



Operationalizing Gas Pipeline Contingencies Normal and Conservative Operations

PJM Operating Committee
October 10, 2017



- Background
- Gas-Electric Coordination Team
- Gas Pipeline Contingency Analysis
- Gas Pipeline Redundancy
- Current Operations Gas-Electric Assessments
- Process Flow Diagram
- Generic Example
- Next Steps



Risks / Dependencies:
 Extreme Weather | Physical/Cyber Attacks | Fuel Source/Security

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Prepare

- Assess Risks**
Targeted risk management
- Strengthen Infrastructure**
Make critical assets less vulnerable
- Increase Coordination**
Cross-sector & public/private partnerships

Operate

- Strengthen Operations**
Expand coordination and communications
- Enhance Continuity**
Planned response exercises
- Apply Innovative Approaches**
Microgrids & distributed energy resources

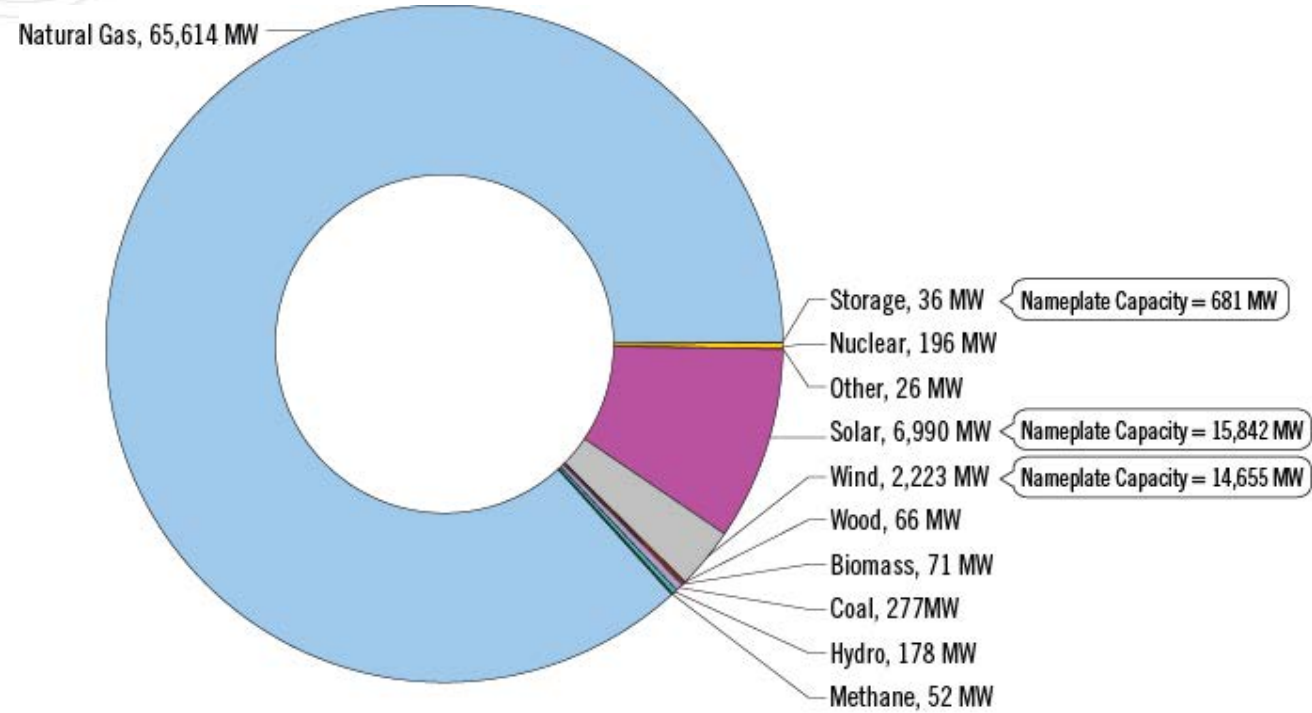
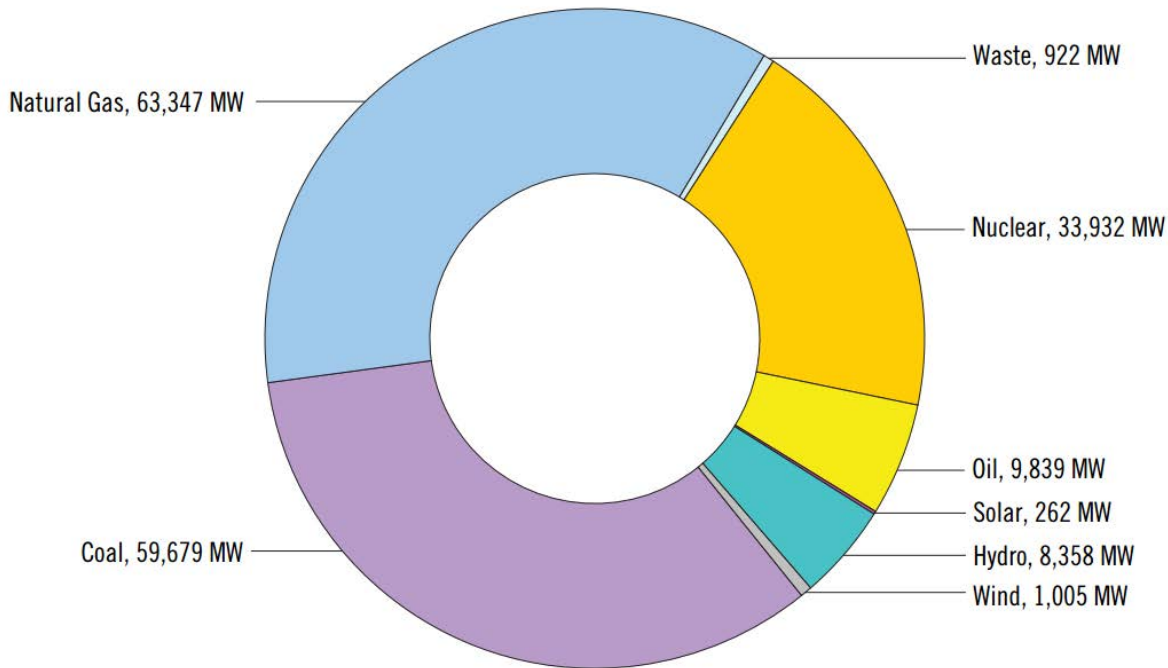
Recover

