

## Technology Advisory

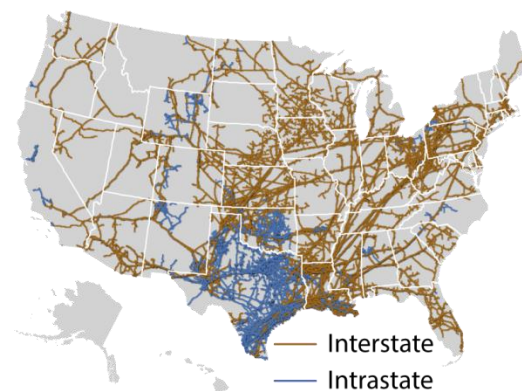
### Today's Natural Gas Supply: Pipeline Infrastructure and its Challenges

Demand for natural gas continues to increase in both the electric and transportation sectors. It is thus important to understand the risks as well as the opportunities of this energy source, as it has displaced coal as the largest fuel source within the nation's electric generation mix. In our previous Tech Advisory, "[Today's Natural Gas Supply: The Impact of the Shale Gas Revolution](#)," we discuss how technological improvements in drilling and fracking have vastly increased the domestic supply of natural gas from unconventional geologic formations and the impact that has had in terms of prices and supply. These changes are evident in the changing national generation mix. Due to low natural gas prices, 2016 was the first year that natural gas generation exceeded coal on an annual basis, accounting for about a third of electric generation. This trend continued in 2017 with natural gas remaining the largest source of electric generation.

Infrastructure is a major area focus when discussing natural gas, as deviations in pipeline capacity availability can severely affect the price and deliverability of natural gas in various regions. Power plant operators rely on a large and complex system of pipelines to deliver the fuel to the site of their electric generators. In its most recent Special Assessment, NERC noted that the "growing interdependence of the natural gas and electric infrastructure has resulted in new operational and planning reliability challenges."<sup>1</sup> The NERC report analyzes major natural gas generation clusters and the impact a single-point disruption in natural gas supply would have on these cluster groupings. NERC concluded that, "natural gas facility disruptions can have varying impacts depending on geographical location and overall infrastructure dynamics."<sup>2</sup> This new paradigm has made it increasingly critical to investigate natural gas infrastructure and the potential risks of a dependence on a single fuel to generate electricity.

#### Current Pipeline Infrastructure

The figure to the right depicts the existing pipeline infrastructure in the United States. There are "roughly 303,000 miles of wide-diameter, high pressure inter- and intrastate pipelines [that] make up the mainline pipeline transportation network, run by more than 210 companies."<sup>3</sup> Nearly one-sixth of the natural gas transmission system is located in Texas, due in large part



<sup>1</sup> North American Electric Reliability Corporation, *Potential Bulk Power System Impacts Due to Severe Disruptions on the Natural Gas System*, November 2017, available at: [http://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC\\_SPOD\\_11142017\\_Final.pdf](http://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_SPOD_11142017_Final.pdf), last accessed on January 16, 2018.

<sup>2</sup> *Id.*

<sup>3</sup> Federal Energy Regulatory Commission, *Energy Primer: A Handbook of Energy Market Basics*, November 2015, available at: <https://www.ferc.gov/market-oversight/guide/energy-primer.pdf>, last accessed on January 16, 2018.

to its abundance of natural gas supply. On the other hand, infrastructure challenges resonate as a key issue facing the northeast region. There is little or no gas production in the Northeast, nor gas storage, and the region has significantly fewer natural gas pipelines as compared to other parts of the country. Due to a large reliance on natural gas for a heating fuel in the northeast region, fluctuations in the supply network can potentially lead to electric reliability challenges during peak load which normally corresponds with the winter season.<sup>4</sup>

### Future Pipeline Development

The strain on existing infrastructure and the increase in demand has prompted utilities and pipeline companies to investigate the need to build significant new natural gas infrastructure. The figure to the right outlines the (typical) timeframe for a new natural gas-fired generator to become operational. From start to finish, it can take over 8 years to get a generator into operation. Pipeline companies and other stakeholders point to the length and complexity of the approval process for pipelines, and the potentially negatively effect on the power industry, if new pipelines are not completed in a timely fashion. Based on this feedback, at the end of 2017, the new FERC Chairman Kevin McIntyre announced that FERC would take a fresh look at the pipeline certificate policies in the new year. In addition, NRECA membership understands this lengthy process and has a resolution to support a plan to address these time requirements.<sup>5</sup>

