Are U.S. Federal reporting thresholds adequate to address an interdependent electricity and natural gas grid?

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Carnegie Mellon University
Engineering & Public Policy
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Production Shortage February 1 – 5, 2011
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Production Shortage February 1 – 5, 2011

Surface temps in Southwest U.S. reached as low as -5°F; wind chills as low as -30°F
Gas grid reliability events have affected power plants

- Cold-weather demand for gas and production well freeze-offs created dangerous shortage of natural gas in pipelines.

- Rolling blackouts on the Texas electricity grid.

<table>
<thead>
<tr>
<th>Power Plant Capacity Affected (MW)</th>
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<tbody>
<tr>
<td>42,000</td>
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<tr>
<td>35,000</td>
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<tr>
<td>28,000</td>
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<tr>
<td>21,000</td>
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<td>14,000</td>
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<td>7,000</td>
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<table>
<thead>
<tr>
<th>Number of Units Out</th>
<th>MW Capacity Out</th>
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<tr>
<td></td>
<td>Lack of fuel from natural gas pipeline</td>
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Electric Reliability Council of Texas (ERCOT) Power Plant Outages
February 1 – 5, 2011

Natural gas is the U.S.’s majority fuel for power plants

- Low-cost gas has overtaken coal for installed power plant capacity and, during some months, electricity generated in the U.S. as of 2016.
Partial gas outages (pressure reductions) are also important

**GE LM6000 (50 MW)**
Requires inlet natural gas at a minimum of 290 psi

**GE 7EA (85 MW)**
Requires inlet natural gas at a minimum of 675 psi

- Per Natural Gas Supply Administration, transmission pipeline pressure ranges from 200 psi – 1500 psi
- Without on-site compression, a 55% drop in pipeline pressure would put the 7EA at risk of failure and an 80% pressure drop would put the LM6000 at risk of failure on a 1500 psi pipeline.
What data are out there for public assessments on the gas side? Pipeline and Hazardous Materials Safety Administration (PHMSA)

49 CFR § 191.3: Reports of events that result in both a release of gas or hazardous liquid from the pipeline and at least one of the following:

1. “A death, or personal injury necessitating in-patient hospitalization;
2. Estimated property damage of $50,000 or more . . . excluding the cost of gas lost or;
3. Unintentional estimated gas loss of three million cubic feet or more.”

Or any event that is “significant in the judgment of the operator, even though it did not meet the [previous] criteria . . . of this definition”

Portion of events that meet explicit PHMSA mandatory report triggers as written

Q1 2010 – Q1 2017

Source: PHMSA Natural Gas Distribution, Gathering, and Transmission Accident and Incident Database

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What data are out there for public assessments on the gas side?

Federal Energy Regulatory Commission (FERC) Forms

- 18 CFR § 284.262 → FERC Form 588
- “Emergency transaction” reports from pipeline operators
  - Emergency transaction – “an actual or expected shortage of gas supply [that forces] an interstate pipeline company, intrastate pipeline, local distribution company, or [pipeline that is not under FERC jurisdiction due to stipulations in the Natural Gas Act] to curtail deliveries of gas or provide less than the projected level of service to any customer.”
- Should capture both complete and partial gas outages (system pressure reductions)
- Captures a lot of maintenance-related events, but no unanticipated events

- 18 CFR § 2.55(b)(4) → Reports of Service Interruptions and Force Majeure
  - Serious interruptions on interstate pipelines
What data are out there for public assessments on the gas side?
State Public Utility Commission (PUC) Reports

- Gas service interruptions are often within the purview of the State PUCs, but mandatory report thresholds vary.
- 2013 National Association of Pipeline Safety Representatives (NAPSR) Compendium
  - 20 states require reports of outages affecting a specific number of customers, specific duration, or gas delivery pressure issues.
    - PA – lesser of 2,500 customers and 5% of total customers
    - FL – lesser of 500 customers and 10% of total customers
    - WA – > 25 customers
    - WY – all service interruptions
    - Only NH, RI, and WA report system pressure issues

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What data are out there for public assessments on the electric power side?

- **1968** - Institute of Electrical and Electronics Engineers (IEEE) Application of Probability Methods subcommittee creates IEEE Standard 762; North American Electric Reliability Corporation (NERC) forms.
- **2003** – NERC becomes the nation’s electric reliability organization.
- **2012** – Mandatory reporting to NERC Generator Availability Data System (GADS)
  - ~8,000 units with events logged in GADS
  - ~85% of the installed capacity in the conterminous U.S. and the Canadian provinces

- Events causing any power plant with nameplate capacity of 20 MW or greater (the vast majority of all plants) to:
  - Fail at startup
  - Be completely unavailable unexpectedly,
  - Experience any event equivalent to having less than 98% of a plant’s net maximum capacity available for a time period of 30 minutes or more. (Derating)
What else do we need for a sufficient public assessment?

- We really need consistent reporting standards for pipeline events that would trigger a GADS report → level the regulatory playing field.
- If we base this on 2% of the median gas plant’s net maximum capacity:
  - A pipeline failure event that causes an:
    - *Unanticipated reduction in operational capacity of the pipeline by 25,000 standard cubic feet per hour (scf/h) should be reported by pipelines with firm contracts to fuel plants of nameplate 20 MW or more*
    - " 900 scf/h should be reported by pipelines with firm contracts to fuel plants of nameplate 20 MW or less"
  - Representatives from gas and electric generation industries should be consulted.
  - These data should be collected by a central reliability agency, like NERC, and made available for third-party reliability assessments.
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