Book Reviews

Oil and Gas in Canada: The Effects of Domestic Policies and World Events

by J.F. HELLIWELL, M.E. MACGREGOR, R.N. MCRAE and A. PLOURDE
Toronto: Canadian Tax Foundation, 1989
pp.xviii,340

Canadian energy policy has proven to be an unusually fertile field for policy analysts during the last 15 years: the "energy crisis" triggered by the two OPEC price shocks, the fear of domestic oil and gas shortages in the mid-70s and rancorous federal-provincial conflict kept the issues associated with energy policy high on the political agenda for most of a decade. The steady stream of books and articles on energy policy that resulted was a welcome relief from the bland government reports and commissioned company hagiographies which had masqueraded as energy policy analysis until that time. Although the publication of yet another book in this crowded field might thus at first appear superfluous, *Oil and Gas in Canada* is less a history of Canadian oil and gas policy than a chronology of events. The reader who is interested in finding out how and why government decisions were taken will have to look elsewhere.

This comment is not a criticism. Many excellent books have already been written on the considerations underlying recent Canadian energy policy. What these books often lacked, however, was a systematic review of the movements of prices, revenues, drilling activity, reserves, production and demand. The consistent data series on these variables in *Oil and Gas in Canada* make this a very valuable reference book, which will be particularly appreciated by the many researchers who have struggled with the differing units and statistical approaches employed by government agencies and industry.

The book's conclusions are entirely orthodox: the government of an open economy, such as Canada's, should define its objectives very carefully before intervening in the energy market. Seen from today's market-oriented perspective, the National Energy Program (NEP) introduced in 1980 does indeed appear as a breathtaking and particularly truculent attempt to direct an industry's activities. Even those who followed the events at the time will probably have forgotten much of the alphabet soup of regulated prices, programs and taxes which became the daily fare of energy policy-makers in the early 1980s: PGRT, IORT, PCC, NGGLT, COSC, PIP, NORP, COSP, CHIP are so many acronyms whose meanings have now largely been forgotten.

In retrospect, it would clearly have been more

efficient to rely on the market to balance supply and demand. As the authors of the NEP found out to their dismay, intervention bred further intervention, until the combination of price controls, high taxes and grants was defeated by its very complexity and its inability to adjust quickly enough to the vagaries in world oil prices.

Most of the Canadian oil industry still sees the NEP today as a symbol of government incompetence and malevolence. Yet, the interventionist policies applied by the government immediately prior to and after the NEP were not entirely nefarious and indeed benefited the industry in an important way. Helliwell and his colleagues argue that the countercyclical pricing and taxation policies, which the federal government followed over the ten-year period starting in 1974, moderated the impact of the swings in world oil prices and actually stabilized the industry's rate of return at a time when international oil prices were extremely volatile. By muting the investment boom resulting from the second OPEC price shock in 1979, these policies also eased the industry's painful adjustment to stagnating demand and the collapse in prices in the mid-1980s.

Some companies also benefited from government intervention in other, more direct, ways. The most expensive NEP program was, of course, the Petroleum Incentives Program (PIP) under which oil companies received grants for exploration based on location and their level of Canadian ownership. *Oil and Gas in Canada* reminds us of the generosity of these grants: between 1977 and 1985, the authors calculate that the government contributed 83% of the cost of oil exploration in northern Canada in grants and tax expenditures, or $6.25 billion (in 1985 dollars). The government's largesse off the East Coast was only slightly less exaggerated — $5.1 billion (79% of all costs).

Helliwell and his colleagues point out that, over the same years, the average well in northern Canada cost 77 times more to drill than in western Canada, and off the East Coast, 100 times more. It is here that the book's descriptive style shows its greatest limitations. Having calculated the staggering subsidy paid by Canadian taxpayers — in many cases to the very oil companies they distrusted the most — the authors do not explore the policy implications of, or alternatives to, this program. What did this investment achieve? What was its opportunity cost? What would the investment of $11 billion in increasing energy efficiency have yielded? What could have been the environmental benefits of more benign forms of energy?

