

CANADIAN OIL AND GAS SUPPLIES FOR THE 1980'S

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by

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I very much appreciate the opportunity to speak here today. Queen's is my alma mater, so, in a sense, it is coming home. I graduated in 1952 in Chemical Engineering.

My firm is Canada's single largest energy supplier, and this requires that we have considerable knowledge of all forms of energy, but particularly oil and gas. I hope I will be able to justify the interest you have shown in attending by communicating some of this knowledge to you.

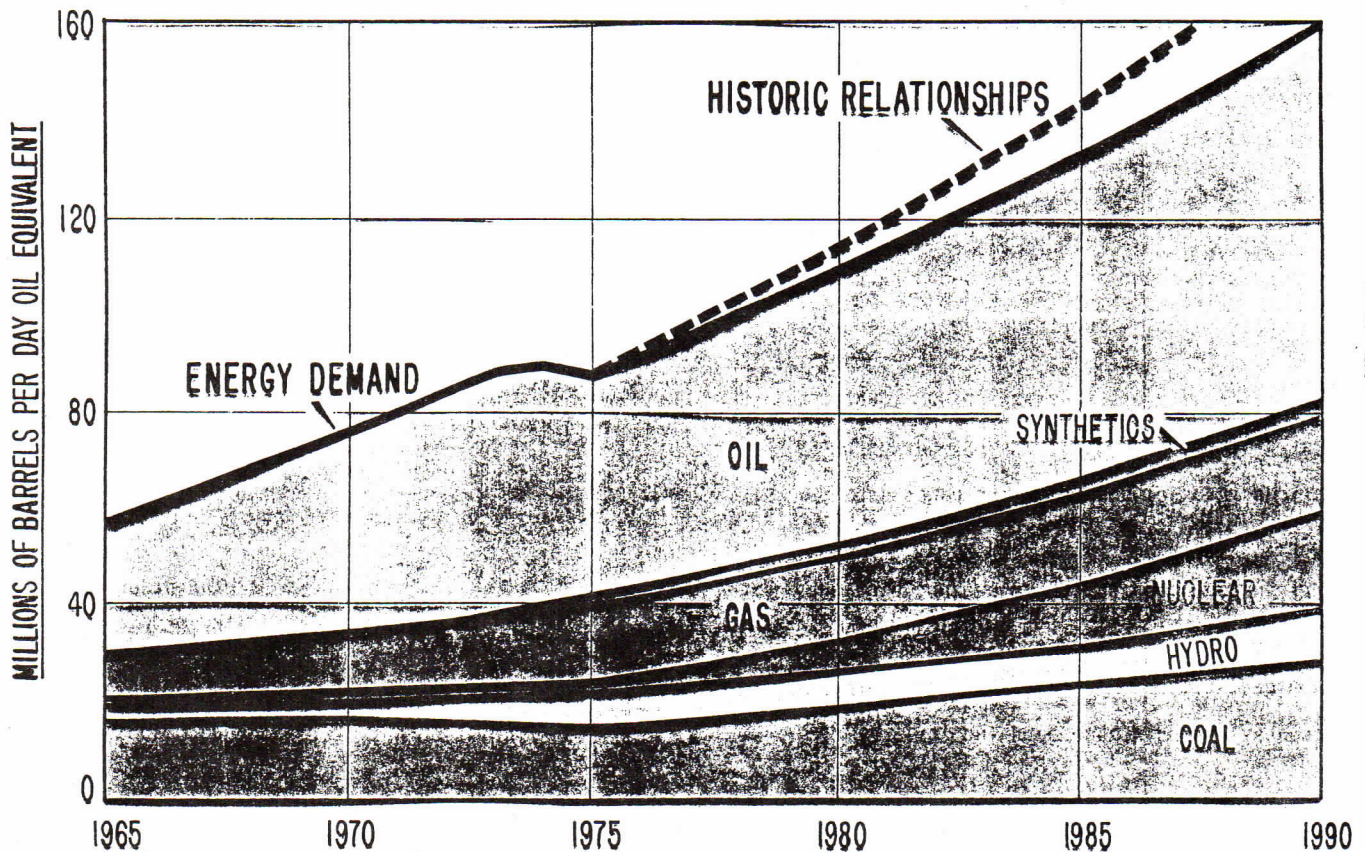
Not only are energy policy issues topical at this time, they are very important to Canada

because nearly all of our energy comes from non-renewable sources which must be continually replaced. Of late we have been falling behind in this task and must speed up the search for new supplies before the cupboard is bare, so to speak. This is the message I would like to leave with you.

My presentation, which is structured around vugraphs, will take about 25 minutes. The rest of the time will be open for questions. Of course, it will be very easy to put a vugraph back on the screen if your question refers to it.

VUGRAPH #1

WORLD* ENERGY DEMAND & SUPPLY



*EXCLUDING COMMUNIST AREAS

VUGRAPH #1 - WORLD ENERGY DEMAND AND SUPPLY

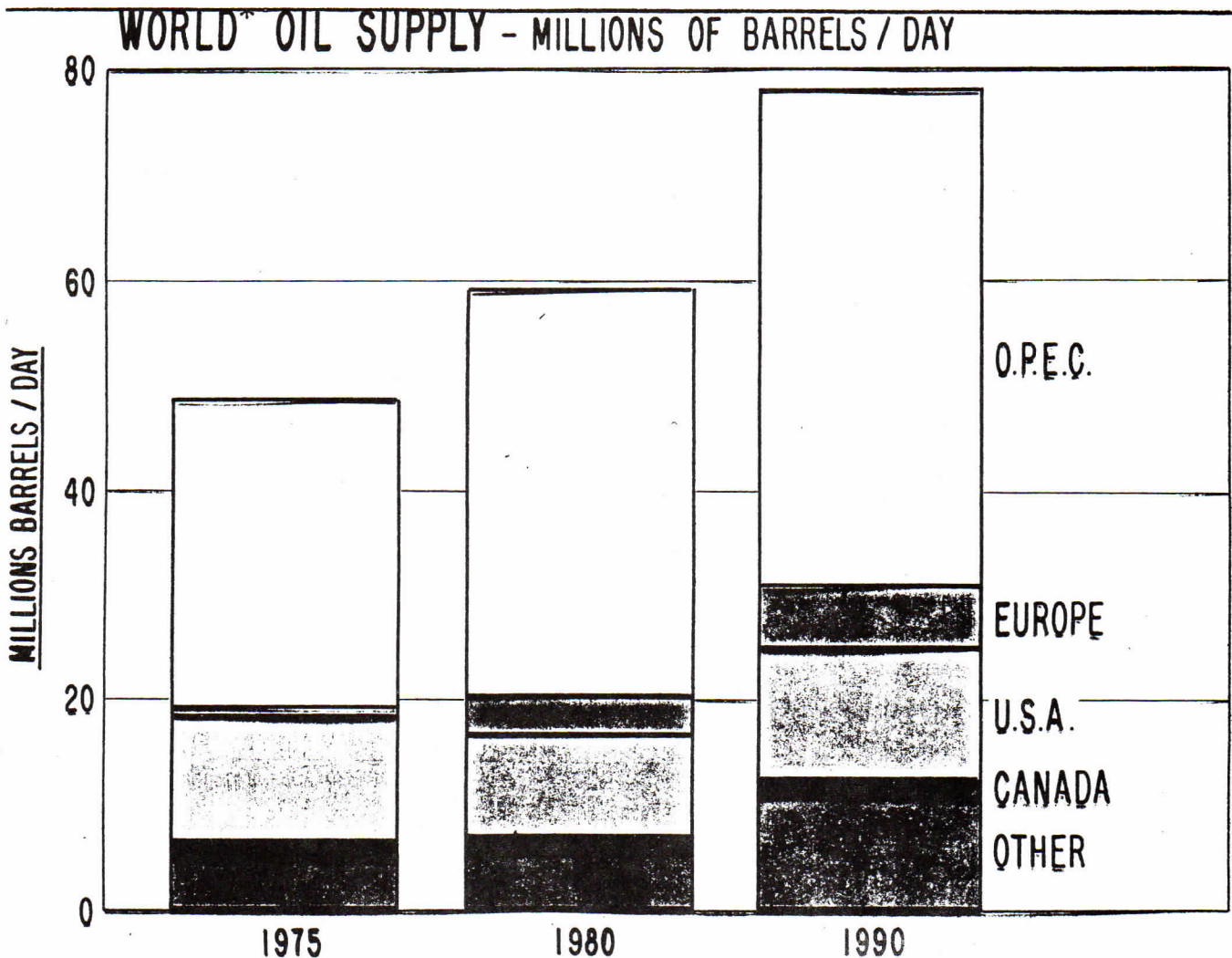
My first vugraph shows the past and Imperial's projection of future demand and supply for the non-Communist world. The scale chosen is millions of barrels per day of oil equivalent. Sources of supply other than oil have been converted on the basis of their respective heat content.

