

THE CHALLENGING OUTLOOK FOR PETROLEUM AND NATURAL GAS

Address by

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Knowing this Club so well I really cannot say which pleases me more today, the chance to meet with old friends or the honor of being your speaker.

Certainly Toronto is a most appropriate place for a person involved in the energy business to speak. Offhand, I know of no other city which recognizes the importance of energy in the same way that you do with your statue of Sir Adam Beck on University Avenue. There are a great many monuments to those who have harnessed energy in steam engines, electrical appliances and internal combustion engines, but it is seldom that one finds a city so imbued with the importance of energy itself as to erect a monument to one of the suppliers.

I was very happy to learn, too, that the tradition is being maintained. I understand a great deal of energy was expended on the acquisition of your latest and perhaps most energetic piece of sculpture -- the Archer!

With so much energy -- both abstract and concrete -- in the community it seems to me most appropriate to report to you on developments in the industry which provide just over 63 per cent of Ontario's and 71½ per cent of Canada's total energy supply -- the petroleum and natural gas industry. I don't intend to describe to you the significance of this industry for Canada. You are all familiar with the role that petroleum has played -- particularly in a country with somewhat

extreme climate and tremendous distances. The spectacle of cowboys on motor cycles and Eskimos on motor toboggans is evidence of the adaptability of this form of energy to the wide-ranging needs of the Canadian scene. I can assure you the same picture of rapid change and development is going on throughout the world.

On a global basis, petroleum and natural gas furnish more than three-fifths of the Free World's total energy today, and account for approximately half of all the tonnage moved in international trade.

The companies that make up the industry range from large integrated international companies, such as the one I am affiliated with, which produce, refine, and market oil and gas; to individual producers who may operate one or two small oil wells; and to retailers, including the man who has a gasoline pump in front of his store.

Here in Canada there are six major integrated petroleum companies which are international in their scope of operations. There are also some 650 producers in Western Canada alone, and perhaps another 100 in Eastern Canada. Fourteen companies engage in petroleum refining, and no one has counted precisely how many companies and individuals sell petroleum products at wholesale and retail. There are probably thousands.

Worldwide, the sales of the petroleum industry in non-Communist countries can be estimated -- very roughly -- at about \$70 billion this year, excluding excise taxes. The industry's net investment in fixed assets is about as big as that of all private industry in Canada, and its yearly spending for plant and equipment is roughly equal to the total of Canada's industrial capital expenditures, plus new residential investments.

In short, the petroleum industry is not only big and capable of broad effects on economies, but is well-populated, which alone makes its prospects a matter of more than narrow interest.

What are these prospects? The most fundamental is growth.

The future is going to bring an immense increase in the demand for energy throughout the Free World. Our most recent projections indicate that through 1980 the average rate of growth in energy consumption will be about $4\frac{1}{2}$ per cent a year. On that basis, Free World energy demand in 1980 will be nearly double what it was in 1965.

As for oil and gas, the rates of growth will be even more impressive. An average annual gain of about five per cent is forecast in Free World oil consumption while gas demand is expected to rise at a rate of about $5\frac{1}{2}$ per cent a year. Here in Canada the demand for oil will grow somewhat more slowly than in the rest of the Free World -- Canada, after all, is a developed country with one of the highest per capita levels of oil consumption -- but Canada's growth in gas consumption will exceed the world average.

The immense need for ever-increasing amounts of oil and gas is, obviously, weighted with implications, economic and otherwise. I believe, in fact, that it is going to entail pronounced and accelerated change for the petroleum industry throughout the next decades. So, without taking more time on background, let me zero in on what some of these implications are and how they may apply to Canada.

One, certainly, is that the petroleum industry is going to have to intensify its already vigorous search for oil and gas, in new areas as well as old.

As you are probably aware, intensive exploration in anticipation

of future needs is under way today in the North Sea and offshore Australia. Both of these are new areas and both of them have yielded significant gas discoveries. There is exploration in Africa, Malaysia, the Philippines, offshore Nicaragua, in the Gulf of Mexico, and Alaska, to take just a sample. Here in Canada, the search is going on in many places -- the Grand Banks, the Northwest Territories, and most notably Rainbow Lake in Alberta. Rainbow Lake is likely to be a multi-billion barrel oil area and of great importance to Canada's future ability to meet its own requirements with spare production for export.

One thing that seems probable, as we intensify this exploration, is that we shall have to give increased attention to the continental shelves.

Not nearly enough is known about the continental shelves, but what we do know suggests that their potential is very large. Even today offshore areas, together with Lake Maracaibo in Venezuela, account for about one out of every six barrels of oil produced in the Free World. Geologists who have made rough estimates of the oil potential of the shelves up to depths of 1,000 feet have suggested that, even within that limit, the reserves are of the magnitude of hundreds of billions of barrels and very possibly exceed the total of our present proved reserves.

