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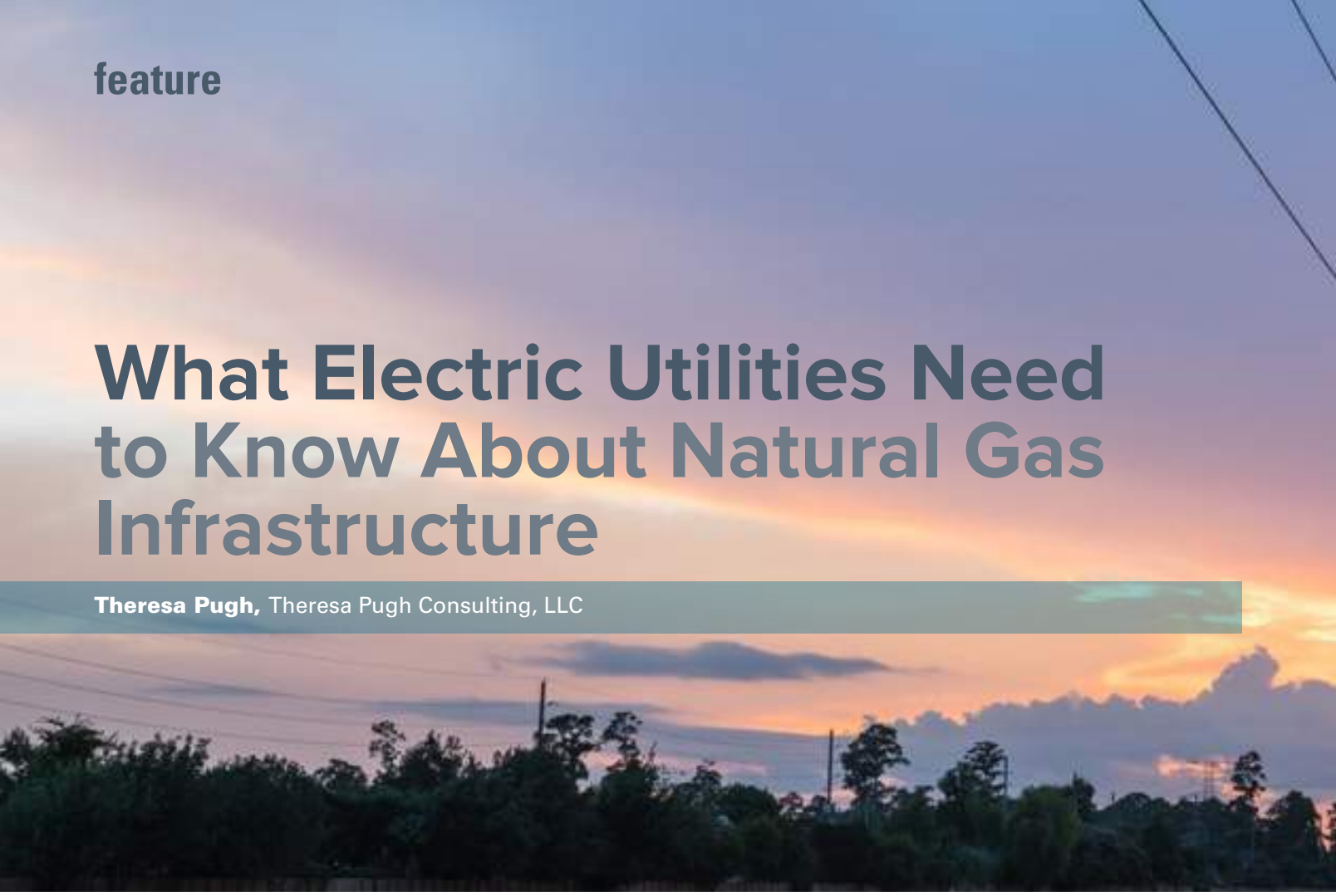

What Electric Utilities Need to Know About Natural Gas Infrastructure

Theresa Pugh, Theresa Pugh Consulting, LLC

Before you toss this edition of *American Coal* against the wall or speed dial ACC, I ask you to read this article in its entirety.