A world energy perspective is important for designing Canada's energy policies because energy commodities, particularly oil, constitute a large part of international trade. We have attempted to build as much economic, technological, and political realism into the projection as possible. But, this doesn't change the fact that major uncertainties exist. I'm sure you have heard it repeated often, but I would be remiss if I didn't stress that the confidence that may be placed in any single numerical projection diminishes rapidly as it is extended into time.

Looking first at "Energy Demand" -- the top line -- we see that until 1973 it grew at a rapid 7% per year. In the last two years demand has declined because of the Arab embargo and the severe worldwide recession. Lower growth is forecast for two reasons: First, because we expect lower economic growth in the industrialized countries; second, because of conservation measures. Higher prices will be the chief driving force behind this conservation. Still, even with the projected growth of 4% a year, energy consumption will almost double in the next fifteen years.

Where will the energy come from? Half of it will be derived from nuclear and hydro electric sources, and from coal. Nuclear will grow to about 12% of total supply by 1990. With natural gas only holding its own, it will be obvious that

VUGRAPH #2



the other half of the growth in demand will have to be satisfied by oil. This will place a heavy strain on the world's oil reserves because since 1970 oil consumption has exceeded discoveries. This trend is expected to continue, given the finite nature of world oil reserves. It is likely therefore that by 1990 world oil production

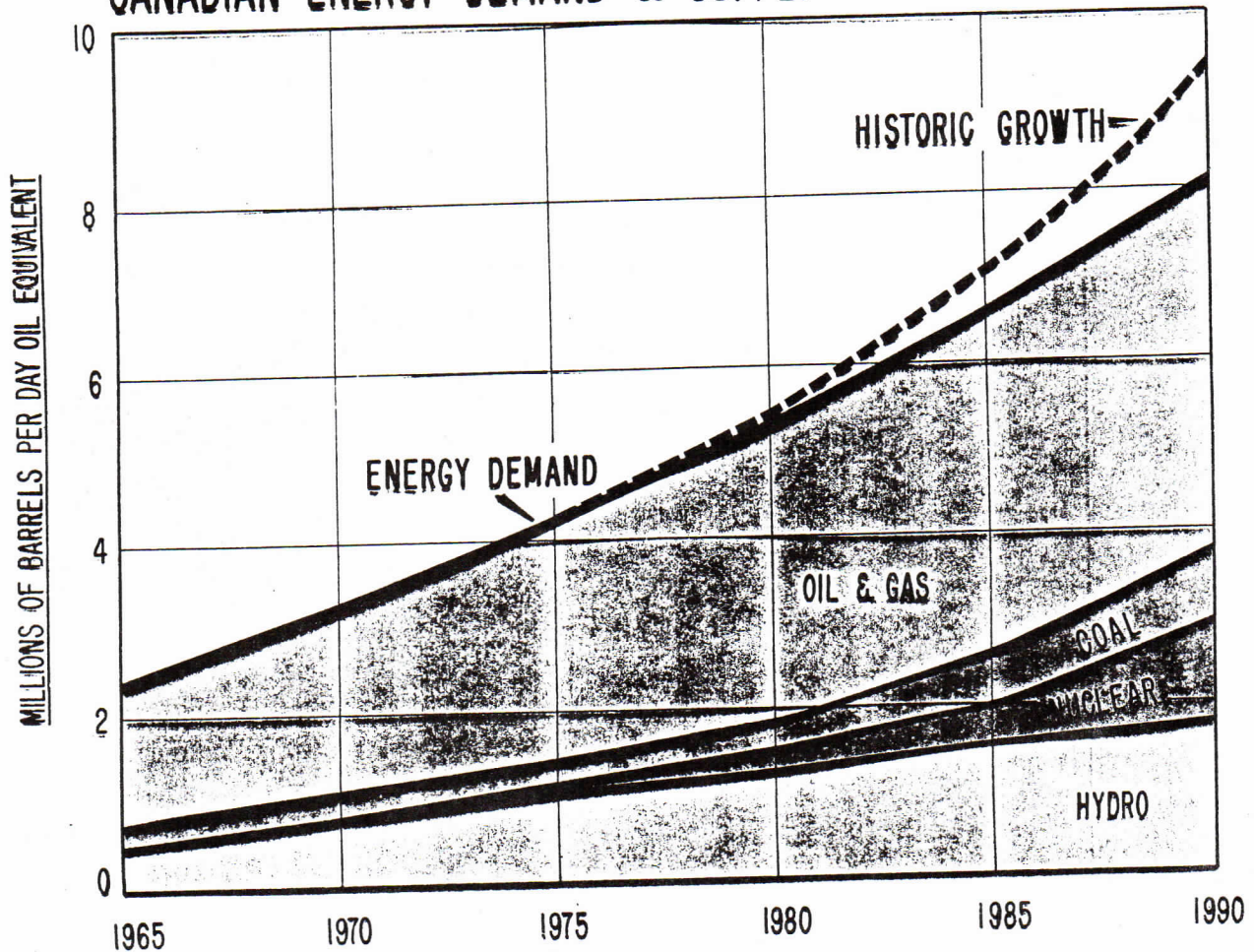
will be at capacity, with limited flexibility to adjust to unexpected variations in demand or supply. To complete this international overview, I think it's important that we look at the sources of oil supply.