It is perhaps unnecessary to point out the significance of these developments for Canada. The very large continental shelf areas off the Atlantic coast, underneath the waters of Hudson Bay, off the Canadian Arctic islands, the delta of the Mackenzie River and the Pacific coast speak for themselves. Not only has Canada a great deal to gain from this exploration in inner space, but Canada has a great

deal to give and proved it in the contribution the Canadian earth sciences fraternity made to the International Geophysical Year, ten years ago. This example of international co-operation lives on in the co-ordinated studies of such organizations as the Bedford Institute of Oceanography at Dartmouth, Nova Scotia.

But, to use a typically Canadian expression, you could well say that we have only begun to scratch the sub surface. The challenge now is to accelerate the advance of deep-water technology so that operations will be economic in waters up to a thousand or so feet deep. On the Grand Banks, two holes have been drilled in seas 300 feet deep, and off California an exploratory evaluation well has been completed in a water depth of 600 feet. But this, obviously, leaves a good way to go.

A second probable effect of the future, which has special significance for Canada, is that the United States will find itself challenged to cover its petroleum supply requirements.

Since 1950, U.S. oil reserves have declined slowly but steadily from the equivalent of about thirteen and a half years of supply to slightly more than 12 years. If the present ratio is to be maintained in the face of rising consumption through 1980, annual additions to liquid reserves must average more than half again as much as they have in the past 15 years.

The U.S. can expect some additional production through new and better recovery techniques. Since 1950, the share of U.S. crude oil production resulting from improved recovery methods has risen from less than one-fifth to approximately one-third and, by 1980, the Department of Interior estimates, it will climb to almost 50 per cent

of crude production. This will be a real achievement.

It can also be assumed that there will be new discoveries, notably in offshore areas. With more intensive exploration, these may well result in larger annual additions to reserves than has been the case in the past. We can hope so. Yet the probability exists that the United States will have to turn in the future to other petroleum sources to meet its needs.

It will have several options -- greater imports from Canada, greater imports from overseas, domestic synthetics, or a combination of all three.

Greater imports from Canada would, of course, be to the liking of many people here. And, certainly, over the longer term, the chances are excellent that Canadian crude oil will command a substantially larger outlet in the United States than it does today. The resources are ample and the security advantage of overland supply lines is obvious.

For the immediate future, the United States is well supplied with oil. To increase the imports from Canada, beyond their normal growth, other sources of supply would have to be displaced, which does not seem reasonable. In other words, I do not think it is realistic to expect that major new supplies can be forced on the market; there is timing to consider in the matter of access, and it is a critical factor.

In this regard, let me say that I believe that the import policy of the United States has helped Canadian producers. It has provided an increasing outlet for Canadian crude oil which probably would not have been available to the extent it has, if quotas on overseas imports had not existed.

As to the possibility of synthetics -- there are vast reserves of oil in the shales of Colorado, Wyoming, and Utah -- an estimated 2 trillion barrels, of which a part, at least, might be economically recoverable by present mining and retorting methods from the higher grade and more accessible deposits. There is also, as you know, a great amount of oil potentially recoverable from the Canadian tar sands of Athabasca, where commercial production is scheduled to begin next year.

In both Canada and the United States, there are equally vast reserves of coal that might be converted to synthetic oil. The amount is probably equivalent to hundreds of years of supply. Moreover, the U.S. coal is well situated with respect to the main potential markets for synthetic fuel, particularly those of the Midwest and the East.

For oil shale and coal, however, a great deal of research and development work must be done before synthetic liquid fuels derived from them become competitive. My own view is that the necessary technological advances will be made to bring costs into a competitive range with conventional crude and that we will see commercial production from shale or coal within the next ten years. Whatever the strides in synthetics, though, it is practically certain that the great part of the near-term demand of the United States will still have to be met by conventional petroleum and natural gas.

A third key future development is that the petroleum industry will need to find ways in the next 15 years to reduce further the costs of getting its products to the consumer.

The industry has already achieved a great deal in lowering the

costs of production, refining, transportation, and marketing, though these savings have been partly masked at the consumer level by rising gallonage taxes. However, in the future it seems safe to say that, except for North American discoveries, the bulk of the oil found will not be in the areas of greatest consumption. It may, in fact, be less accessible to markets than sources are now. Hence, further savings, notably in transportation, will be needed to compensate for the remoteness of supplies.