- Stabilize the System**
Prioritize interdependent infrastructures for system survivability
- Regain Critical Functions**
Balance industry and societal priorities
- Make Enhancements Based on Lessons Learned**

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Existing Installed Capacity

Queued Capacity Requests (CIRs)

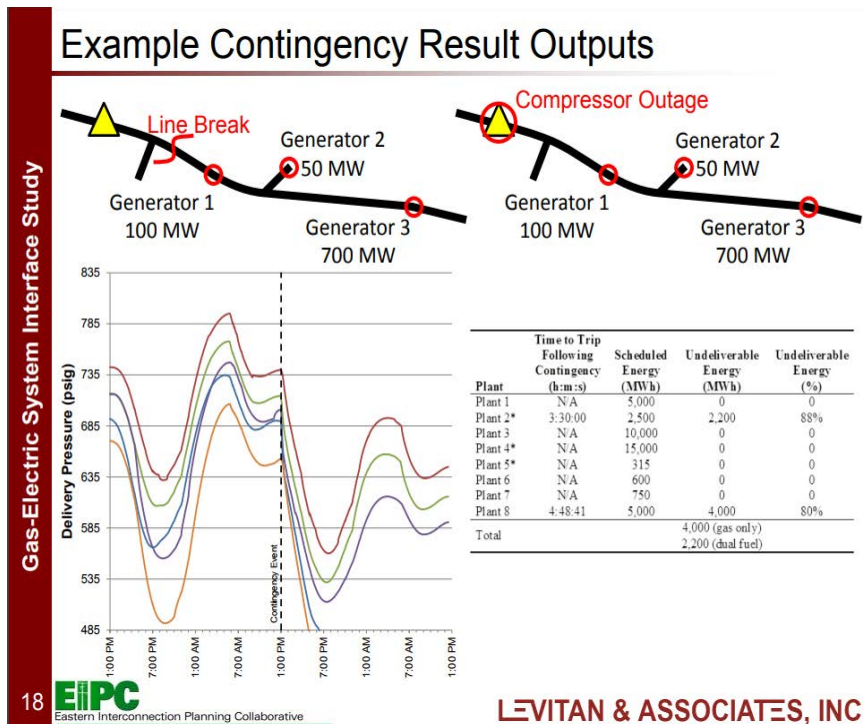


- **EIPC Gas-Electric System Interface study**

- Assess the impacts and consequences of selected gas and electric contingencies under various scenarios for peak day conditions

