Update

Electricity Supply and Demand in Ontario

On December 19, 1989 Ontario Hydro released a major study, 'Providing the Balance of Power,' five years in preparation, outlining plans for the utility for the next 25 years. The report comes out at a time when demand has been growing faster than anticipated and when the utility is beginning to have supply problems in some regions during cold weather. During the unusually cold month of December 1989, voltage reductions were necessary, supplies to some industries were cut, and appeals were made to the public at large to reduce consumption.

Unlike previous studies, a major emphasis has been placed upon energy conservation; the central thrust of the report is to encourage the more efficient use of energy. Nevertheless, such measures are expected to reduce the growth in demand to only about one-half of what it would otherwise have been. Economic expansion is expected to continue in Ontario, although possibly at a reduced pace. The median forecast is that average peak power demand will grow modestly at about 2.2% per year, necessitating new generating capacity soon. The utility believes demand may exceed present capability as early as 1993.

Supply options include purchase of energy from combined heat and power facilities and other generating sources within industry. Measures are being considered to overcome some of the barriers (often institutional) that inhibit private undertakings. But such additional sources, together with higher efficiency of use, will not be enough — even with these measures and additional energy purchased from neighbouring provinces "about 50% of the future electricity needs are unaccounted for," according to the report. Supplies from new central generating stations will also be needed.

The plan proposes to build 10 more CANDU units in three new generating stations, some gas turbine generating capacity and additional hydraulic capacity where feasible, mainly in the north. At the same time, existing coal-based capacity will be refurbished, including the installation (already announced) of flue gas desulphurization equipment on some units. The cost of the proposals over 25 years is massive — $61 billion in 1989 dollars, which amounts to $73-$85 billion when interest costs are included.

Negotiations have been underway for some time to build hydroelectric facilities on undeveloped sites in Manitoba, Quebec and Newfoundland, with most of the energy generated in the early years to go to Ontario. On December 7, 1989 a major agreement was signed with Manitoba to buy 1000 MW of electricity worth $13 billion over 22 years, beginning in 2000. The agreement allows a start on the Conawapa Generating Station in northern Manitoba, though some environmental and native groups oppose this deal.

The related transmission lines will span 800 km from the Nelson river site to Winnipeg, then 1300 km on to Sault Ste. Marie in a project valued at $5.5 billion in construction costs. The lines built to transmit this energy will form the first major connection to the eastern provinces from Manitoba — this link could lay the foundation of a national power grid. In Quebec, which has also experienced a higher rate of growth in demand than expected and has had a prolonged dry spell resulting in reduced hydraulic output, there is little surplus power and, as in Ontario, it has become necessary to resort to generation from oil. Hydro-Quebec has even introduced a program this winter to assist users of electricity to convert back to oil. An arrangement with Newfoundland to expand capacity in Labrador is complicated by the need to reach an agreement with Quebec, which so far has opposed the construction of a direct link across that province to bring the power to Ontario.

By the early 1990s some 63% of the electrical energy consumed in Ontario will come from nuclear stations as the four units of Darlington Generating Station enter service. The performance of the existing Ontario reactors continues to compare favourably with those in other countries from an operating and cost viewpoint. For this reason the utility has chosen to rely more heavily on this source of energy, which is perhaps the most controversial aspect of the study.

The Federal Government is now reviewing the role of Atomic Energy of Canada Limited (AECL) and a decision is expected within the year regarding its continuing support for the industry. Exports have been disappointing, but Korea has decided to install a second reactor of 700 MWe capacity at the Wolsong Station. In the meantime, AECL is developing a new reactor design, known as the CANDU 3, with a nominal capacity of 450 MWe. In planning this reactor, smaller than the units now operated by Ontario Hydro, the engineers set out to design a station that could be constructed quickly and at a reasonable cost. Equally important was the desire to reduce ongoing operating and maintenance costs. One of the most notable features of the CANDU 3 is modular design. The entire station is designed in sections, with each part weighing no more than 300 tonnes, which can be handled on site by heavy-lift cranes. To assure the reliability of the new reactor, its major components are identical in design to those in existing CANDU stations. It is expected that this reactor, intended to go into service about 35 months after the start of construction, will be of interest to other countries, especially in the developing world.

Ontario Hydro proposals are sure to raise much public controversy. The plans will be considered by committees of the provincial legislature and a special assessment panel and it is expected that many public interest groups will participate in these deliberations.