Milestones in the Construction of a New Natural Gas Fired Generator		Approximate Timing
Site Development Timeline	Internal Analysis to Determine Capacity Needs	Months 1 – 6
	Site Analysis: Permitting, Fuel Capabilities, Grid Interaction, Environmental Issues	Months 6 – 12
	Send RFP to Determine market Costs to Provide vs. Self-Build Alternative	Months 6 – 12
	RTO Study	Months 6 – 24
	Selection of Generator Manufacturer	Months 6 – 24
	Certificate of Public Need and Convenience Process	Months 12 – 30
	State and Local Permitting Process	Months 12 – 30
Pipeline Construction Timeline	Develop Pipeline Design and Services	Months 12 – 27
	Conduct Pipeline Open Season	Month 26
	Execute Binding Pipeline Service Agreements	Month 26
	Initiate FERC Pre-Filing	Month 27
	File FERC Application	Month 33
	Purchase Pipe/Compression	Month 35
	Receive FERC Certificate	Month 35
	Commence Construction	Month 36
	Targeted In Service Date	Months 72 – 96
<b>Total Project Time</b>		<b>6 to 8 Years</b>

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### Firm vs. Interruptible

Another element to the natural gas discussion is whether the natural gas delivery contract is firm or interruptible, and the impact that can have on reliability. A supply contract that is considered firm is guaranteed to deliver the gas to the customer and is normally more expensive due to this guarantee. For this reason, merchant suppliers in the New York and New England regions generally do not subscribe for firm capacity. If the contract is

<sup>4</sup> The northeast region has no naturally occurring gas storage; the region is also located at the terminus of the major interstate pipes like Algonquin and Transco. The region historically was more dependent upon oil until recently. Gas has displaced oil except in winter as December 2017-January 2018 just demonstrated as most dual-fuel units had to switch to oil.

<sup>5</sup> NRECA Resolution: Development of a Plan to Meet the Fuel Requirements of the New Natural Gas Fleet and Comply with Environmental Regulations.

interruptible, the delivery of the gas can be interrupted by firm shippers, with heating demand taking precedence for natural gas delivery because local gas distribution companies have firm contracts. Also, FERC bases its review of the economic need for a proposed pipeline upon the existence of sufficient firm contract subscriptions for the new pipeline's capacity, adding to the complexity of building new infrastructure.

As was evident during the Polar Vortex in 2014, not having firm contracts in place can lead to reliability challenges. NERC noted in its Polar Vortex Review, "Increased reliance on natural gas during the polar vortex exposed the industry to various challenges with fuel supply and delivery. This increased reliance, compounded by generation outages during the extreme conditions, increased the risks to the reliable operation of the BPS [bulk power system]."<sup>6</sup> In response to this extreme weather event, many of the RTOs have put market rules in place with strict penalties to guarantee fuel supply and generator availability during critical peak events.

During periods when pipeline capacity is constrained, the demand for heating and gas for electricity can create a situation where generators with non-firm contracts may be exposed to higher spot prices if the local distribution company cannot deliver the agreed upon gas as residential heating demands take priority during constrained periods. In early 2018, the east coast of the United States experienced a weather phenomenon known as a "bomb cyclone"<sup>7</sup> that led to severe below-average temperatures. These extreme deviations in weather caused certain locations to report spot prices of natural gas at \$175 MMBTU, 60 times higher than the typical natural gas spot price.<sup>8</sup>

### What Cooperatives Need to Know

Resource planning is by no means an exact science and electric cooperatives today are faced with what seems to be a perpetually changing landscape. Strategic decision-making based on clear data is imperative for ensuring resource adequacy. While the dependence on natural gas for electric generation increases, pipeline constraints will continue to pose challenges and require evolving solutions to mitigate the risk that comes from this dependence on natural gas. With few cooperatives in constrained regions like the northeast, there is no immediate concern, but it is important for cooperatives to understand the underlying risks of single fuel dependency and be able to address those concerns. The relationship between constraints, prices, and supply will be a topic of upcoming NRECA reporting.

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<sup>6</sup> North American Electric Reliability Corporation, *Polar Vortex Review*, September 2014, available at: [https://www.nerc.com/pa/rrm/January%202014%20Polar%20Vortex%20Review/Polar\\_Vortex\\_Review\\_29\\_Sept\\_2014\\_Final.pdf](https://www.nerc.com/pa/rrm/January%202014%20Polar%20Vortex%20Review/Polar_Vortex_Review_29_Sept_2014_Final.pdf), last accessed on January 16, 2018.

<sup>7</sup> New York Times, *What Is a 'Bomb Cyclone' or Bombogenesis*, available at: <https://www.nytimes.com/2018/01/03/us/what-is-a-bomb-cyclone.html>, last accessed on January 16, 2018.

<sup>8</sup> Bloomberg Markets, *Blizzard Triggers a 60-Fold Surge in Prices for U.S. Natural Gas*, available at: <https://www.bloomberg.com/news/articles/2018-01-04/natural-gas-in-u-s-soars-to-world-s-priciest-as-snow-slams-east>, last accessed on January 16, 2018.

### **Additional Resources**

NRECA website for [Resource Adequacy and Markets](#)

NRECA website for Generation, Environment and Carbon related topics:

- [Public](#)
- [For NRECA Members](#)

### **Contact for Questions**

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