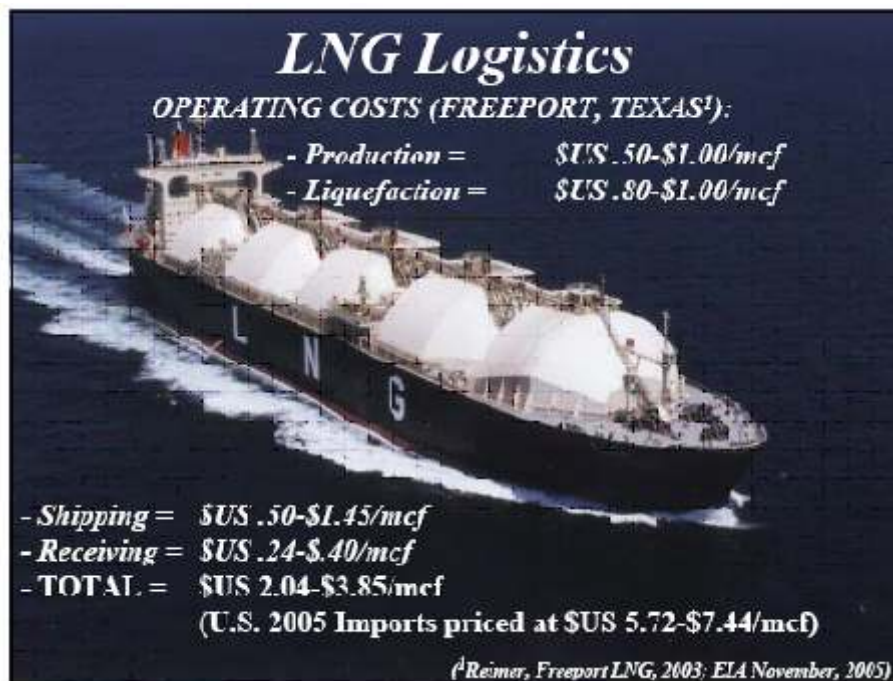


Input To The OPA Discussion Paper #6 Sustainability

Liquefied Natural Gas (LNG):
"You Can't Get Cargoes For Love Or Money"



December 21, 2006

Prepared by Grant Church

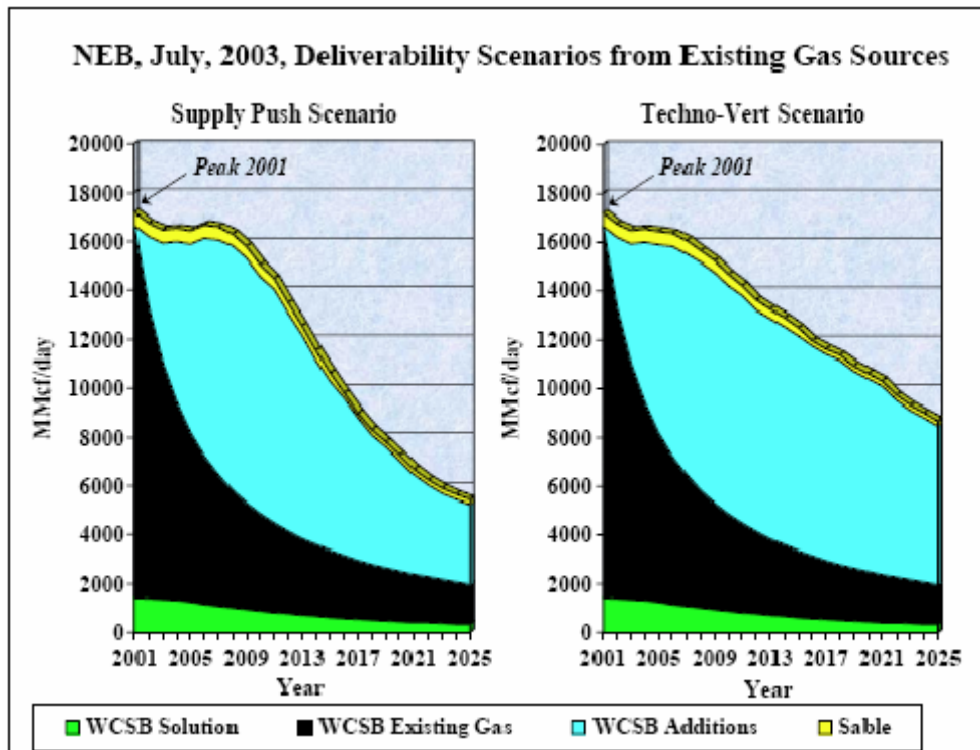
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December 21, 2006

