strategies, assesses the structure and properties of Canada's landmass, and conducts national surveying and mapping programs.

The program is divided into three sectors: Mineral Policy, Earth Sciences, and Research and Technology. Activities of this program include

- establishing policies and strategies to ensure that the minerals and metals sector contributes with maximum effectiveness to the economy of Canada;
- ensuring that adequate technology is available to extract, process, use and conserve energy and mineral resources;
- ensuring that reliable information on mineral and energy technology is available;
- coordinating the scientific investigation of Canada's Polar Continental Shelf;
- improving technologies of remote sensing;
- ensuring that technology, expertise and data are available on the geology, geochemistry and geophysics of Canada, and on the configuration and evolution of the solid earth;
- ensuring the availability of geodetic, topographic and selected geographic information; and
- ensuring public and industrial safety through implementation of the Explosives Act.

ADMINISTRATION PROGRAM

The administration program ensures that departmental programs are effectively managed and accounted for and maintains central support services.

The administration program includes two sectors, Finance and Administration, and Human Resources, and three executive offices.

Sector activities include

- ensuring that the department makes the best use of its allocated human and monetary resources;
- providing advice and support in personnel management, finance, general administration and electronic data processing; and
- advising on departmental plans to achieve equality of opportunity for women, natives and handicapped persons.

Three executive offices are also part of the Administration Program.

The Corporate Policies Evaluation Branch provides the Deputy Minister and Associate Deputy Minister with the coordination, support, analysis and management control necessary for effective management of department operations.

The Departmental Secretariat prepares and coordinates ministerial and executive correspondence, and provides parliamentary and executive document services to the ministers and senior managers of the department.

The Communications Branch provides broad communications and public relations support to all sectors. Its activities include

- providing a range of communications services in support of the Ministers' offices;
- providing communications advice and marketing services to departmental programs;
- analyzing public information requirements;
- publishing material for program support, education and public relations, and reports and books on scientific topics;
- providing audiovisual and advertising support for departmental programs;
- supplying information to the media; and
- arranging exhibitions.

EMR 1985-86: THE YEAR AT A GLANCE

The year 1985-86 was one that saw an end to extensive government intervention in the oil and gas industry. Crude oil prices were deregulated and we began the transition to a market-oriented natural gas policy. The first shipment of crude oil from the High Arctic to southern markets was an historic event in the summer of 1985. EMR worked closely with the private sector in the research, development and demonstration of innovative technology. During this year mineral development agreements were signed with four provinces. This was the year in which the implementation of new policies and programs revitalized the department's commitment to Canada's resource sectors.

- EMR implemented the Western Accord by removing a variety of taxes and charges, dismantling the administered pricing system for domestic crude, eliminating price and volume restrictions on short-term oil exports, and starting to phase out the Petroleum Incentives Program and the Petroleum and Gas Revenue Tax.

- The department implemented the Atlantic Accord by establishing the Canada-Newfoundland Offshore Petroleum Board, tabling enabling legislation, and creating a $300 million offshore development fund.

- An Agreement on Natural Gas Markets and Prices with western producing provinces was concluded. It provides for price deregulation in domestic and export markets and a one-year transition period.

- A revised policy for Canada's energy frontiers introduced fiscal and management changes and enabling legislation, the Canada Petroleum Resources Act.

- The Petroleum Incentives Program Act and regulations were amended to provide for the orderly phasing out of PIP.

- The department implemented the National Conservation and Alternative Energy Initiative, to promote cost-effective conservation and renewable energy measures, and concluded cooperative program delivery arrangements with some provinces.

- EMR concluded an agreement with Prince Edward Island to address its long- and short-term electricity rate problems.

- The Minister visited China, Japan and western Europe.

- A five-year plan for energy research and development was approved. It supports government priorities for economic development and identifies the key role of energy in economic renewal and job creation.

- Petroleum exploration was at a record high: 11 500 wells were completed, compared with 9150 in 1984.

- As promised in the Western Accord, oil prices were deregulated on June 1, 1985.

- Despite the fall in Canadian crude oil prices, NewGrade Energy Inc. began work on a heavy oil upgrader in Saskatchewan.

- Construction of the Drummondville, St-Hyacinthe and Notre-Dame-du-Bon-Conseil lateral gas pipelines under the Quebec Natural Gas Laterals Program was completed.

- The Uranium Resource Appraisal Group confirmed that Canada has become the world's leading producer of uranium and is still the world's leading exporter of uranium.

- Uranium export contract review procedures were streamlined, permitting a shorter processing time. Contract reviews were up 50 per cent over the previous annual average.

- The uranium and Nuclear Energy Branch has enlarged Canada's role in the activities of the Nuclear Energy Agency in Paris and the International Atomic Energy Agency in Vienna, particularly with respect to uranium assessment, CANDU prospects in developing countries, and future directions for the agencies.

- Agreement was reached with provincial officials on the distribution of responsibility for low-level radioactive wastes. The Uranium and Nuclear Energy Branch assisted the Minister of State (Mines) in his initiative to resolve the Port Hope waste problem.

- The Canada Oil Substitution Program was terminated in March 1985. During its lifetime, approximately 988 000 households converted from oil to alternative energy sources, mostly electricity and gas.

- The Natural Gas Fueling Station Contribution Program met its target of 125 stations. These stations are receiving grants to offset part of the costs of setting up natural gas fuel stations.

- Project **MILE**, the first Canada-wide comprehensive field trial of **m**ethanol **i**n **l**arge **e**ngines, was started. It covers every practical aspect of this application of methanol.

- In November and December 1985, in conjunction with major Canadian oil producers, Canada participated in a test of the International Energy Agency (IEA) Emergency Oil Sharing System. This test involved the 21 member countries of the IEA in a simulated crude oil supply disruption, and the redistribution of supplies among member countries in accordance with agreed priorities. Oil companies taking part described the test as the most successful of the five tests to date.

- The Petroleum Incentives Administration began gradual phase-out of the Petroleum Incentives Program and the Canadian Ownership and Control Determination Program.

- The Canada Oil and Gas Lands Administration announced that a very large flow of oil was obtained during initial tests of the first delineation well I-65 in the Amauligak formation in the Beaufort Sea. Tests indicated reserves of 111 million cubic metres, the greatest production potential ever recorded for a single well in Canada.

- The Norman Wells expansion project was largely over in 1985. A new pipeline transports oil to the south at a rate of 3000 cubic metres a day.

- Oil produced in the High Arctic was first shipped south in August. The Bent Horn project produced and shipped 16 800 cubic metres of oil from Cameron Island through the Northwest Passage to a refinery in Montreal.

- The final report of the Royal Commission of Enquiry into the *Ocean Ranger* disaster, published July 2, 1985, presented 70 recommendations on offshore safety on the east coast. About 75 per cent of these recommendations had already been wholly or partly implemented by the time the final report was presented.

- In conjunction with east coast oil and gas associations, COGLA undertook a project to produce and test the prototype of an evacuation system for drilling rigs. Named PROD (Preferred Orientation and Displacement), this system of launching lifeboats by a swinging boom was built in Canada from a British model.

A Natural gas fueling station.

- Consultations were completed on the discussion paper *The Canadian Minerals and Metals Sector: A Framework for Discussion and Consultation,* and the Minister presented a report on his findings at the September 1985 Mines Ministers' Meeting in Charlottetown.

- Mineral development agreements with British Columbia, Ontario, Quebec and Prince Edward Island, were signed and implemented; an amendment to the agreement with Nova Scotia allows for the transfer of selected federal projects to the province.

- The controlled-use approach to asbestos was promoted internationally. A convention on the safe use of asbestos was being prepared by the International Labour Organization.

- A comprehensive report on the lead and zinc industries was issued.

- A program was set up so smelters could meet stricter sulphur dioxide emission standards while maintaining competitiveness. EMR is on the federal team, working with the provinces and the smelting industry.

- Construction of a $33 million circulating fluidized bed boiler at the Chatham, N.B. generating station was almost complete.

- The Geological Survey of Canada reassessed undiscovered oil resources in the Western Canada Sedimentary Basin, and made the first discovery off Canada's west coast of a large sediment-hosted sulphide deposit on the ocean floor comparable to mineral deposits mined in Canada.

- Off the east coast, deep seismic transects were completed and geological interpretations made. A major aeromagnetic survey was carried out off Newfoundland in cooperation with petroleum companies.

- The first season of geological and geophysical investigations from the floating ice island in the Arctic Ocean northwest of the Arctic Archipelago was successfully completed.

- A cooperative deep seismic survey with university and industry participation was made of the Peace River Arch area in northern Alberta.

- Canada became a full participant in the Ocean Drilling Program and took part in several successful cruises including one in the Labrador Sea—Baffin Bay area.

- Surveys and Mapping Branch launched the fifth edition of the *National Atlas of Canada* in January 1986.

- Surveys and Mapping Branch was active in developing three projects for Expo 86, including the *Canada in Motion* map pack; the Vidiwall; and a Telidon component entitled "Geographical Facts from *The National Atlas of Canada*".

- Surveys and Mapping Branch participated in the Committee for Original People's Entitlement (COPE) Native Land Claim Settlement and the Manitoba Northern Flood Agreement.

- In anticipation of the launch of the French earth observation satellite SPOT, initial steps were taken to evaluate how data received might apply to topographic mapping.

- The ten thousandth map of the 1:50 000 scale National Topographic Map System was printed. Map 55E/13 shows the area around Eskimo Point, N.W.T., on the west coast of Hudson Bay.

- The Earth Physics Branch carried out important unscheduled studies of the Mexican earthquake and the Colombian volcanic eruption.

- Earth Physics Branch participated in an international electrical sounding across the Juan de Fuca Ridge and the Pacific continental margin, and a joint project with industry to monitor temperatures in an abandoned Arctic offshore oil well.

- Data were collected on seismicity and strong ground motion following the Nahanni, N.W.T. earthquakes in October and December 1985.

- The Canada Centre for Mineral and Energy Technology sponsored 14 technology transfer projects, valued at more then $10 million.

- Two different CANMET-developed underground diesel-emission reduction technologies were evaluated.

- A study sponsored by CANMET and the Mining Association of Canada said the mining industry wanted to cooperate on R&D projects with government, universities and other industry groups.
- A major five-year rockburst research project began under the Memorandum of Understanding on Rockburst Research between Canada and Ontario.
- Ground control research projects began in cooperation with Manitoba, Ontario and New Brunswick.
- The first CANMET Oil and Gas Conversion Contractors' Review meeting was a milestone in the transfer of CANMET-developed synthetic fuels technology.
- CANMET's hydrocracking demonstration plant in Petro-Canada's Montreal refinery was commissioned late in 1985.
- The Canada Centre for Remote Sensing participated in the design and construction of the European Space Agency's Earth Resources Satellite to be launched in 1989.
- Program definition and cost studies of a Canadian remote sensing satellite, RADARSAT, continued.
- A new satellite receiving station was constructed in Gatineau, Quebec to receive high-resolution data from France's SPOT satellite.
- The Technology Enhancement Program in the Maritime Provinces was completed, and a cooperative program transfers remote sensing technology to provincial resource management agencies in Saskatchewan.

The Canadian Occidental Petroleum LTD, Mazeppa natural gas processing plant near High River, Alberta.

ENERGY PROGRAM

ENERGY POLICY, PROGRAMS AND CONSERVATION SECTOR

In a January reorganization of the Energy Program, the former Energy Policy Analysis Sector and three branches of the former Conservation and Non-Petroleum Sector were amalgamated to form a new sector, Energy Policy, Programs and Conservation. As the name implies, there is a continuing policy analysis component and a significant program delivery component in the new structure.

During 1985-86 energy policy attention focused on implementation of the Western Accord and Atlantic Accord, and on the development, negotiation and announcement of two major additional policies: Canada's Energy Frontiers (October 30, 1985) and the Agreement on Natural Gas Markets and Prices (October 31, 1985). The Energy Policy Analysis and Energy Commodities Sector worked closely on these policy changes throughout this period.

On June 1 regulatory controls on domestic crude oil pricing were lifted and some federal taxes and charges were eliminated or phased out, as provided for in the Western Accord (March 28, 1985). Controls were also lifted on short-term oil exports.

