NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

2013 Special Reliability Assessment: Accommodating an Increased Dependence on Natural Gas for Electric Power

RELIABILITY | ACCOUNTABILITY




Special Reliability Assessments

- Deeper focus on issues identified in Long-Term Reliability Assessment
- Offers unique insights for improvements to reliability strategy
- Determine methods to enhance planning and operations to accommodate an evolving electric system

Significant Industry and Regulator Focus

- Six FERC Regional Technical Conferences
  - Determined Region-Specific Issues
  - High Impact Areas Identified
  - On-going conferences on communication and coordination
- Regional Task Forces and Studies
  - New England Pipeline Capacity/Infrastructure Assessment
  - Northeast Multi-Area Interdependency Assessments
  - ERCOT Curtailment Risk Study
  - MISO Interdependency Analyses
  - Northwest Mutual Assistance Agreement
- State Regulators are Participating
  - Must understand the risk taken by Generator Owners

Problem Statement and Goals

- Increased dependence on natural gas for generating capacity can amplify the bulk power system's exposure to interruptions in fuel supply, transportation, and delivery.
- Goals
  - Enhancements to BPS planning processes
  - Formalized and coordinated operational procedures

Pipeline Perspective

- Pipelines will interrupt power generation without contracts
- A variety of contracting options available to accommodate unique generator characteristics
- Under severe conditions, even firm contracts may be curtailed
- Additional infrastructure will not be constructed without an identified need (firm contract)

Vulnerability Assessment

Electric Industry Risks (Managed Elements)

- Resource Adequacy
- Planning Challenges
- Dual-Fuel and Storage
- Operator Observability
- Non-Firm Fuel
- Gas Scheduling
- Market Options

Interdependencies

Natural Gas Risks Impacting Electric Industry

- Single Point of Failure
- Pipeline Capacity
- Gas Production Issues
- Shale Fracking
- Electric Demands (Compressors)
- Pipeline Capacity

Risk Assessment

Risk
- Loss of Generation When Needed

Risk Type
- Resource Adequacy- Potential Capacity Deficiency

Threat
- Disruption to Fuel Delivery (Interruptions and/or Curtailments)

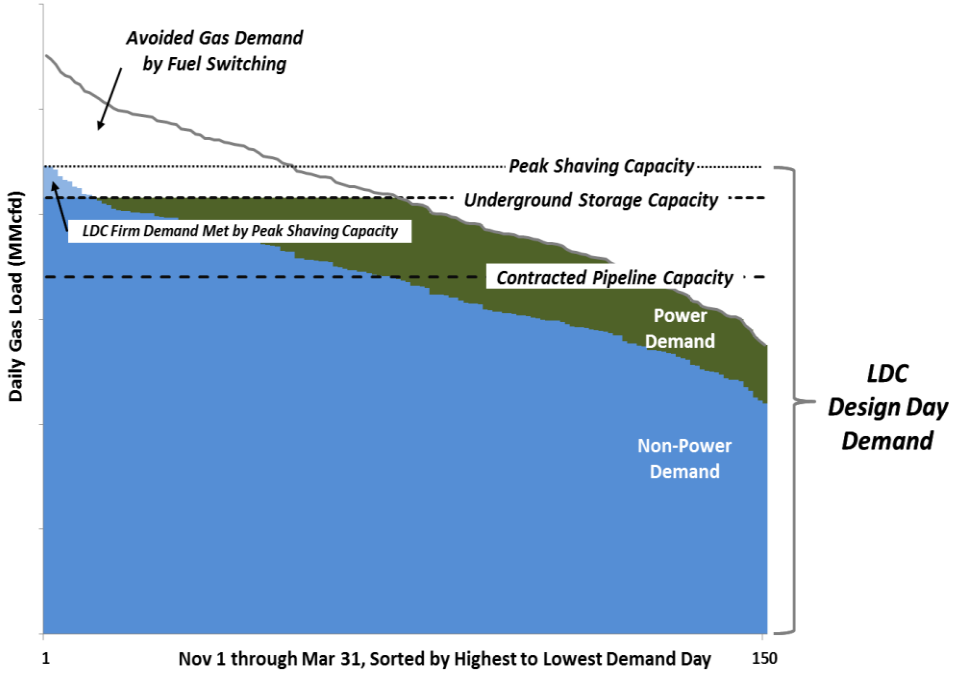
Impact
- Emergency Procedures, Firm Load Shedding, and Rotating Outages

Vulnerable Period
- Pipeline Peak and Electric System Peak Conditions

Likelihood
- Highly Dependent on Extreme Winter Conditions, Preparations, and Planning

