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North American Natural Gas Supply: Is the Message getting through?

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Former United States President, Franklin D. Roosevelt once grumbled, ‘The trouble with this country is that you can’t win an election without the oil block, and you can’t govern with it.’ The National Petroleum Council (NPC) emerged a few years later, in 1946 at the request of President Harry Truman, building on the close cooperation between the U.S. government and the oil industry during World War II. Ever since, the NPC has been a steady force on behalf of the ‘oil block’ in advising successive administrations of the United States government on energy policy, proving that, sometimes at least, it is possible to govern with it.

Understanding the history of oil and the industry it has spawned is a prerequisite to beginning to understand the geopolitics of energy generally and the positions America has taken specifically in global energy issues. Given its share of the world’s energy consumption and the fact that its hydrocarbon needs are increasingly met by imports, energy policies shaped in Washington, and *how* they are shaped and with *whom*, should be of interest to the rest of us. Last year the NPC commissioned some historians to write a history of the Council and of the various issues on which Energy Secretaries have asked its advice. The Council sees itself in Washington as the resident institutional memory educating ‘government officials about conditions in the (energy) marketplace’, thus the title of the book, **Voice of the Marketplace—A History of the National Petroleum Council** (by Joseph A. Pratt, William H. Becker, & William M. McClenahan Jr.). The Council has avoided ‘aggressive lobbying’, preferring to stick to the facts as it sees them. But it is a lobby, for as one member put it during an internal debate whether to give a view on the future, ‘Are we helping ourselves? If not, what are we doing it for?’

Over the years, the Council has tendered advice to policy makers on several principal themes as they evolved over the half century. These include: perceptions of and

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mechanisms to deal with emergency preparedness; U.S. energy policy outlooks and projections; national security and strategic petroleum reserves; balancing energy and environmental goals; and the ascent of natural gas in America's energy mix. The authors of 'Voice of the Marketplace' devote a chapter to the rigour and structure the Council employs to respond to requests from the Energy Secretary for advice.

After Alan Greenspan noted the contradictions in policy and the tightening situation in North American natural gas supply, on May 16th, 2003, Energy Secretary Spencer Abraham summoned the Council to discuss the recent turbulent period in world energy markets and called on it to advise him on the serious state of natural gas supply and storage in the United States. The Council immediately got busy and in 4 months produced a monumental piece of work, titled, **"Balancing Natural Gas Policy—Fueling the Demands of a Growing Economy"**. The background analysis and appendices for the report truly are testimony to the rigour and comprehensiveness that the Council's hundreds of industry experts bring to its work. The volumes provide a wealth of information on the North American gas sector including potential and productive capacity of different sedimentary basins and the various drivers of demand in different end-use sectors. The industrial and power generation sectors account for over 57% of US natural gas consumption, which is a fifth greater than all the gas consumed by all sectors in the EU-15 countries. Electricity is the fastest growing form of energy in final consumption and the construction of new power generation capacity since 1998 has been almost exclusively gas-fired, presumably in part owing to what investors must have seen as reasonable prospects of there being a supply of gas at a competitive price to fuel them. Therefore, it should not be surprising that policy makers in Washington want to know what the industry has to say for itself regarding such a crucial fuel supply sector.

A principal reason why Washington might be wondering what has happened to the natural gas industry in North America is that a mere four years earlier, the NPC submitted another report on natural gas to the government, **"Natural Gas—Meeting the challenges of the Nation's Growing Natural Gas Demand"**, in which the Council painted a picture of gas continuing as a going concern, and specifically that the resource base was adequate to meet the increasing demand foreseen by the NPC, in particular in power generation. While bullish on gas supply, the Council raised several flags regarding their concern about access to resources and to rights-of-way, the need for continued technological development, looming investment requirements, and other factors that could cloud this rosy future. But, the question that surely must be registering with lawmakers, and it certainly has with investors in power generators, who went out and built over 200 GW of gas fired generating capacity: what has changed to the underlying domestic gas resource to have, in its most recent report, altered the Council's outlook so dramatically?

