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1977
Ontario Hydro Annual Report

Ontario Hydro

Head Office
700 University Avenue, Toronto, M5G 1X6

Board of Directors

Officers

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Report of the Board of Directors of Ontario Hydro for the year 1977

To the Honorable Reuben Baetz Minister of Energy

Hydro Chairman Robert Taylor inspects winter work at Thunder Bay GS extension.

Larger export power sales, reductions in the projected cost of operation, maintenance and administration, and the continued outstanding performance of the Pickering nuclear station were among the chief factors that pushed 1977 revenues $122 million above the original forecasts.

The probability that these welcome but unexpected developments would produce excess revenue for the year was pointed out by Ontario Hydro during the July rate hearings of the Ontario Energy Board. Since it obviously exceeded the anti-inflation guidelines established for Hydro by the provincial government, the Board of Directors decided that the extra revenue would be returned to customers, with interest, in the form of rebates on their bills over the 12 months of 1978.

Following the Ontario Energy Board's review of the 1978 rate proposal, the Board of Directors authorized an increase in wholesale or bulk power rates effective January 1, 1978, averaging 9.5 per cent, to cover the forecast costs of supplying wholesale power to municipal utility and large industrial customers. This increase is very close to that recommended by the OEB. The rebate in 1978 bills will effectively reduce the increase to about 2 per cent. At the municipal level, Ontario householders will be paying about 5 per cent more for electricity in 1978. The 800,000 retail customers served by the Ontario Hydro rural system will be paying about 5.7 per cent more.

The favourable operating results experienced by Hydro in 1977 were due to the special factors noted above, rather than to the performance of the

economy. Real economic growth in Canada last year was substantially below full potential. This less than satisfactory economic performance was one of the factors that contributed to a growth in energy consumption for the year of only 2.2 per cent — the smallest annual increase in 33 years.

During the fourth quarter, both peak and energy demands dropped below those reached a year earlier. This could not be attributed entirely to the economy; weather conditions were not a factor either, as they were similar in both years. These facts suggest that the two extraordinarily large rate increases in 1976 and 1977, reinforced by the vigorous conservation efforts of Ontario Hydro, the municipal utilities, the Ministry of Energy and other agencies, are leading to new prudence in consumption.

Forecast lower

The 1978 Load Forecast, which was approved by the Board in February of this year, reflected these developments in a downward revision in both the level of demand and also its rate of growth. The forecast now predicts average annual growth of 5.5 per cent until 1987, followed by a slow decline to about 4.5 per cent by the end of the century.

Last year's forecast was for an annual growth rate of 6.5 per cent. Historically, electricity demand in Ontario has grown at close to 7 per cent a year — doubling every 10 years. A 5.5 per cent growth rate means demand will double in 12.75 years.

If the forecast growth becomes a reality — and there are a large number of uncertainties for the longer term — then the peak demand expected in 1985 will be about 3,700,000 kilowatts lower than previously forecast. This means that about 2,000,000 kilowatts less generating capacity will be needed than previously estimated. The difference of 1,700,000 kilowatts represents the amount of generating capacity needed to re-establish the normal level of system reliability, which had been a casualty of previous cutbacks in the construction program.

In the light of this new data, an intensive review of the current expansion program has been undertaken. Detailed consideration is being given to a wide range of options, all of which will be assessed in order to achieve results that will be of maximum benefit to the people of Ontario.

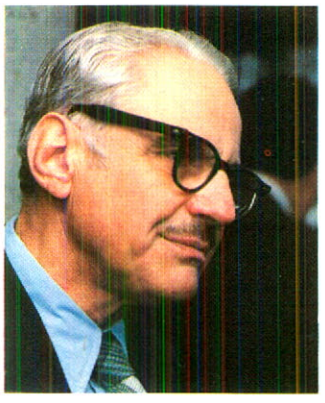
The solution will not be simply a matter of scaling down planned expansion to match forecast demand. There is always a tendency to under-forecast during periods of slow economic growth and the extent and firmness of apparent trends in patterns of consumption are by no means clear. Without an adequate, reliable supply of electricity the economy cannot improve, and the dozen or so years needed to get a new power station from planning — through approvals and construction — to operation make it impossible to catch up quickly if forecasts prove to be low.

There are also strong economic arguments for maintaining momentum in the nuclear program, if only because of the positive effects on the cost of electricity to customers. In 1977, for the first time, nuclear energy produced more than one-quarter of the total electricity generated by Ontario Hydro. For the second consecutive year, unit 3 at Pickering recorded the highest productivity in the world, at 95.6 per cent. Of the 82 largest nuclear reactors in the world, the four Pickering units ranked first, third, fourth and sixth in 1977.

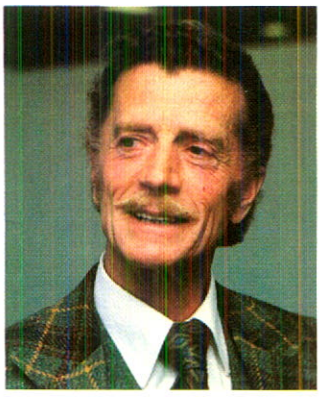
Nuclear waste disposal

While the outstanding success of Ontario's nuclear program has been amply demonstrated, the Hydro Board of Directors is acutely conscious that if public confidence in nuclear power is to be retained, techniques for managing irradiated fuel must be publicly demonstrated to be environmentally safe. During 1977 Dr. Kenneth Hare of the University of Toronto completed a study for the federal government on the disposal of this by-product of nuclear generation and urged early decisions by government so that scientists and engineers can begin testing and demonstrating storage techniques. Early in 1978, Dr. Robert Uffen, Professor of Geophysics and Dean of Applied Science at Queen's University, completed a status report on alternative proposals for the storage, reprocessing, and ultimate disposal of used fuel from CANDU reactors. While noting the severity of technical problems and the need for greater research, Dr. Uffen, who is also Vice Chairman of Hydro's Board of Directors, concluded that the problems of storage and permanent disposal appear to be solvable. He observed that too little has been done in Canada, as elsewhere, in respond-

ONTARIO HYDRO BOARD OF DIRECTORS



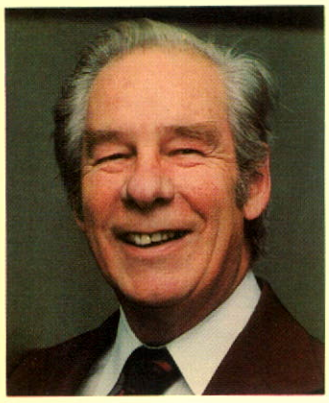
William A. Stewart
Former Minister of Agriculture
Province of Ontario



J. Conrad Lavigne
President
Mid Canada Television System

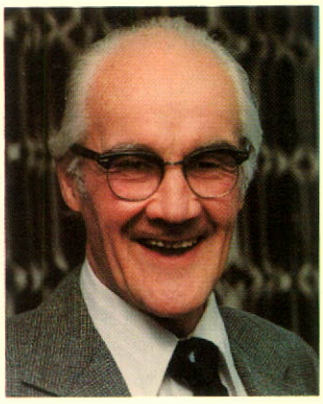
Robert B. Taylor
Chairman

Douglas J. Gordon
President



William Dodge
Former Secretary-Treasurer
Canadian Labour Council

Sister Mary
Executive Director
St. Michael's Hospital



Robert H. Hay
Kingston Public Utilities
Commission

Allen T. Lambert
Chairman
Toronto Dominion Bank

Arthur J. Bowker
National Research Council

Philip B. Lind
Vice-President and Secretary
Rogers Cable
Communications Ltd.

J. Dean Muncaster
President and
Chief Executive Officer
Canadian Tire Corporation

Robert M. Schmon
President and
Chief Executive Officer
Ontario Paper Company
Limited

Robert J. Uffen
Vice-Chairman, Ontario Hydro
Dean, Faculty of
Applied Science
Queen's University

William E. Raney
Secretary and
General Counsel
Ontario Hydro

ing to the legitimate questions and objections of a concerned public and emphasized the need for public participation in assessing alternative plans.

The Ministry of Energy is actively pursuing the development of a joint proposal by the Government of Ontario and the Government of Canada which would commit both governments and their agencies, Ontario Hydro and Atomic Energy of Canada, to develop and demonstrate the safe disposal of irradiated fuel.

Major contracts negotiated

In December, a contract was signed with Denison Mines Limited for a long-term supply of uranium, followed in January 1978, by the signing of a contract with Preston Mines Limited. The contracts, which were subject to government approval, culminated four years of negotiations with the Elliot Lake producers to secure uranium to fuel Ontario's nuclear reactors. The two contracts, the largest commercial uranium transactions ever negotiated, call for delivery of 90,000 metric tons (99,000 tons) of uranium oxide between 1980 and 2020, which quantities can be adjusted by resale or curtailment if requirements should diminish. That uranium represents the energy equivalent of 1.45 billion metric tons (1.6 billion tons) of coal.

The Denison and Preston contracts may well be the most significant ones ever negotiated by Ontario Hydro since they commit a substantial part of the province's known uranium resources to the electric power requirement of the people of Ontario over the next 40 years. The contracts were approved by the provincial cabinet in February, 1978, after a thorough study by government and scrutiny by the Legislature's Select Committee on Hydro Affairs during 18 days of public hearings.

The same Select Committee, during 1978, will also examine the heavy water plant construction at the Bruce Nuclear Power Development, monitor the implementation of recommendations made by the 1976 Select Committee on Hydro rates, and review Ontario Hydro's commitment to nuclear energy.

In its deliberations, the Committee is expected to have the benefit of an interim report on nuclear energy from the Royal Commission on Electric Power Planning, which is due in June. That Commission, headed by Dr. Arthur Porter, which continued its debate-stage hearings, was one of four public inquiries into Hydro affairs over the course of 1977. The Aluminum Wiring Inquiry, which concluded its public hearings early in 1978, required extensive participation by Ontario Hydro staff. Its report is expected by mid-year. The Ontario Energy Board completed its review of Hydro's 1978 rate proposal during the year and also began a separate series of public hearings on the overall subject of costing and pricing of electricity in Ontario. The latter hearing is still underway.

Progress on the restructuring of municipal utilities to rationalize and integrate local distribution systems within regional government structures continued during the year. At the beginning of 1978, the number of municipal utilities in Ontario stood at 341, compared to 352 at the beginning of 1977. The Board recognizes the birth pains that are an unavoidable part of the restructuring process. The new utilities are sturdy and healthy entities. They are doing an outstanding job in pulling together the staff they need and getting down to business.

Special appreciation

The Hydro Board wants to express here a special note of appreciation to the municipal utilities and their associations (the Ontario Municipal Electric Association and the Association of Municipal Electrical Utilities) for their assistance and co-operation during the year. They have responded quickly and effectively to the challenge of conservation, which remains an essential issue even with lower forecasts of growth in consumption.

The Board also wishes to acknowledge the help and support of the ministries and agencies of government with which the Corporation deals, in particular the Minister of Energy and his staff.

To end this report on a happy and positive note, the Board once again records its admiration and thanks for the dedicated efforts of Hydro employees. Without those efforts the many achievements of the year, recorded and unrecorded, would not have come to pass.

On behalf of the Board,
Robert B. Taylor, Chairman.

Hydro generation meets demands

A lagging economy, improved conservation practices and substantial rate increases during 1976 and 1977 were the principal factors contributing to the smallest increase in demand for electrical energy in 33 years — only 2.2 per cent over 1976.

While primary energy demand rose only from 90,853 million kilowatt-hours to 92,855 million, 1977 recorded some memorable milestones in the manufacturing of electricity in Ontario.

Paramount among these was the ascending role of nuclear power in Ontario Hydro's production system. A breakdown of 1977 energy generation by source figures shows that for the first time since their introduction into the system in 1962, nuclear plants produced more than one quarter of Hydro's generation.

The dramatic rise in nuclear-fuelled production — from 0.1 per cent of Hydro's total generation in 1962 to 27.2 per cent in 1977 — can be attributed to the outstanding success of the CANDU system, and particularly the Pickering generating station.