From July to March, and particularly between January and March, when world oil prices dropped dramatically, considerable attention was given to monitoring the industry's response to oil deregulation, particularly its approach to marketing crude oil and petroleum products on both the export and domestic fronts.

In the first year following implementation of the Atlantic Accord, signed February 11, 1985, the Canada-Newfoundland Offshore Petroleum Board, which will manage all oil and gas activities in the waters off Newfoundland, was established; the $300 million Canada-Newfoundland Offshore Development Fund to help the province develop the necessary infrastructure for oil and gas development was established; and enabling federal legislation to implement the accord was introduced in the House of Commons.

Canada's Energy Frontiers establishes a stable management regime, a profit-sensitive royalty system, nondiscriminatory and regionally balanced exploration incentives and fair Canadianization requirements. Enabling legislation, the Canada Petroleum Resources Bill was tabled in the House of Commons in December 1985.

The Agreement on Natural Gas Markets and Prices established interim measures to begin decontrolling natural gas pricing. The agreement provides a framework for making necessary changes over a one-year transition period, to November 1, 1986, including review of pipeline services by an independent three-member panel, and an extensive series of hearings by the National Energy Board concerning such issues as the export surplus test and market access for producers and consumers.

The major event during the year was the May 1985 budget announcement of the National Conservation and Alternative Energy Initiative (NCAEI), which shifts emphasis away from costly grant programs to more cost-effective information and demonstration programs. Memoranda of understanding were concluded with several provinces to detail cooperative arrangements for the implementation of the NCAEI.

Energy Strategy Branch

The branch provides analysis and advice on federal energy policies, strategies and activities to keep the Government of Canada fully aware of energy developments. It assesses adjustments to broad energy policy in response to government direction and trends in energy supply, demand and price. It monitors existing energy programs and federal-provincial agreements to ensure consistency with other programs and with broad energy policy.

The branch ensures coordination and consistency between energy policy and other government policies that may have implications for energy, and explains the federal government's energy policy to other governments, industry and private organizations to enlist their cooperation. It evaluates government programs in the petrochemical, refining, conservation and alternative energy areas; plans, develops and implements policy on Canadianization and Crown corporations; evaluates government electrical and nuclear programs; and analyzes the impact of energy policy on conventional oil and gas projects.

In 1985-86 the branch, working closely with the Energy Commodities Sector, advised on major energy policy changes in response to the government's new policy directions and fluctuations in domestic and international oil supply and pricing. There was extensive discussion with industry and with provincial and territorial governments. Two major initiatives resulted, the policy statement Canada's Energy Frontiers, and the Agreement on Natural Gas Markets and Prices. The branch was also involved in implementation of the Atlantic and Western accords.

The branch processed Petro-Canada's corporate plan and capital budget in accordance with the requirements of that Crown corporation's legislation, and participated in an evaluation of the potential privatization of Petro-Canada. It provided advice concerning the indirect acquisition of oil and gas properties. It also acted as federal government contact for Co-enerco, an oil and gas company joint venture between the Canadian government and an association of cooperative financial and marketing institutions.

The branch also participated in work to realign AECL's activities along more commercial lines. The prospects for privatizing parts of AECL were reviewed and ways to reduce AECL's dependence on parliamentary appropriations to finance its R&D were considered.

The branch played an extensive role in evaluating the merits of possible CANDU exports to Korea and Turkey. As well, the branch helped review AECB's regulatory practices and procedures. The Canadian and world uranium industries and the trade implications of Canada's uranium further processing policy were studied.

In addition, the branch advised the Canada—Nova Scotia Offshore Oil and Gas Board and the Policy Review Committee of the Canada Oil and Gas Lands Administration on policy implementation. It provided advice on various resource-related aboriginal land claim issues, on new and existing expenditure programs, and on major oil and gas projects in the north and east coast offshore. It was also involved in activities related to electricity and other energy trade with the United States.

The SEDCO 706 oil rig off Newfoundland.

Financial and Market Analysis Branch

The branch plans, develops and maintains a federal energy taxation, pricing and incentives system that serves Canada's energy policy objectives of economic growth, self-sufficiency and energy security, enhanced opportunity, fairness and stability. It assesses the economic and financial impact of existing and proposed energy policies on individual companies and company groupings, the overall energy industry, federal and provincial governments, and Canada's broad energy objectives. It assesses the financial impact of existing and proposed energy fiscal policies on major new petroleum projects and assesses all aspects of existing and proposed energy taxation and incentive policies of the federal, provincial and foreign governments to ensure Canada's energy policy objectives are most effectively served.

The branch maintains an up-to-date energy statistics data base to forecast energy supply, demand and price and to monitor Canada's overall supply and demand balance. It also identifies trends in energy supply, demand and price in specific end-use markets and reviews the impact of new policy and program initiatives on those supply and demand balances and prices. The branch can also analyze how energy policies will affect economic growth, employment, inflation, the balance of payments, regional development and other macroeconomic variables.

In 1985-86 the branch helped implement the fiscal provisions of the Western Accord, especially zero PGRT on new production, and monitored and assessed the Western Accord's impact on jobs and investment. Energy revenue and investment estimates were prepared to assist in preparation of two federal budgets. The branch developed Exploration Tax Credit proposals to replace the Petroleum Incentives Program and assisted in preparation of the policy statement Canada's Energy Frontiers, released in the fall of 1985. It conducted fiscal negotiations and reviews of the Bi-Provincial Upgrader (Husky, Alberta, Saskatchewan and Canada), NewGrade Upgrader, Venture, Hibernia, and Syncrude expansion projects. New royalty proposals were developed and assessed for the frontier lands of the proposed Canada Petroleum Resources Act (Bill C-92), and related discussions were held with industry and the provinces.

The branch prepared an overall assessment of the impact on Canada of falling world oil prices. It developed and assessed alternatives to assist the oil and gas industry to cope with the international oil price collapse. It developed forecasts of Canadian energy supply, demand and balance under various world oil pricing scenarios and policy options, and monitored macroeconomic developments and the role played by the energy sector in Canada's economy.

International Energy Relations Branch

The branch manages and coordinates Canada's energy relations with other countries and international organizations. It ensures that the domestic energy policy process is fully informed of Canada's international interests and commitments and that Canada's position is fully explained abroad.

The branch also undertakes studies of the energy situations, industries, policies and programs of other countries as they relate to issues arising in Canada; tracks international energy, economic or technological trends affecting the Canadian energy situation; and studies international market conditions in relation to the potential for Canadian trade or aid activities. The branch administers the contribution agreement between EMR and the Canadian National Committee, World Energy Conference (CANWEC); and also executes the Minister's policy responsibility for Petro-Canada International Assistance Corporation (PCIAC).

International Energy Relations has two divisions: Bilateral and Multilateral Relations, and Special International Energy Projects.

In 1985-86, the branch prepared for the meeting of the International Energy Agency at the ministerial level and for the election of the department's Deputy Minister to the chairmanship of the agency's governing board. This function engages Canada in a central way in the activities of the IEA and its Secretariat.

The Minister visited the United Kingdom, Germany, France, Norway, Japan and China. Among foreign energy ministers coming to Canada and meeting with the Minister were the U.S. Secretary of Energy and the Chinese Minister of Water Resources and Electric Power. The branch began a new activity coordinating a group within the department to focus and guide departmental cooperation with various energy ministries in China.

The branch continued to work closely with PCIAC, reviewing and discussing various project proposals in developing countries, advising on budgets and corporate plans, and undertaking an assessment of the agency's mandate and activities since its inception. Studies were undertaken of energy policy in other countries of interest to Canada, and of the energy situation in some potential PCIAC client countries. The operations of CANWEC were reviewed, and assistance provided in the early stages of the organization of the World Energy Congress to be held in Montreal in 1989.

Energy Policy Coordination Branch

This branch plans and implements energy programs and services in support of the Minister's parliamentary functions and develops and carries out program planning, evaluation and information functions directed towards Canada's energy policy objectives. It prepares material for Question Period, parliamentary speeches and debates, including tabling of energy bills, and briefing required for appearances before parliamentary committees. It coordinates activities related to access to information and privacy, strategic policy planning and program evaluation, and prepares a monthly summary of energy developments in Canada and abroad. In 1985-86, the branch initiated a comprehensive inventory of announced intentions for oil and gas industry investments, acquisitions and cutbacks, in an effort to provide an information source to monitor the impact of the Western Accord and the oil price collapse. It also undertook a comprehensive update of the existing series of booklets which describe federal energy programs as they are delivered in each province and territory.

Energy Conservation Branch

The branch provides information, analysis and policy advice and delivers several programs relating to energy conservation. During 1985-86, the branch was involved in several major activities.

The Canadian Home Insulation Program, which ended on March 31, 1986, contributed up to $500 (one third of eligible material and labour costs) towards insulating any home built before September 1977. Over its lifetime, the program provided 2.4 million grants at a total cost of about $900 million.

As part of Energy Advisory Services, about four million publications were distributed during 1985-86. The HEATLINE, a toll-free telephone advisory service, helped more than 45 000 callers throughout Canada.

Energy conservation information was displayed in about 600 hardware and building supply stores in Atlantic Canada and a training program for store personnel helped them give better advice to consumers.

The Home Energy Program Division embarked upon a major initiative with the National Energy Conservation Association (NECA) to enhance the scope and improve the quality of residential energy conservation retrofit work. Development and implementation of a retrofit energy conservation contractor warranty program to be operated by an independent nonprofit corporation was also initiated.

The Federal Energy Management Program has helped reduce federal energy consumption by 24 per cent over the past nine years, representing a cost avoidance of $192 million in 1984-85 alone and accumulated savings of some $872 million since 1975-76. FEMP's major initiatives consisted of upgrading facilities to make buildings more energy efficient; off-oil investments that have displaced more than 160 000 cubic metres of oil in federal operations; building surveys to identify conservation opportunities; information dissemination; and training programs.

Enerdemo-Canada supports innovative demonstration projects of the energy management industry and energy consumers. The program supported 25 conservation projects at a cost of more than $4 million in 1985-86.

Across Canada, home buyers are discovering the comfort and value of R-2000 homes.

The Technology Transfer and Demonstration Programs Division, in cooperation with the Canadian Home Builders' Association, began in 1984 to implement the second phase of the Super Energy Efficient Home Demonstration Program (R-2000 Home Program). The objective is to stimulate demand for super energy efficient housing and to ensure it is available on a commercially viable basis in the absence of continued government support.

The Buildings Energy Technology Transfer Program disseminates practical knowledge on energy-efficient building construction, operation and retrofit. The program is implemented in cooperation with the Canadian building industry and trade and professional associations.

The Canadian Industry Program for Energy Conservation, a network of 14 voluntary energy management task forces, saved the energy equivalent of 12.5 million cubic metres of oil during 1985 and exceeded its 1972-1985 energy-efficiency improvement target of 23 per cent. Additional energy conservation task forces have been formed for health care facilities, the distributive trades, office buildings, agriculture, postsecondary schools and the hospitality industry. Regionalization of task forces began during this period.

The Atlantic Energy Conservation Investment Program was designed to improve and encourage energy efficiency in the private sector of the Atlantic Provinces by funding up to 50 per cent of the eligible capital cost of energy conservation retrofit projects. The program was phased out during 1985-86.

The Canada Energy Audit Program, which terminated on March 31, 1986, provided free energy audits, financial assistance for consulting services, and energy management seminars and workshops to privately owned industrial, commercial and institutional organizations.

The Industry Energy Research and Development Program encourages the development of products, processes, equipment or systems to increase the efficiency of energy use throughout industry. Funding is available for up to 50 per cent of eligible costs associated with approved research and development projects undertaken by Canadian companies. Twenty-nine projects were active during 1985-86.

The Accelerated Capital Cost Allowance—Class 34 Program is a fast write-off program. Since its inception in 1976, investments by industry accepted under this program have saved the equivalent of about 800 000 cubic metres of oil annually.

The Energy Management and Technology Transfer Program assists industry, commerce and institutions to reduce energy consumption by increasing their general awareness and technical knowledge of energy conservation practices and technologies. The program has developed a series of seminars and workshops on energy management which will be conducted nationally and regionally. In support of these, a series of technical manuals and case studies is being developed on specific subjects (HVAC, combustion, boilers, and so on). In 1985-86 the program sponsored 15 seminars and workshops and published 14 technical manuals.