Air Quality Standards in California

The Los Angeles basin has the most serious air quality problem in the US. Ozone and carbon monoxide reach maximum levels nearly three times the national standard set to protect public health. Fine particulate matter levels reach nearly twice the national health-based standards. The South Coast Air Quality Management District was established to deal with these problems. As it is the announced intention of the Canadian government to adopt the more restrictive existing California standards for auto exhausts over the next few years, it is interesting to examine a few highlights of the 1989 Air Quality Management Plan recently released by the California agency.

The 1989 plan presents a three-tier strategy designed to reduce emissions to the point where all US federal air quality standards would be met in the region by the year 2007, a very ambitious undertaking indeed. Tier I includes about 120 control measures that can be adopted within the next five years using currently available technological applications and management practices. Tier II measures include already-demonstrated control technologies together with 'on-the-horizon' techniques requiring advancements that can be reasonably expected to occur in the near future. Tier III measures require commitments to research, development, and widespread application of technologies that may not exist yet, but may be reasonably expected within the time frame of interest.

Modelling studies suggest that the thorough application of Tier I strategies will result in achievement of desired carbon monoxide and nitrogen dioxide standards within the next 10 years. US federal standards for fine particulate matter can be attained via Tier II strategies. However, Tier III strategies will be required in order to meet the US federal standard for ozone in the next 20 years. The population of the LA basin is expected to grow by 37% during this period, further complicating the problem.

The measures contemplated under Tier I include a wide range of controls affecting industries from agriculture to dry cleaning.

Of perhaps most interest to Canadians are those measures affecting motor vehicles, which involve stricter emission control standards for new vehicles, clean fuels for fleet vehicles, improved inspections and maintenance programs and controls on diesel-powered buses and trucks. Tier II measures in the same field require the widespread use of low-emitting technologies and fuels for cars. Tier III measures include emphasis on fuel cells, solar cells and storage batteries to power vehicles.

If this plan is adopted (or comes anywhere near to being fulfilled) major changes are in store for the automotive and energy industries. Already, one California-based oil company, ARCO, has announced a gasoline of reduced volatility. There is increased emphasis on methanol as a vehicle fuel which may mean new markets for some Canadian suppliers. Finally, the impetus this plan gives to the development of superior batteries and fuel cells may be that required to introduce an entirely new type of personal vehicle with application everywhere. In December, it was announced by the Magna group of companies that battery-powered vans manufactured in Ontario will be shipped to this region. This opportunity occurred as a result of the Los Angeles government's request for a proposal on the supply of 10,000 electric vehicles to that region. Three companies were selected from the submitted proposals: Unique Mobility of Denver, CO; Swedish Clean Air Technologies, Sweden; and Magna (as Vehma) of Canada. All eyes will be on California.

Methanol and Natural Gas As Vehicle Fuels

Although methanol is produced from the nation's ample natural gas supply, there are no cost advantages to its use as a vehicle fuel at present. Nevertheless, the use of this convenient liquid fuel, which has an energy density about one-half that of gasoline, is technically feasible — either as an additive to gasoline or as a 'neat' fuel on its own — provided certain precautions are taken to overcome such problems as corrosion of the fuel supply system and difficulties with starting in cold weather. So far, its advantages in terms of allowing higher engine compression ratios and its somewhat superior environmental characteristics have been insufficient to encourage the general use of methanol as a vehicle fuel in Canada. Some cities of the US, such as Los Angeles, Denver and Phoenix, which are plagued with automotive exhaust problems, use methanol blended with gasoline during the worst seasons of the year and a more widespread application is proposed in fleets of buses and the like. (Other cities with even greater problems, such as Athens and, soon, Mexico City, prohibit the driving of vehicles one day per week, based upon license number; Singapore and Hong Kong also have some restrictions on vehicle use.) From an environmental standpoint, one drawback of methanol-powered vehicles is the production of aldehydes in exhaust gases.

Natural gas has many advantages as a vehicle fuel. It is relatively inexpensive, is widely available, has good 'knock' properties, and has generally favourable environmental characteristics. Natural gas releases less carbon dioxide than gasoline but fugitive emissions of methane (a potent greenhouse gas) must be watched carefully. Canada is a large and growing exporter of natural gas to the US; in contrast, it is now a net importer of the lighter grades of oil from which motor fuels are derived. The main disadvantage to the use of natural gas is the need to fit vehicles with high-pressure tanks, which are costly and have limited storage capacity, leading to restricted driving range between fillings. Research efforts have concentrated upon lighter and cheaper pressure tanks and other methods of storing gas, such as the use of activated charcoal as an adsorbent. There is also a need for a convenient and cheaper compressor to refuel the vehicles at one's own residence by drawing from the domestic gas service. An important requirement in this work is the verification of new technological devices to the satisfaction of regulators. In this respect there is no substitute for time and sample size in proving component durability and reliability. R&D will continue to be essential to improve the safety of systems and components.

