How Reliable Is Natural Gas?: An Historical Overview of Natural Gas Transmission's Outage Track Record

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Overview

As natural gas use has grown in the United States, particularly in power generation, the power industry has raised concerns about fuel dependency. The North American Energy Reliability Corporation (NERC) has begun monitoring power markets for "single fuel dependency" issues related to an increasing share of power generation fuelled by "just-in-time" natural gas. In addition, the Federal Energy Regulatory Commission (FERC) has closely monitored gas/electric coordination and proposed several reforms to promote reliable natural gas fuel delivery to power generators.

The natural gas reliability project assesses historical natural gas disruptions and damage (2005-2015) in order to present the power industry with a natural gas reliability track record of the frequency of incidents and outages on natural gas transmission and storage. While the analysis does capture production outages, the focus of this natural gas reliability assessment is on the transmission sector and its ability to reliably deliver a critical "just-in-time" fuel to customers. This preliminary assessment of publicly available natural gas incident reports reveals that major outages are relatively rare but additional analysis is needed.

Methods

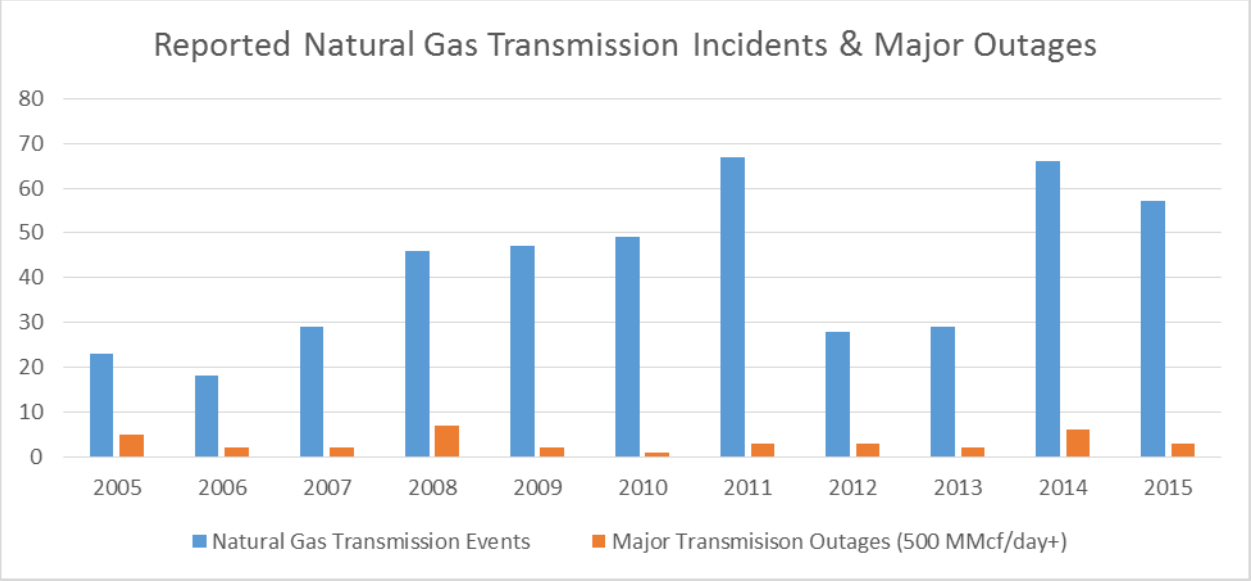
The historical assessment of natural gas reliability was conducted by reviewing and categorizing Energy Assurance Report entries from the Department of Energy's Infrastructure Security and Energy Restoration (ISER) Division over a decade. ISER collects incident reports from publicly available sources such as newspaper articles, public EBB postings and government agency reports.

The reported incidents impacting natural gas transmission and storage were categorized and assessed for volumetric impacts. Incidents were coded for the main cause of damage or disruption. The identified outages were then collated by year and cause to reveal reliability and outage trends in natural gas delivery.

Results

Disruptions to natural gas delivery are relatively rare and downstream impacts of outages are often mitigated with redundant systems, alternate supply routes and swift repairs. Most of the hundreds of outage events reported each year on natural gas infrastructure are quickly repaired or addressed by rerouting supplies onto parallel infrastructure with minimal impacts on throughput (for example, reported nicks to pipelines during repairs that may cause small leaks or shut downs of processing plants when a part fails that are very brief). However, there are half a dozen or so major disruptions per year. In this analysis a "major disruption" includes any outage of more than 500 MMcf/day (million cubic feet per day) of capacity.[1]

[1] 500 MMcf/d was chosen as a reasonable approximation of daily gas use for a gas-fired power generator. A 500 MMcf/d of pipeline capacity outage could impact electric reliability by impacting fuel supply to a generator.



Conclusions

As the power sector increasingly turns to natural gas to replace coal and balance variable renewables, concerns are being raised about the viability of relying "just in time" natural gas. Concerns about disruptions of gas fuel supplies to generators have been used as rationale to maintain various back-up generators with "more reliable" fuel. This analysis takes the first step towards establishing a reliability record for the natural gas industry in order to provide comparisons to other fuel types such as coal piles. Preliminary analysis shows that natural gas outages are relatively rare and downstream disruptions even rarer as the resilient gas system tends to recover from damage to critical infrastructure, preventing downstream disruptions. It could be that calls to maintain backups for gas-fired generation in the name of fuel diversity are overstated. However, additional analysis of individual incidents and potential forecasting of future operational conditions are still needed.

References

Energy Assurance Daily compilations from 2005-2015 as recorded by Infrastructure Security and Energy Restoration (ISER) Division https://energy.gov/oe/services/energy-assurance/monitoring-reporting-analysis/energy-assurance-daily

NERC Long Term Reliability Assessment (LTRA) 2016, December 2016. http://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/2016%20Long-Term%20Reliability%20Assessment.pdf