Renewable Energy Branch

The Renewable Energy Branch is responsible for the development and coordination of renewable energy policies, the implementation of renewable energy programs, and the monitoring of renewable energy technologies and associated industries. During 1985-86, the Renewable Energy Division became a branch of the Energy Policy, Programs and Conservation Sector.

Several programs also were restructured during this period resulting in more streamlined and integrated research, development and demonstration (RD&D) programs. The branch now has four major programs: the Bioenergy Development Program, the Alternative Energy Development Program for P.E.I., the Remote Community Demonstration Program and the Solar Energy Development Program.

The Bioenergy Development Program was expanded to include bioenergy demonstration projects to complement the program's previous research and development mandate. The program supported more than 50 RD&D projects with approximately $6 million. As part of the BDP's increased emphasis on industry involvement, and information and technology transfer, industry was asked for project proposals to cost share in R&D projects. Several projects are now under way. A major workshop, Energy From Municipal Waste, was also held.

The Forest Industry Renewable Energy (FIRE) Program, which supports the installation of nonresidential bioenergy systems, approved five new projects during 1985-86, with expenditures of $10.5 million. As of March 1986, the program is winding down, and no new projects are being approved. Since its inception in 1978, the program has approved 180 projects which are expected to displace the equivalent of 1.4 million cubic metres of oil a year. The program has been effective in generating private sector investments. It is expected that more than $640 million will have been invested by the private sector in addition to $98 million of EMR funds.

As part of an Economic and Regional Development Agreement with Prince Edward Island, the Alternative Energy Development Program administered 25 projects this year with $1.5 million in EMR contributions. Under this joint federal-provincial initiative, funds are available to support industrial and commercial bioenergy conversions and to encourage development of a wood supply infrastructure. The Biomass Energy Consulting Advice Program, supporting businesses in assessing the technical and economic aspects of a biomass energy system, was established to support the ongoing Biomass Conversion Program.

The Remote Community Demonstration Program's demonstration and information transfer phase became fully operational in 1985-86. Five demonstration projects were started and a major conference on alternative energy sources was held in Newfoundland.

An additional 30 projects involving a diverse range of alternative energy and energy conservation technologies are planned. These projects will demonstrate how energy can be used more efficiently in remote communities and how supply alternatives (often locally available renewable energy resources) may be used to reduce energy costs and improve the security of long-term energy supply.

The study phase of the program ended with the publication of the last of its 72 remote community energy option studies and eight regional energy overviews.

The Solar Energy Development Program was expanded during 1985-86 to include support for RD&D projects in active and passive solar, photovoltaics, wind and geothermal energy. To enhance the effect of this program on the renewable energy industry, extensive planning workshops were held to ensure industry's needs are met. Following consultations, a major call for R&D projects was issued, and nearly 200 proposals were received.

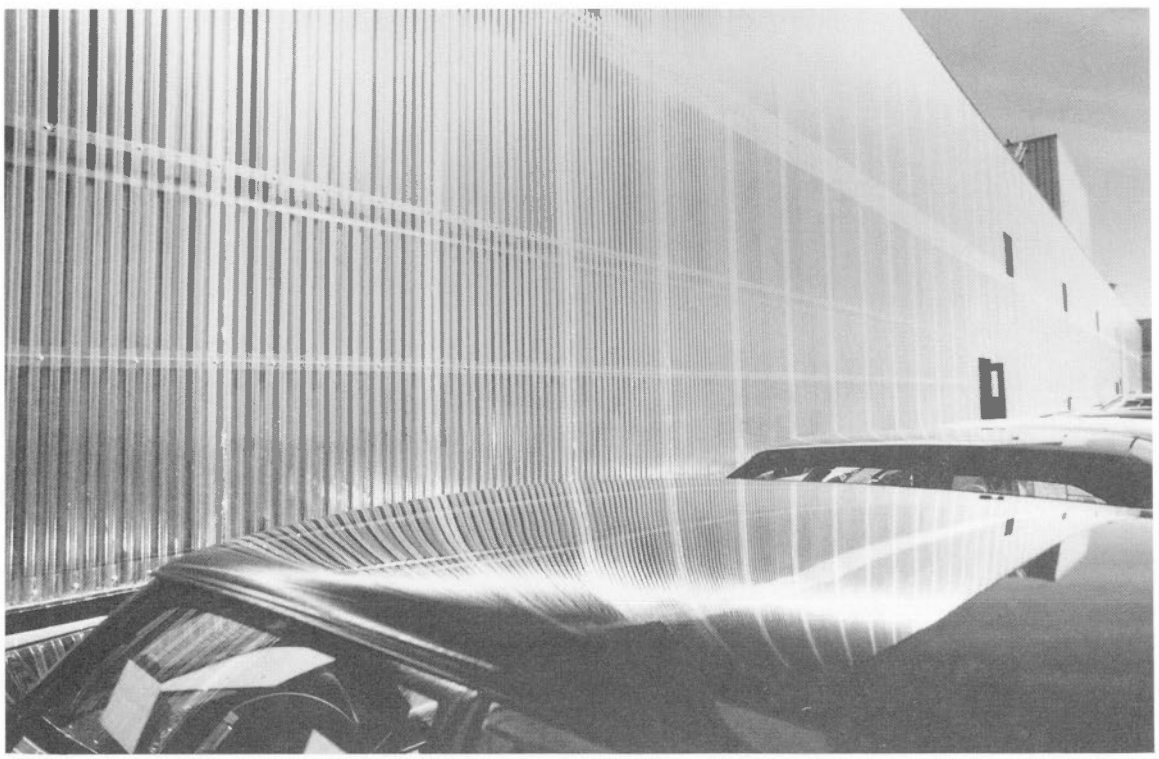
Several technical advisory committees were established within the industry and scientific communities to help evaluate these projects. To encourage continuation of high-level R&D, and to provide testing and development services to the industry, the program also helped establish several centres of expertise.

The expanded SEDP is now fully operational, and 20 R&D and 75 demonstration projects received approval during 1985-86. Under the Solar Domestic Hot Water Demonstration component, more than 1500 residential solar systems were installed. Total EMR expenditures for the SEDP during 1985-86 were $6 million.

Regional Operations Branch

The branch manages regional delivery of sector programs through Conservation and Renewable Energy Offices (CREOs) located in each province and territory, and contributes to the negotiation of cooperative arrangements with provincial and territorial governments for the joint management and delivery of the National Conservation and Alternative Energy Initiative. Working to complete these negotiations, the branch is responsible for promotion of NCAEI programs, evaluation and approval of associated projects, and implementation of technology transfer plans in the regions. The branch also represents the department and provides regionally sensitive advice for departmental policy formulation and program development.

During 1985-86, the branch assisted in concluding the Canada Oil Substitution Program (COSP), which officially ended on March 31, 1985, and administered the phase-out, in May 1985, of the Atlantic Energy Conservation Investment Program and the Canada Energy Audit Program. The number of COSP employees was reduced without laying off permanent employees. The CREOs continued regional activities to demonstrate and disseminate information on energy-efficient technology and methods. One noteworthy event was the workshop held in Corner Brook, Newfoundland to exchange information on energy efficiency in remote communities. During the year, CREOs responded to more than 100 000 enquiries from the public.



A solar air heating system at the Ford auto assembly plant in Oakville, Ontario.

Two pumps at oil wells in the Viewfield oil field south of Stoughton, Sask.

ENERGY COMMODITIES SECTOR

The Energy Commodities Sector, created January 6, 1986, combines the Electrical Energy Branch, the Uranium and Nuclear Energy Branch and the Transportation Energy Division of the former Conservation and Non-Petroleum Sector, with components of the former Petroleum Sector. This places six branches and one division, corresponding to the various industry sectors and governmental responsibilities, under one central sector able to provide specialized and technical advice on a wide range of policies, issues and programs.

The sector is concerned primarily with energy production, allocation, transportation and marketing, both at home and abroad, in the areas of oil, natural gas, electricity, and nuclear energy. Its operating units and specialized personnel monitor and administer programs that have a major impact on energy consumers —whether industry or individuals.

Petroleum Resources Branch

The branch provides analysis and advice for the optimal development of Canada's petroleum resources. It reports on oil and gas exploration, conventional reserves and delivery procedures for domestic and foreign sources, enhanced recovery, oil sands and undiscovered resources, and management of heavy oil agreements and federal research programs.

Major activities during the year include a program to monitor and certify Petroleum Gas Revenue Tax exemptions under the Western Accord, and the economic assessment of the upward-revised, undiscovered remaining potential for conventional light oil in western Canada. Petroleum exploration during 1985 was at a record high in Canada: 11 500 wells were completed, compared with 9150 in 1984. Lower world oil prices at the end of 1985 and the beginning of 1986, however, are expected to constrict future activity.

Oil Branch

The Oil Branch was created in the past year by incorporating elements of Oil Supply, Petroleum Utilization, and Oil Pricing and Compensation branches following oil price deregulation in June 1985. Its mandate includes: collecting, analyzing and reporting on both the prices paid by Canadian refiners for offshore and domestic crude oil, and the current and future availability of domestic and foreign crude oil and products; oil product marketing and downstream operational economics; and providing technical advice on oil transportation, refining, upgrading and the petrochemical industry.

The branch was restructured while the oil market was changing. Oil price deregulation, followed within a few months by a collapse in world oil prices, resulted in a 55 per cent fall in the average domestic light crude price to about $107 per cubic metre ($17 a barrel) by April 1986. During this period, a sophisticated crude oil price monitoring system was created to analyze and report on domestic and imported crude oil prices.

International oil market developments, including the activities of OPEC, the International Energy Agency and the numerous reports from the international oil industry and market analysts, were monitored closely to ascertain the most likely course of world oil supply, demand and prices in the near and long term.

Although Canadian crude oil production capacity increased 5 per cent (12 400 cubic metres per day) last fiscal year, actual production increased by only about 1 per cent. Following deregulation, Canadian crude oil exports, which were increasing, rose from 23 per cent of production in 1984-85 to 31.5 per cent in 1985-86. However, this was not sufficient to overcome the effect of weak domestic demand, and resulted in increased shut-in.

The sharp decline in the cost of producing crude oil reversed the downward trend in refinery margins but competitive market forces will likely suppress gains until product demand strengthens. A further reduction in refining capacity in 1985 helped to increased average refinery use to the 80 per cent level.

Despite the fall in oil prices, NewGrade Energy Inc. began work this year on a 7950 cubic metres per day heavy oil upgrading refinery project in Saskatchewan. Also, in the fall of 1985, Interprovincial Pipe Line Limited added 25 000 cubic metres per day capacity to its system at a cost of $87 million.

Natural Gas Branch

The branch administers programs and policies to promote the expansion of domestic and export markets for Canadian natural gas. Sales of natural gas reached record levels in Canada in 1985 because it is a competitively priced, convenient and clean-burning fuel.

The Agreement on Natural Gas Markets and Prices, developed in cooperation with Energy Policy Branch, took effect on November 1, 1985. This agreement between the federal government and the gas-producing provinces, Alberta, British Columbia and Saskatchewan, implies lower prices for consumers and improved market access for producers.

The 12-month period from November 1, 1985 to November 1, 1986 was the transition time for realizing a fully market-sensitive natural gas pricing regime. While prices would continue to be prescribed by governments during this period, immediate steps were to be taken to enable gas consumers to enter into supply arrangements with gas producers at negotiated prices (direct sales), which would then be endorsed by governments in the context of the administered system. After this transition period, purchase and sale of natural gas will be negotiated freely, and prices will no longer be prescribed.

The Drummondville and St-Hyacinthe regions of Quebec have natural gas service for the first time as a result of a lateral pipeline constructed and brought into operation under the Quebec Natural Gas Laterals Program. Several towns in British Columbia and Ontario, including Blind River and Elliot Lake in northern Ontario, received natural gas service under the Distribution System Expansion Program.

Domestic natural gas prices have remained at approximately the same level since September 1982.

Export volume rose significantly as a result of policies initiated during the previous year allowing for negotiated pricing arrangements between U.S. importers and Canadian exporters. Although prices were falling, Canadian exporters were able to maintain the previous year's level of export revenue.