There are many positive reasons to generate electricity with natural gas. However, there are some operational issues and future—perhaps short term—challenges in infrastructure that could affect localized natural gas-fired generation (combined cycle generation or NGCC) reliability. Let me be clear. I am not predicting any national grid reliability issues, black outs, or brown outs with natural gas generation. And if you are in Texas with its extraordinary natural gas abundance, scores of compressor stations, and pipelines, you can skip to the next article. This article is for the rest of the country.

The convergence of the two industries, electric and gas, should inspire utility managers, fuel managers, and system planners to carefully think about the transition from coal to gas. Operational factors and timing should be weighed when contemplating keeping a coal plant or retiring it.

These infrastructure factors are outside the power plant's fence line. As a result, for some regions of the country, decisions can look like three-dimensional chess. Weighing local infrastructure readiness against continued environmental compliance costs at coal plants is why I'm glad I'm not a power sector CEO.

In states that lack mature and robust natural gas infrastructure delivery (gas storage, pipelines and compressor stations),there might be a tipping point for over-reliance upon natural gas in the short term given the electric sector's special requirements for localized reliability. This is not an argument against natural gas—but for a focus on infrastructure readiness.

Without knowing enough about the infrastructure components, some regions might move too quickly from coal to gas. Perhaps areas could also move too fast from coal to intermittent renewables backed up by NGCC gas plants if public pressure minimizes natural gas usage. Too many intermittent renewables (wind and solar) means following wild (California) combined cycle ramping cycles. New NGCC units can ramp with agility but tighter ozone (smog) regulations on NOx might limit future NGCC approvals. While the NOx emissions may be less than from larger coal plants, they might be emitted at lower stack heights than coal plants. It seems counter-intuitive but permit approval might not be automatic to convert from coal to NGCC at some sites due to future ozone regulations. NOx regulations might also limit placement of new pipeline compressor

stations serving the NGCC plant and other customers.

Power plants might face some unexpected and localized downtime for natural gas delivery at individual plants because either a gas storage facility or local compressor stations/pipelines are under repair. Again, this is NOT a prediction of electric grid instability or threats to the Bulk Electric System (BES). This is about individual units with localized impacts. Some regions might be wise to keep some diversity in generation if the gas storage, pipelines and compressor stations aren't ready.

There are two new regulatory drivers in the natural gas storage industry and the pipeline/compressor station sector that mean an unknown period of localized repair downtimes. The more significant is U.S. DOT's Pipeline and Hazardous Materials Safety Administration (PHMSA) natural gas storage regulation. The second is EPA's "OOOOa" methane leak detection and repair regulation for new pipelines and compressor stations commenced after September 18, 2015. The Trump administration says it will review EPA's 2016 methane regulation. And a very recent announcement suggests that PHMSA wants to give the pipeline and storage industry more time for PHMSA compliance. Regardless of whether the compliance time is two years or two months, electric utilities need to be savvy about the consequences.

As of July 3, 2017 EPA's methane leak repair rule appears to be in effect after the U.S. Court of Appeals for the District of Columbia ruled against the Trump administration's attempts to toss out the rule. Increasingly states are imposing their own leak detection and repair on compressor stations and natural gas pipelines. Even if EPA decides to re-propose a methane rule with far more reasonable compliance dates, maintenance and repairs may still be an issue for some locations.

Utilities should look at three specific concerns in states that already have >60%natural gas generation:

(1) base load coal plant closure sequencing;

(2) readiness of natural gas storage for utilities to meet winter/summer peak hours under new safety regulation; and

(3) whether gas infrastructure (storage, compressor stations and pipelines) has adequate "work arounds" or gas re-routing to serve power plants during safety or PHMSA/EPA mandated repairs.

The third concern may be the biggest. PHMSA's new storage safety standards for natural gas storage

locations were motivated by Aliso Canyon's three-month uncontrolled natural gas leak. It is not yet known how many of the nation's >400 natural gas storage locations might need repairs to meet the new PHMSA standards. In mid-July, the state approved Aliso to reopen but only to operate at approximately 30% of its normal capacity. If Aliso Canyon's safety check process is indicative, the six tests took about one month to complete on each well. More than a year after the leak was stopped, only about 34 of the 114 wells are cleared for operation. About 80 more wells await checkup and some will likely need safety upgrades. The nation's gas storage facilities need similar assessments.