The total unit energy cost for Pickering during 1977 was 9.1 mills per kilowatt-hour or approximately one-half of the cost of producing electricity under similar conditions from Hydro's most efficient coal-fired plant, Lambton generating station, near Sarnia. (One mill equals one-tenth of a cent.)

The year 1977 also saw Ontario Hydro record an all-time peak demand of 15,901 megawatts on January 18.

The dependable peak capacity in December reached 21,347 megawatts — 8.5 per cent above the comparable peak of the previous year.

Availability of energy in Ontario and the need for assistance by American utilities resulted in total export sales to the United States climbing to a record 8,399 million kilowatt hours in 1977, more than double that of 1976. Total export sales in 1977 produced a gross revenue of $205.8 million, compared to $86.8 million in 1976.

Charged with Hydro's overall corporate objectives and policies are members of the Corporate Office. Shown, left to right, are: P. G. Campbell, Acting Vice-President, Engineering & Operations; H. A. Smith, Vice-President, Special Assignments; Milan Nastich, Vice-President, Resources; Douglas J. Gordon, President; H. J. Sissons, Vice-President, Distribution.

Energy made available: 1977

	1977 Millions of kW·h	1976 Millions of kW·h	% Change Over 1976	% of Total 1977	% of Total 1976
Hydraulic	33,546	35,195	—4.7	32.4	36.1
Thermal (coal)	26,309	23,021	14.3	25.5	23.6
Thermal (natural gas)	4,051	4,483	—9.6	3.9	4.6
Thermal (oil)	1,564	2,879	—45.7	1.5	2.9
Thermal (nuclear)	24,488	16,046	52.6	23.7	16.5
Total generation	89,958	81,624	10.2	87.0	83.7
Energy received	13,436	15,854	—15.3	13.0	16.3
Total energy made available	103,394	97,478	6.1	100.0	100.0

Research continues in many fields

A major program initiated by Ontario Hydro in 1974 to develop a heat pump suitable for severities of the Canadian climate continues at Hydro's research center and has been augmented by funds from the Canadian Electrical Association.

Utilizing a newly completed test laboratory that can simulate every type of Canadian environmental condition, design of the prototype heat pump is essentially complete and construction of the unit is now in progress. The scheduled completion date is June 1979, following which 12 months of field trials will be required.

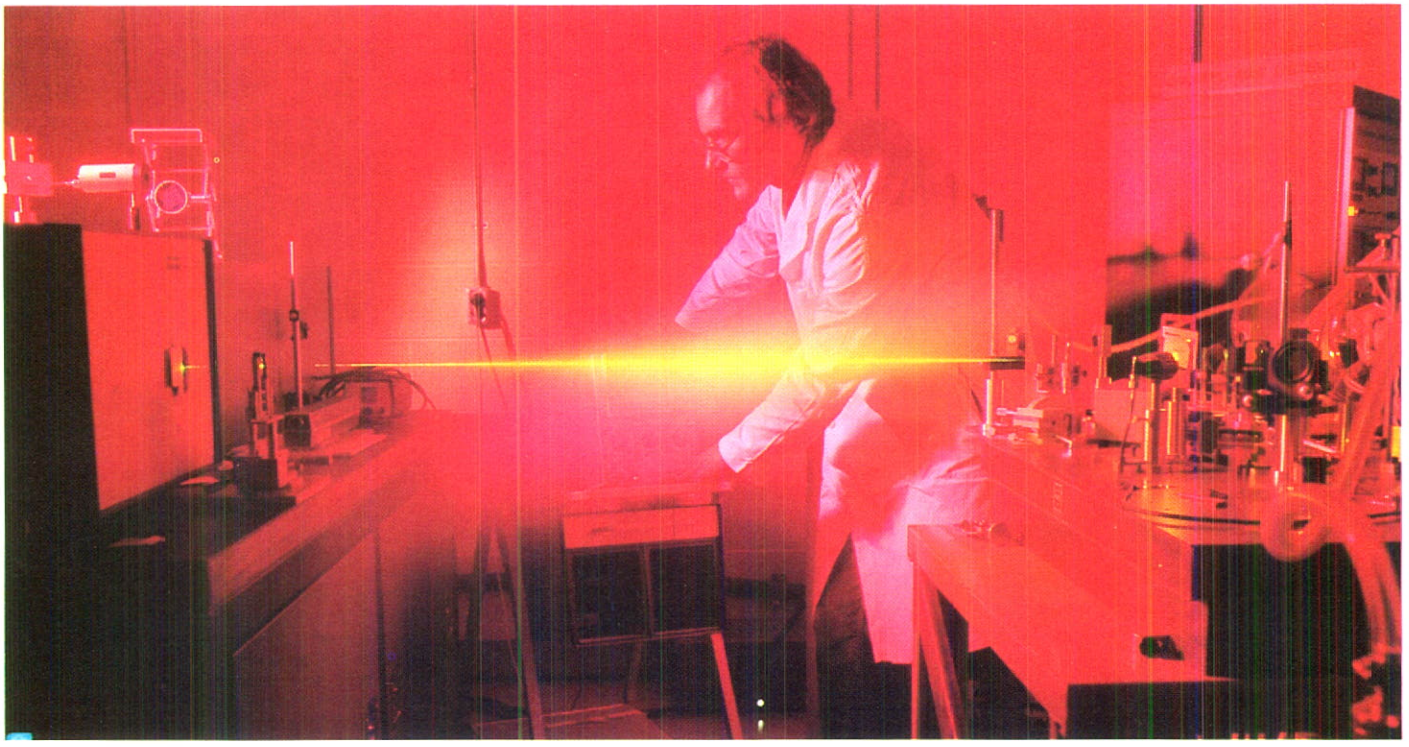
Heat pumps can extract up to three units of heat from outside air, which is solar heat, for each unit of electricity consumed, thus representing substantial savings in energy use.

In a similar field Hydro researchers are testing a model of a rotating heat-reclaiming device, called a "thermal wheel" that reclaims heat from the exhaust system of a residence and uses it to heat outside air required for ventilation purposes.

In co-operation with the Ministry of Energy, research on solar-assisted water heaters continued, with several commercial units being evaluated. Development of wind generators to supply part of the power requirements in isolated windy areas also continued in 1977.

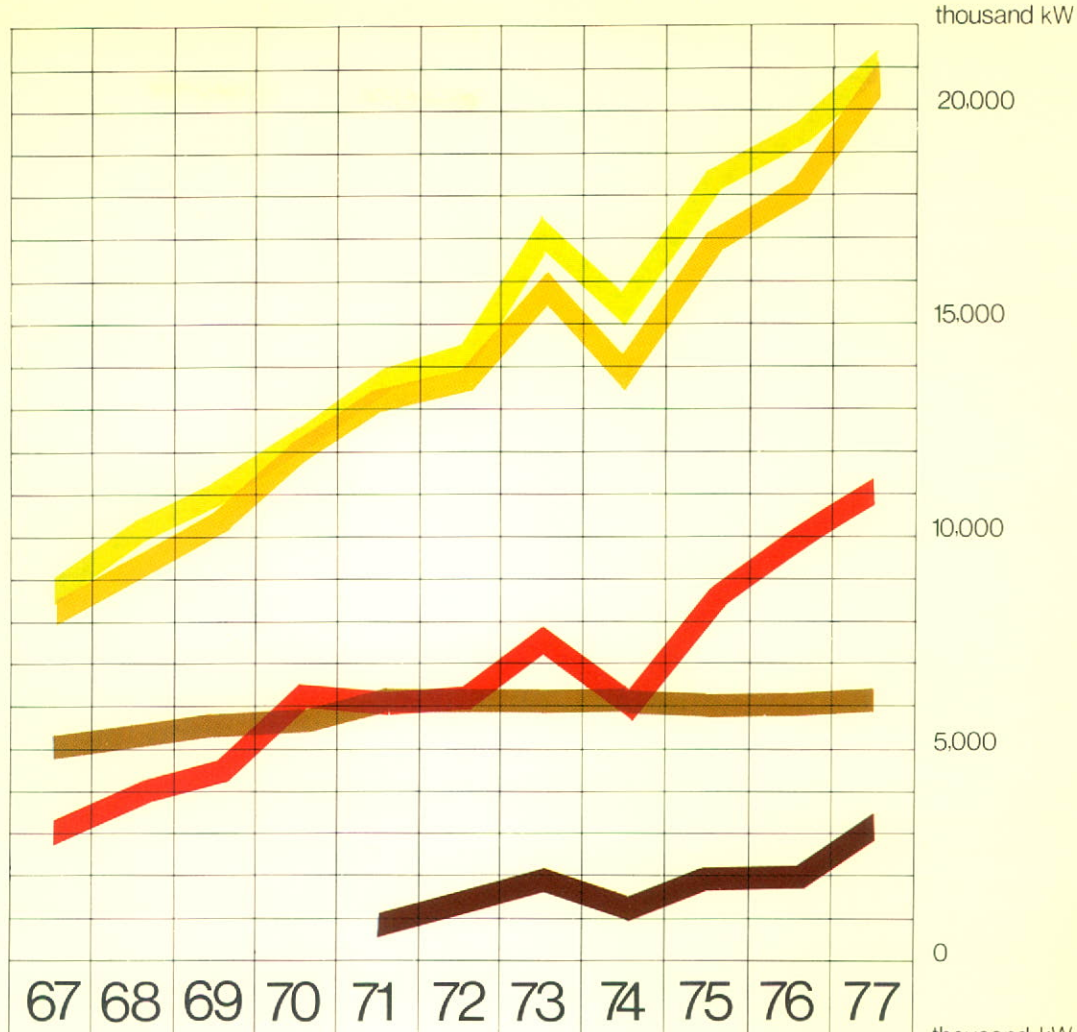
Hydro researchers are also working on two new heavy-water processes that have the potential of replacing the present hydrogen-sulphide process. One involves distilling water, using the waste heat from generating stations as the energy source.

The other uses a laser light to select deuterium-containing molecules from abundant hydrogen-containing molecules.

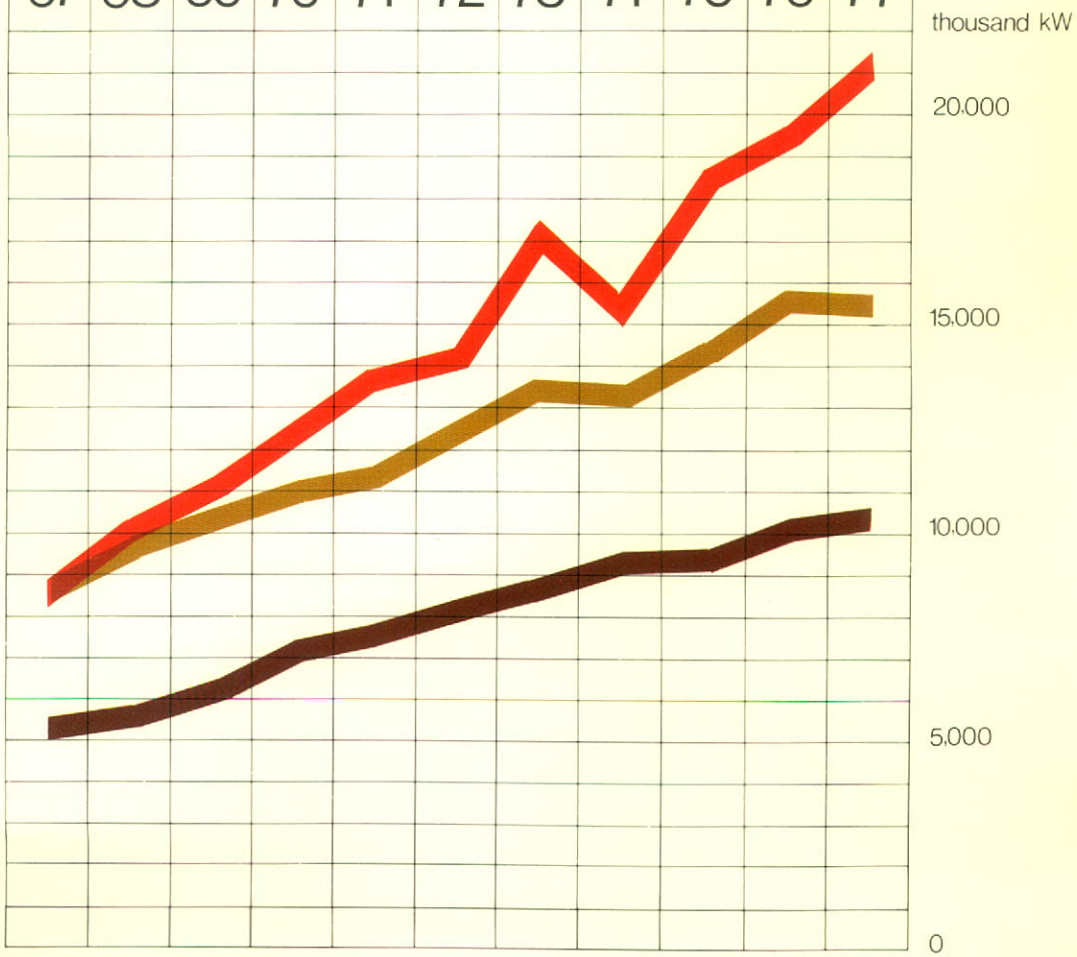


Hydro researcher explores the use of laser light as an economic alternative to present process of producing heavy water.