Uranium and Nuclear Energy Branch

This branch provides policy advice, information and analysis on the nuclear industry, the uranium industry and radioactive waste management. The branch coordinates the activities of the Uranium Resource Appraisal Group which regularly assesses Canadian uranium resource and production capability levels, publishing a formal report every second year. The 1984 assessment was completed during 1985 and results were made available to industry.

The branch has a leading role in the Uranium Exports Review Panel, which reviews export contracts and assesses whether they are consistent with the government's uranium export policy.

Policies were reviewed on the required further processing of uranium prior to export; the permissible level of nonresident ownership of uranium mining properties; and the feasibility and implications of the privatization of Eldorado Nuclear Limited.

The branch represents Canada internationally in the activities of the Nuclear Energy Agency of the Organization for Economic Cooperation and Development in Paris, and in the International Atomic Energy Agency in Vienna. A branch member is chairman of a joint effort of these agencies to prepare a biennial assessment of world uranium resources.

The director general of the branch chaired a special international, high-level committee to recommend the future direction and orientation of the Nuclear Energy Agency to the agency's steering committee.

The branch worked closely with the Energy Policy, Programs and Conservation Sector and with Atomic Energy of Canada Limited on the marketing of CANDU in Turkey, Korea, Holland, Yugoslavia and Romania; local energy systems based on Slowpoke technology; and research reactor applications based on MAPLE technology. The branch took the lead in federal involvement with provincial nuclear power programs, and coordinated the federal government's approach to implementation of the Point Lepreau 2 CANDU project in New Brunswick.

The branch led policy development for dealing with radioactive waste issues. It contributed guidance to AECL's research and development work on storage of irradiated fuel waste, and CANMET's work on long-term effects from uranium tailings. Several small cleanup projects of low-level radioactive waste were completed, including one in Surrey, B.C. Policies were finalized for handling large quantities of low-level radioactive waste in the Port Hope area. Discussions with British Columbia and Ontario on jurisdictional issues continued and a final resolution was imminent at year-end.

Electrical Energy Branch

The branch provides policy advice, information and analysis on the electrical industry in Canada. Advice is complemented by developing, negotiating and managing agreements with electrical utilities, provinces and industrial organizations. The branch also provides policy advice on the role of electricity in the context of total energy supply, and considers priorities to develop domestic and export markets and to improve the efficient use of electricity.

Agreements managed by the branch included Lepreau 1 financing, The Coleson Cove (New Brunswick) Compensation Agreement, the Coleson Cove Conversion Study, and the Nelson River Transmission Agreement.

Aerial view of the Cap-Chat dam in Quebec.

The branch collects and distributes information on industry activities and future plans, and publishes *Electric Power in Canada*, *Electricity Rates in Canada*, and Canadian and regional main electric transmission maps.

Work in 1985-86 involved electricity prices on Prince Edward Island, B.C. Hydro access to California, privatization of the Northern Canada Power Commission, regulatory reform, federal water policy, the Limestone hydro project, and electricity exports to the United States.

Transportation Energy Division

Program objectives in 1986, the final year of the Voluntary Motor Vehicle Fuel Consumption Program, have been met. Studies have shown that new automobile fuel consumption could be reduced by 1 to 3 per cent per year for the next four model years. This reduced consumption, combined with the continued retirement of older, less fuel-efficient vehicles, will result in a reduction of gasoline demand by 6.43 million cubic metres a year by 1990. Fuel consumption programs have been developed and are under review.

This division encourages conservation through the Pro-Trucker program, an information transfer program for the trucking industry, successfully launched in 1985-86.

Under the Natural Gas Vehicle Program, 7542 grants had been provided as of March 31, 1986, and 125 applications had been approved under the Natural Gas Fueling Station Contribution Program.

Energy R & D funds cosponsored a Chrysler Canada study on propane. A second-generation propane conversion kit, made in Canada, will be available for installation on new automobiles. R & D funds also supported creation of a centre for research on the use of natural gas for transportation, at the British Columbia Research Council.

Project MILE, a demonstration project using methanol to fuel large engines, began in 1985-86. The project covers every practical aspect of methanol applications in large engines, and is the first Canada-wide comprehensive field trial in this area.

The Transportation Energy Division provided information to the Parliamentary Standing Committee deliberations on methanol and ethanol blends.

In June 1985 the division participated in a joint U.S.-Canadian seminar on alternative fuels in Windsor, Ontario.

Energy Emergency Planning Group

The Energy Emergency Planning Group provides staff support for the Energy Supplies Allocation Board and Canadian representatives to groups concerned with energy emergency planning in the North Atlantic Treaty Organization and the International Energy Agency.

Substantial progress was made during the year in developing plans for a National Emergency Agency for Energy. An organizational plan for both peacetime and wartime emergencies was approved, and detailed plans for implementation are being prepared.

Energy Supplies Allocation Board

In 1985-86 the board's main activity was participation in the International Energy Agency's Allocation System Test Number 5 (AST-5). Several months of preparation were required to develop procedures for Canada's major oil companies to participate. For the duration of the test, additional staff was required to process company data submissions. The test was described by companies as the most successful so far.

Time was saved and errors reduced by using computer programs to process data submitted by IEA, and by transmitting this data to Paris via computer, thus eliminating use of the Telex system.

Other ESAB activities included development of new manuals for both the Crude Oil and Products Allocation programs, continued progress in the Rationing Program, development of a computer system for the NATO Petroleum Planning Committee, and continuing participation on the Sub-Committee on Demand Restraint of the Inter-Provincial Advisory Committee on Energy.

PETROLEUM INCENTIVES ADMINISTRATION

The year in review marked a period of transition for the Petroleum Incentives Administration (PIA). The Western Accord of March 28, 1985 put the oil and gas industry on notice that the Petroleum Incentives Program (PIP) would terminate on March 31, 1986. Exploration and development activities undertaken after that date would no longer be eligible for PIP contributions apart from certain grandfathered frontier wells that will continue to qualify until December 31, 1987. Amendments to the PIP Act received royal assent on March 26, 1986.

A principal challenge in 1985 was to plan and implement the phase-out of PIP and the Canadian Ownership and Control Determination Program (COCD). Industry was consulted to make the program phase-out as fair and as simple as possible for them and to provide a smooth transition to the new fiscal regime.

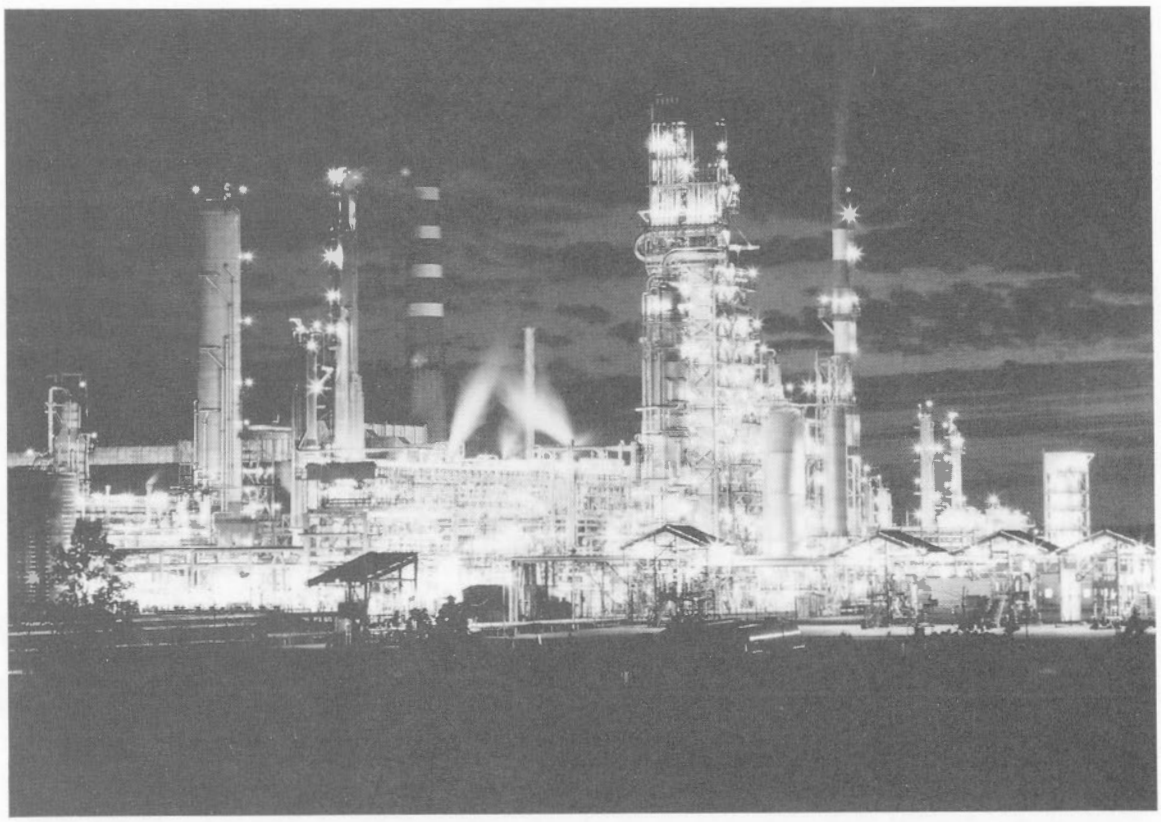
In July 1985 procedures were introduced to enable holders of COCD certificates that had been due to expire before March 31, 1986 to have their certified COCD status extended until that date. On August 29, 1985 the COCD regulations were amended to simplify the Canadian Ownership Rate (COR) procedure for those wishing to renew a COCD certificate.

Approximately 3000 applicants sent 5128 PIP applications during 1985-86, and $1.5 billion in incentives were paid. The COCD program issued 3671 certificates.

About 90 per cent of PIP incentives were paid to companies with the highest COR levels. Regional distribution* of the federal PIP budget is estimated at 49.2 per cent for activities on the east coast, 34.7 per cent for activities in the Beaufort Sea and Arctic Islands, 8.6 per cent on other frontier areas (including the Gulf of St. Lawrence and the Yukon), and 7.5 per cent on provincial lands (other than Alberta, which had its own incentives program).

PIA publishes a separate annual report on its program and activities.

*These figures are for the calendar year 1985, not fiscal year 1985-86.



Night view of the Ultramar refinery in St. Romuald, Lévis, Quebec.

CANADA OIL AND GAS LANDS ADMINISTRATION

The Canada Oil and Gas Lands Administration (COGLA) is responsible for regulating activities relating to the discovery, development and production of oil and natural gas on the frontier lands. It aims to ensure that these activities benefit Canadians to the greatest extent possible in terms of both industrial impact and job creation and that environmental protection and safety standards are met.

COGLA reports to two departments: north of 60° it reports to the Department of Indian Affairs and Northern Development, and south of 60°, including the offshore areas, to the Department of Energy, Mines and Resources.

On October 30, 1985, the ministers of Energy, Mines and Resources and Indian Affairs and Northern Development announced a new frontier energy policy. The document, entitled *Canada's Energy Frontiers: A Framework for Investment and Jobs,* sets out a series of initiatives pertaining to resource management, royalties and Canadianization. Bill C-92 on Canada's petroleum resources, which replaces the Canada Oil and Gas Act of 1982 and provides a legislative framework for these initiatives, was tabled in Parliament on December 20, 1985.

On February 11, 1985, the Government of Canada and the Government of Newfoundland signed the Atlantic Accord, which established, among other things, the Canada-Newfoundland Offshore Petroleum Board. The administration of oil and natural gas activities off the coast of Newfoundland and Labrador will soon be regulated by the Canada-Newfoundland Atlantic Accord Implementation Act, which passed first reading in both houses in February 1986.

On October 17, 1985, the two ministers announced the appointment of permanent members to the new board, which began its work in January 1986. Under the accord, the Canada-Newfoundland Offshore Development Fund was also established. The federal government will provide 75 per cent of this $300 million fund.

Oil rig—Beaufort Sea, Canadian Arctic.

In addition, the Government of Canada and the Government of Nova Scotia have begun a revision of the Canada—Nova Scotia Agreement on offshore oil and gas resources management and revenue sharing. The 1982 agreement served as a basis for legislation governing the management of oil and gas activities off Nova Scotia and the sharing of revenues generated by these resources. Detailed discussions were undertaken with the province on the possibility of concluding a new agreement.