Input To The OPA Discussion Paper #6: Sustainability

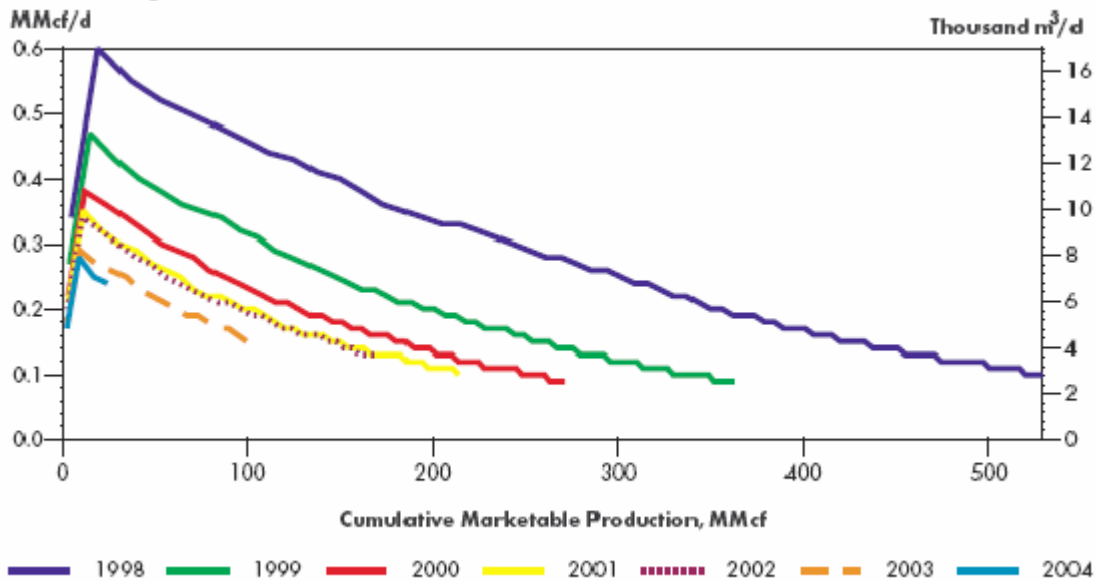
Liquefied Natural Gas (LNG): "You Can't Get Cargoes For Love Or Money"

As the title indicates, so was the LNG situation in the summer of 2005. LNG is not the panacea it's made out to be. It has a lot of problems as I will discuss below and, therefore, is not a secure nor an inexpensive fuel source. A fuel source must be both secure and cost-effective for the production of electricity. LNG-produced electricity would put us at a severe competitive disadvantage in the global marketplace, and the objective of reducing greenhouse gases would be substantially diminished or even eliminated.

The National Energy Board is saying that Canadian gas production is going to fall sharply starting about 2009. The following graphs clearly illustrate this. Why would the OPA contract to build gas-fired power plants knowing this?