VUGRAPH #2 - WORLD OIL SUPPLY

The OPEC countries presently supply about 60% of the world's oil requirements -- a position they will maintain until 1990, at least with Saudi Arabia assuming a growing share of the load. On the other hand, presently-proven reserves in the major industrial nations will be capable of meeting only about 10% of the world's oil needs by 1990.

VUGRAPH #3

CANADIAN ENERGY DEMAND & SUPPLY

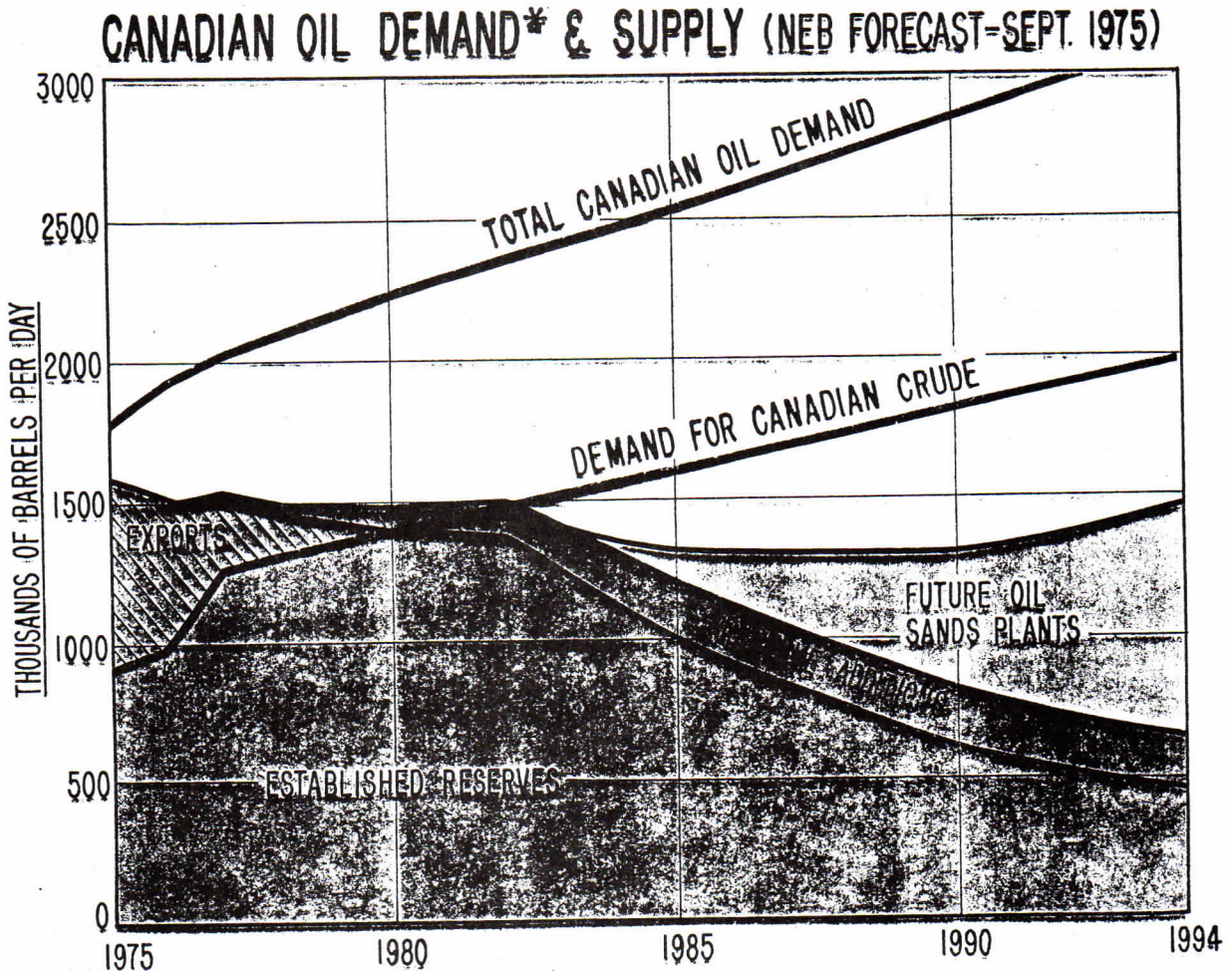


VUGRAPH #3 - CANADIAN ENERGY DEMAND AND SUPPLY

In Canada, total demand for energy is expected to grow more slowly than in the past. A reasonable projection range would be centred around a 4-1/2% a year average growth, about 1% lower than historically. The forecasts you see for energy supply from coal, nuclear, and hydro are based largely on forecasts by electric utilities. These segments of the supply will increase in share to total energy, and it will be a tough challenge for the electric industry to achieve this growth.

The remaining energy demand must be met by oil and gas, implying a rise, from 2.6 million barrels per day currently, to 4.4 million barrels per day by 1990. I mentioned forecast variability earlier. It is easy for me to visualize circumstances whereby this "fall-out" demand for oil and gas could be 1 million barrels per day higher or lower in 1990 than shown. We must be prepared for these contingencies. I will now briefly define the demand and supply for oil and gas separately.

VUGRAPH #4



*SHOWN WITH CONSERVATION

VUGRAPH #4 - CANADIAN OIL DEMAND AND SUPPLY

Last September the National Energy Board, which is a federal agency responsible for the