In 1985, sixty-five exploratory and delineation wells were drilled in frontier regions, 20 per cent more than in 1984. Six discoveries were made off the east coast and nine discoveries were made in the North. Among the largest are Husky/Bow Valley's North Ben Nevis on the Grand Banks, Dome's discovery at Adlartuk in the Beaufort Sea and Esso's Tuk, located in the shallow waters of the Mackenzie Delta.

Mobil Oil Canada Ltd. submitted a development plan for the Hibernia project. At year end, the Canada-Newfoundland Offshore Petroleum Board and the federal and provincial governments were studying the development plan and the Canada-Newfoundland benefits plan.

During the year, Mobil and its partners in the Venture natural gas development project announced that they had concluded agreements with two U.S. transport companies regarding the sale of natural gas. In July, Mobil and its associates submitted an application to the National Energy Board to export 8.5 million cubic metres of natural gas a day from the Venture natural gas field's three deposits.

A federal-provincial environmental assessment review committee examined the study on the environmental impact of the Hibernia project, prepared by Mobil Oil Canada and its partners. In early 1986, the committee submitted its report to the federal and provincial governments, and the Canada-Newfoundland Offshore Petroleum Board.

In 1985, another federal-provincial environmental assessment review committee studied the preliminary environmental assessment conducted by Chevron Canada Limited and Petro-Canada with a view to resumption of oil exploration activities in the territorial waters of the Queen Charlotte Strait, Hecate Strait and Dixon Entrance, off the coast of British Columbia. The review committee published its report on April 29, 1986. It recommends that exploration activities be resumed under well defined conditions.

COGLA continued to encourage petroleum industry initiatives that generate jobs and produce economic benefits for Canadians living in or near the frontier regions where oil and gas activities are carried out. In 1985, there were 1823 petroleum-related jobs in mainland Yukon and the Northwest Territories; in the Mackenzie Delta and Beaufort Sea, there were 3162 jobs; offshore Nova Scotia, the number of jobs totalled 2285; on the Grand Banks off Newfoundland and the Labrador Sea, there were 2856 jobs; in the Hudson Bay region, there were 351 jobs; in the Arctic Islands and the offshore region of the eastern Arctic, there were 251 jobs. Canadians held 96 per cent of these jobs.

MINERALS AND EARTH SCIENCES PROGRAM

MINERAL POLICY SECTOR

Major rationalization and restructuring of world mineral markets continued throughout 1985-86. The Canadian minerals and metals sector focused mainly on cost control and improved marketing.

Mineral Policy Sector concentrated on both the international situation and domestic concerns. New initiatives were developed to improve market access and knowledge.

Consultation Process

The Minister of State (Mines) completed consultations on his discussion paper, *The Canadian Minerals and Metals Sector: A Framework for Dicussion and Consultation.* He reported his findings to the provincial mines ministers at the September 1985 Mines Ministers' Conference in Charlottetown, and sought the concurrence of his colleagues on possible program and legislative changes. These are being reviewed in light of the Natural Resources Study Team recommendation to the Ministerial Task Force on Program Review on the development of a national mineral policy.

Mineral Policy Sector and Manitoba's Department of Energy and Mines jointly studied new financial mechanisms to help troubled mining communities. The discussion document was tabled at the Mines Ministers' Conference in Charlottetown.

Also at this conference, ministers accepted a recommendation on the part of the mining industry to study fiscal proposals. A joint federal-provincial-industrial committee was established to review proposals.

A pilot project leading to establishment of a national Mines Accident Data Bank is being developed with Alberta, British Columbia and Ontario.

Steps were taken to apply Mineral Policy Sector's knowledge of strategic minerals to the preparation of governmental contingency plans for possible supply disruptions.

The mining industry is interested in looking for exploitable sand and gravel deposits, and gold placers, but is uncertain about governmental regulatory powers and jurisdiction. The Minister of State (Mines) has approached the relevant provinces with a proposal that would remove this barrier to private entrepreneurship.

Significant taxation changes were made in response to industry recommendations, including improving flow-through share provisions, extending the fuel tax rebate and additional year, improving taxation rules on prospectors' share proceeds, establishing a new universal system of northern allowance deductions, and providing duty-free entry into Canada of certain equipment and supplies used in mining.

The Mineral Outlook '85 Conference was held in Ottawa in May. It focused on structural change and economic renewal, both domestically and internationally. Representatives from industry, government and the financial community presented papers.

Scooptram at Tantalum mine, Bernic Lake, Manitoba.

International Developments

Canada's future in mining and mineral processing depends on its success in responding to intense international competition for available markets. Mineral Policy Sector contributed through increased cooperation with industry, the provinces and organized labour on several fronts. The flow of information on mineral developments from Canada's foreign missions was strengthened, and its relay to provinces and industry was improved through a new weekly telexed report and a bimonthly review. Several missions were organized to leading mineral-producing and consuming regions of the world, focusing on asbestos and potash, to improve our knowledge of international supply and demand factors and to promote safe use of asbestos in developing countries. Representatives of industry, federal and provincial governments and labour participated.

The sector continued bilateral consultations with other mineral consumers and producers, including the European Economic Community, Japan, Korea and Australia, and began negotiations on a new memorandum of understanding with the United States Bureau of Mines to strengthen cooperation in mineral economics and engineering.

The sector participated in international initiatives to improve market transparency and intergovernmental consultations for specific minerals and metals. Priority continued to be placed on establishing the International Nickel Study Group. Canada took a leading role in a preparatory meeting in April and negotiations began in October. These meetings, involving more than 30 nickel-producing and consuming countries, are expected to lead to a new study group in 1986-87.

The sector, with representatives of other federal departments, participated in negotiations to resolve the crisis in tin following the collapse of market support operations under the International Tin Agreement. Unfortunately, these negotiations did not succeed and resolution may be left to the courts.

As part of the work of the Mining Association of Canada—EMR Sub-Group Task Force on Mineral Markets, regional forums on mineral policy were held in Toronto in March 1985 and Quebec City in January 1986. These forums, sponsored jointly by EMR, provincial natural resources departments, provincial industry associations and the Mining Association of Canada, involved representatives of governments, industry, labour and the provinces. International mineral issues and problems were discussed under the theme Meeting the Competition.

The sector participated in several initiatives to prepare for upcoming trade negotiations, both multilaterally through the General Agreement on Tariffs and Trade (GATT) and bilaterally with the United States. Continuing studies and discussions on tariff and nontariff barriers facing trade in nonferrous metals, in support of the GATT Working Party on Resources, seek to ensure that the problem of such barriers is addressed in the next round of multilateral negotiations. The sector also helped prepare bilateral trade negotiations through analyses and consultations on mineral resources. Participation continued in a range of other international meetings and activities, such as the International Lead and Zinc Study Group, UNCTAD's Fourth Preparatory Meeting on Iron Ore, the UNCTAD Committee on Tungsten and the OECD High Level Group on Commodities.

Mineral Development Agreements

Mineral development agreements subsidiary to economic and regional development agreements were entered into with Quebec, British Columbia, Ontario and Prince Edward Island. Greater emphasis has been placed on provincial initiatives and delivery for these agreements than for those signed in the previous fiscal year.

Energy, Mines and Resources Canada is now responsible for agreements with nine provinces. It is also a party to the Canada-Yukon Agreement on Mineral Resources, subsidiary to the Economic Development Agreement between the federal and Yukon governments, signed early in the fiscal year. As a result of a review of agreements with Nova Scotia, New Brunswick and Newfoundland, an amendment was negotiated with Nova Scotia, and amendments were initiated with New Brunswick and Newfoundland to transfer the delivery of selected federal projects to the provinces. An amendment was also initiated with Quebec to expand the scope of programs, including introduction of a program dedicated to defend and promote asbestos, without a change to the total funding level of the agreement.

Asbestos

The Government of Canada has affirmed that the industrial use of asbestos poses no undue risk to workers or the general public if regulations setting low-level exposure limits are properly enforced. This is important because mining and processing of asbestos contributes to the regional economies of the Eastern Townships of Quebec, northern British Columbia and Newfoundland. The Minister of State (Mines) chairs an Advisory Committee on Asbestos which includes provincial, industrial and labour representatives. It oversees and gives direction to major international initiatives to achieve a convention in the International Labour Organization on the safe use of asbestos, a coordinated response to the proposal of the United States Environmental Protection Agency to ban asbestos, and other efforts to explain why and how asbestos can be used safely and responsibly. Also, additional funding was announced for the Asbestos Institute beginning in 1986-87 to increase its level of activity domestically and internationally. The department produced the annual World Asbestos Survey, a unique marketing tool for the Canadian asbestos industry.

Nonferrous Smelters

Mineral Policy Sector completed a comprehensive study of Canada's nonferrous smelter industry with publication of *Canada's Nonferrous Metals Industry: Lead and Zinc.* The objective was to identify elements of a Canadian strategy to foster a viable and growing industry consistent with environmental goals. Results of the study were subsequently used in developing Canada's policies on, and responses to, the acid rain problem. The latter included a federal offer to financially assist the nonferrous metals industry to modernize and reduce sulphur dioxide emissions by 1994, subject to demonstrated need and equal funding from the provinces. EMR is participating in the federal-provincial-industrial negotiations to implement the Nonferrous Smelter Modernization Pollution Abatement Program.

Coal

The Coal Utilization Program introduced in 1980 supports demonstration projects to encourage the commercialization of technologies for efficient and environmentally safe use of coal.

Construction of a $33 million 22 mW circulating fluidized bed combustion unit at New Brunswick Electric Power Commission's Chatham generating station, using New Brunswick oil shale to capture sulphur in high-sulphur Atlantic coals, is almost complete. Commissioning is scheduled for July 1986.

Modifications are under way to prepare for combustion tests of coal-water fuel in a boiler originally designed for oil at Charlottetown, P.E.I. A successful demonstration of coal-water fuels was carried out with the cement industry in 1985-86.

A 10 000-hour materials-testing program for bubbling fluidized bed combustion at Point Tupper, N.S. was completed in 1985-86 and analysis of results will be available in 1986-87.

Funds provided to the Canadian Electrical Association to evaluate flue gas desulphurization technologies resulted in, among other items, an analysis of wet versus dry scrubbers, a demonstration of low nitrous oxide burner sorbent injection technology, and the advancement of slagging burner technology for low nitrous dioxide and sulphur dioxide emissions.

Mining Industry Employment Update

The sector prepares a quarterly report, *The Mining Industry Employment Update,* based on information from press reports, provincial governments and industry. The report outlines employment opportunities created in new mines and expanding facilities, reduced employment in closed and restructured operations, and highlights of collective agreements.

EARTH SCIENCES SECTOR

Headquarters staff provided management direction to the sector's four branches: the Geological Survey of Canada, Earth Physics Branch, Surveys and Mapping Branch and the Polar Continental Shelf Project; coordinated sectorwide programs, plans, policies and administration; and improved communications and administered the department's Research Agreements Program.

In response to recommendations of the Nielsen Task Force on Program Review for Major Surveys, the Geological Survey and Earth Physics Branch amalgamated at the close of this fiscal year to form a new, reorganized Geological Survey of Canada.

Geological Survey of Canada

The Geological Survey of Canada (GSC) ensures the availability of comprehensive knowledge, expertise and technology pertaining to the geology of the Canadian landmass and offshore areas. Included are mineral and energy resources and conditions affecting land and seabed use, as required to exploit mineral and energy resources effectively, use land efficiently, estimate Canada's resource base and formulate policies.

In 1985-86, GSC was made up of eight divisions; three of these, comprising about 40 per cent of the staff, are outside the National Capital Region.

The Atlantic Geoscience Centre, Dartmouth, N.S. carries out geological, geophysical and geochemical studies in Atlantic and Arctic offshore areas and obtains data used in the search for hydrocarbon resources, in resource evaluations, in marine environment protection, and in improving the safety of coastal and offshore engineering structures.

The Cordilleran Geology Division, with offices in Vancouver and at the Pacific Geoscience Centre, Sidney, B.C., studies the geology of the Cordilleran region and the adjacent Pacific continental shelf and margin. Results are used to assess mineral and hydrocarbon potential and aid in land use and environmental protection.