Tanker efficiency, which has been greatly increased through the use of larger vessels, will have to be improved; and additional investments will be needed in overland transportation, particularly in countries such as Canada, where domestic supplies are separated from the principal markets by great distances.

Fourth, I see the years ahead bringing to prominence a new branch of the petroleum industry, the liquefied natural gas business, or LNG.

Whereas demand for natural gas will almost double in the United States in fifteen years, it will increase nearly ten times in Europe and Japan. This growth in the eastern hemisphere will far exceed the capacity of indigenous supplies, where they exist, to satisfy the market. Hence the opportunity for, in effect, a new industry to liquefy large amounts of natural gas and move it to market from overseas supply points.

The Jersey company, as you may have heard, is engaged in such a venture now. More than \$300 million is being invested for facilities to liquefy Libyan natural gas and transport some 345 million cubic feet daily of LNG to Italy and Spain. That is equivalent to about 80,000 barrels a day of crude oil. We expect to make initial

commercial deliveries in about two years.

The potential world market for LNG has been estimated at 10 million to 20 million barrels daily by the last part of the century. To achieve this tremendous potential, natural gas reserves will, of course, have to be enlarged. But more than that, the industry will have to give attention to certain technological aspects of LNG.

Transportation costs of LNG are now in the order of four to five times the cost of moving an equivalent amount of crude oil.

Storage costs are also high -- three to four times those of crude oil.

In addition, there is the intriguing problem of how to utilize the "cold". Energy has to be supplied to refrigerate the natural gas to minus 260 degrees Fahrenheit, where it liquefies. Obviously, it would help to find economical ways to salvage this energy when the LNG is vaporized at the consumption point. Like the hog butcher, we'd like to use everything but the squeal.

The final thing that I would say about the energy demand ahead is that it is likely to mean new competition for the oil industry. I think we will see a strong growth in electricity, with nuclear energy providing the fuel for a substantial part of future power generation. Coal, too, will have important growth in power production, both in Canada and the United States.

Nuclear energy for power generation has now reached the point of being economically competitive, though it has taken a large government expenditure for research and development to make it so.

In 25 years, nuclear power, which accounts for less than 1 per cent of the Free World's total energy, could account for more than

10 per cent -- a possibility particularly significant to Canada in light of its endowment of uranium deposits.

I would like to say something, too, about another possible competitor -- the electric car, which seems to be getting a lot of attention these days because of the air pollution problem.

The problem of air contamination in our cities is obviously very real. And, without question, part of the contaminants come from the internal combustion engines in automobiles. One way to attack this part of our problem is the electric car. But we must recognize that it is only one way. It is far from certain that it is either a practical method or the most attractive method to choose.

There are major technological problems to overcome if such a development is to be realized -- just to produce a vehicle having reasonable performance characteristics, let alone one that could be economic.

One must remember that the internal combustion engine is a remarkable device, with performance characteristics that will be hard to match. The technical problems involved in effectively eliminating pollution from today's automobiles through modification of the gasoline and of the engine are far less formidable than the technical problems of electric car development. Research along these lines, including continued research on actual effects of exhaust emission, is being pursued so that these modifications can be achieved economically. The petroleum and automobile industries together can and will solve this problem.

It little serves the economies of Canada or the U.S. to invest enormous talent and money to gain, possibly, a goal that can be

accomplished in other ways at far less cost. The internal combustion engine is a proven commodity. It provides a sound base from which to start. We should use it.

There is a great deal more that could be said about the future prospects for the petroleum industry. New uses for oil -- in chemicals, in fertilizers, even in food -- will grow rapidly in importance as technology is expanded. These new uses, added to the formidable task of meeting increasing energy demand, present a truly challenging and exciting prospect for the petroleum industry.

I hope I have imparted a sense of the challenge and of the significant position that Canada occupies, long-range, in energy supply. This position is important in terms of the competitiveness of Canadian industry, generally; of the future of the Canadian oil industry, which is bright; and of international needs for energy.

In discussing future trends, I think it might be appropriate to close with a backward glance. Canada's first hundred years in 1967 will bring the 20th anniversary of the discovery of crude oil at Leduc, Alberta. This discovery meant a tremendous change in the balance of payments for Canada, which had been importing 90 per cent of its petroleum. But it brought even more marked changes to the Canadian West. It reversed the outflow of population and brought that diversification of industry which had long been hoped for and very nearly despaired of by many of us who lived in the area. Taken together with the revival of the market for Canada's wheat, the changes are dramatic to the point of the miraculous. The economy of Western Canada is an indication of the dynamic economic effects of the petroleum and natural gas industry. The long-range developments

which I have been discussing are an indicator that equally big influences are at work today, many of them having a direct bearing on Canada's second hundred years.