Dependable peak capacity of resources



Growth in demands and resources



Conservation produced dramatic savings

Planning launched in 1977 by Ontario Hydro's energy conservation division will see two field trials involving load management systems get underway this year.

Load management, the control of customer's load to reduce demands on the utility and so reduce their costs, has a significant potential to lessen the need for thermal generation capacity and assist in maintaining reliable service during system emergencies.

One trial will involve a large municipal utility and will obtain experience with recently developed sophisticated hardware for controlling distribution system components and customer loads and for meter reading. The other trial will involve a small-to-medium municipal utility and will obtain experience with the AM radio control system developed by Hydro's research division.

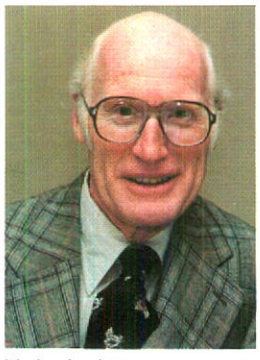
Industrial surveys in manufacturing plants were continued throughout 1977, with many plants achieving dramatic savings in consumption. Case studies developed with many large retail corporations indicated that impressive financial savings can be recorded by recycling waste heat and reducing lighting levels, with no impact on consumer sales. One pilot study at an A&P market in Toronto recorded a reduction in electrical consumption of 43,400 kilowatt-hours, simply by changing lighting times, reducing light levels and recovering waste heat from compressors.

And Ontario Hydro's aggressive in-house TRIM program proved in 1977 that the Corporation practices what it preaches in the matter of conservation. Targeted for a reduction in total energy consumption of 10 per cent in 1977, the program across the Corporation achieved a reduction of 12.5 per cent. This included energy used for environmental control and lighting of buildings which was reduced in 1977 by 16 per cent (102 million kW.h), while a conservative estimate of 1977 fuels savings in transport and work equipment is 4 per cent (300,000 gallons).

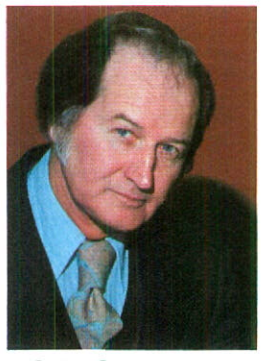
The search continues at Ontario Hydro for more efficient alternatives to incandescent light sources.

The 1978 energy reduction objective of the TRIM program is a further 6 per cent or 52 million kilowatt-hours.

Ontario Hydro General Managers



H.A. Jackson
Acting General Manager
Design & Construction



L.G. McConnell
General Manager
Operations

G.R. Currie
General Manager
Regions & Marketing

W.D. Gillman
General Manager
Computers

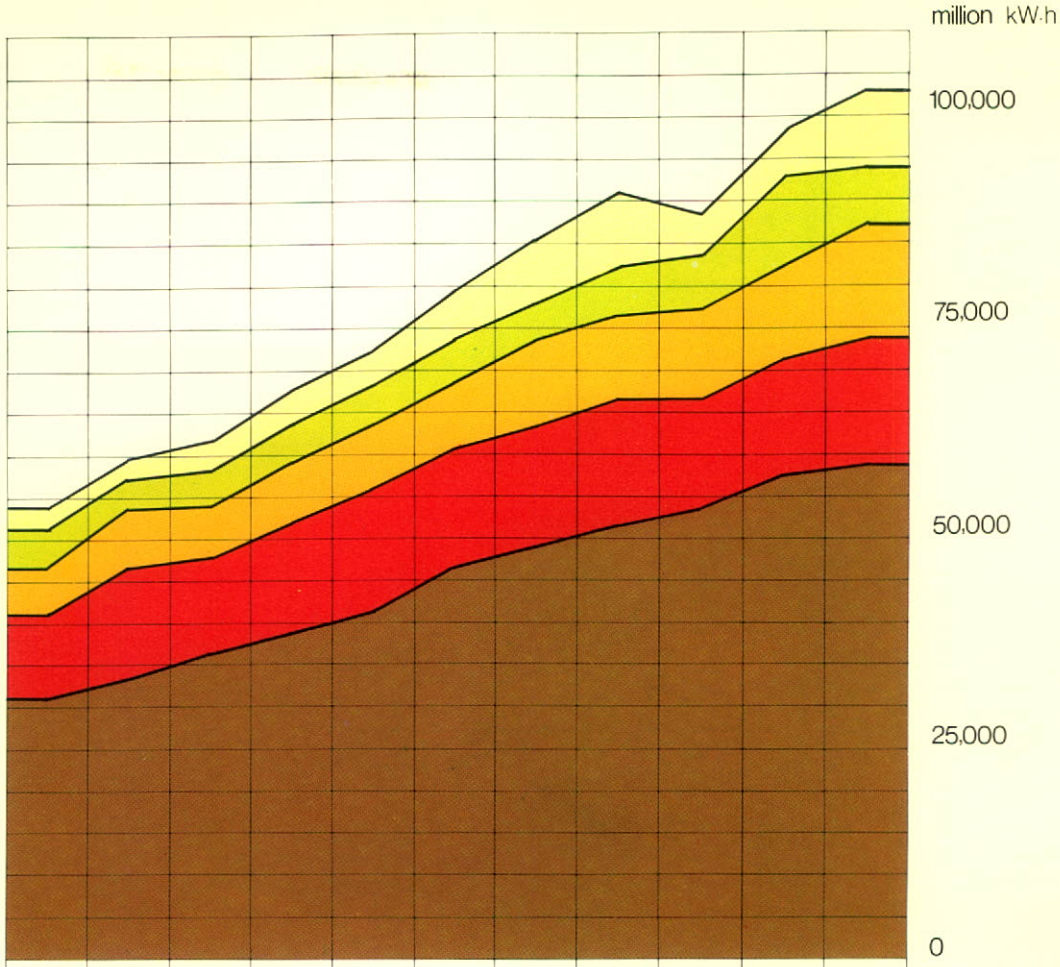
F.W. Gomer
General Manager
Finance

G.M. McHenry
General Manager
Personnel

W.C. Cunningham
General Manager
Services

H.E. Kennedy
Deputy General Manager
Services

Disposal of energy



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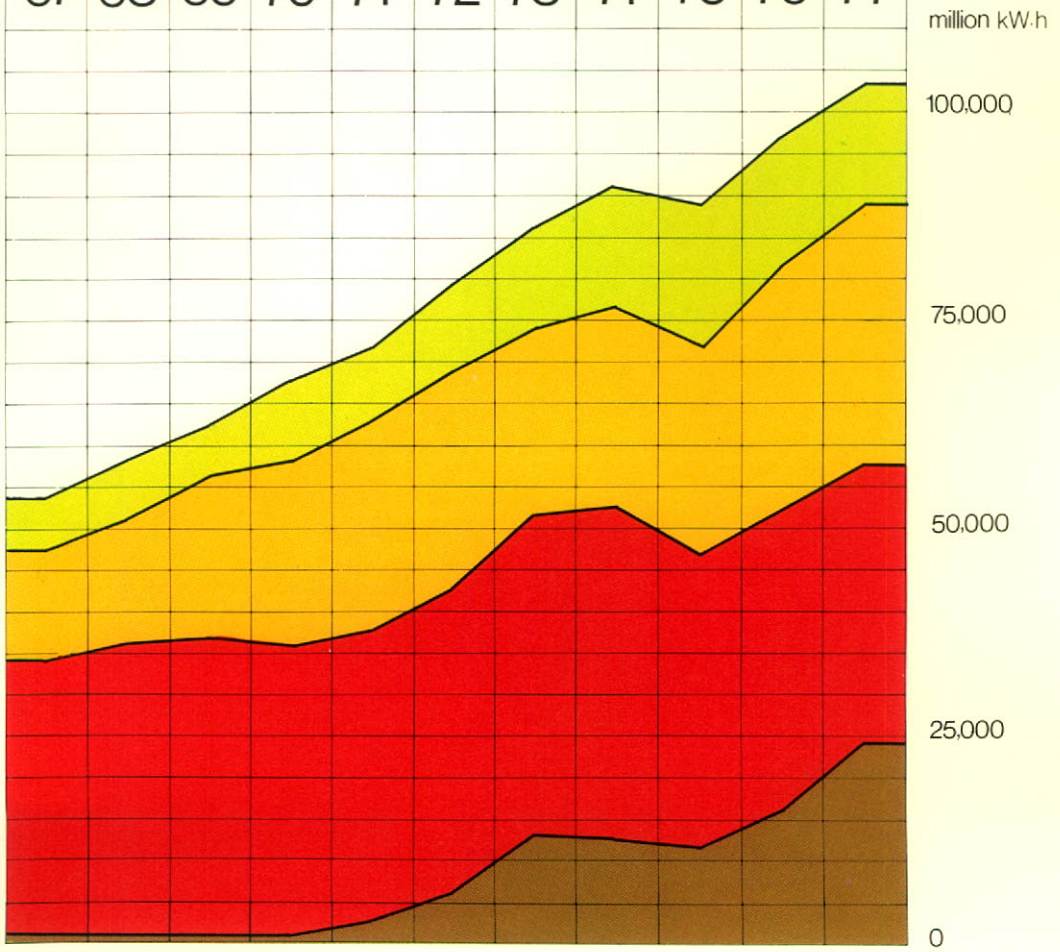
Energy made available



Contracts ensure long-term fuel supplies

On February 28, 1978 Ontario Hydro received provincial government endorsement of entry into two uranium supply contracts which will meet most of the needs of operating and committed nuclear generating stations through the year 2000 and beyond.

The contracts, with Denison Mines Limited and Preston Mines Limited, call for the delivery of 90 million kilograms (198 million pounds) of uranium oxide (U_3O_8) beginning in 1980 and through the year 2020. In Denison's case, the price to be paid is a Base Price, composed of the cost of production plus $5 per pound, plus half the difference between the Base Price and a Negotiated Price, which is intended to reflect world market conditions in the year of delivery. In Preston's case, the price is the Base Price plus one-third of the way to the Negotiated Price. Value of the uranium oxide in present-day dollars is estimated to be some $7 billion.

Artificial contamination tests at sub-zero temperatures in Ontario Hydro's environmental test chamber determine the voltage withstand strength of new suspension insulation developed for compact transmission lines.

Negotiations for uranium supplies began in 1974 after Hydro had sought proposals from every producer and potential producer known to have uranium reserves in Canada. Under the two agreements, Hydro would make prepayments totalling an estimated $339 million (in 1975 dollars) to allow the two companies to expand their facilities, creating direct, continuing employment of approximately 2,600 jobs in the Elliot Lake area.

