Running Out of Gas

by David Hughes

The National Energy Board (NEB) recently produced a draft energy outlook through 2025 for Canada. In the report, the NEB projects natural gas supplies would come from existing sources (Western Canada Sedimentary Basin, East Coast Sable Field) and from new conventional projects developed in offshore Nova Scotia and Newfoundland, the West Coast, MacKenzie Delta, and the Beaufort Sea. The NEB also anticipates Liquefied Natural Gas (LNG) imports into Canada, along with massive development of coalbed methane (CBM). However, even given these rather optimistic assumptions, Canada's natural gas supply will still peak in 2010 in one case, and in 2020 in the other.

South of the border, the US Department of Energy's Energy Information Administration (EIA) projects Canadian exports to grow by over 60% through 2025 (even given a 2010-2020 peak by NEB's own assumptions), and projects optimistic assessments of increased supply from the lower 48 states.

The optimism of the NEB and EIA for growth in production from existing gas sources is not realistic given drilling statistics. In Canada, gas well drilling completions nearly tripled from 1996 to 2001, yet production increased by less than 10%. Reserves declined in every year except 2001, when additions barely replaced production. Reduced drilling in 2002 marked Canada's first successive decline in natural gas production, suggesting production from existing areas peaked in 2001.

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With a yearly decline in gas production of more than 20%, Canada needs to find reserves of more than one trillion cubic feet of natural gas each year just to keep production flat. In the US, gas well drilling completions nearly doubled from 1997 to 2001, yet there was little response in terms of increased production. This suggests that both the NEB and EIA assumptions of future supply are overly optimistic and that the current volatility in natural gas prices will continue—and probably get worse—given the forecast expansion of gas-fired electricity generation (see North American Electric Reliability Council Report, October 2002). If, as drilling statistics suggest, production from existing supply areas peaked in 2001 in Canada, there could be a supply-demand gap as early as 2004, with corresponding impacts on natural gas prices.

The NEB suggests a 400+ percent increase in gas-fired electricity generation by 2025. The EIA suggests an expansion of 185% over this period in the US. What is missing here is an appreciation of the realities of gas supply. Reliability of electricity supply is on the line and must be managed with the lowest possible environmental impact while maintaining the highest degree of security possible.

What About the Tar Sands?

The urban legends surrounding the Tar Sands (oilsands) are just that: legends with no consideration for the amount of resources that are actually recoverable, given technological and gas and water supply constraints. Here's some facts:

• Getting oil from oilsands cannot significantly offset declines in world production because of the lead times and capital investment required.

• Producing oil from oilsands is energy-intensive. Energy from natural gas equal to one-third of a barrel of oil is required to refine a barrel from surface operations; the in situ operations have an even higher ratio of 1:2. The economics of oil production from oilsands could be disastrous if there are shortfalls in gas supply.

• Expansion of surface mining capacity is limited by water supply; two and a half to three barrels of water are needed for every barrel of oil produced.

The National Energy Board has forecast a five-fold expansion of in situ and mining operations in the Tar Sands by 2025. Even with this expansion, Canada's oil production will still peak in the 2013-2019 timeframe and accounts for less than 4% of forecasted 2020 world oil demand.

Some Facts From the Bottom Line

• North Americans consume five times as much energy per capita as the world average (and produce five times the per capita carbon emissions).

• The developing world (5 billion people) is increasing its energy consumption at a rate of 13% per year, compared to 2.5% per year in the industrialised world (960 million people). The industrialised world still

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consumes 60% more energy than the developing world.

• North America is impoverished in oil and gas relative to the rest of the world. World oil production is expected to peak in the 2008-2012 timeframe.

• Earth simply does not have the resources to allow for North American levels of consumption in the developing world.

Solutions

There is no free lunch. All forms of energy creation — wind, photovoltaic, biomass, nuclear, hydro, oil, gas, or coal — have an environmental and energy penalty. A radical reduction in consumption is the lowest-cost and most sustainable option. By their nature, however, governments are reluctant to provide the stimulus to make this happen because it could be unpopular with gas-guzzling voters.

Clean coal technologies (at 60% efficiency compared to today's 32%) could provide part of the transition to something more sustainable. However, these technologies are expensive and take long lead times (7+ years) to implement relative to gas-fired plants (1+ years). If there is a supply crunch for gas, it is unlikely to be possible to switch to coal because of the lead time needed. Governments think in timeframes of elections, but a longer term vision is needed to ensure sustainability. Coal is far more abundant in the world than are other hydrocarbons.

Hydrates from the ocean floor cannot be considered part of the energy solution. There is no technology to develop this potential energy source; the Japanese say 12 years and Canadians say 15 years. That's the up-side; the down-side is never. Assuming that hydrates will save us is akin to planning your finances on the assumption you will win the lotto in 12 or 15 years. The promoters of hydrates quote astronomical numbers, which, in my view, is irresponsible because they simply lull those who don't understand the uncertainties into doing nothing.

Nuclear energy still faces the waste issue—a 10,000+ year problem. Even if the proposed Yucca Mountain waste facility in Nevada goes ahead (at a cost of over $US50 billion), it will be completely full with just the wastes generated in the US since the beginning of the atomic age.

Coalbed methane is not a panacea. It could provide a small increment to the gas supply (8% of US production after 20 years of development; essentially 0% in Canada).

LNG is forecast to be about 8% of US consumption by 2025 (EIA). Problem is, you need to build $US200 million terminals that nobody wants located next door, as well as $US150 million ships that each contain about 3 billion cubic feet of gas at minus 165 C°. The energy used to liquefy, refrigerate, transport, and re-gasify LNG costs up to 25% of the energy produced and has the same increase in associated GHG emissions. An LNG terminal is being built in Tijuana for export across the border to the US. LNG could come from the Middle East and the former Soviet Union, which together have about 75% of the world's gas resources.

Hydrogen is an energy carrier, not an energy source. It takes energy to create hydrogen. Most hydrogen is created from natural gas, although China is creating it from coal. Hydrogen has a very low energy density by comparison to gasoline (<10%) and could be an important part of the solution.

There isn't a silver bullet. The solution lies in a portfolio of options, the most important of which is greatly reducing people's expectations. One thing is certain: "business as usual" is not sustainable.

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David Hughes is a geologist with more than 30 years experience studying Canada's energy resources for the Geological Survey of Canada and the private sector. For several years, he has developed a keen interest in the "Big Picture" as it relates to the longer term prognosis for continuity of energy supplies, and some of the political and environmental ramifications.

Burning Coal and Raining Mercury

A study by the National Wildlife Federation has found that levels of mercury in surface water exceed the US Environmental Protection Agency's federal safe standards for people and wildlife. The source of the mercury is rain.

Mercury attacks the brain and nervous system and can be dangerous to anyone who eats freshwater fish. According to the Centers for Disease Control and Prevention, one in 12 women of childbearing age has blood mercury levels that exceed the federal safe level for protection of the fetus. This translates into approximately 320,000 babies born annually in the United States at risk for neuro-developmental delays.

In wildlife, mercury inhibits reproduction among species such as rainbow trout, mallard and American black ducks, loons and terns, otters and mink.

Eighty-five percent of all mercury pollution is created by coal-fired power plants and municipal medical waste incinerators that send mercury into the air, where it falls back to Earth as rain or snow, according to the Mercury Policy Project (*www.mercurypolicy.org).*

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