Three-Layer Analysis

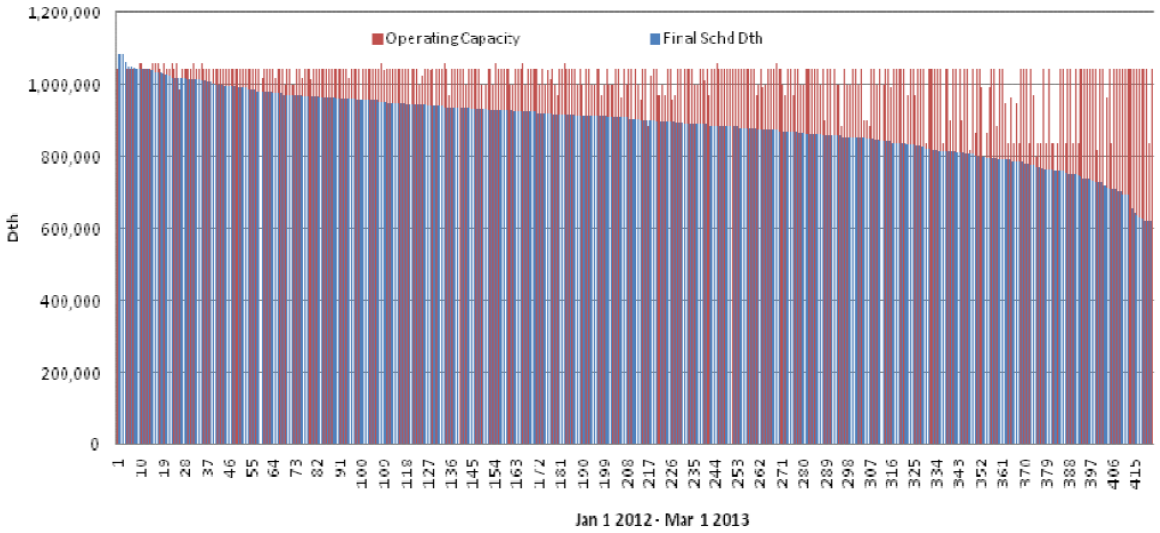
- Layer 1
- Assess the capacity of the gas infrastructure under normal operating conditions, and compare that capacity to the gas load by developing daily gas load duration curves for a specific set of weather conditions (e.g., 50/50 or 90/10).
- This provides an indication of the potential for fuel-related outages if the gas system is fully operational



Three-Layer Analysis

- Layer 2
- Compare the same gas load duration curves to gas infrastructure capacity under selected gas transportation contingencies, such as a compressor station outage or mainline capacity reduction.
- This provides an indication of the additional incremental fuel outages that could be caused by potential large disruptions with the regional gas system.

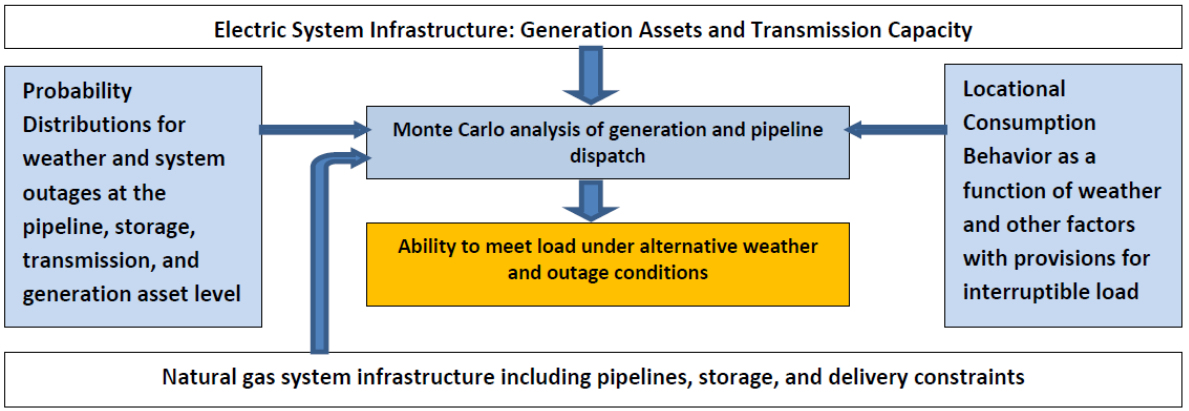
Figure 23: Operating Capacity and Final Scheduled Volume – Example Pipeline