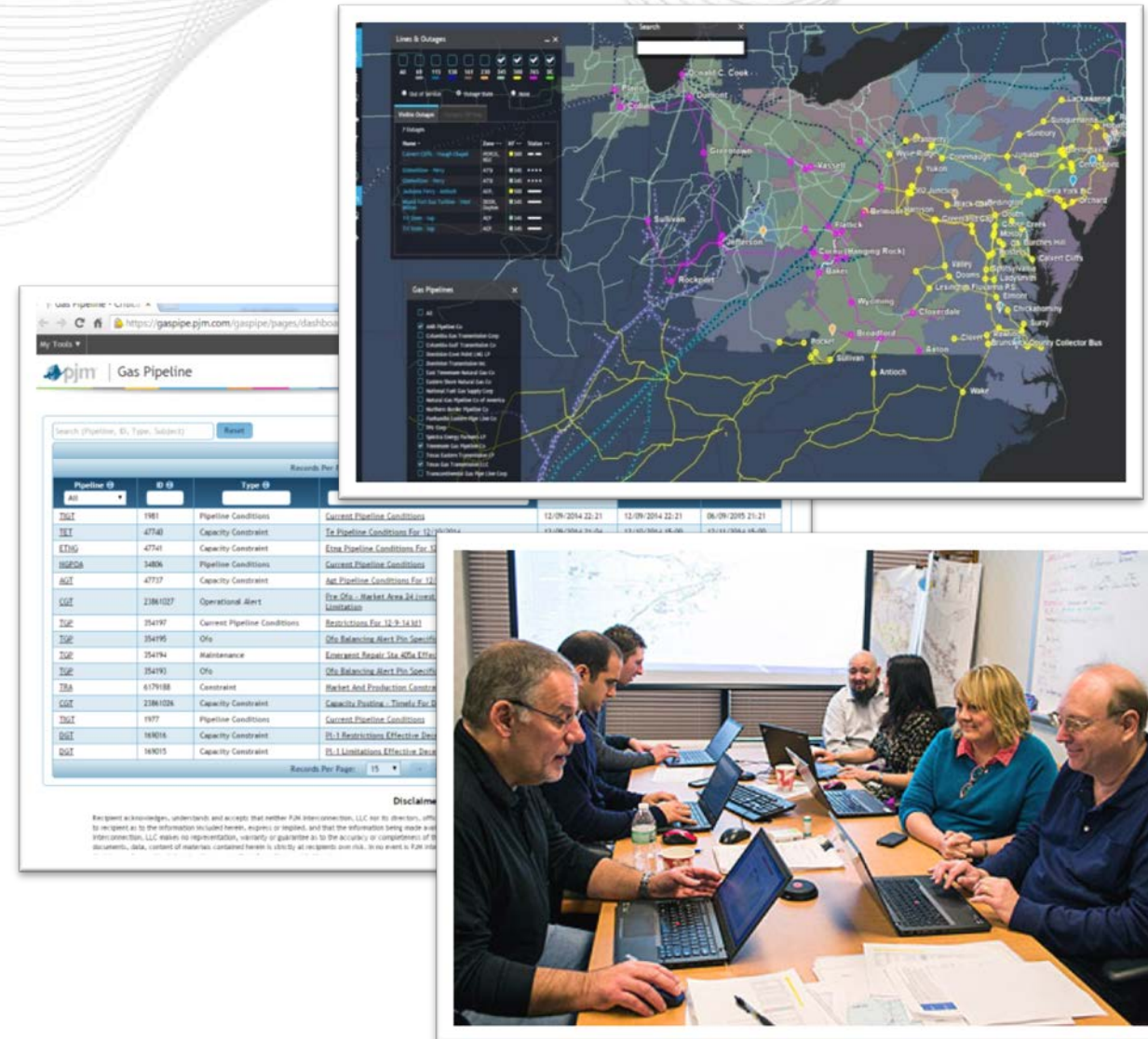
- **NERC TPL-001-4**

- TPL-001-4 standard requires PJM to maintain reliability over a broad spectrum of System conditions and following a wide range of probable contingencies.