The Institute of Sedimentary and Petroleum Geology, Calgary, collects information on the sedimentary basins of western and northern mainland Canada, and the Arctic—regions which contain much of our oil, natural gas and coal resources. Estimates of Canadian potential oil and gas resources are prepared in cooperation with other federal agencies and a repository is maintained of samples, cores and other data derived from work done by the petroleum industry on the frontier lands.

Economic Geology and Mineralogy Division conducts geological studies of metallic and other mineral deposits to determine their distribution, origin and potential abundance, thereby facilitating resource exploration and policy formulation. The division provides analyses of rocks, minerals and ores needed by other GSC divisions.

Geological Information Division communicates results of branch scientific programs by preparing and publishing maps and reports, maintaining Canada's largest earth science library, and providing a public information system.

Precambrian Geology Division studies the bedrock geology of the mineral-rich Canadian Shield to provide data used by industry in the search for mineral deposits and by government in developing mineral policies. The division provides isotopic age and paleomagnetic determinations and petrological information for all parts of Canada.

Resource Geophysics and Geochemistry Division serves as a national centre for research and development into geophysical and geochemical methods used in the interpretation of geology and the search for mineral resources, and conducts systematic geophysical and geochemical surveys. Technologies developed are tested and made available to the private sector and government.

Terrain Sciences Division studies the geology of the unconsolidated materials of the landmass, processes that modify the landscape and hazards that may affect our use of the land. The division coordinates studies concerned with nuclear fuel waste management.

Major achievements during 1985-86 included completion of a comprehensive reassessment of undiscovered oil resources of the Western Canada Sedimentary Basin and the first discovery off Canada's west coast of a large sediment-hosted sulphide deposit on the ocean floor comparable to mineral deposits mined in Canada. Off Canada's east coast, deep seismic transects were completed and geological interpretations made of the data acquired. A major aeromagnetic survey was carried out in cooperation with a consortium of petroleum companies offshore from Newfoundland. The first season of geological and geophysical investigations from the floating ice island in the Arctic Ocean northwest of the Arctic Archipelago was successfully completed and plans made for further work in 1986.

The GSC coordinated a major seismic refraction survey of the Peace River Arch area using geology, geochemistry and geophysics to develop an understanding of how intrabasinal arches and troughs are formed. Such structures are economically important but are poorly understood. The survey employed equipment and personnel from six Canadian universities and the Earth Physics Branch.

The Office of Energy Research and Development (OERD) funded most of the survey, with support from two petroleum companies. OERD also funded a study of potential petroleum source rocks of the Williston Basin in Saskatchewan. Frontier Geoscience Program resources were used for shooting a seismic reflection line in the Mackenzie Delta designed to elucidate deep structural controls on the evolution of oil- and gas-bearing basins beneath the Mackenzie Delta and Beaufort Sea.

This was the first full year of Canadian participation in the Ocean Drilling Program (ODP). The Atlantic Geoscience Centre had staff on two cruises. The co-chief scientist for the Baffin Bay/Labrador Sea cruise was from the Atlantic Geoscience Centre also. ODP offers a chance to obtain the long sediment cores needed for worldwide stratigraphic correlation and thus complements work done under the Frontier Geoscience Program.

A GSC survey team at work.

Research studies of gold and platinum group metals and seafloor massive sulphides were emphasized. Recent work with platinum has resulted in widespread interest by industry and subsequent exploration programs. Mineral resource assessment work was completed for proposed national parks on Banks Island and northern Baffin Island and preliminary work for similar assessments was started in the Wager Bay — Southampton Island and Nahanni areas, Northwest Territories.

In British Columbia, studies continued of landslide characteristics in parts of the Columbia Mountains, of landslides in glaciolacustrine deposits in central parts of the province and geotechnical aspects of natural dams in the Selkirk and Coast mountains.

Icebergs are a serious threat to offshore oil and gas development. Several icebergs, large enough to scrape the ocean floor, were studied. The submersible *Pisces IV* examined seabed deformation. The results are applicable to assessment studies of proposed underwater pipelines or other conduits.

The Canadian Shield is an important source of minerals. Finding these resources requires increasingly sophisticated understanding of the highly complex geological history of this region. To obtain this information, field studies were carried out in many parts of the Shield. In the northwest, major regional studies focused on the Thelon Tectonic Zone and the Great Slave Shear Zone. The stratigraphy of the Goulburn Group was shown to reflect convergence and upshift along the Thelon Tectonic Zone. In Keewatin District, topical studies were initiated on a major shear zone near Wager Bay and on a volcanic-sedimentary sequence near Rankin Inlet, which comprises at least two major cycles of volcanism with intervening turbidite deposition.

Geoscientific studies funded under federal-provincial mineral development agreements, coordinated by GSC staff and principally carried out under contract, were conducted in the Atlantic Provinces, Manitoba and Saskatchewan. During the year GSC published more than 50 preliminary reports as well as several formal reports, Open File releases and maps resulting from these studies.

Dating rocks is an important tool in unraveling their history. The new Geochronology Laboratory became fully operational and the new chemistry laboratory is in routine operation. A major geochronological study of the eastern Abitibi Belt was started, to provide a firm basis for developing tectonic and metallogenic models of this important mineral-producing area.

One- and two-day forums held in Ottawa, Calgary and Vancouver gave industry and university staff and students the opportunity to see and hear about current GSC activities. More than 3000 visitors were attracted.

Surveys and Mapping Branch

As the national organization for surveying and mapping, the branch formulates and maintains national standards for surveying and mapping that support national economic development, respond to Canadian needs, reflect changing technology and contribute to the formulation of internationally accepted standards and practices.

In 1985-86 official marketing of the fifth edition of the *National Atlas of Canada* was launched. Maps of the *National Atlas of Canada* relating to the physical environment, socio-economic geography, natural resources and the historical development of the nation are designed to provide a better understanding and knowledge of the country's geographical characteristics. This year, the ten thousandth topographic map sheet at 1:50 000 scale was printed.

The branch was active in developing projects for Expo 86. An agreement was reached with Discover Canada Shops Inc. to sell the *Canada in Motion* map pack, a special package of four transportation network maps (road, rail, air and water) at Expo 86. Other projects include the Vidiwall, a bank of 108 video monitors incorporating *National Atlas* transportation and communications maps, specially adapted to use the Electronic Atlas system; and a 21-page Telidon information system project, "Geographical Facts from the *National Atlas of Canada*", which deals with popular facts in physical geography.

Treasury Board approved funding for surveys relating to the Committee for Original People's Entitlement (COPE) Native Land Claim Settlement and for work relating to the Manitoba Northern Flood Agreement totaling $9.6 million over the next eight years. In anticipation of the launch of the French earth observation satellite SPOT and under the arrangement negotiated with the Institut Géographique National of France, initial steps were taken to evaluate how data received might apply to mapping, in particular to revision to topographic maps.

The branch continued to review offshore activities regarding legal and geodetic surveys. It provides scientific and technical advice to federal and provincial government agencies, and consulting services in surveys and mapping for international development programs through the Canadian International Development Agency (CIDA).

Filming a mosaic of Canada with a camera fixed to the arm of a coordinatograph—Surveys and Mapping.

Geodetic Survey Division provides a national reference system through a network of geodetic surveys. This ensures that surveys done in any part of the country have the same frame of reference and define Canada's territorial limits in a global reference system. National geodetic data are available from a computerized file.

During 1985-86, the division worked to develop a new concept for positioning in Canada using Global Positioning System (GPS) technology. This concept, know as the Active Control System (ACS) would comprise 10 to 15 stations throughout Canada, each housing a GPS satellite receiver controlled by a microcomputer to monitor the tracking of all visible satellites. The resulting ACS will act both as a GPS satellite tracking network to determine regional orbits over Canada, and as 'base station' for differential positioning by various users. In addition to its impact on survey positioning, ACS is expected to become a major land, air and marine navigation technology of the future.

The division participated in the NASA Crustal Dynamics Project, involving Long Baseline Interferometric measurements, and the North American Datum 83 project, a comprehensive readjustment and redefinition of North American geodetic survey networks. Data needed to begin recomputation of the primary survey framework have been exchanged between Canada and the United States.

Topographical Survey Division produces topographic maps that serve a multitude of applications, including resource development, environmental protection and conservation, transportation and communications, defence and national security. The maps are an accurate visual representation and inventory of the earth's surface and artifacts, portraying relief elevations, natural features and major structures.

The entire country has been mapped at the reconnaissance scale of 1:250 000 in 920 map sheets. At 1:50 000, a larger scale, 325 first-edition sheets were produced in 1985-86, including the ten thousandth sheet. This increases the coverage of Canada at this scale to 79 per cent. At the same scale, 425 maps were also revised. Satellite imagery is being used extensively in revising 1:250 000 scale maps and to effect changes on the 1:50 000 series.

The Cartographic Data Processing System for the automated digitizing of the 1:250 000 series became fully operational, and 110 maps were converted to digital format. Projects to change digital topographic data continued with provincial survey and mapping agencies. The division participated in technical management of programs for federal-provincial flood damage reduction, and provision of technical advice and inspection on surveying and mapping projects under the auspices of CIDA in Egypt, Indonesia, Tanzania and Zimbabwe.

Legal Surveys Division, under the terms of the Canada Lands Survey Act, manages and regulates all surveys of frontier lands and maintains a parcel framework for registration of land interests, such as property and mineral rights, situated within frontier lands. The frontier lands consist of national parks, the Yukon and Northwest Territories, the offshore and 2300 Indian reserves. Work continued on automation of the Canada Lands Information System to safeguard the interests of land rights holders, particularly those of Canada's native people. Properties protected by these records exceed an estimated $15 billion.

The International Boundary Commission (Canadian Section) is a bilateral treaty organization that maintains and regulates the land and water boundary between Canada and the United States. Field maintenance continued along the New Brunswick – Maine, and British Columbia – Washington section of the boundary for a total of 130 km. On the Niagara River, a monument referencing the international boundary was relocated to facilitate development by the Niagara River Parks Commission. Along the Alberta-Montana boundary, a monument that interfered with an international airstrip taxiway was reconstructed to eliminate danger to both monument and aircraft.

Geographical Services Division researches and disseminates geographical information and produces aeronautical charts and publications. Maps in the *National Atlas of Canada* providing information on the physical environment, socioeconomic geography, natural resources and historical development are designed to provide a better understanding and knowledge of Canada's diverse characteristics. The atlas is used extensively in government and the private sector, as well as by educators, students and publishers. In January 1986 the fifth edition of the *National Atlas of Canada* was introduced. Two maps were produced for Parks Canada to celebrate the 100th anniversary of the national parks system (1885-1985): *Jasper National Park and Banff*; and *Kootenay and Yoho National Parks.*

More than 1300 aeronautical charts and related flight publications were produced for navigation and control of air traffic in Canada. The division provides cartographic support and advice to the Chief Electoral Officer as well as to EMR and to other government departments and agencies that do not have cartographic expertise. Geographical names reflect the history and culture of Canada. A data bank of 350 000 geographical names is maintained by the division to support mapping and the production of provincial volumes of the *Gazetter of Canada* series.

In response to the growing demand for digital geographical information, work continues on computerization of the National Atlas Information System, including work on the Electronic Atlas.

Reproduction and Distribution Division publishes data compiled by other Surveys and Mapping Branch divisions and sells them through authorized dealers in Canada and other countries on a cost-recovery basis. Custom-made reproductions of aerial photography and satellite imagery are available from the National Air Photo Library.

Technological advances included installation of a seven-colour Miller printing press. The press, equipped with a microprocessor-controlled inking system, will permit one-pass printing, including the backprint of topographic maps and similar cartographic products.

This year 2400 map titles were printed, 3 500 000 maps distributed, and 550 000 aerial photographs reproduced.

In the May 1985 federal budget speech, the government announced that the planned move of Surveys and Mapping Branch to Sherbrooke, Quebec, was deferred. Pending a further decision on the project, Treasury Board has provided funds and capital for existing operations at the Sherbrooke Institute of Cartography.