Measures to secure a steady supply of western Canadian coal continued when agreements for rail and vessel service, terminalling facilities and purchase of rolling stock were executed during the year. Initial shipments of western Canadian coal using the integrated transportation system are expected to be made in July of 1978.

Coal deliveries to generating stations from U.S. mines totalled 9.1 million megagrams (10 million tons), 25% greater than in 1976. Supplementary spot U.S. coal purchases were made during the year to compensate for early production shortfalls and in anticipation of the United Mine Workers strike in December.

First deliveries were received in October, 1977 from the U.S. Steel Corporation's Cumberland coal mine in western Pennsylvania under Hydro's 30-year contract with that company for 82 million metric tons (90 million tons) of coal. The mine is expected to reach full production in late 1979.

FINANCIAL SECTION

Financial Review

Ontario Hydro's 1977 operating results showed significant improvement over 1976. The net income of $194 million for 1977 was $141 million greater than the 1976 net income. Total 1977 revenues of $1,969 million exceeded amounts allowed within the spirit and intent of the Anti-Inflation program by $122 million. These excess revenues, together with interest, will be applied to reduce customers' bills in 1978.

Revenues from sales of primary power and energy in 1977 were $1,759 million. This was $439 million or 33% higher than the previous year. This increase was a result of increases in rates and in the volume of sales. Revenues from sales, by class of customer, were:

Class of Customer	Revenues in $ million 1977	Revenues in $ million 1976	Per Cent Increase
Municipal utilities	1,108	838	32
Retail customers	407	312	30
Direct customers	244	170	44
TOTAL	1,759	1,320	33

Revenues from sales of secondary energy in 1977 amounted to $210 million, $120 million or 133% higher than in 1976. This increase was almost entirely the result of greater demand for secondary energy by United States utilities.

Total costs, excluding interest, rose from $1,030 million in 1976 to $1,250 million in 1977, an increase of 21%. Operation, maintenance and administration costs were higher by $72 million as a result of increases in wage and salary rates, staff levels, and prices paid for materials and services. Fuel used for electric generation increased by $56 million in 1977, due to higher prices and the continued growth in reliance upon thermal electric generation. Charges for energy produced by generating units during commissioning increased from $8 million in 1976 to $52 million in 1977 due mainly to units being commissioned for service at the Bruce generating station. Payments required under the nuclear agreement payback, associated with the Pickering generating station, increased by $9 million. In 1977, power purchased was higher by $2 million. Depreciation costs rose $36 million in 1977 to $216 million, largely as the result of new units being placed in service at Bruce, Lennox and Nanticoke generating stations.

Interest expense increased in 1977 by $86 million. This represents an increase of 27% over 1976 and is primarily the result of new borrowings during the year and foreign interest payments made at higher rates of exchange.

The amount of net income appropriated for debt retirement as required by The Power Corporation Act, increased by $10 million in 1977 to $98 million. In addition, in 1977, $96 million of net income was appropriated for the stabilization of rates and contingencies. In contrast, in 1976, a withdrawal of $35 million from the reserve for stabilization of rates and contingencies was made.

Net additions to fixed assets in 1977 were $1,413 million, increasing fixed assets in service and under construction to $11,561 million. Major capital expenditures in 1977 included $763 million for generation facilities, $237 million for transformation and transmission facilities, and $312 million for heavy water plants and facilities. The major expenditures for generating stations were $198 million at Bruce G.S., $258 million at Pickering G.S., $44 million at Nanticoke G.S., $44 million at Thunder Bay G.S., and $30 million at Wesleyville G.S. At December 31, 1977 the costs of fixed assets in service and under construction were:

Asset Classification	In-Service Cost $ million	Under Construction Cost $ million
Generation facilities	5,224	1,812
Transformation and transmission facilities	1,872	377
Retail distribution facilities	710	4
Heavy water production facilities	267	939
Administration and service facilities	350	6
TOTAL	8,423	3,138

Funds provided from operations during 1977 were $409 million while financing provided a net of $974 million in 1977. Compared to 1976, these were an increase of $167 million and a decrease of $148 million respectively. In addition, increases in interest and accounts payable amounted to $100 million in 1977.

Proceeds from issues of long-term bonds and notes during 1977 totalled $1,407 million. Canadian currency issues amounted to $754 million, while issues in United States currency amounted to $625 million (Can. $653 million). The average coupon interest rate of 1977 issues was 8.8% as compared to an average in 1976 of 9.5%. Retirement of long-term debt during the year amounted to $277 million. Short-term notes outstanding at year-end amounted to $45 million, a decrease of $84 million from 1976.

Major applications in addition to the expenditure of $1,413 million on fixed assets were increases in fuel, materials and supplies of $78 million, increases in advance payments for fuel supplies of $57 million and increases in accounts receivable and other assets of $57 million.

Auditors' Report

We have examined the statement of financial position of Ontario Hydro as at December 31, 1977 and the statements of operations, reserve for stabilization of rates and contingencies, equities accumulated through debt retirement appropriations and changes in financial position for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as we considered necessary in the circumstances.

In our opinion, these financial statements present fairly the financial position of Ontario Hydro as at December 31, 1977 and the results of its operations and the changes in its financial position for the year then ended in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.

Toronto, Canada
March 13, 1978

CLARKSON, GORDON & CO.
Chartered Accountants

Summary of Significant Accounting Policies

The accompanying financial statements have been prepared in accordance with accounting principles generally accepted in Canada. The significant accounting policies are described below.

Fixed assets

Fixed assets include power supply facilities (generation, transformation, transmission and distribution); administration and service facilities (land, buildings, office and service equipment); and heavy water production facilities.

The cost of additions and replacement of component units is capitalized. This cost includes direct material and labour, and overhead costs such as engineering, administration and procurement that are considered applicable to the capital construction program. The cost of commissioning generating units, less the value attributed to energy produced during the commissioning period, is capitalized. Interest is capitalized on construction costs at effective annual rates of 9.4% in 1977 and 9.2% in 1976. These rates approximate the average cost of long-term funds borrowed in the years in which the expenditures have been made for fixed assets under construction.

In the case of nuclear generation facilities, cost includes the cost of heavy water purchased and produced. The cost of producing heavy water includes the direct costs of production, applicable overheads, interest, and depreciation of the heavy water production facilities.

For normal retirements, the cost of assets retired less salvage proceeds is charged to accumulated depreciation with no gain or loss being reflected in operations. For unusual or premature retirements, the gains or losses on assets retired are reflected in operations.

Depreciation

Since January 1, 1971, all additions to fixed assets and the net book value of thermal-electric generating stations in service at the end of 1970 have been depreciated using the straight-line method. All other assets in service at the end of 1970 continue to be depreciated on the sinking fund method. Depreciation rates for the various classes of assets are based on the estimated service lives, which are subject to periodic review. The service lives of major asset classes are:

Generation — Hydro-electric	50 to 100 years
Generation — Thermal-electric	30 years
Transmission and distribution	25 to 50 years
Heavy water production facilities	20 years

Nuclear agreement — Pickering units 1 and 2

Ontario Hydro, Atomic Energy of Canada Limited and the Province of Ontario are parties to a joint undertaking for the construction and operation of units 1 and 2 of Pickering Nuclear Generating Station, with ownership of these units being vested in Ontario Hydro. Contributions to the capital cost by Atomic Energy of Canada Limited and the Province of Ontario amounted to $258 million and these have been deducted in arriving at the value of fixed assets in service in respect of Pickering units 1 and 2. Ontario Hydro is required to make monthly payments until the year 2001 to each of the parties in proportion to their capital contributions. These payments, termed "payback", represent in a broad sense the net operational advantage of having the power generated by Pickering units 1 and 2 as compared with coal-fired units similar to Lambton units 1 and 2.

Commissioning energy

Revenues from the sale of power and energy include revenues from energy produced by generating units during the commissioning period. A charge is included in the cost of operations for the value attributed to the energy produced during the commissioning period. This charge is equivalent to the operating and fuel costs of producing the same quantity of energy at generating units displaced because of the commissioning activity. As explained under Fixed Assets, the cost of commissioning generating units, less the value attributed to the energy produced during the commissioning period, is capitalized.

Appropriations from net income

Under the provisions of The Power Corporation Act, the price payable by customers for power is the cost of supplying the power. Such cost is defined in the Act to include the cost of operating and maintaining the system, depreciation, interest, and the amounts appropriated for debt retirement and stabilization of rates and contingencies.

The debt retirement appropriation is the amount required under the Act to accumulate in 40 years a sum equal to the debt incurred for the cost of the fixed assets in service. The appropriation for or withdrawal from the stabilization of rates and contingencies reserve is an amount established to maintain a sound financial position or to stabilize the effect of abnormal cost fluctuations.

Foreign currency translation

Long-term debt payable in foreign currencies is translated to Canadian currency at rates of exchange at the time of issue. Current monetary assets and liabilities, including long-term debt payable within one year, are adjusted to Canadian currency at year-end rates of exchange. The resulting translation gains or losses, together with realized exchange gains or losses, are credited or charged to interest expense in the statement of operations.

Advance payments for fuel supplies

As part of its program to ensure the adequate supply of fuels for its generating stations, Ontario Hydro has entered into long-term contracts for the supply of coal, oil and uranium. Where these contracts require Ontario Hydro to make payments in advance of product delivery, the prepayments and associated costs such as interest are carried in the accounts as advance payments for fuel supplies. These advance payments are to be amortized as part of the cost of the fuels delivered under the contracts or are to be recovered over periods which do not exceed the life of the contracts.

Pension and Insurance Plan

The Pension and Insurance Plan is a contributory, defined benefit plan covering all regular employees of Ontario Hydro. The pension costs for each period include current service costs and amounts required to amortize any unfunded obligation. The most recent actuarial valuation of the plan, at December 31, 1976, reported an unfunded obligation of Ontario Hydro of approximately $143 million. Of this amount, $105 million, representing an experience deficiency and deficits resulting from changes in actuarial assumptions, is being amortized over the years 1977 through 1981. The balance of $38 million, representing an unfunded liability with respect to improved benefits, is being amortized over the years 1977 through 1991.

Statement of Operations
for the year ended December 31, 1977

	1977 $'000	1976 $'000
Revenues		
Primary power and energy	1,759,041	1,319,624
Secondary power and energy	210,046	90,278
	1,969,087	1,409,902
Less excess revenues (note 1)	122,093	—
	1,846,994	1,409,902
Costs		
Operation, maintenance and administration	414,307	342,134
Fuel used for electric generation (note 10)	441,902	385,382
Power purchased	75,842	74,156
Commissioning energy (note 10)	52,322	7,548
Nuclear agreement — payback	49,643	40,432
Depreciation	215,601	180,213
	1,249,617	1,029,865
Income before interest and extraordinary item	597,377	380,037
Interest (note 2)	403,828	318,121
Income before extraordinary item	193,549	61,916
Extraordinary item (note 3)	—	9,419
Net income	**193,549**	52,497
Appropriation for (withdrawal from):		
Debt retirement as required by The Power Corporation Act	98,078	87,635
Stabilization of rates and contingencies	95,471	(35,138)
	193,549	52,497

See accompanying summary of significant accounting policies and notes to financial statements.

Statement of Financial Position
as at December 31, 1977

Assets	1977	1976
	$'000	$'000
Fixed Assets		
Fixed assets in service, at cost	8,423,173	6,943,457
Less accumulated depreciation	1,607,067	1,404,982
	6,816,106	5,538,475
Fixed assets under construction, at cost	3,137,872	3,217,984
	9,953,978	8,756,459
Current assets		
Cash and short-term investments (note 4)	447,973	375,963
Accounts receivable	256,035	203,079
Fuel for electric generation, at cost	357,502	295,300
Materials and supplies, at cost	99,271	83,526
	1,160,781	957,868
Other assets		
Advance payments for fuel supplies (note 5)	95,077	37,908
Long-term investments (note 6)	68,623	68,672
Unamortized debt discount and expense	91,003	81,211
Long-term accounts receivable and other assets	16,173	21,557
	270,876	209,348
	11,385,635	9,923,675

See accompanying summary of significant accounting policies and notes to financial statements.