Three-Layer Analysis

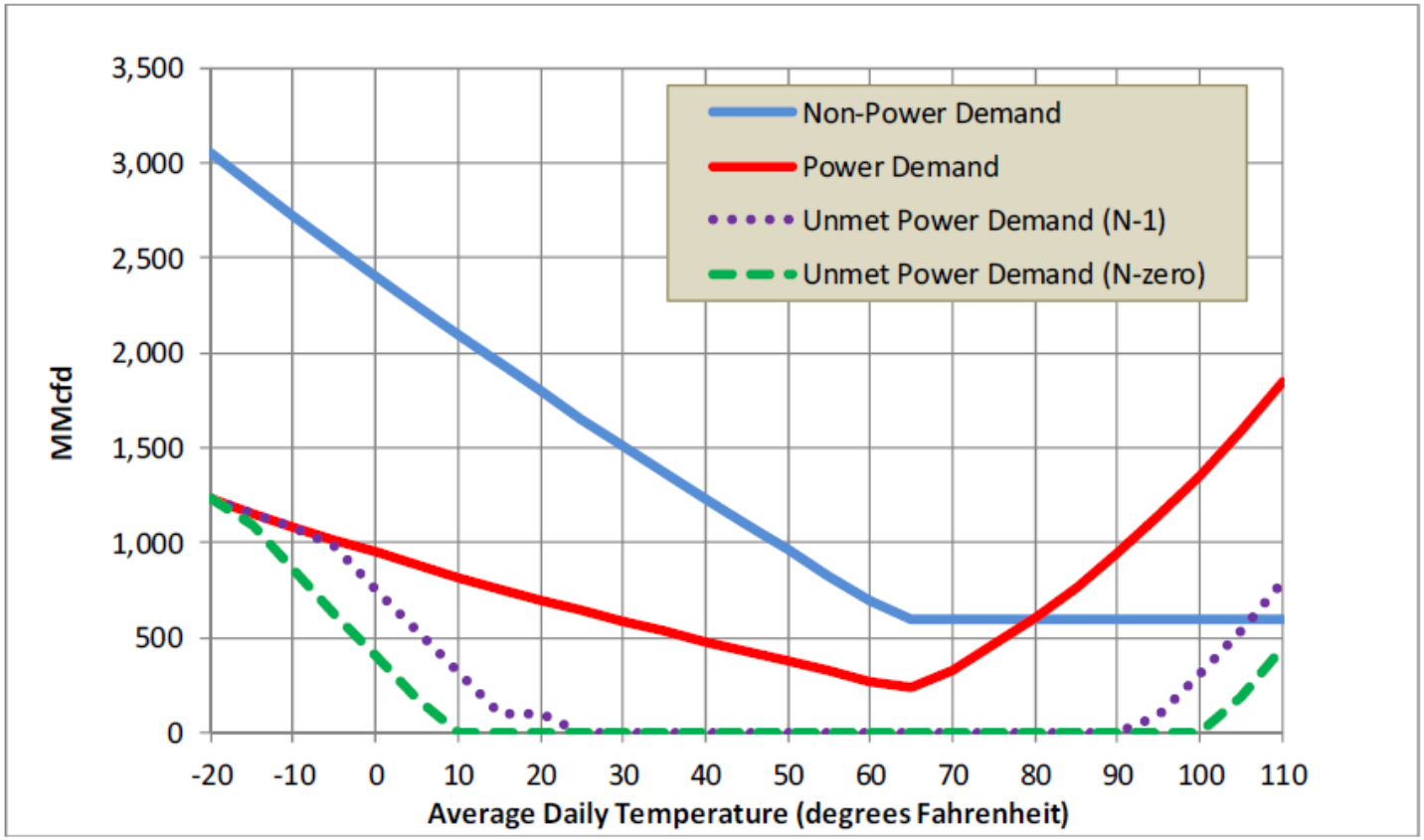
- Layer 3
- While Layer 1 and Layer 2 provide an initial assessment of the potential severity of fuel-related outages, they do not fully quantify the probability that demand for gas will not be met.
- The third step (Layer 3) is to perform a Monte Carlo analysis, which examines a wide range of weather and gas supply and/or transportation conditions to determine how often expected power sector gas demand cannot be served and the resulting threat of potentially lost electric loads.

