

## 2011 Special Reliability Assessment Gas and Electric Interdependencies: *A Bulk Power System Reliability Perspective*

### Background

The majority of new North American generating capacity projected for the next ten years will rely on natural gas as its primary fuel.<sup>1</sup> With a shift to unconventional gas production in North America, the potential to increase availability of supply makes gas-fired generation a premier choice for new generating capacity in the future. However, increased dependence on natural gas for generating capacity can amplify the bulk power system's exposure to interruptions in [natural gas](#) fuel supply and delivery. Mitigating strategies, such as storage, firm fuel contracting, alternate pipelines, dual-fuel capability, [access to multiple natural gas basins](#), nearby plants using other fuels, or additional transmission lines from other Regions, can contribute to managing this risk.

In a 2004 report by the North American Electric Reliability Council, the Gas/Electricity Interdependency Task Force<sup>2</sup> identified interdependencies considerations between the gas pipeline and electric generation operations and planning activities. The task force concluded:

- Gas pipeline reliability can substantially impact electric generation.
- Electric system reliability can have an impact on gas pipeline operations.
- In general, pipeline and electric system operators do not understand each other's business very well.
- Pipeline planning and expansion are substantially different from the electric equivalent.
- Communications between pipeline operators and electric reliability coordinators are generally weak
- Pipeline tariffs for firm delivery service are not compatible with peaking generation economics in many electricity markets.
- Modern combustion turbines have stringent fuel delivery and fuel quality requirements.

The task force prepared a list of seven recommendations for NERC's considerations to mitigate reliability impacts from interdependency between the gas pipeline industry and the electric industry.

---

<sup>1</sup> Refer to the 2011 LTRA here

<sup>2</sup> Add reference and link here

1. NERC Regions should include their regional assessment program [Long-Term and Seasonal Reliability Self-Assessment] a review of the impact of any fuel transportation infrastructure interruption that could adversely impact electric system reliability.
2. NERC Reliability Coordinators or their delegates, subject to appropriate treatment of commercially sensitive information, should develop regular, real-time communications with pipeline operators about disturbances that could adversely impact the reliability of either the electric systems or the gas pipeline.
3. For planning purposes, gas pipeline outages that could have an adverse impact on reliability of the electric systems must be coordinated with the electric industry so that plans to mitigate any impacts to the electric systems may be developed.
4. NERC should develop a reliability standard relating fuel infrastructure reliability to resource adequacy.
5. NERC should include analysis of fuel infrastructure contingencies that could adversely impact the reliability of the electric systems in the NERC planning standards.
6. NERC should establish a monitoring system that tracks fuel infrastructure contingencies that have, or could have, an adverse impact on electric system reliability.
7. NERC should, in concert with other energy industry organizations, formalize communications between the electric industry and the gas transportation industry for the purposes of education, planning, and emergency response.

Since the 2004 report, some actions have been taken by other industry groups to address these issues. Specifically, recommendations 4 and 7 address developing standards for electric and gas coordination. A North American Energy Standards Board (NAESB) filing recounts the history and background for the FERC final rule on gas and electric coordination. Consequently, the information gathering and analysis associated with recommendations 4 and 7 has been completed by NAESB and approved by FERC (Docket No. RM 96-1 et al). The RAS will avoid duplicating this work in the 2011 assessment.

Further, NERC Reliability Standards for the interconnected electrical transmission systems dictate planning strategies to operate and withstand any single contingency electrical failure. The lack of similar reliability standards for the natural gas pipeline makes it difficult to assess the adequacy of the pipeline infrastructure under single pipeline contingencies. In some areas of North America, a single disturbance or common mode condition to the gas system could result in the eventual loss of more electrical generation than traditional analysis would indicate for an electrical disturbance. In addition, electrical disturbances can result in wide-spread gas disruptions, especially if electrical compressors are used to support gas transportation.

## **Reliability Assessment Design**

To address these concerns, this reliability assessment will take a broad view for the upcoming 10 years at areas within North America where extreme cold weather or loss of a major gas supply could impact electricity production, review existing procedures designed to mitigate the reliability impacts from such

events, required coordination between planners and operators in both industries, and provide input into NERC's Reliability Standards, if required. NERC will identify the reliability impacts that gas/electricity interdependencies can have across North America.

Additionally, this reliability assessment will review the recommendations from the 2004 NERC study on gas and electric interdependencies, provide an update and status on these recommendations, determine follow-on actions to fulfill recommendations, and present guidance to reduce potential vulnerabilities through guided solutions.

The study will be divided into two parts:

1. A qualitative assessment and primer on gas and electric interdependencies

- Review and status of the 2004 recommendations;
- Review and assessment on natural gas supply and transportation;
- Generation operation and planning versus pipeline operation and planning;
- ~~Identify Electric industry coordination challenges;~~
- ~~Contributions to vulnerabilities~~ and recommendations to reduce exposure;
- Assessment of existing Regional practices and operational procedures for managing gas pipeline and fuel delivery vulnerabilities;
- Actions taken by generators to mitigate impacts to reliability due to pipeline disruptions, such as fuel switching;
- Discussion of modeling requirements to simulate severe pipeline failures; and
- ~~Discussion of potential best practices for~~ Identifying needs for coordination with the pipeline industry to ensure reliable system operations.

2. A quantitative analysis representing gas pipeline vulnerabilities through contingency simulations

- Determine areas (subregions) which are most vulnerable to gas pipeline disruptions;
- ~~Infrastructure assessment~~ Modeling of pipeline dynamics to determine leading indicators of catastrophic pipeline disruption and associated timing for industry reaction;
- ~~Detailed analysis of compressor station failures and its contribution to pipeline disruption;~~
- Evaluation of historical events and lessons learned; and
- Recommendations for improving gas-fired generation reliability and reducing vulnerabilities associated with the interdependencies of the electric and gas pipeline industries.

The Reliability Assessment Subcommittee will take the lead on developing and coordinating this special assessment. NERC will use a consultant to gather relevant information and perform the modeling analysis needed to complete the study, as well as leverage the expertise of the gas pipeline industry through groups, such as the *Interstate Natural Gas Association of America (INGAA)*. Further, Regional Entity involvement will be vital to assess the individual interconnected components within specific vulnerable areas.