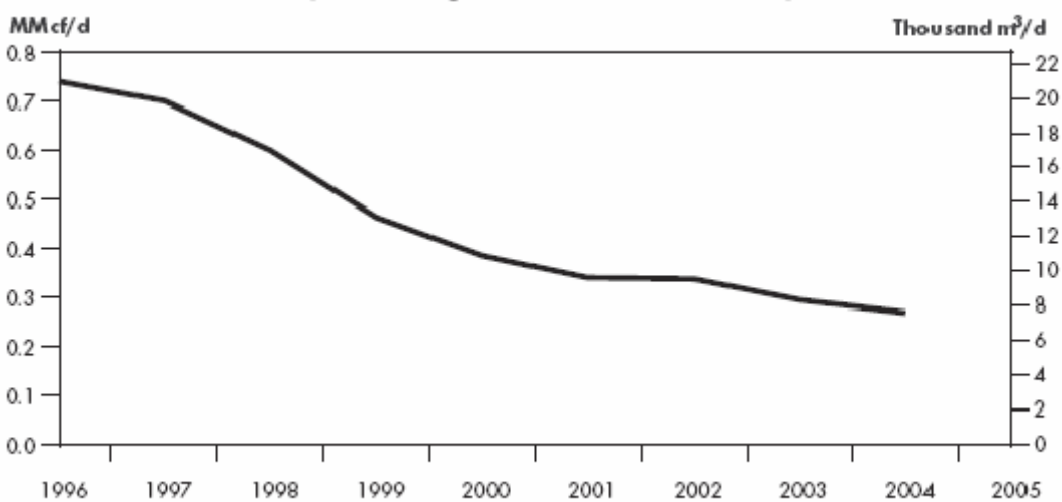


WCSB Average Gas Connection Performance



Source: Board Analysis of GeoScout Well Production Data

WCSB Initial Productivity of Average Gas Well Connections by Connection Year



Source: Board Analysis of GeoScout Well Production Data

Both of the above graphs show that the Western Canada Sedimentary Basin is depleting rapidly. Existing wells are declining at a rate of 20%/yr. Each successive year's crop of new wells has a lower initial production rate and a faster depletion rate. At the November OPA workshop, it was said that the OPA doesn't do its own studies on natural gas but looks to existing studies from NRCan and the NEB. It's obvious that you are ignoring them and David Hughes of the Geological Survey of Canada. Nobody with any business sense would commit to building a gas-fired power plant knowing the abysmal future of gas in this country.

The Ontario Energy Board's Natural Gas Electricity Interface Review (NGEIR) reported that gas-fired generators would become the largest class of gas-consumers in the province if all current (ie not including the Lakeview Generating Station – 1,000 MW closed in April 2005) coal-fired generation were replaced with natural gas. They would consume more gas than all of the residential customers in the province combined.

"... the quantity of natural gas required to replace all the OPG coal-fired plants with gas-fired plants would be about ... 347 Bcf per year. The total primary demand for natural gas in Ontario in recent years have averaged about 986 Bcf/yr." (Dr. J. T. Rogers, Professor, Department of Mechanical and Aerospace Engineering, Carleton University – "Options for Coal-Fired Plants in Ontario, September, 2004")

That is a whopping 35% increase in Ontario demand. Is there even the pipeline capacity to deliver that volume of gas? I've heard from one source who works at a combined-cycle gas plant that the capacity isn't there to do it. He also says those plants aren't as clean as they claim. According to him, as the gas turbine load decreases, the NOx level rises, and you can see a yellow steam from the smokestack. At a certain point, there is insufficient exhaust to run the steam turbine, and the efficiency plummets. At the 10% operating level, the emissions are so bad they are required by ministry regulations to run the plant for no more than two hours.

Where will the gas come from? It will have to come by LNG tankers, if you can find one. Most of the current fleet of ships and liquefaction facilities are committed to delivering gas that has been contracted, often 20 to 25 year contracts. There are a lot of consuming nations who have little or no gas of their own, and they are willing to pay the price to insure they get it. Qatar, Iran, and Russia, who have the greatest ability to further develop their gas potential, recently announced a moratorium on new LNG exporting facilities. The ones that are currently under construction are already spoken for. We will have to wait a long time and be on the ball in the bidding process when new facilities are announced. And you want to base our electricity system on this?

