Electricity and Gas Markets Are Out Of Sync: Sooner or Later, This Will Hurt Us

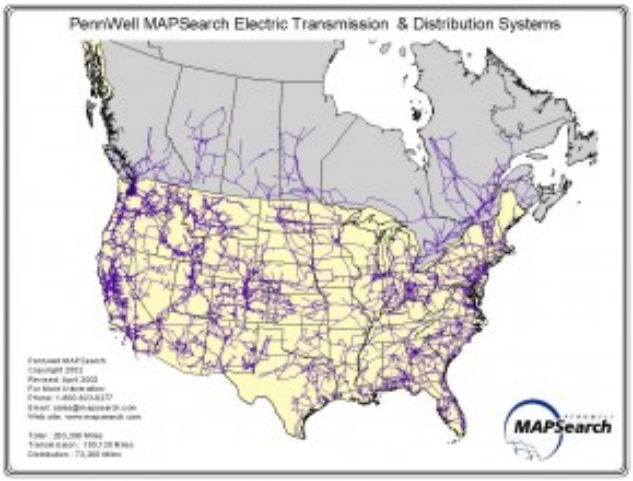

Image Source: Pennwell

Imagine the following: your family doctor says you need emergency heart surgery and books you into the top clinic in the country, which is out of state. The surgeons will be ready for you at 10 AM tomorrow. So you go to the airport, and book a standby ticket rather than reserve a seat.

Seems like a risky approach, doesn't it? And yet, the electric and natural gas industry operate in a similar fashion all the time. Gas fired power plants need gas to run, but they often fly standby with respect to gas deliveries rather than reserving capacity on the pipelines. Which means they run the risk of not getting the gas to generate when the power market needs it.

Furthermore, the markets don't even line up to allow for the necessary flexibility and reliability. During New England's February blizzard, a problem developed in New England's electric power system. High winds and heavy snow that night knocked out some power transmission lines in New England. The New England Independent System Operator (ISO) – the entity that coordinates and runs the power grid – called on a number of idle gas-fired generators to start generating power. And nothing happened. The New York Times quoted Dr. Ramsi Chadalavada, executive vice president and chief operating officer of the ISO as saying "We were sitting here, 3 in the morning, trying to get gas generators to start up, and we started seeing where they couldn't access that market in the overnight hours."

In other words, the generators were ready to run, but they had no access to natural gas because neither the gas commodity nor the gas pipeline market was open to transact supply or schedule deliveries. That is a big problem, and it may be a sign of more trouble to come.

Natural gas has supplanted coal to become the fuel of choice in North America's electric power generating system, for a number of reasons. Among them:

1) It's relatively cheap and abundant

2) It's cleaner than coal, with much lower carbon emissions per kilowatt hour generated

3) Natural gas fired plants are relatively inexpensive, and easier to site and build than other types of power plants. A gas generator, once permitted, can be built in about a year. Coal and nuclear plants take many more years to bring online.

As a consequence, the reliance on natural gas is significant and growing. In the past 10 years natural gas fired generation has grown 61% while coal fired generation has shrunk by 17%, according to the

US Energy Information Agency. As a result, natural gas is now equal to coal in total generation market share. In places like New England, this shift has been particularly abrupt. Less than 2o years ago, electric generation was primarily the domain of oil, coal, and nuclear plants. Today, natural gas dominates the generation mix, with its share just over 50%.

Furthermore, because power plants such as coal and nuclear require many hours to either ramp up or down in response to demand shifts, natural gas plants are preferred because they can be turned up or down in a matter of minutes This has implications for both power costs and system reliability.

Due to the concern that gas generation has grown rapidly and yet the rules for gas and power markets are different, the Federal Energy Regulatory Commission held regional hearings on market syncing issues in 2012. FERC staff identified a number of issues related to gas-electric interdependence. These included:

1) A lack of communications, coordination, and information-sharing between the gas and electric industries in terms of timing and volumes of gas needed for generation
2) Scheduling related issues
3) Electric resource adequacy, including wholesale capacity markets,
4) Reliability issues

The FERC noted that these issues deserve additional consideration and that Staff will be closely monitoring efforts to resolve these issues.