Liabilities	1977 $'000	1976 $'000
Long-term debt		
Bonds and notes payable (note 7)	8,640,531	7,502,298
Other long-term debt (note 8)	268,232	276,400
	8,908,763	7,778,698
Less payable within one year	212,910	147,519
	8,695,853	7,631,179
Current liabilities		
Accounts payable and accrued charges	428,086	373,165
Short-term notes payable	44,935	128,740
Accrued interest	217,647	168,304
Long-term debt payable within one year	212,910	147,519
Excess revenues payable (note 1)	122,093	—
Estimated liability on cancellation of heavy water plant	7,348	11,479
	1,033,019	829,207
Equity		
Equities accumulated through debt retirement appropriations	1,279,667	1,181,569
Reserve for stabilization of rates and contingencies	250,401	155,025
Contributions from the Province of Ontario as assistance for rural construction	126,695	126,695
	1,656,763	1,463,289
	11,385,635	9,923,675

On behalf of the Board

Chairman

President

Toronto, Canada
March 13, 1978

Reserve for Stabilization of Rates and Contingencies for the year ended December 31, 1977

	Held for the benefit of all customers	Held for the benefit of (or recoverable from) certain groups of customers			Totals	
		Municipalities	Direct Customers	Retail Customers	1977	1976
	$'000	$'000	$'000	$'000	$'000	$'000
Balances at beginning of year	196,063	1,144	(6,537)	(35,645)	155,025	190,198
Appropriation (withdrawal)	92,151	95	(96)	3,321	95,471	(35,138)
Deficit recovered from municipalities on annexations	—	—	—	—	—	55
Payment to Ontario Municipal Electric Association (note 9)	—	(95)	—	—	(95)	(90)
Balances at end of year	288,214	1,144	(6,633)	(32,324)	250,401	155,025

Equities Accumulated through Debt Retirement Appropriations for the year ended December 31, 1977

	Municipalities	Power District (Retail and Direct Customers)	Totals	
			1977	1976
	$'000	$'000	$'000	$'000
Balances at beginning of year	816,832	364,737	1,181,569	1,094,081
Add:				
Debt retirement appropriation	64,115	33,963	98,078	87,635
Annexation transfers and refunds	75	(55)	20	(147)
Balances at end of year	881,022	398,645	1,279,667	1,181,569

See accompanying summary of significant accounting policies and notes to financial statements.

Statement of Changes in Financial Position for the year ended December 31, 1977

		1977 $'000	1976 $'000
Source of funds			
Operations			
Income before extraordinary item		193,549	61,916
Depreciation, a charge not requiring funds in the current year		215,601	180,213
		409,150	242,129
Financing			
Long-term debt			
Bonds and notes issued	1,406,720		1,539,245
Less retirements	276,655		252,188
	1,130,065		1,287,057
Short-term notes payable — (decrease)	(83,805)		(51,400)
Cash and investments — (increase)	(71,961)		(113,334)
		974,299	1,122,323
Excess revenues (note 1)		122,093	—
Increase in accounts and interest payable including estimated liability on cancellation of heavy water plant		100,133	42,402
		1,605,675	1,406,854
Application of funds			
Net additions to fixed assets		1,413,120	1,309,378
Increase in advance payments for fuel supplies (note 10)		57,169	12,911
Increase in fuel, materials and supplies		77,947	12,288
Increase in accounts receivable and other assets (note 10)		57,439	62,858
Extraordinary item-loss on cancellation of heavy water plant (note 3)		—	9,419
		1,605,675	1,406,854

See accompanying summary of significant accounting policies and notes to financial statements.

1. Anti-Inflation program

Effective October 14, 1975 the Government of Canada passed the Anti-Inflation Act (Canada). Subsequently, the Province of Ontario entered into an agreement with the Federal Government whereby Ontario Hydro is subject to the guidelines under this Act only in the matter of employee compensation. Management is of the opinion that Ontario Hydro is in compliance with the requirements of the anti-inflation legislation insofar as employee compensation is concerned.

Ontario Hydro is also required by the Province of Ontario to conform with the spirit and intent of the Federal Anti-Inflation program as it applies to net income. As a result of higher than anticipated secondary revenues and lower than anticipated costs in 1977, the Corporation had excess revenues of $122 million. These excess revenues, together with interest, will be applied to reduce customers' bills over the 12 months of 1978.

2. Interest

Interest costs consisted of:	1977	1976
	$'000	$'000
Interest on bonds, notes and other debt	753,251	612,735
Less:		
Interest capitalized on fixed assets under construction	279,492	244,223
Interest charged to advance payments for fuel supplies	4,132	2,708
Interest earned on short-term and long-term investments	56,874	51,836
Net gain on redemption of bonds and sale of investments	5,201	1,187
Net exchange gain (loss) on redemption and translation of foreign assets and liabilities	3,724	(5,340)
	349,423	294,614
	403,828	318,121

3. Extraordinary item

During 1975, in response to the Ontario Government's concern about capital availability, Ontario Hydro reviewed and made revisions to its capital construction program. As a result, Bruce Heavy Water Plant "C", the cost of which had been estimated to be $562 million, was cancelled. This cancellation resulted in extraordinary charges against income of $60 million in 1975 and $9.4 million in 1976 to write off the cost of preliminary construction and to provide for the costs of cancellation of contracts.

4. Cash and short-term investments

	1977	1976
	$'000	$'000
Cash and short-term investments, with short-term investments recorded at the lower of cost or market (approximately market value), consisted of:		
Cash (overdraft)	(10,187)	9,848
Notes of, and interest bearing deposits with, banks and trust companies	306,715	216,644
Corporate bonds and notes	82,930	96,472
Government and government-guaranteed bonds	68,515	52,999
	447,973	375,963

5. Advance payments for fuel supplies

The advance payments consisted of:	1977	1976
	$'000	$'000
Coal supply	58,589	37,908
Residual fuel oil supply	36,488	—
	95,077	37,908

Based on present commitments, additional advance payments for fuel supplies, including uranium supply, will total approximately $362 million over the next five years (including approximately $101 million in 1978).

6. Long-term investments

	1977	1976
	$'000	$'000
These investments are recorded at amortized cost and consisted of:		
Government and government-guaranteed bonds	68,623	68,672

Market value of these investments at December 31, 1977 was $58 million. (1976 — $58 million)

7. Bonds and notes payable

Bonds and notes payable, expressed in Canadian dollars, are summarized by years of maturity and by the currency in which they are payable in the following table:

	1977				1976	
Years of maturity	Principal outstanding $'000			Weighted Average Coupon Rate	Principal outstanding $'000	Weighted Average Coupon Rate
	Canadian	Foreign	Total			
1977	—	—	—		139,424	
1978	140,530	63,601	204,131		228,701	
1979	141,300	10,459	151,759		156,402	
1980	78,050	178,735	256,785		290,785	
1981	208,267	94,430	302,697		330,048	
1982	271,434	183,746	455,180		—	
1 - 5 years	839,581	530,971	1,370,552	7.3%	1,145,360	6.7%
6 - 10 years	386,773	826,117	1,212,890	7.4	1,389,663	7.6
11 - 15 years	368,292	246,578	614,870	7.2	538,680	7.1
16 - 20 years	769,434	384,319	1,153,753	8.1	965,561	8.3
21 - 25 years	1,291,180	641,046	1,932,226	9.1	2,174,561	8.9
26 - 30 years	900,000	1,456,240	2,356,240	9.0	1,288,473	8.9
	4,555,260	4,085,271	8,640,531		7,502,298	

Currency in which payable		
Canadian dollars	4,555,260	4,006,966
United States dollars	3,842,686	3,248,187
West German Deutsche marks	127,924	132,484
Swiss francs	114,661	114,661
	8,640,531	7,502,298

Bonds and notes payable in United States dollars include $2,651 million (1976 — $2,250 million) of Ontario Hydro bonds held by the Province of Ontario and having terms identical with Province of Ontario issues sold in the United States on behalf of Ontario Hydro. Except for these issues, all bonds and notes payable are guaranteed as to principal and interest by the Province of Ontario.

Long-term bonds and notes payable in foreign currencies are translated into Canadian currency at rates of exchange at time of issue. If Ontario Hydro were to translate the face value of its foreign bonds and notes payable at rates of exchange current on December 31, 1977, the total amount of these liabilities would have to be increased by $440 million.

8. Other long-term debt

	1977	1976
	$'000	$'000
Other long-term debt consisted of:		
(a) The balance due to Atomic Energy of Canada Limited for the purchase of Bruce Heavy Water Plant "A". Under the purchase agreement, Ontario Hydro pays equal monthly instalments of blended principal and interest to December 28, 1992, with interest at the rate of 7.795%	224,486	232,176
(b) Capitalized lease obligation for the head office building at 700 University Avenue, Toronto. The lease obligation is for the 30-year period ending September 30, 2005, payable in United States dollars at an effective interest rate of 8%.	43,746	44,224
	268,232	276,400

Payments required on the above debt, exclusive of interest, will total $51 million over the next five years. The amount payable within one year is $8.8 million (1976 — $8.1 million).

9. Payment to Ontario Municipal Electric Association

The amount of this payment is equivalent to interest on the balance held for the benefit of Municipalities in the Reserve for Stabilization of Rates and Contingencies.

10. Reclassification of 1976 amounts

(a) In prior years, the value attributed to energy produced during the commissioning period was included in the cost of fuel used for electric generation. To be consistent with the 1977 presentation, 1976 amounts have been reclassified in the Statement of Operations.
(b) Changes have been made in the classification of items in the Statement of Changes in Financial Position. The presentation of the comparative 1976 items has been changed to conform with the 1977 presentation.

11. Subsequent event

In February 1978 the Board of Directors, following receipt of a revised load forecast projecting a substantially lower rate of growth than previously forecast for the period up to 1987, initiated a review of the current construction program. This review will not affect the 1977 financial statements. The financial effects, if any, upon 1978 and subsequent years cannot be determined at this time.

Progress on power developments

Nanticoke: Despite serious technical problems during 1977, Nanticoke's net peak output of 2,910 megawatts on November 25 is the largest amount of power ever produced at a single thermal generating station in Canada. Technical problems were first encountered at Nanticoke in late 1976 when defective boiler hanger rods were discovered. The installation of new hanger rods began in July 1977, and all eight units were completed by November. Concurrent with this problem, cracks were discovered in the generator rotors of units of similar design in the United Kingdom. Checks were made of the Nanticoke rotors and small cracks were found. Interim corrective action was taken while investigation into the cause continued. The investigation is now complete and modifications designed to eliminate the problem will be carried out in 1978 and 1979.

Lennox: The fourth and last unit of the 2,295,000 kilowatt oil-fired station was declared in service in early January, 1977.

Bruce: On September 1, the first two units of the 3,200,000 kilowatt Bruce A nuclear station were declared in service. The third unit was added in February, 1978, and the last unit should be in service by early 1979. Work on the Bruce B station is well underway, with the first unit expected to be in service by 1983. Work is nearing completion on Bruce Heavy Water Plant B. Although parts of the plant are now in service, the total plant will not be in full operation until early 1980. Bruce Heavy Water Plant D is under construction and 25 per cent complete at year's end.

Arnprior: The second and last unit at the 74,100 kilowatt hydro-electric station was declared in service in March, 1977.

Thunder Bay: Lack of precipitation in northwestern Ontario prevailed throughout the first half of 1977, causing a shortage of hydraulic generation. Consequently, the coal-fired, 100,000 kilowatt unit at Thunder Bay achieved an unprecedented capacity factor of 90 per cent during the January-May period. Meanwhile, work continued on the 300,000 kilowatt extension to the Thunder Bay station. The two lignite-fired units are expected to be in service by 1981.