Recently Harvard's Chan School of Public Health looked at natural gas storage facilities and asserted that many storage locations are designed very similarly to Aliso Canyon's re-purposed design. The study suggests 210 active but "re-purposed" oil/gas wells are like Aliso Canyon and might be problematic. While we shouldn't jump to hasty conclusions because there is no indication the other storage facilities and wells are leaking, at a minimum Harvard's paper begs for more information. Utilities need to better understand their own unique circumstances. Harvard suggests wells in Ohio, Pennsylvania, New York and West Virginia need the highest priority in self-assessments since they don't have cement zonal isolation methods. I don't know if Harvard is right or wrong, but their report makes me want to know more about gas storage.

Shouldn't more be understood about gas storage before making power plant retirement or conversion decisions? Electric utilities have special reliability obligations—serving residential customers, hospitals, data centers and industrial customers.

Together these considerations suggest utility managers learn more about their natural gas suppliers, gas storage and the compressor station infrastructure supporting gas delivery to their power plants. Taking a compressor station down might require a methane "blowdown" or safety evacuation affecting pipelines between 5 and perhaps 20 miles away. What happens to the power plant during an unscheduled methane "blowdown" on the pipeline? Is there pipeline re-routing?

There are thousands of compressor stations across the country and this is not mentioned to exaggerate local reliability concerns. Many existing pipelines have work arounds with gas re-routing. But not all pipeline segments serving power plants currently have secondary pipelines. When a new NGCC plant replaces a coal plant, the utility should know about work arounds for the gas plant—and with any other power plants in the same vicinity if a key compressor station or gas storage facility is out of service for a day, week or month. For those pipelines serving large industrial customers and electric utilities, the utility needs a capacity assessment to know it can meet summer and winter peak demand HOURS

given any typical compressor station or storage location outages.

Power generators are required to disclose scheduled power plant maintenance for reliability reasons to their planning authority. Perhaps a similar requirement is needed between gas providers and the power sector. It will help utilities to know if the infrastructure has adequate "belts and suspenders" to work around gas infrastructure down time.

Understanding gas infrastructure is as important as understanding environmental compliance for coal generation.

Infrastructure readiness issues during the transition convince me some fuel diversity with coal, gas, renewables, hydro, and some nuclear generation is wise. Diversity is good whether it is in investments, nutrition, or energy. Saying energy diversity or "all of the above" often sounds trite, but electric reliability demands diversification. Every state might not have or need adequate water for nuclear power. Not every state needs all existing base load to be coal because of an abundance of natural gas and the commensurate mature infrastructure. Not every state has geology suitable for subsurface gas storage and that possible bottleneck nags at me. Perhaps a handful of states really can reliably sustain a 50% intermittent renewable combined with natural gas and hydro. One day we may see even better breakthroughs in battery storage. During this transition utility managers need to weigh gas infrastructure and operational issues. Natural gas is terrific but it's not exactly the same as having a three-month coal supply onsite.

Despite the many benefits of firm (uninterruptible) gas contracts, they cannot eliminate all the localized issues with infrastructure repair downtime. Until most states look like Texas with robust gas infrastructure,we should not dismiss the infrastructure readiness questions. Natural gas storage remains the fulcrum for electric utilities.

Theresa Pugh is a consultant to electric utilities and manufacturers on EPA regulations and energy policy (www.theresapughconsulting.com). She worked for the utility sector for 13 years.

REFERENCES

1 **Drew R. Michanowicz et al.,** Harvard T. H. Chan School of Public Health, Environmental Research Letters, May 24, 2017 https://www.hsph.harvard.edu/air-pollution/

2 **Blowdowns** are evacuations conducted for safety reasons. In some circumstances, the methane can be rerouted and not evacuated from the pipeline/compressor station. Methane blowdowns are usually not scheduled in advance and are conducted for public safety reasons. https://www.youtube.com/watch?v=WtSH5V1YQvQ