In its two 2003 scenarios, labelled *"Reactive Path"* (RP) and *"Balanced Future"* (BF) that might be characterised as 'Governments Prevaricate' and 'Governments Facilitate', the NPC charts out two different futures for American gas consumers. With the world oil price fixed at \$20 for both scenarios, they are designed to show government the difference in the nation's gas bill under two sets of assumed energy policies. In other words, the 'Voice' of the marketplace examines what happens if government policies trump the forces of the marketplace. Prices rise by 2025 to more than \$7/MMBtu in RP,

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and rise only slightly to \$4.80 in BF. If, in the view of the NPC, governments don't approve drilling licenses faster, allow drilling in offshore areas that are currently off-limits, expedite approvals of LNG re-gasification facilities and the Alaskan gas pipeline, encourage increased energy efficiency and conservation, adopt emission regulations that promote fuel switching, and take or don't take a host of other actions, the prices will increase costing America one trillion dollars more than if it does all these things. Perversely in this high price scenario, fuel switching does not happen even when the price of gas rises to 140% of fuel oil prices, investors invest less in wind, LNG, Arctic gas and unconventional gas and consumers consume *more* than they would in the BF scenario at lower prices where there is more supply from more diverse sources and more alternatives to free up gas. Essentially the model is contorted to force outcomes. A particularly glaring example is with respect to coal—in the RP no new coal plant is built out to 2010 yet, according to a recent survey by the DOE's National Energy Technology Laboratory¹, nearly 40 GW of coal-fired capacity additions are planned out to 2010, and half that many more contemplated. Power generators in the United States are going back to the old stalwart, secure and economic King Coal.

It is perfectly legitimate to employ modeling as an analytical tool to examine different outcomes under different sets of assumptions. And it is certainly legitimate for an industry group such as the National Petroleum Council to say to governments they are part of the problem if the latter's rules, regulations, policies and procedures or lack thereof, impede their commerce. Others will have different views on the desirability of gas exploration where currently off-limits and whether emissions controls should be more flexible, and they should and do make known their concerns to governments. One has the suspicion that the NPC's recommendations reflect one of the chronic tensions within the Council, described in "Voice of the Marketplace"; namely that between the commercial perspectives of its big international members versus the small stay-at-home independents. Arctic gas, LNG, frontier and deep offshore Gulf exploration—these are the high-impact areas that most interest the major oil companies, not fiddling about with thousands of miles of little pipes draining water and gas from what amount to 'water wells' into coal seams in the Rocky Mountain Basins where they have to deal with cantankerous ranchers and environmentalists about soil disturbance, land use and water disposal. Which faction of the 'oil lobby' will win out remains to be seen. In any event, unless it wanted to atone for a rather bland and skimpy 1999 report, the Council really did not need to go through such modeling gymnastics to reinforce its important, simple and clear message; namely, that the solution to the problem is less government in some places and more government in others. Lobbying is a reality, after all.

The point of this note is not to discuss the art and science of modeling nor its merits and pitfalls—others² have done so, exhaustively and competently—apart from saying there

¹ "Tracking New Coal-Fired Power Plants—Coal's Resurgence in Electric Power Plants", Scott Klara and Erik Shuster, National Energy Technology Laboratory, US DOE/EIA, July 20, 2004

² See for example, K. Costello, Hillard Huntington and James F. Wilson, "After the Natural Gas Bubble—A critique of the modelling and Policy Evaluation contained in the NPC's 2003 Natural Gas Study", in preparation and available from the authors. See also various studies by the US DOE/EIA, such as "Accelerated Depletion: Assessing Its Impact on Domestic Oil and Natural Gas Prices and Production", US

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might well be a situation of ‘mind-boggling by over modeling’. Decision-makers’ eyes glaze over when faced with dozens of scenarios and they tend to reject the lot as too theoretical, but in doing so, ignore the important warnings in the empirical data at the starting point for these scenarios. Over-cooking scenarios to make a point is neither the greatest surprise nor the most serious in terms of what these reports imply for North America’s natural gas prospects. It is in the changes in recent and near-term natural gas productivity that must cause concern and we have to wonder whether this message got through in Washington and in State capitals. In its 1999 report, the NPC projected that U.S. natural gas production in 2002 would be 6 Bcf/d higher than it actually was (50 Bcf/d). Going out to just next year, the Council now sees even a greater variance from its earlier projection—20% less producibility than projected in 1999. Not surprisingly the difference increases the further out in time: 2015 production drops 30% from 92 Bcf/d projected in the 1999 to 70 Bcf/d in the 2003 projection.

A lot can happen to change a picture projected over 10 or 15 years; much depends on the assumptions made. But projections out 5 or 6 years are well within the normal planning framework of most large companies. They usually have a fairly accurate estimate of their proven reserves, which by definition and reporting convention, are conservatively defined and therefore only in the most abnormal of circumstances do firms downgrade their proven reserves, and this would not usually happen in an environment of rising prices. Firms regularly make assumptions about prices and how much drilling will be needed to replace reserves and therefore what their production is going to be four or five years out. Few are off in their projections by more than 10 % and those that are; their executives are sent off on permanent golfing. The recent write-down of reserves by Shell—interestingly also by 20%—comes to mind when examining these variances of the North American collectivity of natural gas producers. Yet, paradoxically, while North American gas production has declined, the under-pinning reserves have increased. For its three successive reports, the ‘US GAS INC’ (in the NPC) advised the government that its Lower 48 *proven reserves*’ as of 1/1/91, 1/1/98 and 12/01 were 160, 157 and 175 Tcf respectively. The increase in reserves since 1998 reflects the significant increase in average gas prices since 1999, which saw an attendant increase in drilling (except in 2002 when prices sagged and drilling accordingly) over the period 1999 to 2003. But throughout the Lower 48 and Western Canada, while gas connections have increased, the amount of gas per connection has steadily declined over the last decade.