Even if there was a lot of LNG available, you need to build the ships to transport it. The biggest ships cost about US\$250 million a piece. World ship building capacity is about 20/yr. North American production will be falling even faster than they can build the ships. One ship can make about 10 round trips to Qatar per year. Remember, we aren't the only nation with falling production. Several European nations, the US, and Mexico are in the same boat. Under NAFTA rules, the US can force us to continue to export gas to

them. If we do reduce exports to them, it will only increase the pressure on them to bid higher for LNG. Fifty-six percent of US energy needs are met either directly through gas or gas-fired power plants.

The following article clearly shows the trouble the US is having, and they've been importing LNG for several years. I strongly suggest that you read the entire article. It mirrors what the NEB and David Hughes are saying.

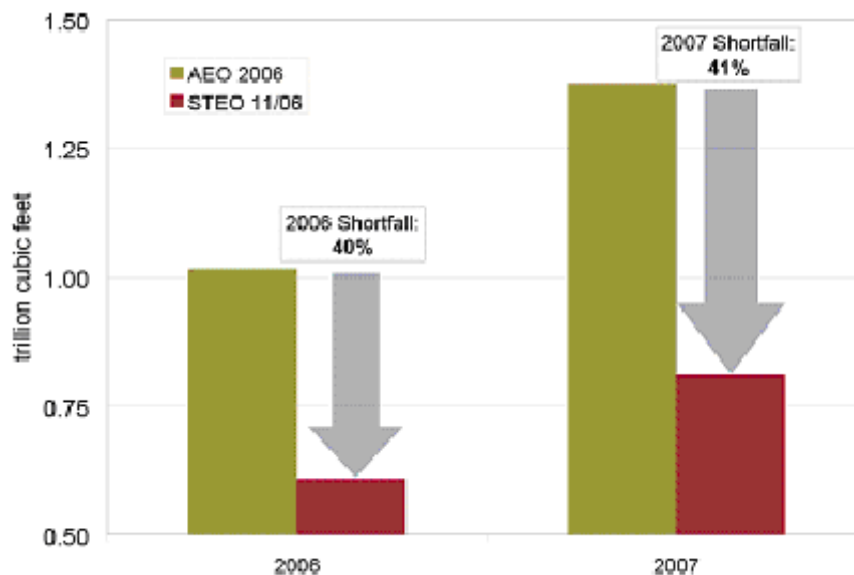
EnergyPulse

Playing with Fire – The 10 Tcf/year Supply Gap -- Part I

Author: Andrew Weissman

December 15, 2006

"EIA's most recent short-term forecast predicts that 2006 LNG imports will fall 40% below the level forecast in AEO 2006. The gap in 2007 is expected to remain at essentially the same level – viz., a shortfall of 41%:

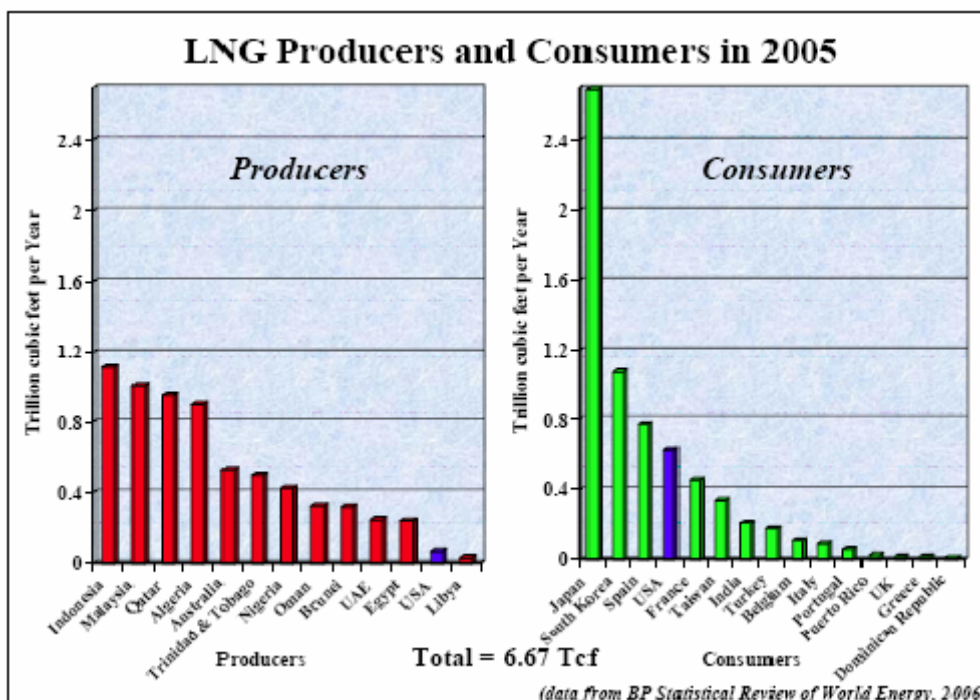
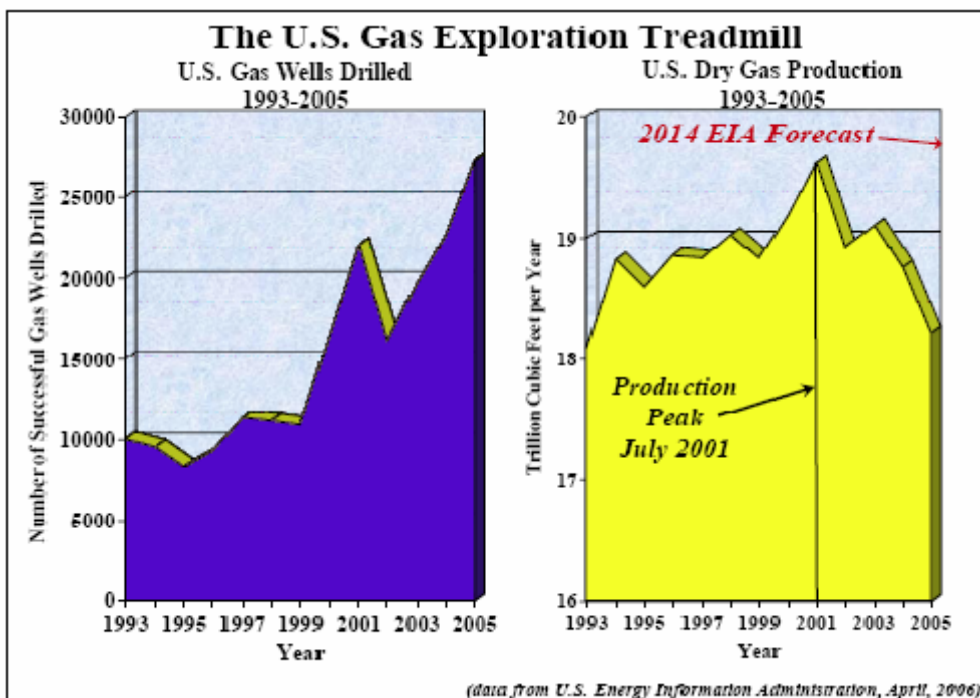


This startling gap between actual and expected imports of LNG (i.e., for 2007, an expected gap of 1.6 Bcf/day, equal to 2.6 % of expected U.S. supplies for the year) provides a foretaste of what is likely to be a recurring pattern throughout the next decade, as major new LNG liquefaction projects frequently come on line on their original target dates, and U.S. bidders frequently are outbid for the available supply by purchasers in other markets."

http://www.energypulse.net/centers/article/article_print.cfm?a_id=1388

US LNG imports will have to increase to make up the production shortfall. The bottom graphs show the other countries we will have to compete with. China is not listed, but its first LNG port opened this year, with many more planned. With one 25 year contract with Australia, they have almost caught up to Taiwan. See this article for the details.

<http://www.bp.com/genericarticle.do?categoryId=2012968&contentId=7019205>



China may not be able to fulfill its desire for LNG because of the competition.

LNG Terminals China 2006

July 20, 2006

"China has placed a high priority on LNG development. Two terminals (Guangzhou LNG and Fujian LNG) are under construction. However, the other planned additional LNG terminal projects may be delayed because of the shortage of LNG suppliers and its escalating price in the global market."