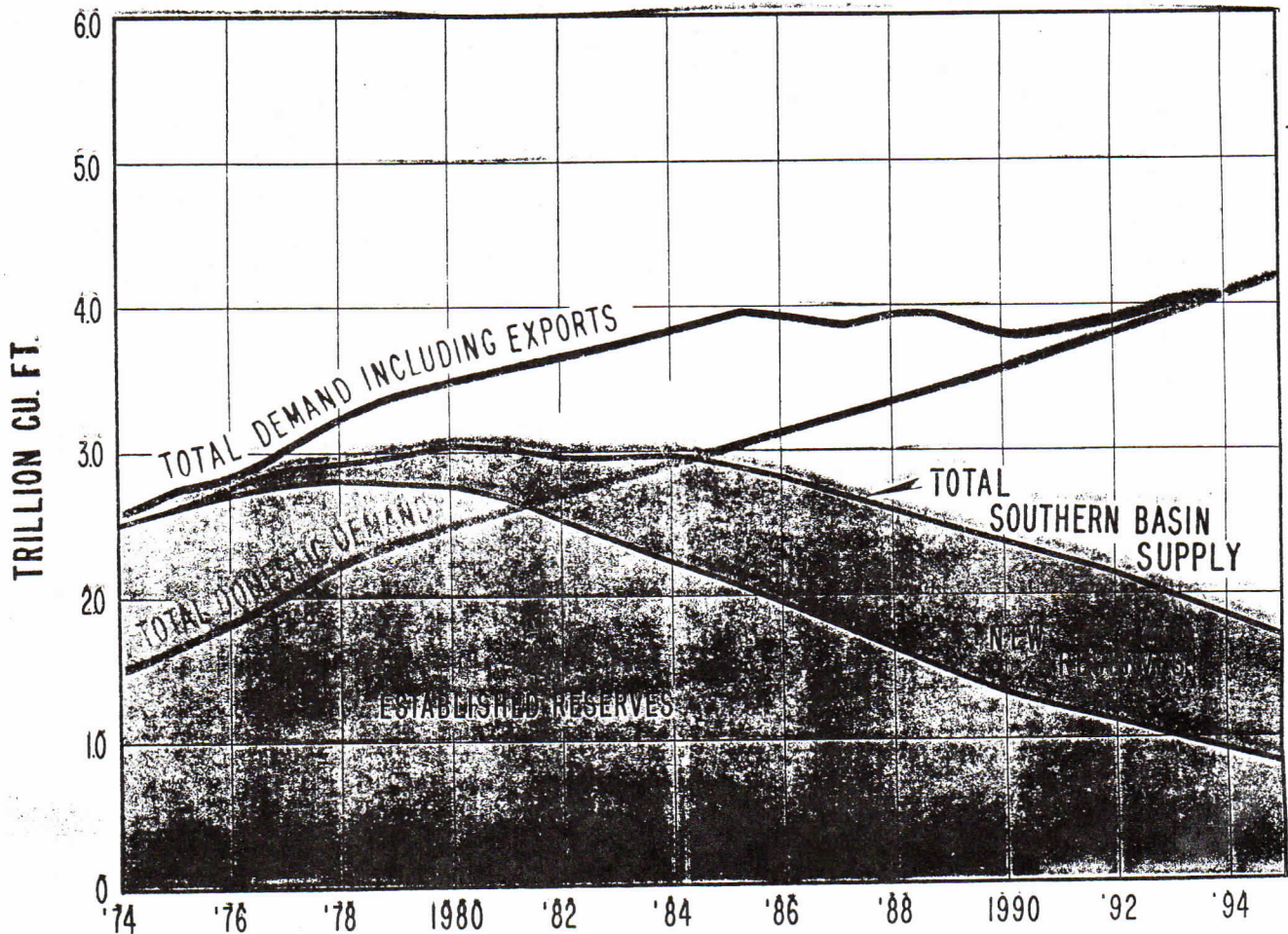
administration of oil and gas exports, and also advises the Government on energy policy matters, published this forecast of oil demand and supply.

No doubt many of you are aware that about half of our oil consumed is produced in Western Canada and the other half is imported. When the Sarnia to Montreal link of the Interprovincial pipeline starts up, Canadian crude will begin to flow into Quebec, thus placing an additional strain on domestic oil reserves. Of the 1.6 million barrels produced each day in Canada last year, 700,000 barrels were exported to the United States. As demand rises and production capacity falls, exports will diminish, so that by 1980 they will be essentially zero. By 1982 the National Energy Board forecast the need for imports to replace a portion of the requirements previously supplied by domestic crude. By 1990 the situation will be something like this:

- established reserves, including the Syncrude and Great Canadian Oil Sands plants, which will supply 600,000 barrels per day.
- reserve additions in Western Canada will supply another 200,000 barrels per day;
- *Future oil sands plants are expected to add 500,000 barrels per day,* bringing the total from these sources to 1.3 million barrels a day;
- finally, imports of 1.5 million barrels a day, at a cost to our annual balance of payments of nearly \$7 billion at current oil prices, will be required to balance to total Canadian demand;
- this requirement for imports will be reduced by an expected, but as yet unknown, increment of new supplies from the frontier regions of Canada.

VUGRAPH #5

CANADIAN NATURAL GAS DEMAND & SUPPLY (NEB FORECAST-APR. 1975)



VUGRAPH #5 - CANADIAN NATURAL GAS DEMAND AND SUPPLY

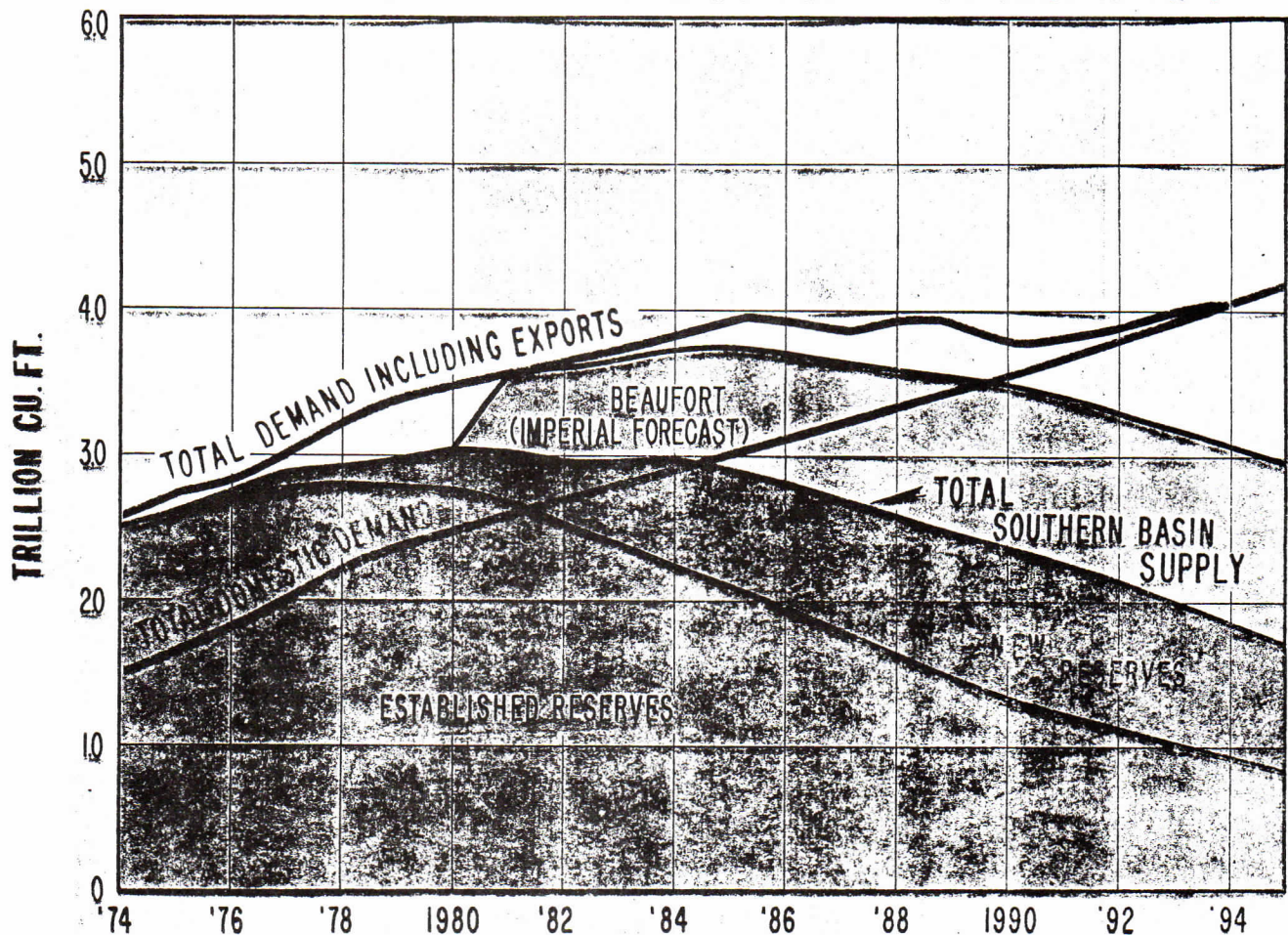
This forecast of natural gas demand and supply was made by the National Energy Board following hearings in the spring of 1975. Total demand shown by the upper red line includes approximately 1 trillion cubic feet per year exports authorized by the National Energy Board in the 1960s and 1970. Without the scale economies provided by these exports, it would not have been possible

to build the major trunk pipelines which now serve Eastern Canada and the Vancouver area.