Pickering: Construction is well advanced on the four-unit Pickering B nuclear station. The first of the 540,000 kilowatt units is expected to be in operation in 1981.

Darlington: Site work was started in 1977 on the 3,400,000 kilowatt Darlington nuclear power station on Lake Ontario between Bowmanville and Oshawa. The four-unit station should be fully operational by 1988.

Wesleyville: Following a one year postponement, work resumed on the 2,295,000 kilowatt Wesleyville station. The first of four oil-fired units should be in service near the end of 1981.

J. Clark Keith: Modernization of the four-unit J. Clark Keith generating station continued in 1977. The 264,000 kilowatt coal-fired station will be outfitted with improved electrostatic precipitators and a single stack. These measures will help the station meet the air quality requirements.

Hydro's continued concern with the protection of the environment is evident in the new A. W. Manby hydraulic test laboratory, simulating the cooling water intake and thermal discharge plume of the Bruce nuclear power development. From the model, scientists and engineers can study the impact generating stations have on Ontario's rivers and lakes.

The transmission system

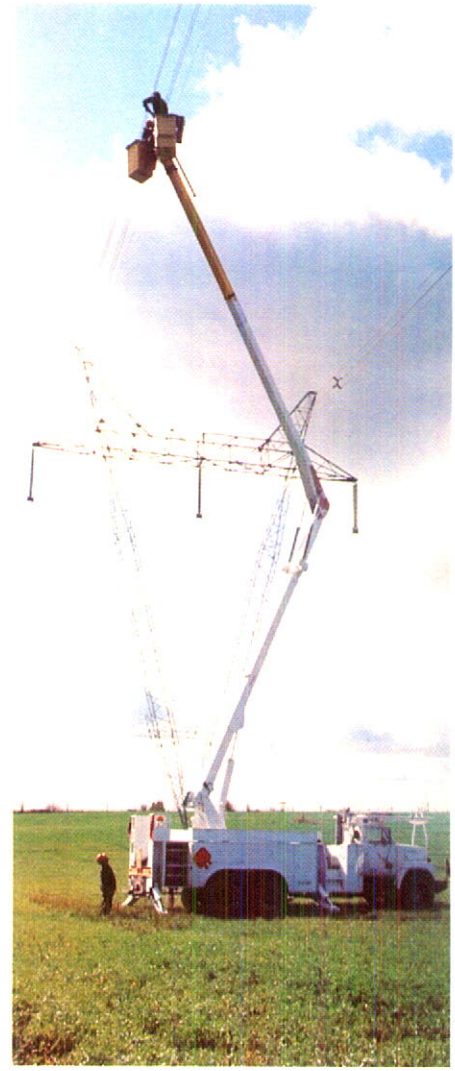
The design, construction and acquisition of property for the 500 kV transmission line corridor from Middleport transformer station to connect to new transformer stations near Milton, Trafalgar and Claireville continued in 1977. The 500 kV line from Milton to Trafalgar was completed and significant progress was made in the construction of the other line sections.

Considerable opposition is still being encountered to the route of the 500 kV line from Bruce generating station to Milton transformer station. Construction commenced on portions of the line between Bruce generating station and Colbeck where property rights could be obtained. The completion date for the line is indefinite pending the outcome of hearings before the Ontario Municipal Board and the Niagara Escarpment Commission.

Since the third unit of the Bruce A nuclear station began producing power in December of 1977, there have been times when energy is locked in due to the lack of a 500 kV line. This loss of energy will cost an estimated $12 million during 1978 as Hydro turns to more expensive, fossil-fuelled plants in the system to replace the locked-in power.

Expropriation hearings were held on the 500 kV line from Lennox generating station to Oshawa and the Minister approved the expropriation in February, 1978. In addition a number of 230 kV and 115 kV transmission lines were completed during the year involving the construction of approximately 320 kilometers (200 miles) of line.

Old-time corduroy road saves Beverley Swamp during 500 kV line construction.



Once called a "cherry picker," this 75-foot insulated aerial lift allows linemen to work on energized 500 kilovolt lines.

Hydraulic plants upgraded

While construction and expansion of thermal plants continues apace, Ontario Hydro is also active in the upgrading of some of the older hydraulic plants and is studying the technical, economic and environmental possibilities of the northerly flowing rivers.

At the Chats Falls, Abitibi Canyon and Des Joachims hydraulic plants, Hydro is installing modern and more efficient generating equipment. It has also launched a five year study program re-examining the economic feasibility of previously identified power sites, plant extensions and redevelopment schemes.

Ontario Hydro is also pursuing the development of small, air-transportable turbine generators for northern and isolated settlements. These generators, rated at 150 kilowatts, use siphon penstocks or small dams across only a portion of the river. Pilot projects are currently under way, including one at Deer Lake.

Hydro purchases 86% Canadian

Compared with the $1 billion value of awards in 1976, the 1977 total value stood at $1.4 billion, excluding the value of primary fuel. The $400 million rise over 1976 can be attributed to increased buying activity associated with a growth in Ontario Hydro's construction program which moderated during 1976.

During 1977, outstanding commitments increased from $1.77 billion in 1976 to $1.95 billion.

Excluding primary fuel, 86 per cent of the total value of 1977 purchases were directed to Canadian sources, and 88 per cent of this business was placed in Ontario. Ontario Hydro is therefore continuing in its efforts to award business to, and stimulate the development of, Canadian suppliers wherever possible.

In general, availability of materials continued to be excellent in 1977 with a highly competitive environment in evidence, one which should persist for the next few years.

Staff relations, health and safety

Ontario Hydro's relations with its 25,000 employees remained generally good throughout 1977, and its record in the health and safety sector is high in comparison with other utilities and industries in Canada.

Wage and salary settlements were below the limits established under Anti-Inflation Board guidelines. These agreements were aided by the Corporation's regular discussions with the two bargaining agencies representing the vast majority of regular staff.

Health and safety performance continues at a high level, specifically in the nuclear program, and especially in the occupational radiation protective sector. From 1959 there have been no fatalities from any cause and there has not been a single lost-time day due to exposure to ionizing radiation. This period represents 35 million manhours.

A long range health study being carried out by Dr. T. Anderson of the University of Toronto shows that all major categories of employees in Ontario Hydro are healthier than the average person in the Ontario population, with no indication of any statistically significant increased incidence of cancer or other occupational related disease among any segment of the work force.

Public, government in Hydro planning

The expansion of the provincial electrical system in the past year has witnessed a major effort by Ontario Hydro to involve potentially affected publics and governments in the planning process.

To ensure public debate and input in the matter of line and site locations, teams involving several disciplines within Hydro worked directly with citizens and elected officials. As an example, a total of 82 meetings were held in 1977 to examine and evaluate 24 projects falling under the new requirements and exemption clauses of the Environmental Assessment Act. In Eastern Ontario, this process identified four possible generating sites out of a possible 23. In each case the Hydro/citizens' groups examined the study area, the need for the facility and the alternatives available, as well as the environmental and socio-economic factors involved. At year's end, 28 additional projects were under active public participation planning.

Since energy saving begins in the home, Hydro conservationists move into the kitchen to evaluate the energy efficiency of pots, pans and electric ranges. Their studies show that cooking costs can be reduced, with no loss of quality, using energy-efficient appliances and methods.

Why Electricity Costs More

Ontario Hydro
700 University Avenue
Toronto, Ontario

Dear Sir:

I am a life-long resident of Ontario and have always had great admiration for Hydro and the cheap electricity it provided.

Things seem to have come unstuck in an awful hurry. I understand about the market manipulation of the OPEC oil-producing countries and why the price of gasoline, oil, and natural gas is going up — even though I don't like it.

But, why has Hydro jumped on this charge-what-the-market-will-bear bandwagon? We used to have cheap power in this province and I thought Hydro was supposed to produce electricity at what it cost and not make any profit, regardless of what prices of other energy companies might be.

What's going on down there in Toronto?

A concerned Hydro customer

The cost of electricity has risen substantially in recent years, prompting an increasing number of letters like the one above. The simple reason why Hydro bills are rising is that it costs more to manufacture electricity than it used to.

Yes, electricity *is* a manufactured product, although many people seem to regard it as a service or as a natural resource of this province. As for other manufactured products, although with the profit factor removed, the final cost of electricity to the customer in Ontario is dictated by the prices of the ingredients in the recipe for electric energy — the primary fuel sources necessary to operate generating stations; the steel, aluminum, electrical equipment, property, wages, and salaries that are all required to operate and develop the provincial power system to meet customer demands.

Fuel costs

The chart opposite shows that the cost of the fuel needed to produce electricity took the largest part of the customer's dollar in 1977 — 22 cents. Rising costs of fuel are a primary reason for the higher price of electricity in Ontario as the contribution of water power to the total has diminished. In 1973, coal had to be imported by Ontario Hydro from mines in the United States at a cost of $13 per ton ($14 per megagram). In four short years that price ballooned to $35 per ton ($38 per megagram).

Fossil fuels not only cost more, they also contribute an increasing share to electric production, and the major factor in the rise of electric bills is the shift in the source of electric power from falling water to expensive fuel sources. As late as 1960, 99.5 per cent of the power generated by Ontario Hydro came from hydro-electric stations utilizing most of the fast-flowing and accessible Ontario rivers. By 1977, hydro-electric generation constituted only about 37 per cent of total energy generated while thermal generation — coal, oil, natural gas, uranium — supplied the rest. So, in a decade and a half, Ontario has moved from a position of enjoying electricity produced from a virtually free, almost inflation-proof primary energy source — water power — to a reliance on fuels that are expensive and subject to inflationary pressures.

Interest charges

Twenty-one cents of each customer dollar in 1977 went to meet interest charges on the money Hydro has borrowed to pay for new power facilities. As demands for electricity grow, Ontario Hydro has had to expand its power system to meet these needs. New generating plants and transmission lines must be built. Major borrowings are required to help finance the costs of these expensive undertakings. Because of larger borrowings and higher interest rates, this cost has gone up by 110 per cent over the past five years.

Operating costs

Another 21 cents of each customer dollar was applied to the cost of operating, maintaining, and administering the provincial power system. The cost of OM&A has risen by an annual average of 14.3 per cent over the past five years. The two primary components are labor and materials. Since 1973 the annual escalation in labour costs has ranged from a high of 17.3 per cent in 1974 to a low of 9.3 per cent in 1977. The annual average increase in the number of people employed by Hydro over the same five year term was 2.3 per cent. Inflation has caused substantial increases in equipment and material costs in the same period.

Depreciation a factor

Eleven cents of each dollar represented the depreciation of power system facilities. That is the annual charge established to recover the original cost of capital facilities over their estimated useful service lives. The effect of inflation on the cost of building new facilities has also contributed to increased charges in this sector.

Appropriations to reserves

Ten cents of each dollar was applied to the retirement of debt (a statutory requirement) and to the reserve for the stabilization of rates and contingencies. It is vital that Ontario Hydro maintain its financial integrity. If the Corporation is to continue to be able to borrow the money it requires at reasonable interest rates it must demonstrate that it is financially sound. Much the same rules apply to each of us and to our personal finances. If you want to borrow money to purchase a new car, the one thing the lender wants to know is how much debt you already have. If he discovers that you owe other people for almost every asset you possess, he could refuse the loan or charge a much higher interest rate on the loan. Such is the risk run by Ontario Hydro if its debt is allowed to get too high. Hydro must avoid an over-reliance on borrowed capital and make sure that sufficient revenues are obtained from customers to keep its credit rating secure.

Purchased power

A further seven cents of each dollar goes for power purchased at economical prices from other utilities. This seven cents also includes charges equivalent to the operating and fuel costs incurred in producing the same quantity of energy at generating units displaced in the process of commissioning new units.

Nuclear payback

When Ontario Hydro built Pickering A, Canada's first full scale, commercial nuclear station, the governments of Canada and Ontario shared the risk of this new technology by contributing to the capital cost. Two cents of each dollar was applied to a portion of these loans in 1977.

