

# Operationalizing Gas Pipeline Contingencies

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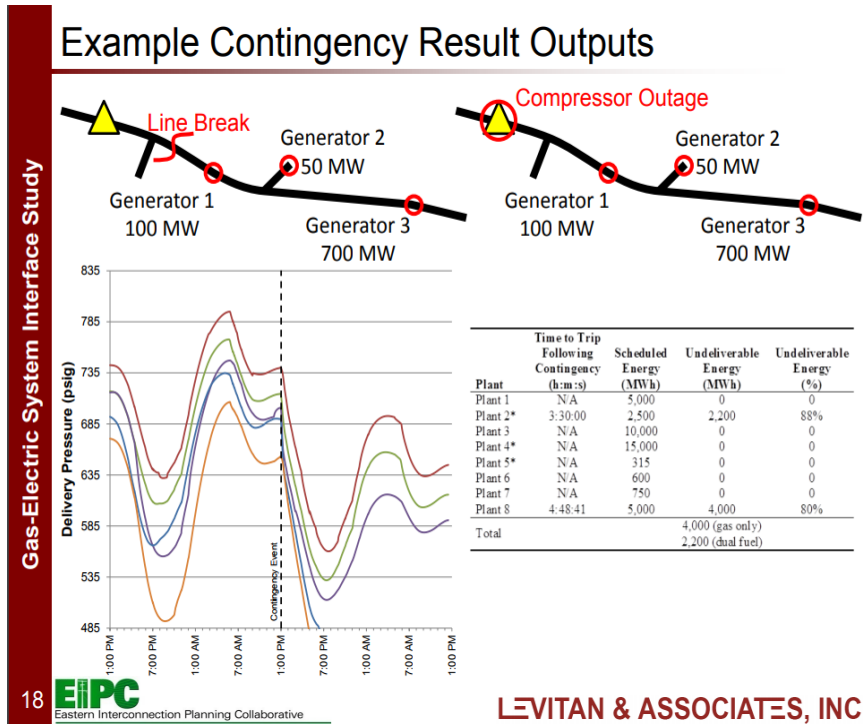
- Background
- Gas-Electric Coordination Team
- Gas Pipeline Contingency Analysis
- Gas Pipeline Redundancy
- Current Operations Gas-Electric Assessments
- Process Flow Diagram
- Generic Example
- Next Steps