The projection shows a growing inability, beginning now, to meet all of the demand. It also shows that by 1985 production from established reserves will not be sufficient to satisfy domestic demand.

VUGRAPH #5 - Overlay On

CANADIAN NATURAL GAS DEMAND & SUPPLY (NEB FORECAST-APR. 1975)



VUGRAPH #5 - CANADIAN NATURAL GAS DEMAND AND SUPPLY

Overlay On

Superimposed on the National Energy Board's forecast of Western Canada supply, I have placed our own forecast of future supply from the Beaufort Basin. Geographically, the Beaufort Basin includes the Mackenzie Delta and extends offshore into the Arctic Ocean.

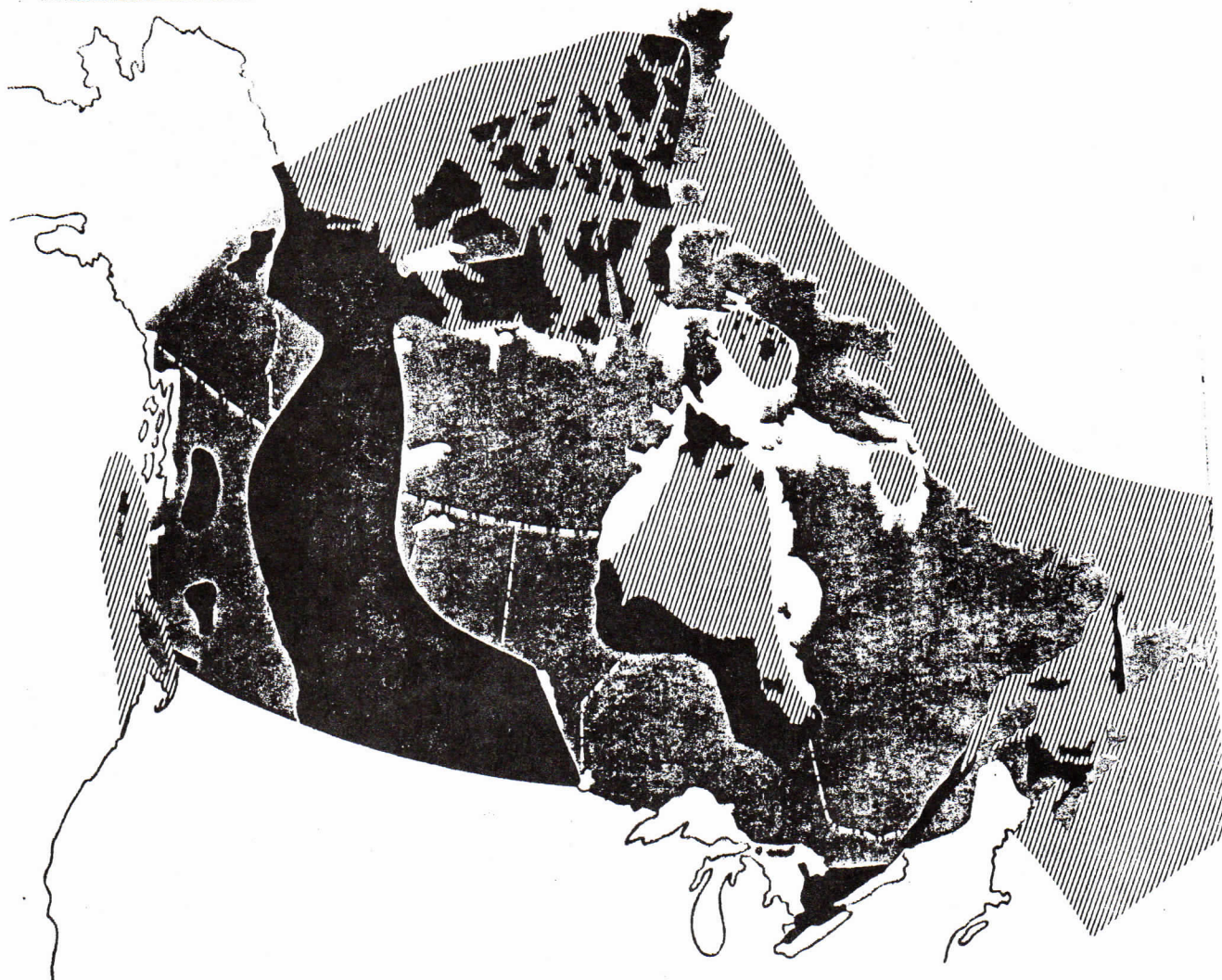
With this supply, Canadian self-sufficiency in natural gas will be extended several years. On top of this, substantial reserves discovered by Panarctic in the Arctic Islands will probably be available in the late 1980s.

The Beaufort Basin supply shown will be of particular interest to you because of the pipeline application presently before the National Energy Board for approval. My company supports the application made by Canadian Arctic Gas to build a 48-inch pipeline to carry both Alaskan and Canadian gas to southern markets. The resulting large scale of operations will significantly reduce transportation costs. Furthermore, Canadian reserves in the Beaufort are not yet sufficient in themselves to justify a pipeline on their own, and it may be several years before they will be. It is therefore important that native, environmental, and other concerns be resolved so that Canada can take advantage of this one-time opportunity to piggyback Canadian gas on Alaskan volumes.

We also should not exclude from our thinking the possibility, if the decision is made to delay construction and build a pipeline for only our own needs, that it might never be viable. This could happen if the pace of finding the additional reserves, needed to generate the income to pay for the pipeline, doesn't keep up with inflationary increases in the cost of the line.

I have mentioned the oil sands and frontiers as areas offering our major opportunities for the discovery and development of new oil and gas supplies. These supplies will come from potential sources, and I'd like to continue the discussion in this vein.