Customer rebate

Six cents of each dollar of revenue in 1977 is being returned to Hydro customers in the form of an anti-inflation rebate applied to their bills in 1978.

In July of 1977, Hydro informed the Ontario Energy Board that it was forecasting excess revenue of $108 million for 1977 because of several unexpected factors. The OEB reviews in public hearings each rate increase proposed by Hydro. Although Hydro is technically exempt from the federal anti-inflation guide lines, Hydro and the provincial government decided when the program was introduced that any application for rate increases before the Ontario Energy Board would conform to the spirit and intent of the program.

The factors which produced the extra revenue — finally determined to be $122 million — included profits from sales of power to the United States, the reduction in the projected cost of operation, maintenance, and administration already mentioned, and the continued outstanding performance of the Pickering A nuclear station.

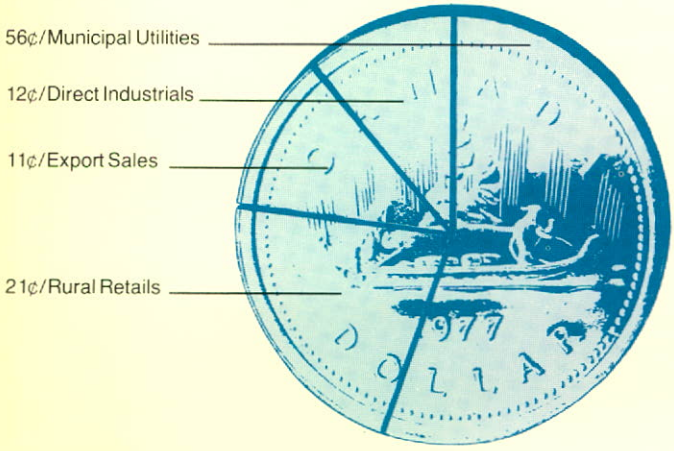
The total unit cost of electricity produced from Pickering's nuclear reactors is about one half of that from a comparable coal-burning station. Nuclear energy contributed more than a quarter of Hydro's total production for the first time in 1977.

The future

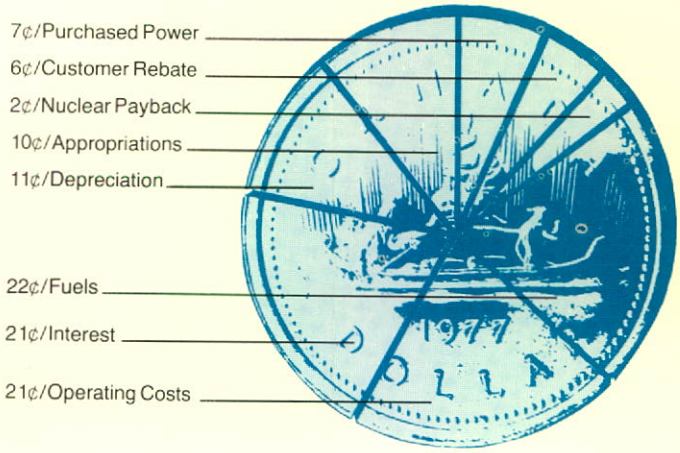
Although there will be further increases in the real price of electricity in the near term, that is, after the effects of inflation are allowed for, the transition from a low-cost hydro-electric system to a higher-cost thermal one is nearly at its end.

For the future, nuclear energy offers the promise of much greater stability in that element of the cost of electricity that in 1977 took the largest part of the customer's dollar — fuel. Although the raw materials and equipment that go into a nuclear station are subject to pressures of inflation, once the plant is finished it becomes about as inflation-proof as one can get because the cost of its fuel — uranium — represents such a small amount of the cost of the energy produced compared with a plant using coal, oil, or natural gas.

Where each Hydro dollar came from:



Where each Hydro dollar went:



Western Canadian coal for Ontario Hydro

One of the largest bulk transportation systems ever launched in Canada, involving millions of tons of western Canadian coal for Ontario Hydro boilers, will commence operation late in 1978.

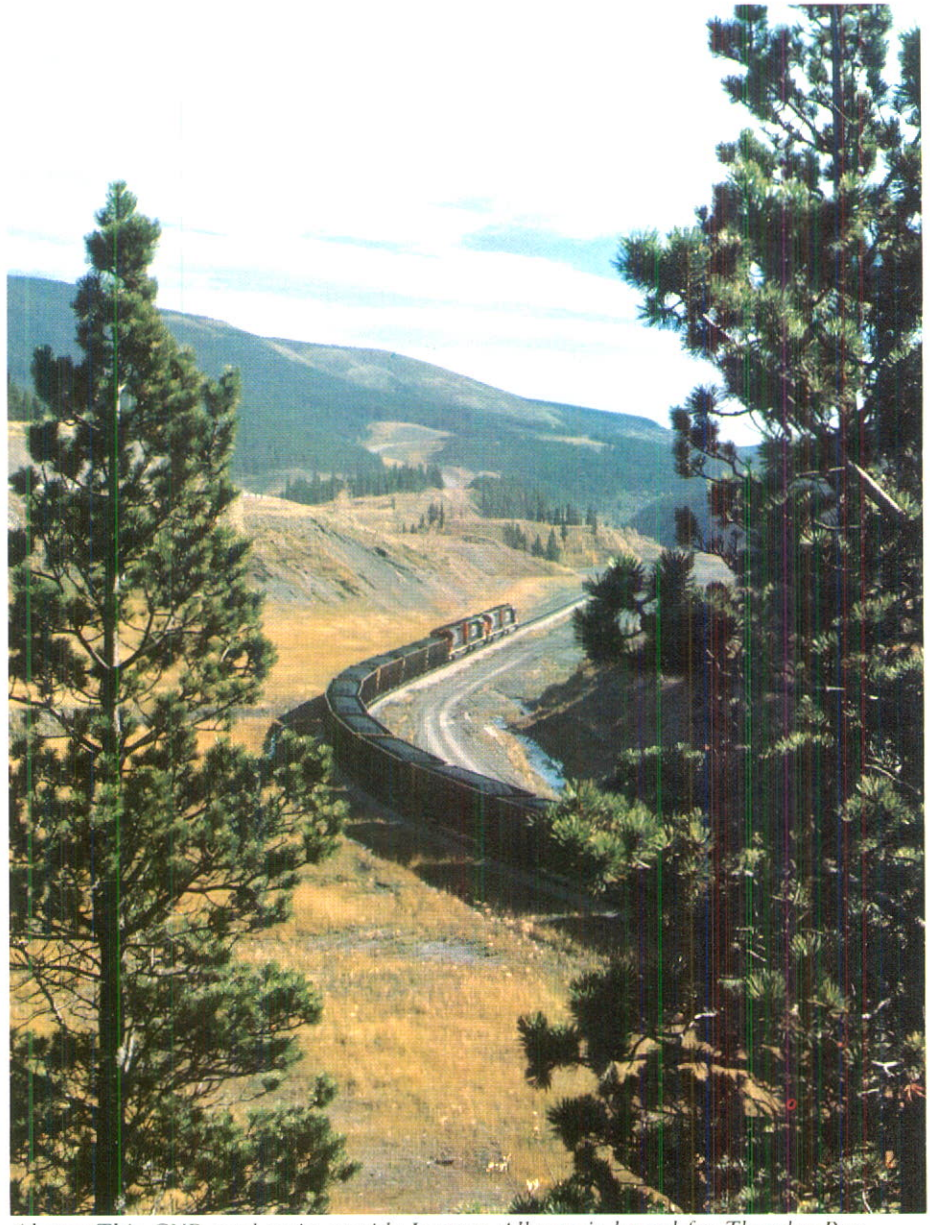
The program, with capital expenditures of $422 million, will have a dramatic effect on Canada's bulk transportation capabilities and beneficial implications for its national balance of payments.

Designed to lessen Ontario's dependence on foreign coal sources, the project will provide a direct stimulus to the Canadian economy as a whole and will create jobs and a considerable cash flow into the economies of Ontario, British Columbia, Alberta and Saskatchewan over the next 15 years.

Initiated by Ontario Hydro, the supply system involves five key elements: supply from the mines; rail transportation to Thunder Bay; terminalling at Thunder Bay; lake vessel shipment to Nanticoke generating station; and the blending with U.S. coal prior to use at Nanticoke.

Nearly 3,400,000 megagrams (3.7 million tons) of fuel per year will be mined and moved east at the outset: 2,500,000 Mg (2.7 million tons) per year of bituminous coal from sources in Alberta and British Columbia and approximately 910,000 Mg (1 million tons) per year of lignite from Saskatchewan for use in the Thunder Bay generation station.

To move this mountain of fuel to the Thunder Bay transhipment terminal will require a total of 36 diesel locomotives, 800 gondola cars with a capacity of more than 90 Mg (100 tons) each, eight cabooses and one robot (control) car. The total value of this equipment, which will be built largely in Ontario, will exceed $50 million, and delivery is scheduled for 1978. Ontario Hydro is responsible for providing this equipment and is expected to do so through leasing arrangements with the railroads involved.



Above: This CNR coal train outside Luscar, Alberta is bound for Thunder Bay.
Below: CP Rail locomotives being built at the General Motors plant in London.

All of this equipment will roll night and day along the 2,250-kilometre (1,400-mile) route from Alberta and British Columbia to Thunder Bay, and down the 1,200-km (750-mile) line from the Saskatchewan lignite fields. Turnaround times will be six and seven days for the mines in British Columbia and Alberta respectively and three to four days for the Saskatchewan source.

Loads will be approximately 9,000 Mg (10,000 tons) per trip, or about 486,000 Mg (500,000 tons) per year, for each bituminous coal train and 910,000 Mg (1 million tons) per year for the lignite train.

To achieve these load factors, both Canadian National Railways and CP Rail are completing major work to upgrade the tracks, lengthen sidings and make other improvements to speed the new traffic.

At Thunder Bay the new terminal being constructed on McKellar Island will have an initial capacity of 2,722,000 Mg (3 million tons) of throughput per year with provision to expand to 5,440,000 Mg (6 million tons) per year. The facilities are designed to unload a 100-car train in six hours, and to load a conventional 222-metre (730-foot), 27,000 Mg (30,000 ton) capacity ship in about eight hours. Lignite will also be unloaded at the terminal, but will be transferred to the generating station on nearby Mission Island by a belt conveyor to be routed under the McKellar River.

The new system has also sparked the laying of hulls for new lake carriers at Collingwood and Port Weller, designed to be capable of floating at least 910,000 Mg (1 million tons) of coal per year.

Meanwhile, a $26 million blending facility is under construction at Nanticoke. Western Canadian coal can not be burned alone in Hydro's boilers, which were designed for the high heat content of U.S. coal, so extensive tests were carried out to determine the best way to use the western Canadian product.

The Canadian coal has a low sulphur content and thus emits less sulphur dioxide when burned, but on its own does not support efficient operation of existing fly-ash precipitators.

The plan is to use a 50-50 mixture, with two types of coal being fed into separate 1,675-Mg (1,850-ton) silos after which they will be automatically mixed at rates up to 5,400 Mg (6,000 tons) per hour.

Massive shovel carves the coal from an open-pit mine in the Alberta foothills.

Preliminary estimates of the capital investment involved in the new system are in excess of $422 million. Ontario Hydro's share is approximately $79 million, or 18.7 per cent, and covers the manufacture of the railroad equipment and the Nanticoke blending terminal. Other costs being contributed by the companies involved are $133 million in mine development, $60 million for the Thunder Bay terminal, $90 million toward improvement of railroad facilities and approximately $60 million in ship building.