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

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

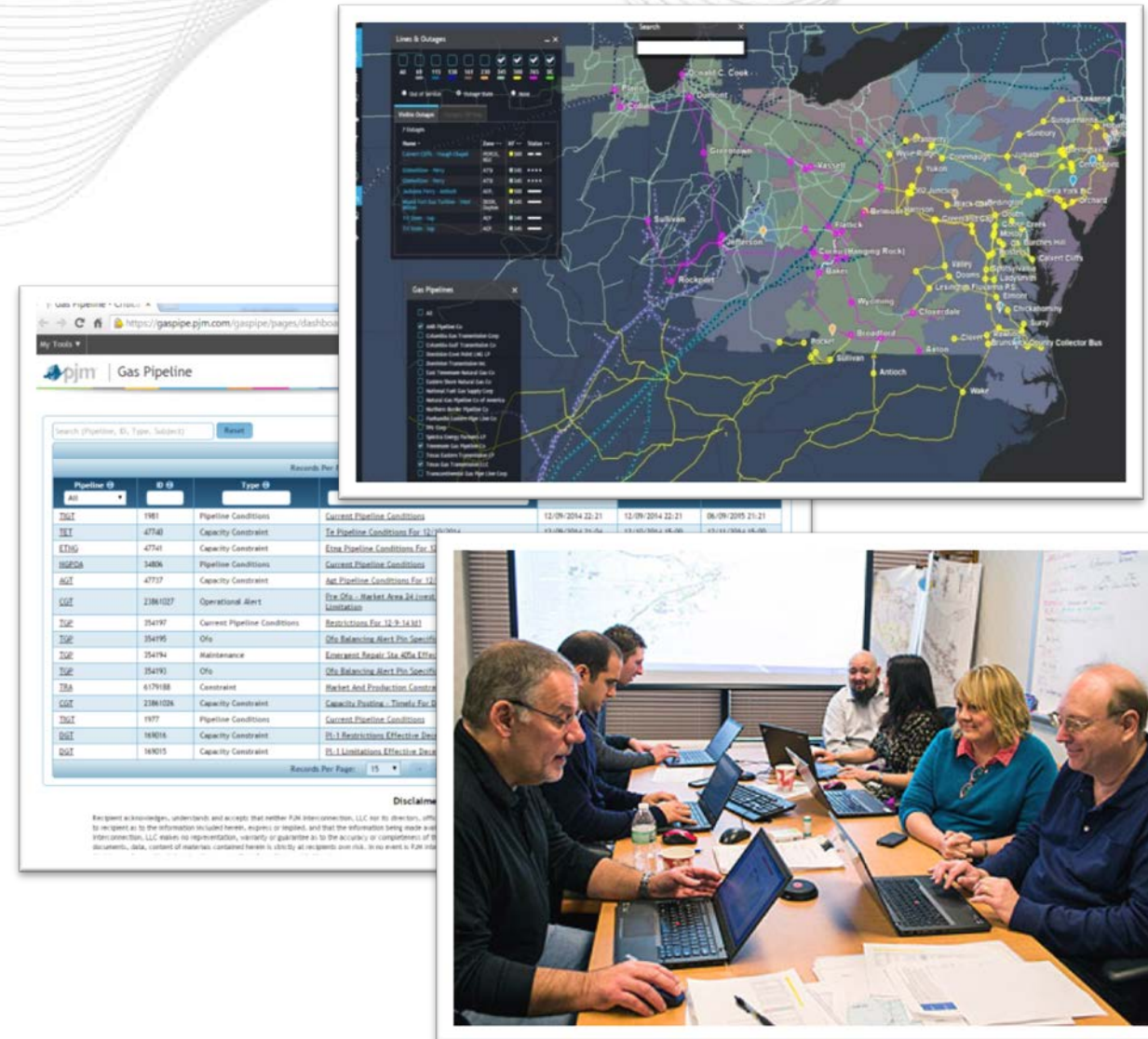
- **NERC TPL-001-4**

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



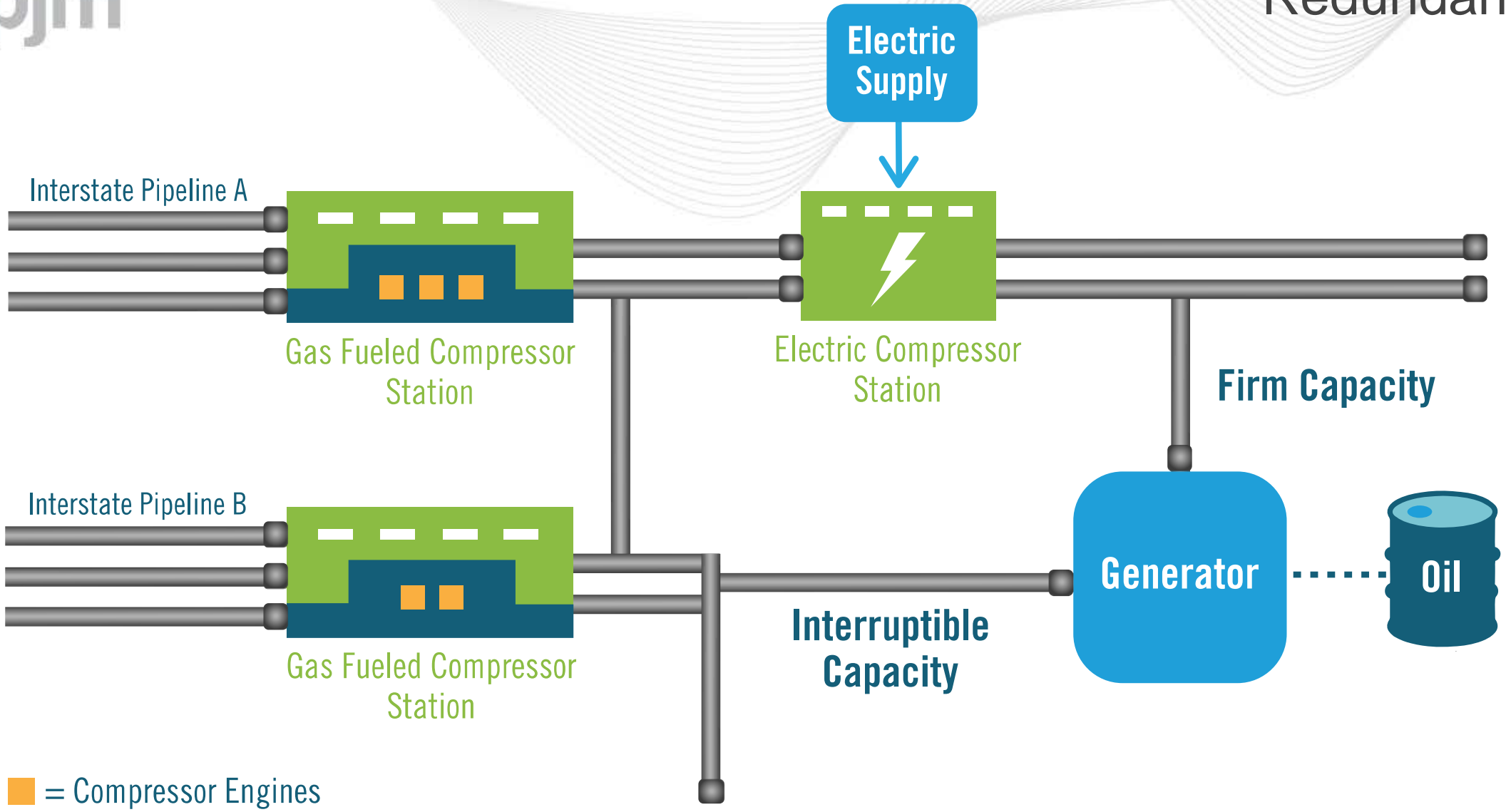
## PJM team formed to:

- 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 evaluate gas infrastructure redundancy and operationalize gas contingencies under

- 1. Electric/Natural gas infrastructure constraints/failures and**
  - 2. External threat conditions (cyber/physical threats).**
- Define Gas infrastructure redundancy criteria
  - Refine gas unit exposure time
  - Define Operating procedures to include triggers, thermal/voltage and reserve requirements.
  - Define new process with
    - Decision flow diagram
    - Outline assessment steps in Operating Memo and PJM Manuals.



■ = Compressor Engines

## Seasonal

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

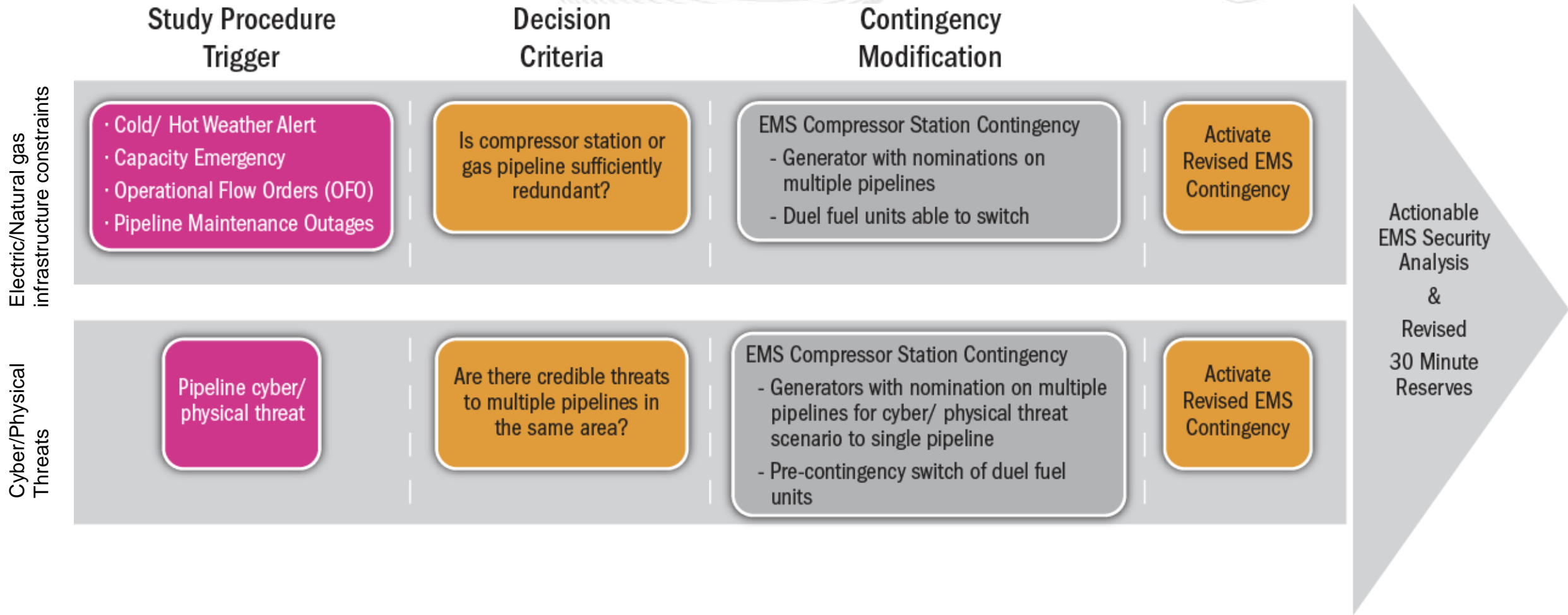
## Monthly

- 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	Primary Firm Capacity	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	No	-	-	Pipeline B	231	Voltage limits
		Unit B	545	No	Yes	545	1	Pipeline C, Pipeline B	545	
		Unit C	565	No	Yes	565	1	Pipeline C, Pipeline B	565	
		Unit D	450	No	Yes	450	2	Pipeline C, Pipeline B	450	
		Unit G	174	Yes	No	-	-	Pipeline C, Pipeline B	174	
		Unit F	86	Yes	No	-	-	Pipeline C, Pipeline B	86	
		Unit G	1240	No	No	-	-	-	-	
		Unit H	760	No	No	-	-	-	-	
		Contingency Totals	4051				1560			

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
- Manual Updates and System Operator Training
- Decision Tree automation