Figure 27: Flow Diagram of Monte Carlo Modeling Process



Output of Layer 3

Figure 29: Amount of Unserved Natural Gas Load in Power Sector as Function of Weather Temperature and Gas Contingencies[12]



Key Findings and Recommendations

Planning

Short and Long-Term

- Risk-based and probabilistic analysis (3 Layer)
- Cross-industry information and data sharing
- Robust understanding of dual-fuel capabilities

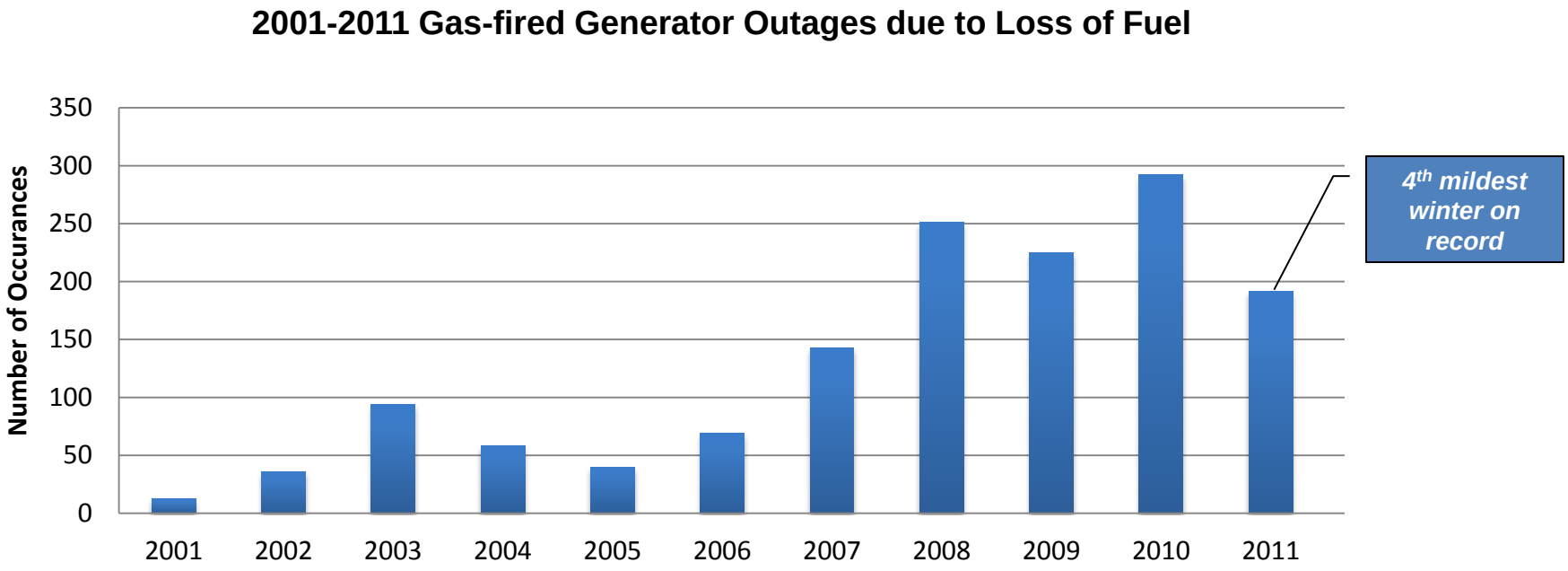
Operations

Season-Ahead through Real-Time

- Preparations and response plans
- Coordinated operational planning and information sharing
- Harmonized procedures for extreme conditions

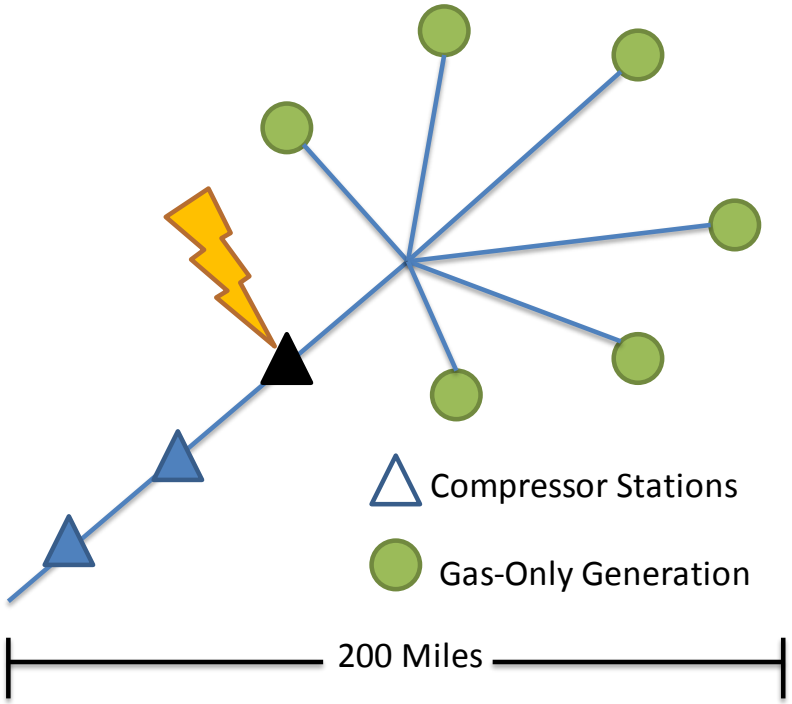
Historic Performance Data

- GADS data will be important in tracking gas-fired capacity availability rates.
- Trends for some areas may reveal increasing risks