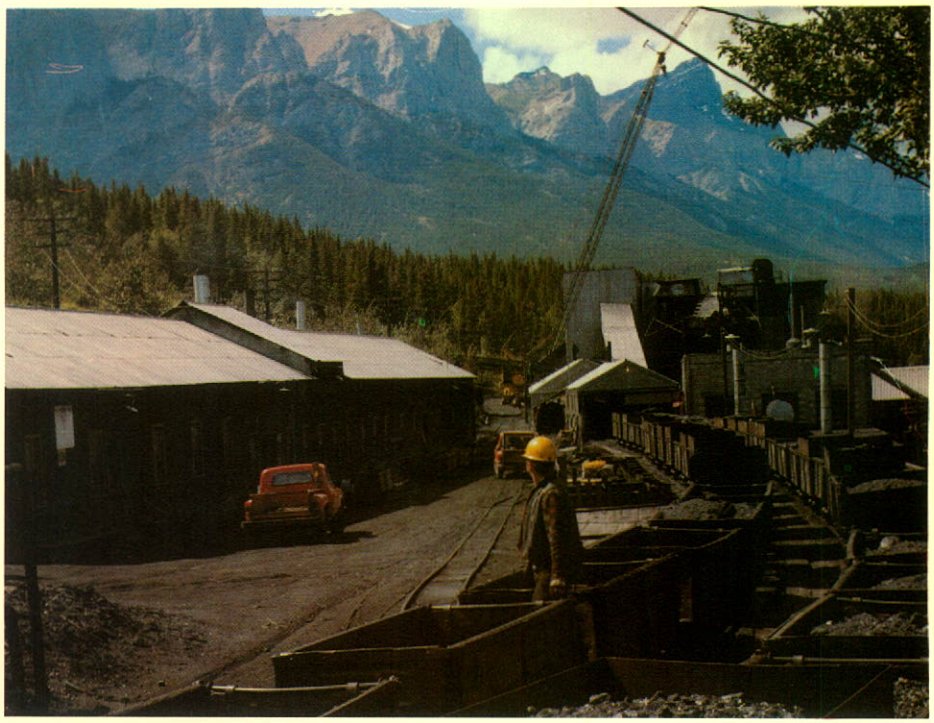
Despite the western Canadian coal purchases, Ontario Hydro will continue to import the bulk of its requirements from the Appalachian region of the U.S., for even with the expanding nuclear program, coal-fired generation will account for one-third of Ontario's electrical resources by 1980. It is estimated that up to 13,600,000 Mg (15 million tons) of coal will be required by the mid-1980s, up more than 50 per cent from 1977.

While there is no anticipation that existing U.S. coal sources are insecure, it seemed prudent — with U.S. leaders looking more and more toward coal as a solution to their energy problems — for Ontario Hydro to seek a measure of domestic supply.

Based on 1976 estimates, western Canadian bituminous coal will cost an average of 40 to 50 per cent more than that from existing U.S. sources, primarily because of transportation and handling costs.

However, once the new supply system is established, the capital intensive nature of the project should make operating costs less sensitive to inflationary pressures.

And there seems little doubt that the improved bulk rail and water transport system, ushered in by Ontario Hydro's fuel requirement, will improve the west-east flow of bulk commodities and may spark an interest by other eastern industries in western coal as a fuel source.



A worker at the minehead is captivated by the awesome beauty of the Rockies.

Comparative Statistics

	1977	1976	1975	1972	1967
Dependable peak capacity ('000 kW)	21,347	19,677	18,667	14,422	8,995
December primary peak demand ('000 kW)	15,677	15,896	14,513	12,739	8,964
Primary energy made available ('000,000 kW.h)	92,855	90,853	84,222	73,497	51,357
Primary energy sales ('000,000) kW.h)					
Municipalities	58,300*	57,635	54,523	45,950	30,534
Retail	13,800*	12,436	11,049	9,069	5,891
Direct	15,200*	14,071	12,588	13,539	11,136
Total	**87,300***	**84,142**	**78,160**	**68,558**	**47,561**
Secondary energy sales ('000,000 kW.h)	8,500*	4,157	4,918	6,478	3,164
Number of ultimate customers ('000)					
Residential	2,350*	2,297	2,239	2,091	1,904
Farm	118*	121	123	125	132
General	302*	292	285	264	209
Total	**2,770***	**2,710**	**2,647**	**2,480**	**2,246**
Average annual kW.h per customer					
Residential	10,000*	9,708	9,203	8,363	6,781
Farm	17,500*	16,955	15,914	13,577	10,158
General	207,500*	198,722	188,583	182,446	155,138
Average revenue per kW.h (¢)					
Residential	2.80*	2.23	1.94	1.53	1.24
Farm	2.95*	2.46	2.24	1.78	1.67
General	2.10*	1.63	1.39	1.04	0.86
Transmission lines					
miles	24,684	24,211	23,741	22,325	19,492
kilometres	39,724	38,964	38,207	35,929	31,369
Retail distribution lines					
miles	56,671	56,150	55,567	53,322	50,316
kilometres	91,184	90,365	89,426	85,813	80,976
Long-term bonds and notes issued ($'000,000)	1,407	1,539	1,601	557	340
Gross expenditures on fixed assets ($'000,000)	1,425	1,326	1,442	562	252
Revenues ($'000,000)					
Primary power and energy	1,637**	1,320	1,027	665	367
Secondary power and energy	210	90	43	37	3
Assets ($'000,000)	11,386	9,924	8,593	5,525	3,443
Staff, average for year	25,118	24,123	25,361	22,582	16,651

* Preliminary

**after deducting excess revenue of $122 million

Ontario Hydro wins four design awards

Ontario Hydro won awards for all four of its entries in the American Public Power Association's biennial awards program for utility design during 1977.

The prestigious APPA honor awards, which were originated to "stimulate aesthetic consideration by local publicly-owned electric utilities," were granted to the Lennox and Arnprior generating stations and the Lorne Park substation.

The awards jury determined that the fourth entry, Ontario Hydro's headquarters building — Hydro Place — exceeded the scope of the electric utility building category since the structure also contains commercial facilities. The jury, however, decided the entry should receive a Special Award for "its architectural excellence and benefit to the community."

Lennox generating station

The Corporation story

Ontario Hydro is a special statutory corporation that was established by the Provincial Legislature in 1906 and now administers an electric power enterprise having broad powers to produce, buy, and deliver electric power throughout the Province of Ontario. It now operates under The Power Corporation Act, Revised Statutes of Ontario 1970, c. 354 as revised.

The Corporation is administered by a Board of Directors that consists of a chairman, a vice-chairman, a president, and not more than ten other directors. The Corporate Office, composed of the president and three vice-presidents, concentrates on overall corporate objectives and policies with day-to-day operations being the responsibility of seven general managers each of whom reports to a vice-president.

The prime concern of the Corporation is the provision of electric power to municipalities for resale to the people of the Province. Ontario Hydro also provides power to certain direct industrial customers such as pulp and paper mills and mining operations and to retail customers either in rural areas or in communities not served by municipal electric utilities. In addition to supplying power, Ontario Hydro exercises certain regulatory functions with respect to the electrical service provided by municipalities and maintains seven regional offices and 61 area offices suitably located throughout the Province.

The Power Corporation Act by which Hydro is governed stipulates that service be provided at cost. The Act defines cost as including charges for power purchases, operation, maintenance, administration, fixed charges and reserve adjustments. Fixed charges include interest, depreciation and the provisions for the retirement of debt over a 40-year period.

The Province of Ontario guarantees the payment of principal and interest on all bonds and notes issued to the public by Ontario Hydro. In the case of public borrowing in the United States, the Province borrows on behalf of Hydro by issuing its own debentures and advancing the proceeds to Ontario Hydro upon terms and conditions agreed upon between the Corporation and the Treasurer of Ontario.

Pension and Insurance Fund Statement of Assets as at December 31, 1977

	1977	1976
	$'000	$'000
Fixed income securities		
Government and government-guaranteed bonds	130,468	110,045
Corporate bonds	119,565	111,739
First mortgages	248,460	228,510
Total fixed income securities	498,493	450,294
Equities — corporate shares	271,466	227,934
Cash and short-term investments	27,578	4,356
Total investments	797,537	682,584
Accrued interest and dividends	10,488	7,830
Receivable from Ontario Hydro	11,499	2,450
	819,524	692,864

Notes

1. The most recent actuarial valuation of the pension plan, at December 31, 1976, reported an unfunded obligation of Ontario Hydro of approximately $143 million. Of this amount, $105 million, representing an experience deficiency and deficits resulting from changes in actuarial assumptions, is being amortized over the years 1977 through 1981. The balance of $38 million, representing an unfunded liability with respect to improved benefits, is being amortized over the years 1977 through 1991.
2. In the above statement of assets, bonds are included at amortized cost, first mortgages at balance of principal outstanding and shares at cost. Total bonds and shares at December 31, 1977 with a book value of $521 million had a market value of $510 million (1976 book value $450 million — market value $438 million).

Auditors' Report

(Pension and Insurance Fund)

We have examined the statement of assets of The Pension and Insurance Fund of Ontario Hydro as at December 31, 1977. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as we considered necessary in the circumstances.

In our opinion, the accompanying statement presents fairly the assets of the fund as at December 31, 1977.

Toronto, Canada
March 13, 1978

CLARKSON, GORDON & CO.
Chartered Accountants

OPEN PAGE FOR MAP OF ONTARIO HYDRO SYSTEM

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Georgian Bay Region
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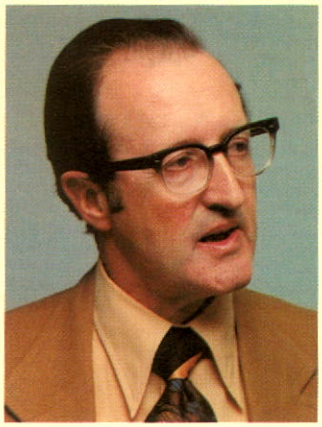

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L.A. Coles
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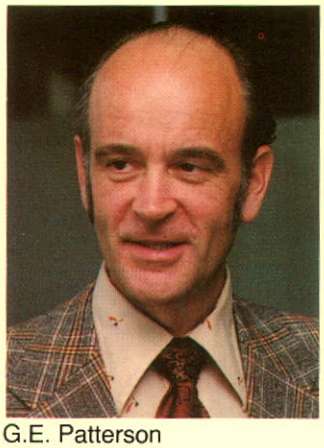

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Postal Station "P"
Thunder Bay, P7A 4L5

E.G. Bainbridge
Western Region
1075 Wellington Rd. S.
London, N6A 4P2


HUDSON BAY
JAMES BAY
River
ARIO
MOOSONEE
LOWER MATTAGAMI RIVER PLANTS
OTTER RAPIDS
ABITIBI CANYON
Abitibi River
UPPER MATTAGAMI RIVER PLANTS
TIMMINS
River
SUDBURY
MONTREAL RIVER PLANTS
Lake Nipissing
WANAPITEI PLANTS
OTTO HOLDEN
QUEBEC
SOUTH RIVER PLANTS
DES JOACHIMS
NPD
CHENAUX
CHATS FALLS
OTTAWA
MUSKOKA RIVER PLANTS
MADAWASKA PLANTS
ARNPRIOR
MONTREAL
BRUCE NUCLEAR DEVELOPMENT
BARRIE
CORNWALL
ROBERT H. SAUNDERS
TRENT RIVER PLANTS
TORONTO
PICKERING
DARLINGTON
KINGSTON
LAKEVIEW
RICHARD L. HEARN
WESLEYVILLE
LENNOX
HAMILTON
LONDON
SIR ADAM BECK 1 & 2
NIAGARA FALLS
NANTICOKE
NEW YORK


MANITOBA
CARIBOU FALLS
WHITE DOG FALLS
MANITOU FALLS
EAR FALLS
CROW RIVER
English River
Albany
Lake Nipigon
ONT
PINE PORTAGE
ALEXANDER
CAMERON FALLS
SILVER FALLS
KAKABEKA FALLS
THUNDER BAY
AGUASABON
MINNESOTA
LAKE SUPERIOR
WISCONSIN
AUBREY FALLS
WELLS
GEO. W. RAYNER
Mississagi
SAULT STE MARIE
RED ROCK FALLS
LAKE MICHIGAN
MICHIGAN
LAKE HURON
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LEGEND
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PARTIAL OPERATION
UNDER CONSTRUCTION
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NUCLEAR
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