[\(http://www.iqpc.com.cn/cgi-bin/templates/genevent.html?topic=229&event=10326&\)](http://www.iqpc.com.cn/cgi-bin/templates/genevent.html?topic=229&event=10326&)

According to the NEB report, "Natural Gas for Power Generation: Issues and Implications" (http://www.neb.gc.ca/energy/EnergyReports/EMAGasPowerGeneration2006_e.pdf), more than 45% of US electricity generating capacity is gas-fired. However, the utilization rate is low because it can't compete against other means of generation. California has only two very small coal-fired generating stations, which didn't even register on the 2001 US EPA Scorecard. It imports 21% of its electricity from coal plants outside of the state. It sounds like the Ontario plan. Back in 2000 they had a drought. The hydroelectric plants suffered a huge drop in production. The gas plants tried to make up the shortfall, but the pipeline capacity couldn't support it. They had a blackout. The same thing would happen here if we had a drought. What if we had no wind and a few nuclear reactors were down? And what if the LNG supply was disrupted? Coal plants have all weather operating capabilities and on site fuel storage that can last several months. LNG would not meet the mandated reliability requirement.



Hurricane Ivan
September 2004
Category 5
Ninth worst hurricane ever

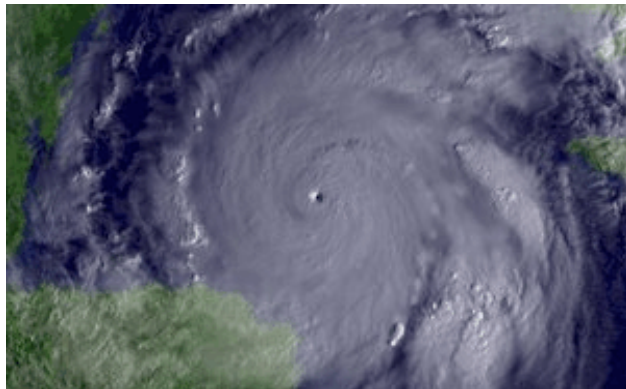
Natural gas must be looked at from a North American perspective. The US gets 20% of its gas out of the Gulf of Mexico.



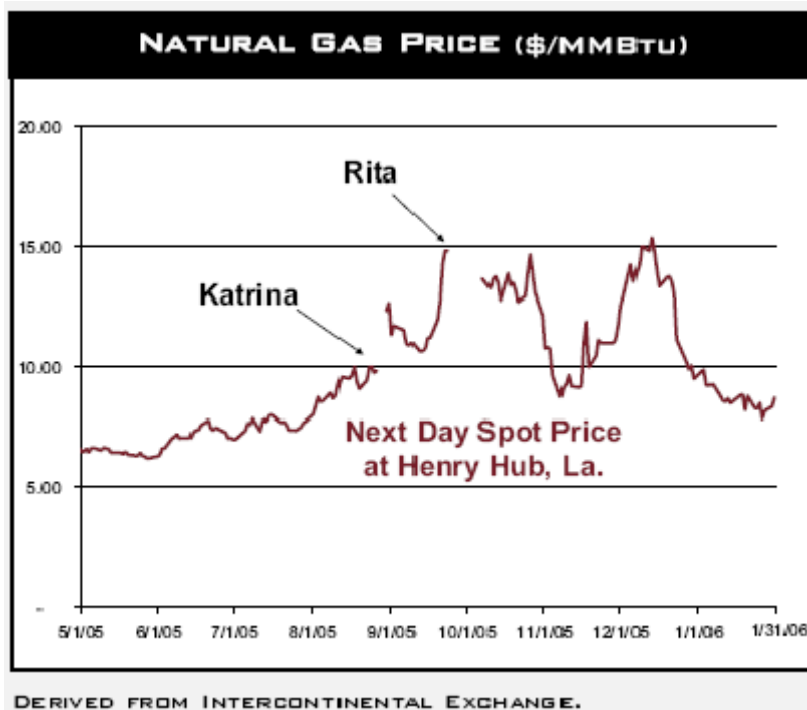
Hurricane Katrina
August 2005
Category 5
Sixth worst hurricane ever