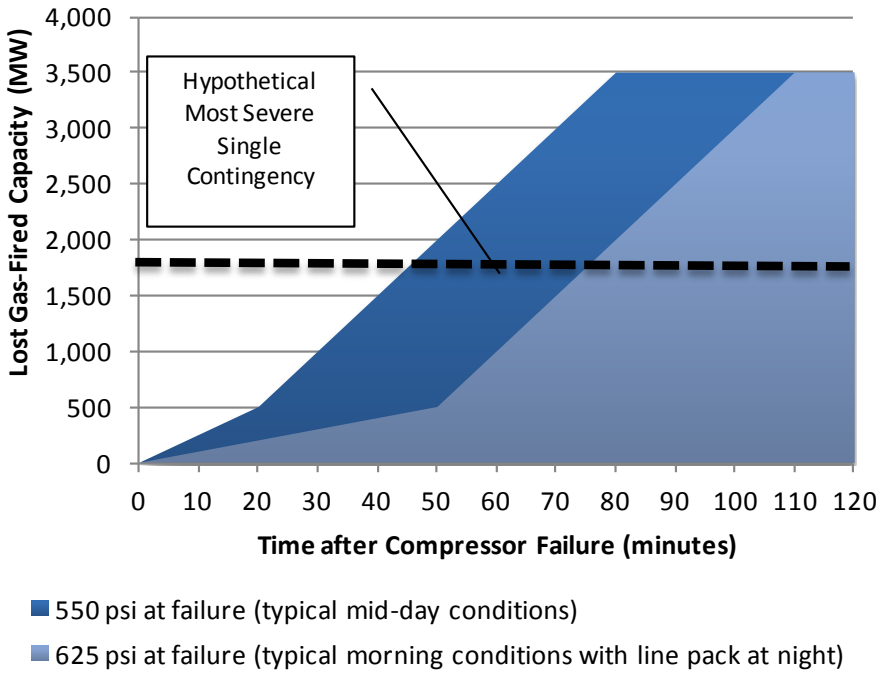


Pipeline Contingency Scenario

Compressor Failure Scenario



Time Profile of Capacity Loss



How to Incorporate in Planning?

- Is this a contingency?
- NERC defines “contingency” as:
  - *The unexpected failure or outage of a **system component**, such as a generator, transmission line, circuit breaker, switch or other **electrical** element.*
- How should this be studied, incorporated, and ultimately mitigated for electric sector?

Next Steps

- Prioritization
  - RISC involvement and guidance
  - OC/PC consideration of RISC input
  - Incorporate into committee work plan
- Project Scoping and Work Plan Development
  - Identify tasks and deliverables
  - Determine coordination opportunities with natural gas industry

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Thank you,

Questions and Comments?

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John Moura, Director of Reliability Assessment
North American Electric Reliability Corporation
john.moura@nerc.net
404.446.9731

Recommendations for Committees

- Planning Committee
  - Promote advanced modeling and analysis approaches. NERC recommends the Three-Layer approach or similar advanced probabilistic techniques.
  - Incorporate natural gas fuel availability or natural gas-fired generation availability into the NERC Long- Term Reliability Assessment and Seasonal Reliability Assessments.
  - Enhance the NERC Generator Availability Data System (GADS) to increase the effectiveness of trending gas-fired generator outages and causes related to fuel issues.
  - Improve Generator Owner procedures and methods to maintain fuel switching capabilities.
  - Work jointly with the natural gas industry to identify data requirements that can be used for electric reliability analysis.

Recommendations for Committees

- Operating Committee
  - System operators should re-examine inter-industry communication protocols that apply during periods of stress
  - NERC should leverage its stakeholder groups to identify best practices in areas currently most vulnerable to gas dependency risks and taking immediate actions for improvement, such as New England. Such an effort could lead to insights for enhanced operator training and table-top exercises.
  - Joint industry drills or table-top exercises with the key players of both gas, electric, and various state commissions would foster enhanced coordination and harmonize cross-industry issues, response plans, and mitigation measures.