Many of the impediments to the wider application of natural gas vehicles are institutional. For this reason there have been a number of Federal/Provincial projects aimed at overcoming 'chicken-and-egg' obstacles that inhibit vehicle conversions. An augmented Canada/Alberta program, announced on October 2, 1989, will provide more than $28 million in Market Development Incentive Payments (MDIP) to expand the market for both natural gas and methanol as transportation fuels. These funds will be directed to initiatives which can, over five years, contribute to a viable and self-sustaining natural

gas vehicle industry in Canada. Specific measures under this new agreement include: extension of the existing programs which support vehicle conversions and market development of natural gas vehicles (NGV); provisions for the establishment of public natural gas fuelling stations; encouragement of the installation of residential appliances and commercial compressors for both individual and commercial/fleet users of NGV; and a related technology development program. The program provides, over five years, $500 for each vehicle converted to natural gas (to a maximum of 35,000 vehicles) and $50,000 for each new public gas fuelling station (to a maximum of 30 stations) calculated on a nation-wide basis. In Ontario, natural gas utilities are launching a somewhat similar market demonstration, with help from the provincial government. In the case of methanol, the federal Methanol in Large Engines Program (MILE) has been extended to provide the city of Medicine Hat with $150,000 towards the cost of three new methanol-fuelled city buses.

Approximately 40% of all natural gas vehicle conversions in Canada in 1987-88 occurred in each of British Columbia and Ontario; 15% in Quebec; and 5% in Alberta and Manitoba. By March 31, 1988 there were approximately 16,500 converted vehicles in Canada (4500 of which were converted in 1987-88). About 120 public natural gas fuelling stations are currently in operation throughout the country.

High vehicle conversion costs are the major impediment to greater growth in the industry. Through bulk buying of component parts, by arranging for improved conversion facilities, and by providing better warranties, the natural gas utilities hope to significantly lower these costs. A reduction of approximately 20% in the average cost of conversion (currently at $3200) is judged possible within the year, with the ultimate goal of a reduction to $2000. At that price, the industry believes direct conversion assistance by the federal government will no longer be required and Canada will have a viable and expanding natural gas vehicle option.

Source: Energy, Mines & Resources Canada

Canadians Active in Middle East Power Grid Studies

The Arab Fund for Economic and Social Development has awarded a $650,000 contract to a consortium of Ontario Hydro and Hydro Quebec to draw up a master plan for an Islamic power network in the Middle East. In addition, a contract worth $1.26 million has been awarded to Hydro Quebec in association with the Montreal firm of Lavalin International which will work with several local firms to study the possibility of linking the countries of the Gulf Cooperation Council — Saudi Arabia, Qatar, United Arab Emirates, Bahrain and Kuwait — into an Arabian peninsular grid.

Ministers from Jordan, Egypt, Iraq, Syria and Turkey agreed in Ankara earlier this year to cooperate in building a regional network that would eventually be connected to Europe. Jordan and Egypt have agreed to proceed with a $170 million scheme to link their power grids by cable under the Gulf of Aquaba. BC Hydro International will be a subcontractor in the design and planning for this project which will also involve a tunnel under the Suez Canal and power lines across the Sinai Peninsula. Talks for a linkage with Libya are in progress.

Egypt has taken a leading part in these discussions because this populous country will not be generating sufficient electricity to meet demand at peak periods. Demand is expected to increase at the very high rate of 11% annually for the coming decade. There is also concern over water supply in the Nile after periods of drought in the African hinterland, which have reduced generation at the Aswan high dam. In the meantime, the United States is assisting Egypt to rehabilitate and extend existing power stations in a $136 million program under the US Agency for International Development. This work includes the construction of a combined-cycle installation at a Cairo power plant and the refurbishing of gas turbines at a number of other locations. In many oil-producing states in the Middle East, natural gas is in surplus. There are, thus, good reasons to plan the interconnection of the power systems of the region and, in effect, export gas in the form of electricity. It is now hoped the basic Islamic Grid will be in operation in five years.

Source: Financial Times of London

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