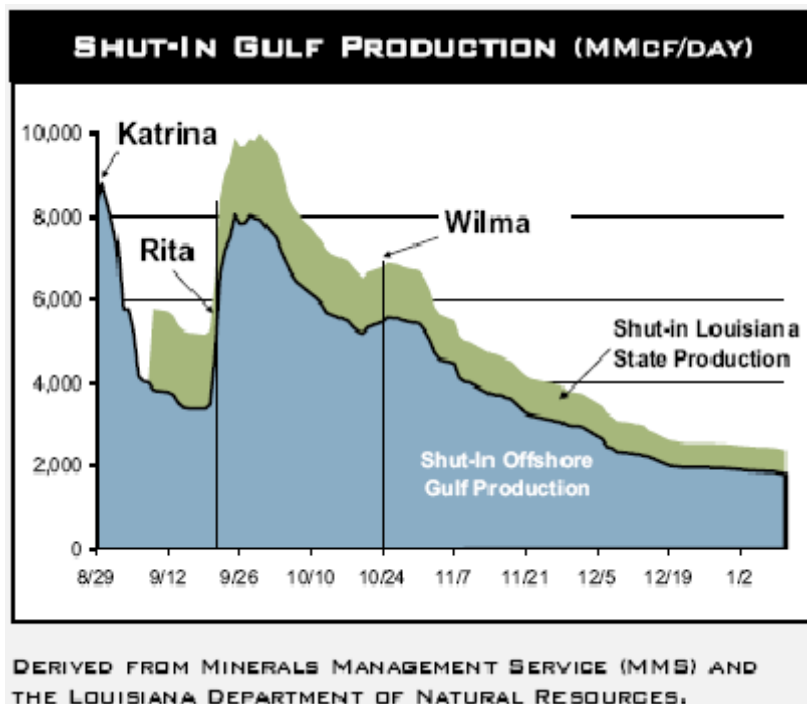
Hurricane Rita
September 2005
Category 5
Fourth worst hurricane ever



Hurricane Wilma
October 2005
Category 5
Worst hurricane ever



As you can see, those powerful hurricanes had a potent effect on the price of gas. Billions of cubic feet of production were lost as wells were shut in and infrastructure was damaged. No LNG could be delivered through weather systems like them. We didn't lack for gas in Canada; but we sure paid the price, not only for gas, but for gas-fired electricity too.



The damage in the gulf and on land to gas and oil infrastructure was severe. By March 2006, only 85% of gas and 76% of oil production had been restored to pre-Katrina levels (White House press release, March 8, 2006). If the winter had been severe, there could have been shortages, and the stellar prices would have continued.

EnergyPulse

The Critical Need to Examine More Carefully the Role of Liquefied Natural Gas (LNG) In Meeting Future U.S. Energy Needs - Part 2

Author: Andrew Weissman

May 18, 2005

"We saw vividly last fall, for example, the impact on the market price of natural gas of the temporary loss of approximately 2.2 Bcf per day of production from the Gulf of Mexico due to Hurricane Ivan. At its peak, the cash market price for natural gas jumped by as much as 60% and the price for natural gas futures traded on NYMEX sky-rocketed to as high as \$ 10.00 per MMBTU. No other event affecting the natural gas market in the U.S. has ever caused a temporary loss of supply even close to the magnitude of the loss of production caused by Hurricane Ivan; instead, from a domestic supply standpoint, the temporary loss of production that resulted from Hurricane Ivan was a classic "1 in a 100 year" event. By contrast, however, the production temporarily lost due to the storm – i.e., at its peak, 2.2 Bcf per day -- is the same scale size as each one of the largest LNG supply projects targeting the U.S. market.