For its part, the North American Reliability Council (NERC), who oversees power market reliability, issued a December report highlighting that gas and power markets need to be more synchronized to effectively enable reliability in light of higher dependence on natural gas generation.

The energy consulting firm, Skipping Stone, also reviewed these gas-electric interdependence issues in detail in a recent white paper, "Synchronizing Natural Gas and Power Markets." Skipping Stone characterizes the current discrepancies as "serious." They highlight five areas – similar to those identified by the FERC – of major concern. These include:

1) Compliance and Definition of Firm Power
2) Market Timing and Coordination
3) Economic Syncing
4) Communication
5) Pipeline Capacity Availability

The main issues as Skipping Stone sees them are:

1) Gas-fired generators bid in firm power without firm gas pipeline capacity contracts standing behind them that assure delivery – this could be rectified if all types of generators were made to verify either physical inventories (e.g., coal) or firm fuel supply and delivery contracts.
2) The market timelines of the gas and electric systems are not synchronized. One major issue is that the bids for firm power are due before the gas market's schedule for confirming short-term primary or secondary gas pipeline capacity. What this means is that the electricity offered to the market by generators is bid as 'firm,' but in truth the generator does not actually know if they have confirmed pipeline capacity to ensure delivery and hence may not have the gas to burn. Skipping Stone notes "Given the daily timing differences…it is amazing the grid hasn't already experienced a train wreck resulting in a major power outage."

3) The consulting firm further points out that increased integration of renewables will required more frequent dispatch of gas-generators – a potentially big problem if gas supply cannot be guaranteed. However, they point out this problem could be rectified if the markets were re-sequenced, with the gas market clearing before the electric power bidding process.

4) The definitions of on- and off-peak hours are not the same between markets, which leads to confusion and contracting irregularities. The suggestion here from Skipping Stone is to define on-peak as a specific number of hours Monday-Friday (non-holiday). Power markets would begin with forecasting their Day-Ahead on-peak hours. The gas markets would then open, and after closing they would report capacity volumes traded. Generators can then get the capacity needed to firm up bids, and power market operators would then be able to confirm availability which impacts reliability. Off-peak would function similarly. This modification would result in both markets using the same definition of on- and off-peak hours and be able to share key operational information.

5) Skipping Stone also recommended new Pipeline "Day-at-a-time" services which could include new pipeline-as-merchant services that might close the off-hours gap seen in some markets (particularly New England). Development of such services might have mitigated the issue that occurred during the New England blizzard.

There is very limited communication between pipeline operators and generators. Indeed, in the FERC hearings, pipeline operators wanted to know more about the dispatch and operations of the gas-fired electric generation fleet, since it would help them better schedule pipeline operations. Similarly, power grid operators (ISOs and RTOs) requested more information on whether the gas-fired units committed to generating in the Day-Ahead markets (i.e., committed today to produce power tomorrow) actually had firm gas contracts to back up their scheduled generation.

Generally, the participants at the FERC hearings all expressed a preference for better sharing of information concerning pipeline capacity scheduled for power generation, individual power plant burn rates, fast notification of major operational changes, and coordination of maintenance work to both systems. The California ISO and local pipelines have already addressed many of these issues, so there is a model to be followed. If market timing were improved and the hours were synced, this communications issue would already be much better.

One significant difference between gas and power markets is that gas pipeline markets are based on daily capacity transactions while power markets are hourly. Skipping Stone notes that gas pipelines, with regulatory approval, could start offering hourly capacity services to address this problem. Further, Skipping Stone suggests that if there are markets with insufficient pipeline capacity (such as New England and parts of New York), by syncing the two markets, economic price signals would become more transparent and should stimulate provision of services or construction of additional pipeline capacity.

In the long run, if the projections of the US Energy Information Administration are correct and gas fired generation continues to grow rapidly, then there is little question the market rules need to be modified to assure reliability and spur more pipeline capacity and flexibility. The questions of how to synchronize the two markets, who is impacted, and who pays for it are significant and will require a good deal of consideration. At the same time, the train wreck may not be far off, so these issues will need resolution sooner rather than later.

Peter Kelly-Detwiler
PKD Energy, LLC
Scituate, MA 02066
(617) 875-6575