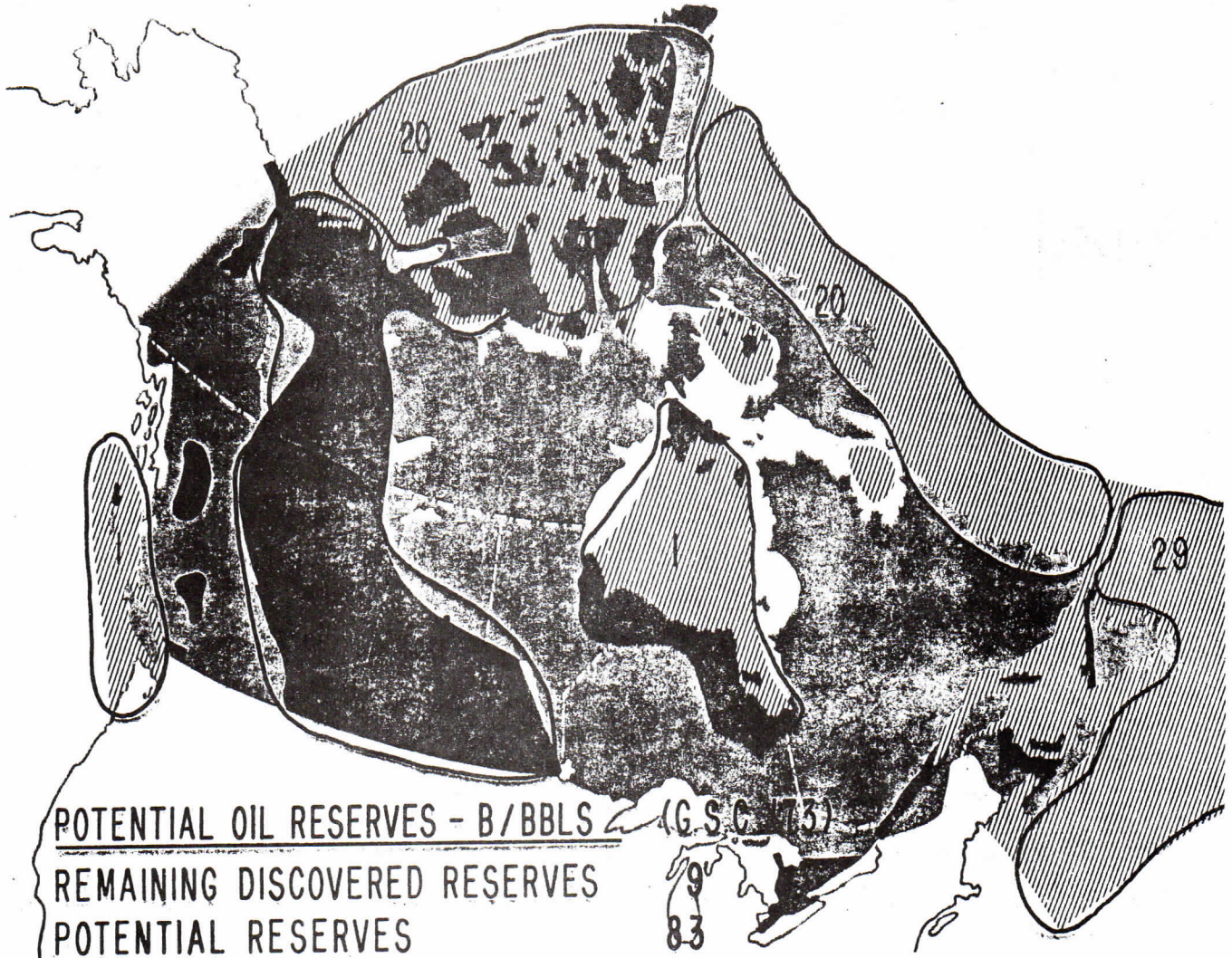
VUGRAPH #6



VUGRAPH #6 - POTENTIAL OIL AND NATURAL GAS RESERVES

The brown areas of this vugraph show the geography of Canada's sedimentary basins. Portions of these basins lying offshore are hachured. The major sedimentary areas are in Western Canada, the Arctic, and the East Coast offshore.

VUGRAPH #6 - Oil Overlay On



VUGRAPH #6 - POTENTIAL OIL AND NATURAL GAS RESERVES

Oil Overlay On

The numbers in the encircled areas are Geologic Survey of Canada estimates of undiscovered potential crude oil reserves. These estimates were made in 1973 and have not been updated since. Most industry experts would consider them to be optimistic in view of subsequent exploration results.

What sets the exploration/production industry apart from other industries is that the risks we take when we invest are, relatively, either white or black -- we make a discovery or, more likely, drill a dry hole. We use all the tools available, but we never know in advance what the result of our exploration will be. It is the same with potential reserves. Geologic estimates are based on limited data, and are subject to wide variation; therefore, no real value can be attached to potential reserves until they are

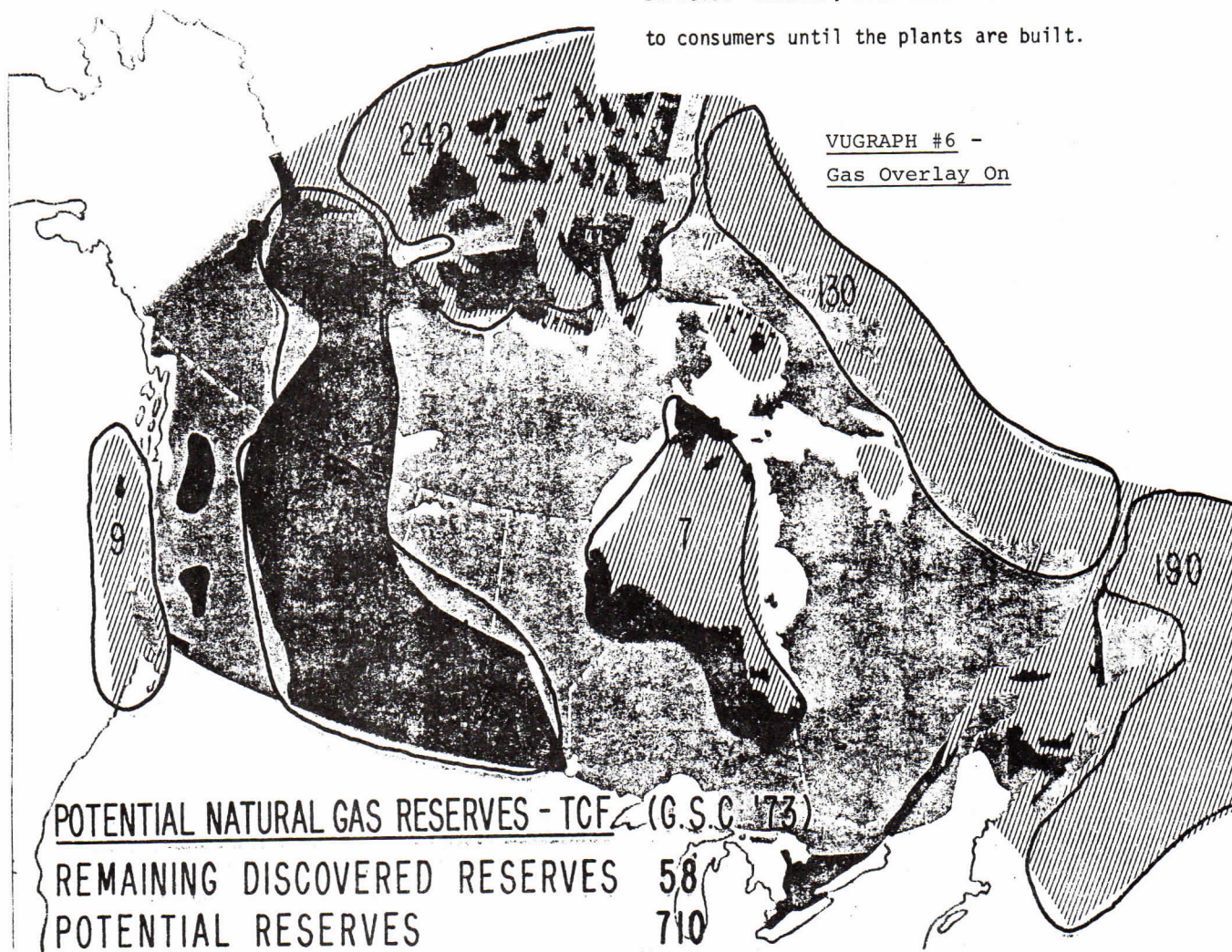
discovered, developed, and linked to markets by transportation systems.