In a tight U.S. market, there already was evidence this past summer that the ability of Japanese buyers to outbid the U.S. for a small number of LNG cargoes originally expected to be delivered into the U.S. market but ultimately diverted to Japan (including at least one cargo from Trinidad reportedly shipped halfway around the world to satisfy demand this summer in the Japanese market) was sufficient to significantly affect the price of natural gas futures traded on NYMEX – possibly by as much as 50 cents per MMBTU." (http://www.energypulse.net/centers/article/article_print.cfm?a_id=1009)

Purchasing.com

Spot LNG Prices Surge to Record Highs

September 19, 2005

"Spot liquefied natural gas prices have surged to record highs near \$10 per million British thermal units (mmBtu). Hurricane Katrina has reduced U.S. natural gas output while LNG projects in Nigeria, Australia and Egypt have lost nearly 1.6 million metric tons of output due to production problems in August and early September. In July, global LNG was selling around \$6/MMBtu. An LNG cargo to be delivered into the U.S. was reported sold last week at a record high of \$9.50/MMBtu, reflecting a surge in U.S. gas prices after the hurricane slashed output. The LNG plant problems mean between 22 and 24 cargoes have been lost this summer, putting upward pressure on

spot prices. These days, "you can't get cargoes for love or money," Frank Harris at Edinburgh-based consultants Wood Mackenzie tells the Australian Associated Press. The Houston-based industry newsletter Waterborne LNG Report writes that Japanese utilities reportedly are willing to pay \$12-\$13/MMBtu." (<http://www.purchasing.com/article/CA6258257.html>)

The government claims that combined-cycle gas plants emit 60% less CO2 than coal-fired plants. This is only possible if the plant is operating at full load and if the gas is dry. It is like those car mileage ratings, where even under optimum driving conditions they aren't met. As I mentioned previously, real life operations are radically different. When fugitive releases of gas are factored in, the improvement disappears. Gas must be cooled to -165C to make it into a liquid, requiring a considerable amount of energy. It must be kept cool while in transit, using more energy. Furthermore, it takes energy to get it here. The Middle East, our most likely source, is half way around the world. On a trip from Qatar, only 2.3Bcf out of an initial load of 2.6-2.8Bcf arrives in North America. See the following link for more details.

(http://www.energypulse.net/centers/article/article_print.cfm?a_id=839)

Natural gas has widely varying heat values depending on its source. This would require the injection of air or nitrogen to make it compatible. What complications would this cause if used in gas plants, other industries, or even in our homes? Even if you could get it, LNG is not an environmental advantageous fuel.

National Energy Board

Natural Gas for Power Generation: Issues And Implications

"According to 2004 data from the IESO, coal-fired generation set the price of electricity 56 percent of the time in the Ontario wholesale market, including peak and off-peak periods, and sets the price of gas about 30 percent of the time. When gas generation set the price, it is more than twice as high (about \$78/MWh, versus about \$33/MWh for coal). **It follows logically that increased gas-fired generation in Ontario will likely result in higher electricity prices** due to greater frequency in setting the price of electricity, greater operational flexibility required in gas supply and services to serve the electric power generation sector, and the potential risks inherent with timing differences between gas and electricity markets."

(www.neb.gc.ca/energy/EnergyReports/EMAGasPowerGeneration2006_e.pdf)

The above NEB report is indicative of the high prices your plan to make electricity with natural gas will condemn us to pay.

Between weather and other production problems around the world, not to mention the already tight supply situation in North America, the price of gas hit record levels. It was reported that in one market by the US Federal Energy Regulatory Commission that the price hit \$US16/MMBTU. It was open season on LNG tankers, with what wasn't under contract going to the highest bidder. Sometimes, cargoes were diverted half way around the world. The LNG port closest to being operational in Canada, the Canaport by Irving Oil in St John, New Brunswick, will only be serving New Brunswick and the northeastern United States, not Ontario. LNG will not be able to meet the coming gas production shortfall, and it won't be cheap. It is incumbent on the OPA to bring the facts to the minister of energy, and make it clear to him that natural gas does not meet the objectives of affordability, sustainability, nor reliability.

Sincerely,

Grant Church