The Institute began operations in May 1985, and 24 professional staff were hired. They are engaged in a training plan covering advanced techniques in surveying and mapping and are carrying out projects for the exchange of digital topographic data with provincial survey and mapping agencies.

Earth Physics Branch

The branch provides geophysical knowledge on the framework, dynamic processes and hazards of the Canadian landmass and its offshore to meet the nation's economic safety, security and scientific needs. It operates national networks of geophysical observatories, carries out national geophysical surveys and contributes to the definition of international geophysical standards. During the year, the branch was involved in multidisciplinary studies to delineate Canada's offshore boundaries and frontier petroleum resources, and to manage nuclear fuel waste.

Highlights included unscheduled but important studies of two major geophysical events, the Mexican earthquake and the Colombian volcanic eruption; participation in an international electrical sounding across the Juan de Fuca Ridge and the Pacific continental margin and a joint project with industry to monitor temperatures in an abandoned Arctic offshore oil well; and the collection of remarkable data on seismicity and strong ground motion following the Nahanni, N.W.T. earthquakes in October and December 1985.

Seismology and Geomagnetism Division operates several seismographic networks across Canada to monitor earthquakes and determine seismic risk, and a network of geomagnetic observatories to monitor the earth's magnetism and forecast magnetic conditions that may affect human activities. The deep structure of the Canadian landmass and its offshore is probed using seismic and geomagnetic techniques and the division undertakes seismological research on the detection and identification of underground nuclear explosions. The division cooperated in university-industry-government seismic reflection or refraction surveys across the southern Cordillera, the Peace River Arch in Alberta and the Arctic continental margin. Cabinet approved new funds to modernize the Yellowknife seismological array used for test-ban research.

Gravity, Geothermics and Geodynamics Division conducts gravity surveys over the Canadian landmass and its offshore and maintains national standards for gravity measurements. It conducts regional geothermal studies, evaluates the potential for geothermal energy in Canada and investigates the distribution and physical properties of permafrost. It operates global dynamics observatories near Ottawa and Calgary, which contribute data to international agencies for earth rotation, polar motion, earth tides and crustal stability by measuring surface deformation and changes in gravity and groundwater levels.

This year 3000 new gravity stations and 8250 line-kilometres of marine gravity readings were added to the national gravity data base. A new apparatus for the absolute measurement of gravity was received and tested. Efficient methods were developed for producing customized coloured gravity maps, including maps of the horizontal gradient of gravity over Canada and North America. The division also carried out a contracted feasibility study for using the heat from the warm water of flooded coal mines in Nova Scotia, field studies of permafrost conditions in Cominco's Polaris mine, N.W.T., and the assembly of a new system for geophysical long-baseline interferometry, ready for a proof-of-concept experiment.

The Pacific Geophysics Division is part of the Pacific Geoscience Centre located at the Institute of Ocean Sciences near Sidney, B.C. It conducts a wide range of geophysical studies in the Canadian Cordillera and the adjacent offshore.

Geoscience studies conducted in the Juan de Fuca and Beaufort offshore boundary areas have given Canada the world-class information base required for bilateral negotiations. The division researched sulphide mineral deposits in the Juan de Fuca Ridge system and monitored earthquake hazards in the high-risk west coast region.

Massive landslide triggered by the October 1985 earthquake in the Nahanni area of N.W.T.

Research conducted by the polar continental shelf project.

Polar Continental Shelf Project

Polar Continental Shelf Project scientists study the paleoclimate and climatology of the Arctic Islands, the interrelationships of climate and vegetation, the modeling of glacier flow as related to past glacial periods, and the temperature of past and present ice sheets. The logistics arm of PCSP coordinates and provides support to scientific research groups working in the Arctic Islands and over the Arctic Ocean. Facilities at Tuktoyaktuk, at the mouth of the Mackenzie River, and at Resolute, on Cornwallis Island in the eastern Arctic, provide logistics support to scientific research between mid-February and October each year.

Base camp facilities established in 1984 on the drifting ice island in the Arctic Ocean were expanded while the camp was occupied from March 1 to September 17, 1985. Geophysical, geological and oceanographic studies were undertaken from the island.

Demand for PCSP support continues to increase. In 1985, a record 225 scientific parties were supported through the base camps at Tuktoyaktuk and Resolute.

RESEARCH AND TECHNOLOGY SECTOR

Canada Centre for Mineral and Energy Technology

CANMET maintained its role as the principal agency responsible for research and development in the mining, metals and fossil-fuel industries. CANMET's program is oriented to the needs of industry and, to a large extent, is guided by consultation with industry through the National Advisory Committee on Mining and Metallurgical Research, and with research establishments, professional and technical groups and private sector companies.

Transfer of technologies developed at CANMET and in the private sector continued to grow in importance. By year-end, fourteen major technology transfer projects sponsored by CANMET were in progress as part of the Program for Industry-Laboratory Projects (now Industrial Research Assistance Program—Laboratory Network). Total value of these projects, funded equally by the National Research Council and the private sector, exceeded $10 million. CANMET also assisted its client industries to use other assistance programs and sources of expertise. A study sponsored by CANMET and the Mining Association of Canada highlighted the mining industry's concern with productivity and its desire for coordination and cooperation within industry and also between industry, governments and universities.

Minerals

CANMET maintained a full program of research, development and technology evaluation in the fields of mining, processing, metal extraction and physical metallurgy.

The new Mining Research Laboratory at Elliot Lake was completed and occupied with research personnel in November 1985. A major rockburst research project began in accordance with the Canada-Ontario Memorandum of Understanding on Rockburst Research. Funding equivalent to $4.2 million by federal, provincial and industry sources will ensure this project continues for five years. Major research projects on ground control began in association with Manitoba, Ontario and New Brunswick, under federal-provincial mineral development agreements (MDAs).

The Canadian Explosive Atmospheres Laboratory continued to certify materials and equipment for use in underground mines, and to transfer diesel-emission reduction technology to industry. Three of these technologies, two developed by CANMET scientists, were evaluated under working conditions in underground mines.

The Canadian Explosives Research Laboratory evaluated 350 explosive materials during the year and completed its assessment of new international explosive testing methods promulgated by the United Nations.

Research programs undertaken by the Mineral Sciences Laboratories covered a variety of commodities and technologies. The application of biotechnology in the minerals industry focused on leaching base metal ores, the absorption of metals by microorganisms, and the impact of bacteria on mineral recovery processes.

Environmental concerns led to a research project with Canadian mining companies to improve technology for the disposal of sulphide tailings. Gold extraction technology has been advanced by the study of cyanide recycling procedures, alternative leaching systems, and novel purification and recovery techniques. Metallurgical application of plasmas was also reviewed.

CANMET has applied for a patent to fabricate dense, strong and durable hydrogen-ion-conducting solid ceramic electrolytes, for applications in hydrogen sensors, hydrogen pumps and hydrogen fuel cells. These also have potential use for radioactive environmental cleanup.

The Physical Metallurgy Research Laboratories devoted a significant part of allocated R&D resources to research related to the steel industry. Much of this work concerned characterization of the microstructure of steels and determination of the microstructure-property relationships in order to develop, in cooperation with industry, improved steels for harsh environments.

An electroslag casting process was developed for producing fine-grained hollow shapes in alloys with low hot-working potential. The transfer to industry of narrow-gap welding technology for thick-walled pressure vessels, to facilitate improved and uniform notch toughness in welds subjected to low temperatures continued. Laboratory tests on the use of acoustic emissions to detect and locate crack formation in welding thick steel plate were completed and the resultant software is now being demonstrated in industrial field trials.

CANMET'S portable X-Ray diffractometer.

The National Uranium Tailings Program has reached the final year of its mandate. The two major studies of tailings disposal sites in Ontario and Saskatchewan were completed, and results were used to complete initial designs for a sophisticated software program that will be used for decommissioning active mine tailings sites.

Energy

Production of diesel fuel from synthetic distillates progressed and plans were initiated to involve the private sector in scale-up demonstrations. A pilot plant facility for the preparation of coal for coprocessing of coal and heavy oil was completed. R&D on the conversion of natural gas to methanol progressed sufficiently for the industrial community to show interest in developing commercial projects in this field.

The Combustion and Carbonization Research Laboratory completed construction of a laser flame probing device for diagnostic testing, and also certification of a CANMET-developed retrofit module for increasing the efficiency of residential gas furnaces, and a carbonization study on the strength of blast furnace cokes.

The first CANMET Oil and Gas Conversion Contractors' Review Meeting enabled the Synthetic Fuels Research Laboratory to transfer technology generated by CANMET through contract work over several years. Several international representatives as well as those from Canadian federal and provincial government groups, universities and the industrial sector attended the meeting. Late in the year, scientists assisted with the commissioning of the CANMET hydrocracking demonstration plant in Petro-Canada's Montreal refinery.

CANMET's underground coal mining research activity in eastern Canada continued to emphasize health and safety. Scientists carried out R&D associated with respirable dust and methane control through the improvement of ventilation and a better understanding and control of the sources of workplace pollution. New technologies, including flame-resistant wood replacements for underground supports and water-jet-assisted roadheaders, were demonstrated in industrial settings. Environmental R&D work was directed towards control of combustion in underground mines.

CANMET's R&D programs related to mining surface coal and oil sands in western Canada promoted new technologies to enhance productivity, and advocated improved technical understanding and better control of operations. Computer simulation and other operations research techniques were used to improve the scheduling and deployment of open mining equipment.

Geotechnical R&D concentrated on developing a better understanding of the control and monitoring of open-pit slopes and working benches.

The Edmonton Coal Research Laboratory was involved in research on coal beneficiation, upgrading and improved handling properties, and also on the treatment of fluids produced during in situ production and processing of bitumen and heavy oils.

Low-rank coal upgrading was investigated under cost-recovery agreements with industry. Surfactants improved coal dust control in laboratory and pilot plant studies. The technology was field tested on two 100-car-unit trains in Canada and at two ports in Europe.

Research opportunities and technology transfer to the coal industry were pursued by testing mobile water treatment and dewatering plants under operating conditions.

Investigation of the recovery and processing of bitumen from tailings ponds provided a better understanding both of possible causes of product loss and of willingness to undertake further research.

Explosives Branch

Explosives Branch is responsible for regulating the manufacture, distribution and transportation of explosives in the interests of safety. No major explosives-related accidents occurred in the year. Ninety-six factories were licensed to manufacture explosives. The branch licensed 2187 magazines for explosives storage and issued 802 permits to vehicles for transportation. These were supported by about 1800 inspections.

Fireworks supervisor courses were conducted at centres throughout Canada, and major cities were given help in planning and carrying out Canada Day fireworks celebrations. The branch also helped Montreal to stage an international fireworks competition.

Most inspectors attended a training course to learn about the new Transport of Dangerous Goods Regulations and in turn gave lecture courses to about 400 interested people in the explosives industry.

The Canadian Explosives Research Laboratory determined the characteristics of all explosives submitted so that the Chief Inspector could assess their suitability for manufacture.