Another category of reserves frequently referred to is discovered (or proven) reserves. These have been defined by drilling and engineering data that demonstrate they can be produced under existing economic and operating conditions. They represent supplies available to the customer, and there is little disagreement among authorities as to their magnitude. The quantity of these reserves remaining in Western Canada is 9 billion barrels.

Continued exploration reflects the oil industry conviction that Canada's potential reserves are indeed large. However, our experience over the past few years has taught us that these reserves will be found and developed more slowly and at much higher cost than was forecast. Discovery rates have not equalled early projections, not so much because of a reduction in the estimates of potential, but because current forecasts are based on an updated view of the

time it takes to discover, develop, and transport new reserves to markets. It is this fact, combined with declines in production capacity from discovered reserves, that now indicate to us that oil and gas production will fall short of meeting requirements in the next few years.

Before leaving this vugraph, I would like to refer briefly to the potential reserves in the Alberta oil sands. They are not included in the total shown on this vugraph. The oil sands cover about 19,000 square miles of northeastern Alberta and are buried as deep as 2,000 feet. The Alberta Energy Resources Conservation Board's judgment of the total quantity of oil contained in these sands is an incredibly large thousand billion barrels; however, only a portion of this total will be recoverable, and most of it will require new technology. The portion in the category of being recoverable by mining techniques similar to those planned to be used by Syncrude is about twenty-seven billion barrels. However, even this will not be available to consumers until the plants are built.



Gas Overlay On

Canada's potential reserves of natural gas will be found in the same basins as our potential oil reserves. The total gas potential, which I also suggest be treated as an upside estimate, is 710 trillion cubic feet. About three quarters of this potential lies offshore, much of it in ice-covered water. Because of the remoteness and the hostile operating conditions, the cost of these future supplies will be several times that of the reserves being consumed at present.

VUGRAPH #7

MAJOR FACTORS AFFECTING THE AVAILABILITY OF NEW OIL AND GAS SUPPLIES

- OCCURRENCE RISK
- MARKET
- ECONOMIC ATTRACTIVENESS
- INVESTOR CONFIDENCE
 - FAIR TREATMENT
 - REGULATORY STABILITY
- CAPITAL

VUGRAPH #7 - MAJOR FACTORS AFFECTING THE AVAILABILITY
OF NEW OIL AND GAS SUPPLIES

Several factors enter into the decision whether or not to explore and this, in turn, determines the amount of new oil and gas supplies that will be made available.

Occurrence Risk

There is a low probability of finding significant quantities of oil or gas in any given area.

This is due to the unequal distribution of reserves in the earth. For example, in the Western Canada basin, more than half of all the discovered reserves are located in fifteen accumulations out of a total of more than 800. The reason for this erratic distribution lies in the complex interplay of geological events that must occur simultaneously in order to provide an oil or gas accumulation. Source rock in which hydrocarbons were formed must exist in conjunction with

porous and permeable reservoir rocks. There must be a trap to prevent escape, and all of these factors must escape destruction by erosion, faulting, etc.

Looked at from this perspective, the estimates of oil and gas potential which we saw earlier can be misleading in that they generally imply significant reserves virtually everywhere. This tends to minimize, in the eye of the observer, the risk involved in locating them. Canada's undiscovered hydrocarbon reserves will be unevenly distributed like those elsewhere in the world -- concentrated in a few basins and, further, in restricted parts of those basins.

Market

The assurance of markets is also an important component of the incentive for exploration. The timing of discoveries cannot be predicted, yet the realities of exploration economics dictate that the explorer must be able to market new supply reasonably promptly.

Economic Attractiveness/Investor Confidence

Economic attractiveness and investor confidence both relate to the explorer's perception of his reward if he makes a discovery. Economic attractiveness is quantitatively estimated by analysis of potential revenues and expenditures. Investor confidence,

VUGRAPH #8 - EXPLORATION/PRODUCTION INDUSTRY HISTORIC REVENUES AND EXPENDITURES

Canada's modern exploration and production industry had its beginning with the discovery of the Leduc field in Alberta in 1947. Since then a total of \$32 billion has been collected in revenues from the sale of oil and gas. The industry has also spent \$5 billion on operating costs, \$8 billion for development investments, and \$8 billion for exploration drilling and seismic expenditures. A further 3 billion exploration dollars has been paid to governments for land costs. The industry has also paid \$8 billion in royalties on production and income taxes on profits.

on the other hand, can only be judged subjectively. The basic ingredients for good investor confidence are a history of both fair and stable levels of taxation.

In the past three years there have been at least 20 significant changes in the levels of taxes and provincial royalties on producer's increases. This has caused investors to become suspicious that further changes will occur, and that they may not be able to keep the potential profit from investments now being contemplated.

Capital

The final factor affecting the decision to explore is the availability of capital. I believe this point is self-evident, and I will leave it, except to point out that the inherent risks of exploration generally preclude borrowing; therefore, most of the capital required must be reinvested from profits.

I have listed these five factors in the order in which they would be considered in a decision whether or not to invest. However, the one that is at the top of my list of concerns at present is investor confidence. Without improvement in this area, the availability of new oil and gas supplies for Canada is in jeopardy. In my next two vugraphs I would like to address this problem by attempting to clarify the facts about alleged high industry profits and windfalls from price increases.

Of the \$32 billion revenues, \$21 billion have been reinvested in the business and \$11 billion have been paid to governments, leaving a cash balance of zero at the end of 1975. Therefore, in total, the industry has not yet earned any profit on its investments, although it is a fact that individual companies certainly have, while other companies will never get out of the hole.