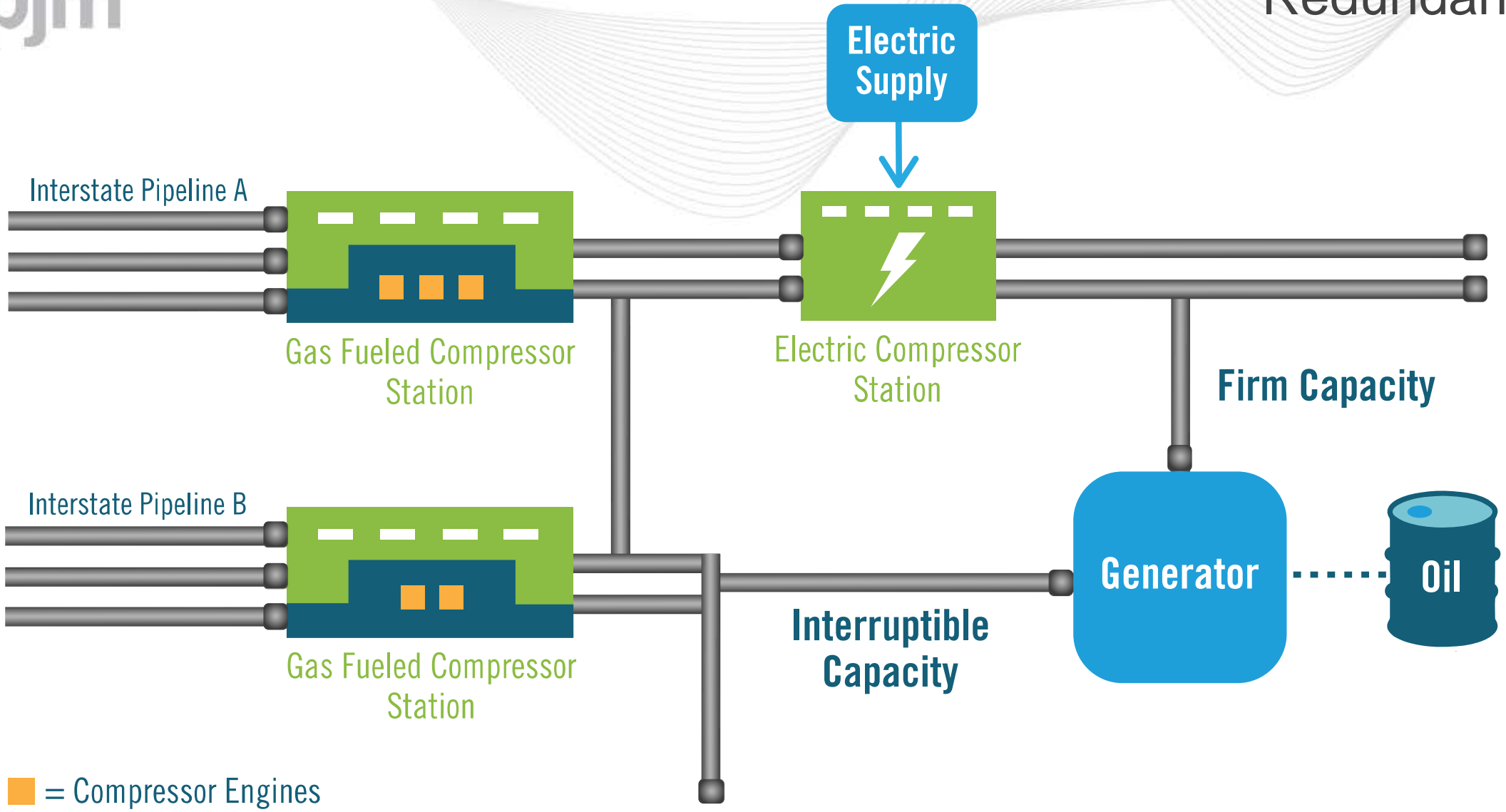
PJM team formed to:

- Analyze data related to gas delivery to units
- Provide operational info that allows PJM operators to make better decisions
- Improve coordination with pipelines and LDCs
- Develop tools to support processes



Current initiative is to create operating procedure to define processes to evaluate gas infrastructure redundancy and operationalize gas contingencies under normal operations and external threat conditions (cyber/physical threats).

- Define Gas infrastructure redundancy criteria
- Refine gas unit exposure time (minutes versus hours)
- Define Operating procedures to include triggers, thermal/voltage reactive limits and reserve requirements.
- Define new process with
 - Decision flow diagram
 - Outline assessment steps in Operating Memo and PJM Manuals.