Office of Energy Research and Development

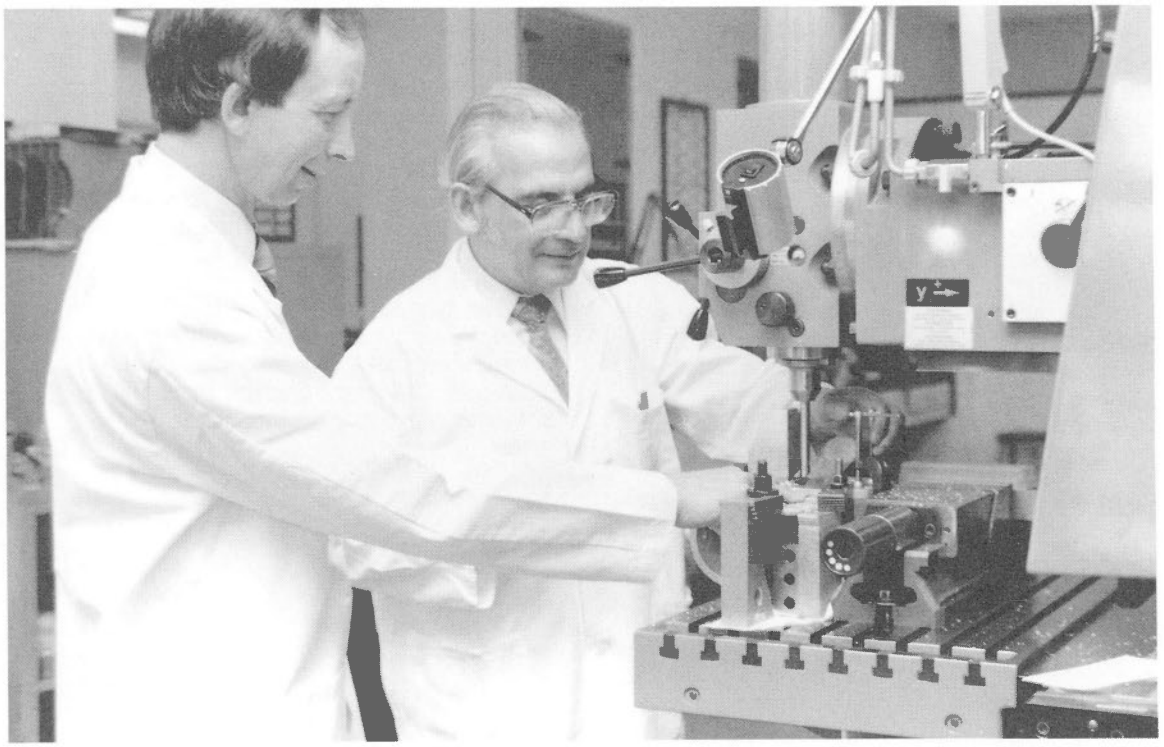
The Office of Energy Research and Development coordinates the interdepartmental Federal Energy R&D Program. It acts as secretariat to the Federal Panel on Energy R&D, manager of the program.

The program emphasizes development of a broad Canadian energy science and technology base for energy security and a continuing place for energy in sustained economic renewal.

Technical progress and resulting industrial activity and energy savings made since the inception of the program were documented in the publication *An Assessment of the Economic and Energy Supply Benefits from the Federal Energy R&D Program*. The Minister announced a continuation of the program with a five-year plan from 1986-87 to 1990-91.

Canada continued to participate in the International Energy Agency's energy research and development activities and played a major role in the IEA Energy Technology Policy Study.

Cooperation was maintained with provincial and university programs through joint projects, seminars and informal meetings as well as through participation on the governing and other committees of the Alberta-Canada Energy Resources Research Fund and on the Energy Strategic Grants Program Panel of the Natural Sciences and Engineering Research Council.



Polarographic analysis at CANMET.

Satellite receiving station
Gatineau, Quebec.

Canada Centre for Remote Sensing

The Canada Centre for Remote Sensing, established in 1972, provides remotely sensed data for resource management and environmental monitoring.

CCRS participated in the design and construction of the European Space Agency's Earth Resources Satellite (ERS-1) program. Launch is scheduled for 1989. ERS-1 will carry microwave sensors for ice, ocean and weather applications research. Canadian industry was under contract to develop its ground system and space radar telemetry elements.

The centre is planning for a Canadian remote sensing satellite, RADARSAT. Canada has international agreements with the United States and the United Kingdom for collaboration in the program. CCRS developed critical radar technology for space and ground systems, and has conducted aircraft experiments to simulate satellite performance over ice, icebergs and land.

CCRS completed construction of a new satellite receiving station in Gatineau, Quebec, which will receive high-resolution data from France's SPOT satellite, launched in February 1986.

CCRS received and distributed multispectral scanner data from the LANDSAT-4 satellite and high-resolution Thematic Mapper data from LANDSAT-5 at the Prince Albert receiving station in Saskatchewan.

An advanced remote sensing data processing system, MOSAICS, was developed and brought into operation. MOSAICS corrects satellite imagery so that it is compatible with topographic maps.

Research on applications concentrated on crop and forest monitoring, vegetation and soil moisture assessments, and the application of microwave sensors to structural geology and physical oceanography.

Transfer of remote sensing technology to provincial resource management agencies continued in Saskatchewan. The Technology Enhancement Program in the Maritime Provinces was successfully completed.

ADMINISTRATION PROGRAM

FINANCE AND ADMINISTRATION SECTOR

Financial Management Branch

The department made expenditures of $2964 million for the Energy Program, $320 million for the Minerals and Earth Sciences Program and $41 million for the Administration Program. Offsetting revenues totaled $1104 million, including levies of $1093 million collected under the Energy Administration Act. The department's total net expenditures were $2220 million.

Financial and Managerial Information System reports, implemented in 1983-84, were modified to offer report selection at managers' option, and to run on the department's equipment. This has created savings in production costs, and has advanced the delivery time.

Informatics Policy and Planning Secretariat

A departmental Informatics Policy and Planning Strategy document was prepared and a review of centralized computing services was initiated.

Administration and Informatics Services Branch

The analysis of departmental scientific computing requirements was completed. The branch began a study of long-term departmental requirements for non-office accommodation and a second study of office accommodation use.

Development of an automated Information Management System, structured to provide departmental managers with an information locator system, up-to-date administrative policies and procedures, and a forms inventory, was completed. More than 3500 subjects are described in the system, as well as 18 000 files, 90 active information collections, 25 computer applications and 75 administrative policies and related procedures. Data entry will continue until the complete index to all departmental records is listed in both official languages. Once completed, the Information Management System will contain an estimated 8000 subjects on which the department creates, collects and retains information through the use of paper, computers, microfilm, photographs and maps to ensure program delivery.

Office automation.

HUMAN RESOURCES SECTOR

In 1985-86 the Human Resources Sector's main task was to redeploy personnel affected by staff reduction in various sectors of the department. A Workforce Adjustment Unit was established to effect redeployments and the proportion of employees successfully redeployed has steadily increased.

The compensation system was automated to provide a faster and more accurate pay and benfits service. The sector began integrating corporate official languages operations with sector personnel unit operations to bring official languages services closer to EMR employees. Bilingual capacity across the department continued to improve, and service to the public is now offered in both official languages at all customer service points. Francophone representation in the scientific and professional category improved to its highest level yet.

The first Multi-Year Human Resources Plan was prepared, consolidating all human resource issues into one departmental plan and linking human resource planning to long-term operational planning across the department.

EXECUTIVE OFFICES

Corporate Policies Evaluation Branch

The Corporate Policies Evaluation Branch provides an executive staff function by coordinating, supporting, analyzing and controlling departmental operations. In particular, it provides the Deputy Minister and Associate Deputy Minister with reviews, analyses, and support required for effective decision-making.

The Coordination and Liaison Group

The Coordination and Liaison Group prepares ministerial briefing material relating to Cabinet and Cabinet committees through effective liaison and coordination with departmental sectors, Central Agencies and other government departments. The group also provides analyses and recommendations on a variety of departmentwide matters.

The Program Evaluation Group

By providing independent and objective assessments of all departmental activities, the Program Evaluation Group is able to examine program component objectives and assess how well they have been achieved.

In 1985-86 program evaluations of the Petroleum Incentive Program, the Voluntary Motor Vehicle Fuel Consumption Program and the Canada—Nova Scotia Subsidiary Agreement on Energy Conservation were completed. Evaluation assessments (the planning phase of the evaluation process) were also completed for four components of the Energy Program. An evaluation framework (the basis for future evaluation) was developed for one other component. Monitoring the implementation of earlier program evaluation recommendations continued.

The Internal Audit Group

In accordance with guidelines and standards established by the Office of the Comptroller General, the Internal Audit Group reviews and appraises departmental operations for efficiency, economy and effectiveness in terms of internal management practices and controls.

In 1985-86 the results of eight audits of responsibility centres were reported. These included departmental headquarters, the office of the Deputy Minister, and the Polar Continental Shelf Project. In addition, at the behest of Central Agencies, special audits of the quality of departmental classification decision-making and a year-end review of the freeze on discretionary expenditures and staffing were undertaken.

Office of Environmental Affairs

The Office of Environmental Affairs is responsible for ensuring that EMR complies with the federal governments's policy on environmental assessment and review. It is also responsible for advising departmental management on environmental policies and issues, and advising external environmental agencies on EMR concerns.

In 1985-86 the office assisted elements of EMR to better understand such environmental issues as acid rain, climate change and water export. It has become directly involved with the high- and low-level radioactive waste disposal issues, federal water policy, fish habitat policy, land-use policy, marine and terrestrial parks policies, environmental issues associated with the Panel on Energy R&D funds, and the Environmental Assessment and Review Process (EARP). Many projects have been screened through EARP. The Port Hope Low-Level Radioactive Disposal Project has been formally referred for public review.

Departmental Secretariat

The Departmental Secretariat prepares and coordinates ministerial and executive correspondence, and provides parliamentary and executive document services to the ministers and senior managers of the department.

Communications Branch

The Communications Branch informs the public of the activities of the Energy, Minerals, Research and Technology, and Earth Sciences programs of the department.

Major activities supporting the Energy Program included announcements of the Agreement on Natural Gas Pricing and a new frontier lands energy policy.

The government's shift from direct financial incentive programs in energy management and conservation to consumer education, research and development support and demonstration projects caused a similar shift in communications efforts. Support for energy management and alternative energy initiatives included exhibition and publishing activities, a home energy supplement that appeared in more than 500 weekly and 50 daily newspapers throughout the country, and the promotion of alternative fuels.

The branch provided advertising support to the Transportation Energy Division's efforts to publicize natural gas conversion and the growth of the natural gas vehicle market and its associated fueling station network throughout Canada. An R-2000 advertising program was designed to promote Super Energy Efficient Housing.

The branch placed stands containing departmental brochures promoting home energy conservation in hardware and building supply stores in the Atlantic Provinces. This was supported by an advertising campaign.

Communications Branch supported the Canada Oil and Gas Lands Administration (COGLA) by preparing the 1985 COGLA annual report and through media relations. The branch supported the Petroleum Incentives Administration (PIA) by publishing and distributing the PIA annual report.

Communications activities supporting the Minerals, Research and Technology and Earth Science programs included advertising and media relations for EMR's Mineral Outlook Conference and the Mines Ministers' Meeting in May. Branch regional information officers helped organize special events and issued news releases on the signing of mineral development agreements with British Columbia, Ontario, Quebec and Prince Edward Island. Factsheets and posters were published to inform school-age children of the activities carried out by these programs.

The branch promoted the services of the Canada Centre for Remote Sensing (CCRS) to mining, geological and forestry industries, to develop the general public's knowledge about remote sensing applications and benefits. The branch conducted a direct mail campaign to advertise release of the new fifth edition of the *National Atlas of Canada*.

In addition, a ministerial and media event was organized when the Ocean Drilling Program research vessel the *JOIDES Resolution* docked in St. John's, Newfoundland. Posters, publications, audiovisuals and exhibits were produced.

Communications services were provided through the nine offices of the Regional Communications Division. In addition to routine releases of information, continuous monitoring of the public environment, and communications services to the department's regional components, regional officers handled several events related to offshore operations, including several ice alerts threatening rigs off the coast of Newfoundland. Preparations for EMR's participation in Expo 86 were coordinated through the Vancouver office.

Advertisements and notices were placed announcing seminars, exhibitions and workshops. Ads were developed promoting investment opportunities in Canada's energy and mineral resources. An ad was also developed to promote the department's participation in Expo 86.

The branch took part in 150 national, provincial, regional and local exhibitions. The Exhibits Unit was involved in producing new displays where more than 600 000 brochures, pamphlets and other publications were distributed.

The branch's Editorial Division wrote and edited speeches, news releases and other publications and produced the department's corporate publications, such as the quarterly scientific magazine *GEOS*, the monthly department newspaper *Entre nous* and the *EMR Annual Report*.

The branch distributed 148 press releases and 41 speeches and met a continuous public demand for EMR publications. Fourteen new audiovisual programs were completed.

CROWN CORPORATIONS AND AGENCIES

CROWN CORPORATIONS

Atomic Energy Control Board
Atomic Energy of Canada Limited
Petro-Canada
Petro-Canada International Assistance Corporation
Uranium Canada Limited

AGENCIES

Board of Examiners for Canada Lands Surveys
Canadian Permanent Committee on Geographical Names
Energy Supplies Allocation Board
National Energy Board
Petroleum Monitoring Agency

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REGIONAL INFORMATION OFFICES

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