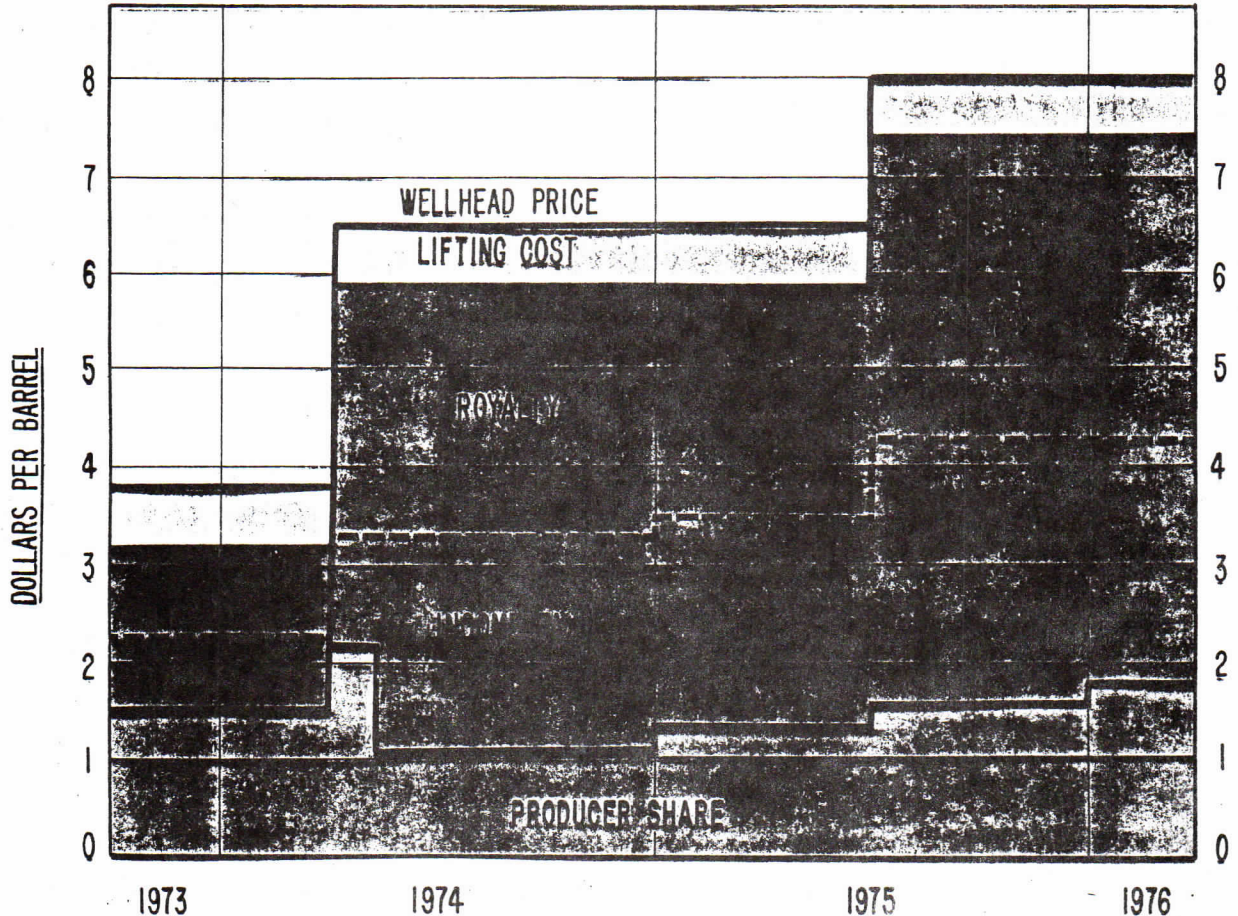
It appears that industry had expected to obtain a 9-12% real* rate of return on its investments to date. Under current royalty and tax rules, only a 7% return will be obtained. You might wonder how investors will get less than expected in view of the doubling of crude oil and natural gas prices in the last two years.

EXPLORATION/PRODUCTION INDUSTRY HISTORIC REVENUES AND EXPENDITURES

Cumulative
1947-1975
\$ Billions

TOTAL REVENUES	32		
LESS: OPERATING COSTS	5	}	
DEVELOPMENT INVESTMENTS	8		INDUSTRY
EXPLORATION - PROGRAM	8		NON-GOV'T
- LAND COSTS	3	OUTLAYS 21	
ROYALTIES	6	}	
INCOME TAXES PAID	2		GOV'T
	11	RECEIPTS 11	
INDUSTRY CUMULATIVE NET CASH POSITION AT END 1975		NIL	

PRODUCER/GOVERNMENT SHARING OF REVENUES - ALBERTA OLD OIL



VUGRAPH #9 - PRODUCER/GOVERNMENT SHARING OF REVENUES

This vugraph shows how revenues from a barrel of crude oil production are shared between the two levels of government and the producer. Actually, the total revenues are greater than shown here. Exports are sold at the world price, while refiners of Canadian crude pay a lower price. Today exports command about \$12.50/bbl., while the wellhead price is controlled by agreement between the federal and Alberta governments. As you are probably aware, the \$4.50/bbl. difference between the selling price of exports and the wellhead price paid by refiners in

Central and Western Canada is collected by Ottawa and used to subsidize the cost of imports in Eastern Canada.

If we can go back to 1973 on the vugraph for a moment, you will see that after lifting costs and payments to governments, the producer was permitted to retain about \$1.50 per barrel. Several changes in the producer share have occurred since 1973, but, overall, the producer share has barely risen. Large increases in the wellhead price have substantially enriched Ottawa and the producing provinces, but have not contributed meaningfully to improving the industry's return on its past investments.

VUGRAPH #10

THE CANADIAN PETROLEUM CHALLENGE

• ACHIEVING CANADA'S PETROLEUM DEVELOPMENT OPPORTUNITIES WILL:

- ADD TO NATIONAL WEALTH.
- ENHANCE EMPLOYMENT AND TECHNOLOGICAL BASE.
- IMPROVE BALANCE OF PAYMENTS OUTLOOK.
- INCREASE SUPPLY SECURITY.

VUGRAPH #10 - THE CANADIAN PETROLEUM CHALLENGE

The very last thing I want to do is to leave this group with the impression that I, or Imperial Oil, are pessimistic about Canada's longer term energy future. The opposite is true. However, achieving Canada's petroleum development opportunities will be a major challenge. Success will bring many rewards; it will add to the national wealth, enhance our employment and technological base, improve our balance of payments outlook, and provide supplies that we will be assured of having when we need them.

I do not feel that present tax and royalty policies contain the necessary ingredients to facilitate the large investments that will be required to achieve this objective. The greatest need is for improved investor confidence. Basically this depends on producers obtaining a larger share of oil and gas revenues to pro-

vide a fair return on past investments. The second need is for reasonable and stable tax and royalty regulations for the future. Frontier and oil sands regulations have been under study by the federal and Alberta governments for half a decade. The importance of finalizing these grows day by day as existing supplies dwindle. The fact that the industry is presently investing is a tribute to the trust that these problems will be satisfactorily resolved before it is too late.

Many of you people are now in the final process of choosing your careers. My decision, of course, was made years ago; however, I have never regretted choosing the energy industry because of the interesting challenges it has and will continue to provide.