The lessons for the future, which the authors draw from their analysis, are also disappointingly modest: that detailed price regulation at a time of international price volatility is impossible to design and administer, and that the government should develop a robust fiscal system capable of withstanding large changes in prices and demand. These conclusions are valid, but it is unfortunate that the authors have not taken fuller advantage of the analytical tools at their disposal to make more detailed policy recommendations.

As governments world-wide seek to promote more environmentally sustainable forms of development, some of the most difficult policy decisions they must make relate to oil and gas policy. For example, how should the environmental costs associated with the greenhouse effect be internalized? Should Canada impose a carbon tax, as environmentalists recommend? How high should such a tax be to encourage conservation? What would be its impact on Canada's international competitiveness? Would regulation more efficiently reduce oil consumption? What are the economic implications for the producing provinces, of a federal policy designed to limit the environmental impact of fossil fuels?

There are admittedly no easy answers to these questions. But they are likely to form the core of the public policy debate over oil and gas in the 1990s. Helliwell, MacGregor, McRae and Plourde are uniquely qualified to propose answers and guide this debate. One of the lessons of the past decade is that, all too often, political rhetoric overwhelms economic analysis in the Canadian energy debate. Books such as *Oil and Gas in Canada* bring back a much-needed objectivity to this important public debate.

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Industrial Natural Gas Demand

by MERETE HEGGELUND
Calgary: Canadian Energy Research Institute, 1989
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Merete Heggelund's objective in this CERI report was to provide "...a comprehensive overview of likely long-term trends in Canadian industrial natural gas demand." By examining the energy use patterns of major industrial consumers, she hoped to: (i) assess how future production technologies might impact long-term energy demand, and (ii) estimate the magnitude of these effects on natural gas demand.

To accomplish this task, Heggelund shunned the standard econometric tools often used in long-range forecasting. Instead, she pursued a rigorous, detailed examination of production processes in major energy-consuming industries: Pulp and Paper, Iron and Steel, Petroleum Refining, Industrial Chemicals and Fertilizers. To support her analysis, the author relied on a variety of process models, including the AERAM model (to study Alberta's petrochemical industry), the MARKEL-Quebec model (developed under the auspices of the International Energy Agency) and the ISTUM model (used for studying the pulp and paper industry in BC). Final results were generated using the structural SERF model, developed by Statistics Canada.[1]

The result is a thorough, well-researched report that responds equally well to an economic forecaster trying to gain insights into future industrial energy requirements or to a corporate planner in the gas industry trying to plot the direction of future marketing initiatives.

Indeed, the report could just as easily have been entitled "A Business Plan for Industrial Natural Gas Marketing — 1989 to 2015." It clearly identifies the challenges and opportunities facing the gas industry in the industrial sector. Virtually all the major elements of an industry's strategic plan are included: assessment of strengths and weaknesses; analysis of the operating environment; identification of competitive issues; presentation of base-case forecasts and sensitivity analyses; and suggested objectives and strategies for the industry.

For students or new employees of the industry, *Industrial Natural Gas Demand* is an indispensable text/reference book. Particularly useful are: Chapters 2-5, which provide a thorough description of process and energy end-use detail for the selected energy-intensive manufacturing industries; and Appendix A, which gives an overview and evaluation of the data sources available in Canada for energy-use analysis.

Although the liberal use of technical jargon sometimes makes for slow reading, the Glossary included in the report helps tremendously in this regard and is a valuable resource for any non-engineer working in this field.

One of the most useful contributions of this report is the insight it provides into conservation. This is a topic to which most forecasters devote, at best, nominal discussion in preparation of their projections.

The industry-specific information provided by Heggelund, particularly in regard to future trends in process technologies, is an excellent primer on the fundamental processes driving energy consumption. More importantly, by quantifying these trends, the study provides a real-world benchmark against which other industrial demand forecasts can be assessed.

