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From Botswana to New England - a different story

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I have recently been writing about Botswana, and their sudden discovery of vulnerability when they found that their supply of electricity was no longer to be available. There is a passage in Cape Wind, the book by Wendy Williams and Robert Whitcomb, that shows the increasing vulnerability of places such as New England as the balance that exists between available supply and demand narrows. The event occurred in mid January 2004 when there was a sudden cold spell that lasted over a week, and the story is told from the point of view of the Independent System Operator (ISO) that manages the supply for some 14 million folk, and is located in Holyoke, MA.

On January 14th the ISO had assurances that up to 10,000 megawatts would be available from gas-fired power plants as they anticipated demand rising to around 23,000 to 25,000 megawatts, as the temperature was anticipated to drop to minus ten degrees. But by 8:30 am on the first morning of the crisis, this began to change:

> A trickle of phone calls began coming in to the Holyoke headquarters, all with pretty much the same bad news. Plant operators who relied on natural gas as their fuel reported that although their plants were in working order, there was no gas available for them to buy. It had all been taken by the companies responsible for providing gas for home heating.

By afternoon the trickle of "no gas" calls became a flood. . . . .During this all-time winter peak, when electricity was essential for the very survival of many New Englanders, roughly 7,200 megawatts of gas-fired generation was now unavailable. . . . .because they couldn't find enough natural gas to buy."

In the end crisis was averted by some load shedding, including closing the schools, but it illustrates the coming vulnerabilities that we face as our historic assumption that there will be enough power when we need it, suddenly starts to be significantly challenged. However, in this case, action was taken, and things no longer look as grim.

Following the 2004 event there was a report (pdf) prepared for the New England Governors in 2005, from a specially appointed Natural Gas Subcommittee. Summarizing their conclusions (from March 2005) they reported:
• Supplies will largely be challenged in the winter, there is more than enough power otherwise. (The highest electricity use is in the summer – this relates the NG).
• Demand can be met, through 2010, providing there is adequate LNG supply, without which

supply would not be reliable.
• To ensure reliable deliveries beyond 2010 there must be either significant demand reduction or infrastructure development.
• Expansion of fuel switching, energy efficiency and renewable energy programs may be the least expensive ways to improve gas supply reliability, while improving fuel diversity. But expanding LNG facilities provides considerably greater improvement to gas supply reliability.
• Investing in energy efficiency programs may yield benefits, but this will require more study.

The LNG facility in question was that at Everett, MA., and this supplied 20% of the regions normal gas demand, but 30% at peak. The network had, in 2005, storage capacity for 10 days of peak winter demand, but this is conventionally stored at pressures below that required as feed for the natural gas power stations. Nine different supply scenarios were developed that looked at ways of meeting the need. In terms of cost fuel switching, so that gas-powered stations could switch to burning oil, was considered the cheapest; expanded electricity efficiency the next in cost; followed by new coal and nuclear power plants, and then renewable power. It was anticipated that expanded LNG facilities would be the most expensive.

Natural gas usage in New England was at 800 Bcf per year in 2005. It received some 60 tanker loads of LNG for a total of 158 Bcf, but has the capacity to handle up to 98 tankers per year. At that time it was supplied from Trinidad and Tobago (pdf). Growth was anticipated to be around 1.38% (EIA) or higher. By 2007 natural gas use was still providing 29.3% of electrical power, but the absolute amount (39,367 MWH) was down slightly from 2006 (39,423 KWH) but up over 2005 (38,583 KWH), and it provided 40% of New England's total fuel supply.

In order to improve LNG supply the Northeast Gateway was proposed, with the ability to offload LNG tankers offshore, and pipe the gas ashore. It was completed in January 2008.

> With peak deliveries of up to 800 MMcf/d of gas, Northeast Gateway can deliver about 500 MMcf/d of gas into the New England market during normal operations, or approximately 20 percent of the New England market's current annual gas consumption. The facility cost between $350 and $400 million about half that of an onshore facility, and was installed in around seven months. The downside to the operation, however, comes from the concept around which the facility was designed. For instead of off-loading the LNG as liquid and revaporizing it on-shore, the Gateway uses special tankers (ppt) that regasify the fluid on-board and deliver the revaporized gas to the pipeline. At present the company has only 3, with more scheduled for delivery by 2010. However, with this system, the overall storage capacity of the system is not greatly increased. This may mean that the worries that the ISO saw back in 2004, which were in part because the pipeline delivery volumes were already committed to their full capacity, may not be fully remediated by this additional supply. However a number of power stations have now converted so that 8,600 MW of plant can use dual-fuel (pdf) , i.e. natural gas or oil, so the criticality issue of being able to deliver energy is no longer quite as severe – only the price now becomes more of an issue. And there are always issues with ships losing power. That is, of course, if there is still LNG available. There are already stories of shortages.
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> > "Globally, gas prices have shot up and it's not available. For example, an 8,000 mw power plant in Japan is lying idle for want of fuel and they're desperately looking for gas from anywhere. So it's going to be a problem to source gas for our power plants too," said a central power ministry (India) official, who did

> not want to be named.

I started looking into the consequences of the 2004 scare as a result of reading "Cape Wind", which is a well written story that is quite easy to read and digest, and tells the sad story of a company foolish enough to want to put a wind farm in the waters where the Kennedys sail. At the time that the book was written (late 2006) the final decision as to the fate of the farm was not decided, but end runs through Congress to effectively shut it down had been derailed. At present the public hearings which the Minerals Management Service have held have brought significant outcry from both sides. The comment period has been extended until April 21.

> The proposed Cape Wind Energy Project would be comprised of 130 wind turbine generators that could generate a maximum electric output of 468 megawatts and an average output of approximately 180 megawatts. The project is proposed to be located on federal submerged lands in Nantucket Sound off the coast of Massachusetts.I await the book sequel, it is a comment on how controversial the topic has become that there may well be one.