Seasonal (OATF)

- Summary of extreme event gas contingencies from the Winter OATF Study
 - Gas Pipeline or Compressor Failure
 - Loss of Individual LDCs
 - Temperature Threshold Gas Contingency

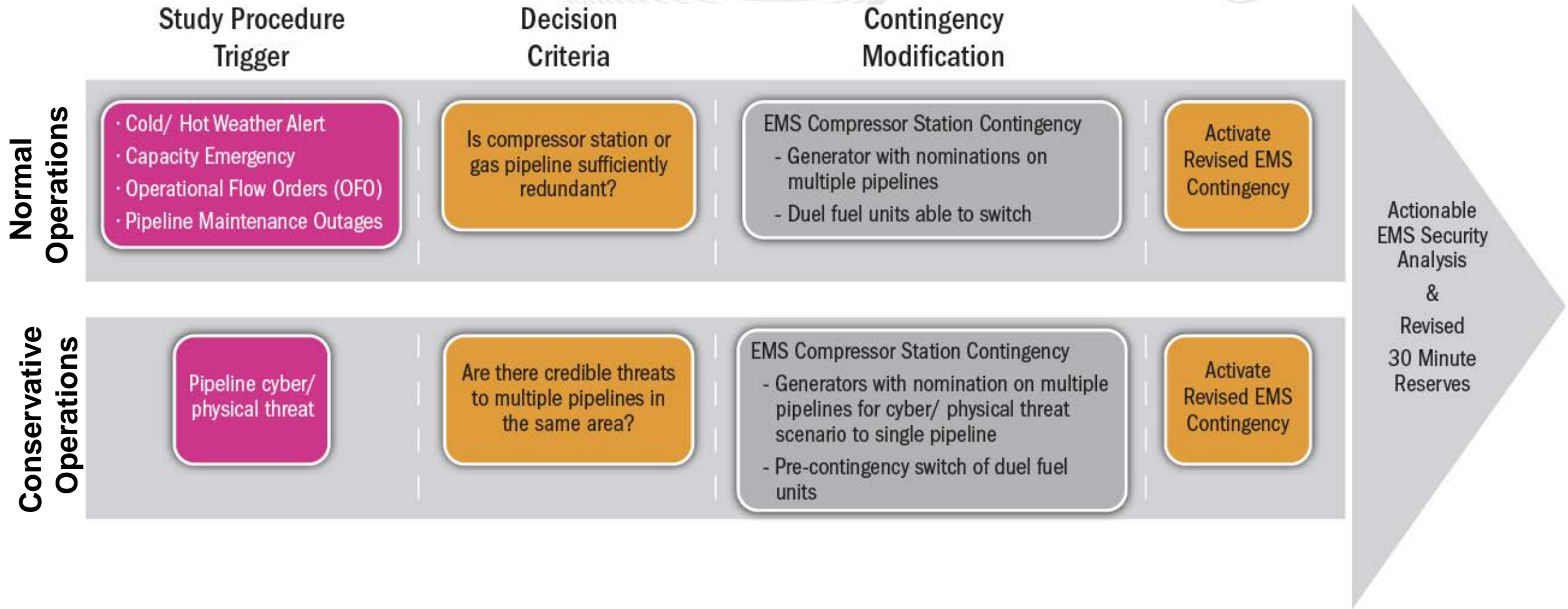
Monthly

- Summary of an EMS study
- Monthly reports for December, January, February
- Assessment of planned pipeline maintenance outages

Ad-hoc EMS study

- Assessment of credible pipeline issues or threats by activating the defined EMS “Gas/Elec” contingencies.

Operationalizing Gas Pipeline Contingencies Process Flow Diagram



Pipeline	Compressor Station	EMS Contingency with Impacted Generating Units	Unit ICAP	Dual Fuel Details			Alternate Gas Pipeline		Study Results
				Capable	Alternate Fuel MW	Fuel Transition Time(h)	Pipeline(s)	Source MW	Issue Type
Pipeline A	Station A	Unit A 1-4	231	No	-	-	Pipeline B	231	Reactive Transfer
		Unit B	545	Yes	545	1	Pipeline C, Pipeline B	545	
		Unit C	565	Yes	565	1	Pipeline C, Pipeline B	565	
		Unit D	450	Yes	450	2	Pipeline C, Pipeline B	450	
		Unit G	174	No	-	-	Pipeline C, Pipeline B	174	
		Unit F	86	No	-	-	Pipeline C, Pipeline B	86	
		Unit G	1240	No	-	-	-	-	
		Unit H	760	No	-	-	-	-	
		Contingency Totals	4051		1560			2051	

Modified Operational EMS Contingency = UNIT G + UNIT H

Required 30 Minute Reserves = 2000 MW (1240 MW + 760 MW)

- Pipeline Coordination
 - Continue to pursue critical pipeline and compressor station operational redundancy information
- Pipeline Modeling
 - Ongoing work with Argonne Labs
- Stakeholder Discussions
 - Operating Committee
 - System Operations Subcommittee
 - Generator Feedback Session(s)?
- Manual Updates and System Operator Training
- Decision Tree automation