The change in North American gas production today from 1990 can be summarized as follows: with gas prices three times as high, twice as many rigs drilling twice as many wells that are 5 to 16% deeper, the amount of recoverable gas found per well has dropped by one third or more, and while initial well production is higher (owing to fracturing as many gas zones per well as possible to accelerate gas and cash flows), the decline rate in the first year has increased by 50 to 100%. Today the US gas industry has to add 50% more productivity than in 1990 just to keep production flat. In the Western Canada Sedimentary Basin, one of the largest contributors to North American supply, the situation is even worse. For the first time in its history, gas production in western Canada

DOE/EIA SR/OIAF/2000-04, July 200; and “Analysis of Restricted Natural Gas Supply Cases”, US DOE/EIA, SR/OIAF/2004-03, February 2004.

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fell in 2002. In 1990, 3000 wells found 1.7 Bcf/well. In 2002, three times as many wells found just 0.3 Bcf/well. The US has been relying on Canada to meet an ever-growing share of U.S. gas requirements. In the spring of 1971, responding to nationalist sentiments in Canada regarding energy exports, Canadian Energy Minister Joe Greene warned the United States that “It would be wrong for your industry and your policy makers...to look to Canadian supplies as a panacea for the ills of the natural gas industry”³. Today, for geological rather than ideological reasons, the same message would appear to apply.

As noted, proven reserves in the US at least have increased over the last few years. How is this possible and what does it mean? This is due to the subtle distinction between *producing reserves* versus *non-producing reserves*. Virtually all of the recent reserve additions are in what the industry calls proved but non-producing reserves. This does not mean the industry has drilled up reserves and is sitting on them waiting for prices to rise until they are economic—they have to be economic today in order to call them ‘proven reserves’. Most of these new reserves are in the ‘non-conventional’ category: gas from tight sands, coal beds and shale. Coal Bed Methane wells are drilled and then de-watered over one to three years; once the water pressure in them has been relieved, gas increasingly flows from the wells. As North America increasingly turns to ‘non-conventional’ gas, ever more wells will be required at ever closer spacing—the treadmill will speed up. Compounding the deliverability challenge is the presence of so many gas-fired power plants at the demand end of the pipeline system. When they are called on for power they draw gas from pipelines instantaneously. The higher the gas pressure going into a gas turbine the better, and the sudden demand from a big gas fired power plant can drop the pressure in the feeder pipeline significantly. Therefore pipeline companies have to use more gas to keep the line pressure up even higher. But at current prices, this is not happening too often as many gas fired plants are simply not running.

The decline in gas well performance in Western Canada, as noted above, has been a shock; it might partly reflect the changed structure of the industry and its shifting priorities, and a propensity of those involved in gas exploration to chase cash flow by concentrating on sure-fire drilling in the eastern, shallow part of the basin. Certainly the drilling statistics help support this interpretation, but the basin is ‘tired’. Another shock, however, is what is happening in the three U.S. Gulf Coast producing areas—onshore, shelf and deep offshore—which accounted for over 55% of US production in 2000. Here, recoverable volumes per onshore well for 2005 are now projected to be 30% lower than projected in the earlier study and for wells on the shelf, more than 50% lower (28 Bcf to 13 Bcf) per well. What is staggering is not that gas per connection is declining—that has been observed for years—but, rather, that within just four years, the industry has changed its view so dramatically for the near term (next year) for the two most important sources of gas on the continent, which together supply two thirds of its gas.

How this picture can change so much and so quickly in what is probably the most transparent gas industry and sedimentary basins in the world, in terms of drilling statistics

³ Quoted in “We’re Running Out of Gas”, by Ralph E. Lapp, The New York Times Magazine, March 19, 1972.

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and reserves data, should be the most troubling revelation from these studies. Moreover at current prices, while land rigs appear to be fully utilized, the number of offshore rigs operating is down to nearly half of the 2001 level. If this means there simply are few prospects worth drilling, then President Bush and Senator Kerry had better start leveling with the American people, rather than dishing out tired, retread energy policy platitudes from the seventies that are nothing more than subsidies under another name for automobile and agriculture lobbies, as the solution to America's energy needs.