By clearly identifying the major technological developments facing the important gas-using industries, Heggelund conveys to a larger audience a fact that has been familiar only to those directly involved in gas industry research and development; namely that, relative to the electrical industry, for example, the natural gas industry lags in the development and implementation of industrial technologies that use the energy form it is selling. Curiously, Heggelund de-emphasizes this fact, arguing that, because electricity's share of total industrial energy demand is rising only slowly, the much-discussed issue of electro-technology penetration is overblown. This conclusion is at odds with her analysis. For example, it ignores the fact that her results show only moderate gains in electricity's market share mainly because they are based on measures of purchased energy. If one were to trace process end-use energy demand, the inclusion of the growing amount of self-generated electricity would significantly raise electricity's share of process energy. In contrast, the growing amount of natural gas used for cogeneration, which in Heggelund's report inflates natural gas'

1/ Appendices B and C of the report describe these and other process models in detail.

market share of purchased energy, would be excluded. The resulting divergence in market shares would then properly reflect the increasing penetration of electricity into industrial processes.

Heggelund's results are sobering for the natural gas industry: the market share of gas is likely to fall in almost all sectors and any energy conservation measures introduced in the future are likely to have a disproportionate (negative) impact on natural gas demand. Furthermore, the gas industry's mediocre track record in R&D relative to the electrical industry means that future trends in capital replacement, upgrades and process changes dramatically favour electricity. The author identifies the major strategy that must be pursued by the gas industry to remedy this situation. Specifically, the industry needs a major program to develop and encourage the implementation of new gas-utilizing technologies if it is to achieve moderate, sustainable, long-term growth.

Other conclusions outlined in the report are equally relevant. For example, Heggelund's suggestion that the development of cogeneration technologies and opportunities for their application should be actively pursued, particularly by natural gas suppliers (as opposed to transmission or distribution companies), is generally accepted within the industry. This is one of very few areas where natural gas faces a potentially huge, largely untapped market.

A disappointing aspect of the report is the analysis of the "Constant Energy Intensity Case." Designed to measure the importance of the assumptions regarding energy intensity in the Reference Case, this sensitivity analysis fixed energy intensities at their 1985 levels. To this reviewer, such an exercise defeats the main purpose for using the process-modelling approach, which is to take account of the dynamics between industrial output, technological developments and energy demand. One would think that, even in a worst-case scenario, the assumption of such a static-technology case is unrealistic. Even many demand projections based on econometrics, while notorious for being unable to capture technology changes satisfactorily, include time-trends to reflect some of capital stock adjustment.[2]

A more relevant scenario, that one hopes can be incorporated in planned updates to this study, would be an "Accelerating Technology/Efficiency Case." Such a scenario would be consistent with: (i) efficiency gains attributable in recent years to the increasing penetration of electronics, computers and CAD-CAM techniques, at continually decreasing real cost; (ii) the likelihood that real energy prices will increase at a higher rate than during the last decade; and (iii) the competitive pressures likely to materialize in many industries (especially in those that are resource-based) due to liberalized trade and increasing activity in newly industrialized countries.

If CERI should want to be courageous in future updates on this topic, they could also attempt to predict the impacts of new environmental priorities and legislation on the energy consumption habits of various industries.

Finally, turning to matters of presentation, it is an oversight in the report that, with the exception of a few graphs, energy price projections are not specified. In addition, while relative energy prices, as well as the cost of energy relative to other productive inputs, are recognized as important factors influencing capital equipment/technology choices in industry, the report is very vague as to how these relationships are captured.[3]

These minor issues aside, the natural gas industry owes CERI a measure of thanks, not only for identifying the challenges it must confront in promoting the utilization of natural gas in Canada's industrial sector, but also for providing a plan of how to achieve its objectives. It remains to be seen whether the industry will meet the challenge.

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2/ For a complete review of dynamic energy demand models, see Raymond S. Hartman (1979) 'Frontiers in Energy Demand Modelling,' *Annual Review of Energy* 4:443-66.

3/ Ontario Hydro, for example, incorporates within its INDEPTH models, functions that select the least-cost alternative among competing capital equipment choices. These functions account for the cost of the equipment, as well as fuel and other operating costs.