Fuel Security Senior Task Force Summary

FSSTF

December 16, 2019

Phase 2 Charter

- The activities of the group will begin in April 2019. By the end of the 4th quarter 2019 the group will complete key work activities #1 - #4*, and expected deliverable #1, and will report to the MRC their recommendations.
  - Deliverable #1: ***A recommendation to the MRC on whether market or operational changes are needed to ensure current or future fuel/energy/resource security***.

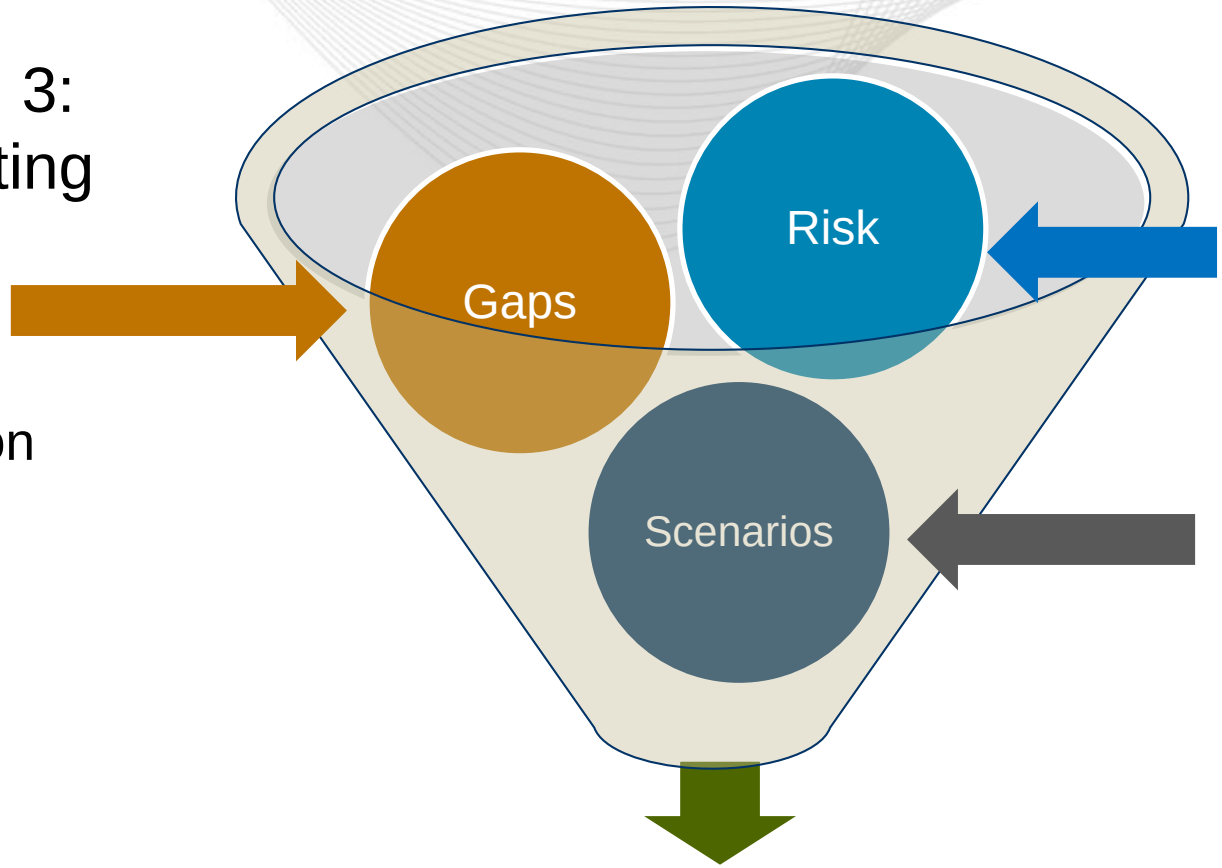
- The remainder of the key work activities and deliverables will be completed by the deadline to be set by the MRC at the December 19th, 2019 meeting.

*Key work activities #1-4 provided in Appendix A

FSSTF Phase 2 Work Streams

Work Stream 3: Gaps in Existing Mechanisms

- ✓ Modeling of uncertainties
- ✓ Compensation



Work Stream 1:

Relevant period & credible risks informed by historical data and stakeholder feedback ✓

Work Stream 2:

Relevant risks determine focused scenarios ✓

- Supplement Phase 1

What scenarios result in loss of load and what is threshold?

What is cost and incentive?

Inform stakeholder recommendation

(Are changes necessary?)

→

- Poll (November)
- MRC Recommendation (December)

Work Stream 1: Relevant Period and Credible Risks

Identified Risks

- Reviewed historical data and solicited input from stakeholders and area experts to list Risks to the PJM system (Pipeline disruptions, Cold snaps, Heat Waves, etc.)

Narrow to Relevant Risks

- Analyzed the Risks identified and developed a list of risks within the Fuel/Energy/Resource Security scope and the identified Relevant Period (Pipeline disruptions, Cold snaps, Solar and Wind Intermittency, Fuel Availability)

Collect Data on Study Risks

- Collect data on the frequency of occurrence, generation impact, locational nature, and other factors necessary to model the Study Risks and their affect of Fuel/Energy/Resource Security

Define Relevant Scenarios

- Combine the Relevant Risks into event scenarios and identify any significant gaps from Phase 1 scenarios

Evaluate Relevant Scenarios (Work Stream 2)

- Identify Relevant Scenarios for simulation to determine impact on the PJM system

Work Stream 2: Phase 1 Sensitivity Scenarios

Based on stakeholder feedback adjusted following **Phase 1 input assumptions**, one at a time, for selected scenarios:

1. Pipeline disruption concurrent with event peak load (days 6 - 10)
2. 14-day pipeline disruption
3. Initial oil inventory level at 50%
4. Portfolio sensitivity with additional renewable replacement of retirements (Escalated 3)

56

sensitivities

Sensitivity results mirrored those of Phase 1:

- 2023 portfolio at expected reserve margin ("Announced" portfolio, 28.5%), No immediate threat to the reliability of the PJM RTO due to risks associated with fuel delivery infrastructure interdependencies, even in scenarios with the most conservative assumptions.
- Some scenarios with *stressed* portfolios at the IRM ("Escalated 1, 2, 3", 15.8%) and conservative fuel delivery infrastructure risk assumptions resulted a need for emergency procedures, including Voltage Reduction and Manual Load Shed.
  - PJM operational procedures to manage resource limitations like onsite fuel inventory and on-going coordination with natural gas pipeline industry may reduce the need for escalating emergency procedures

Work Stream 2: Scenario Analysis Summary: Relevant Risk Assessment

Risk Assessment (Work Stream 1) determined relevant period & risks, which informed the relevant scenarios for Work Stream 2:

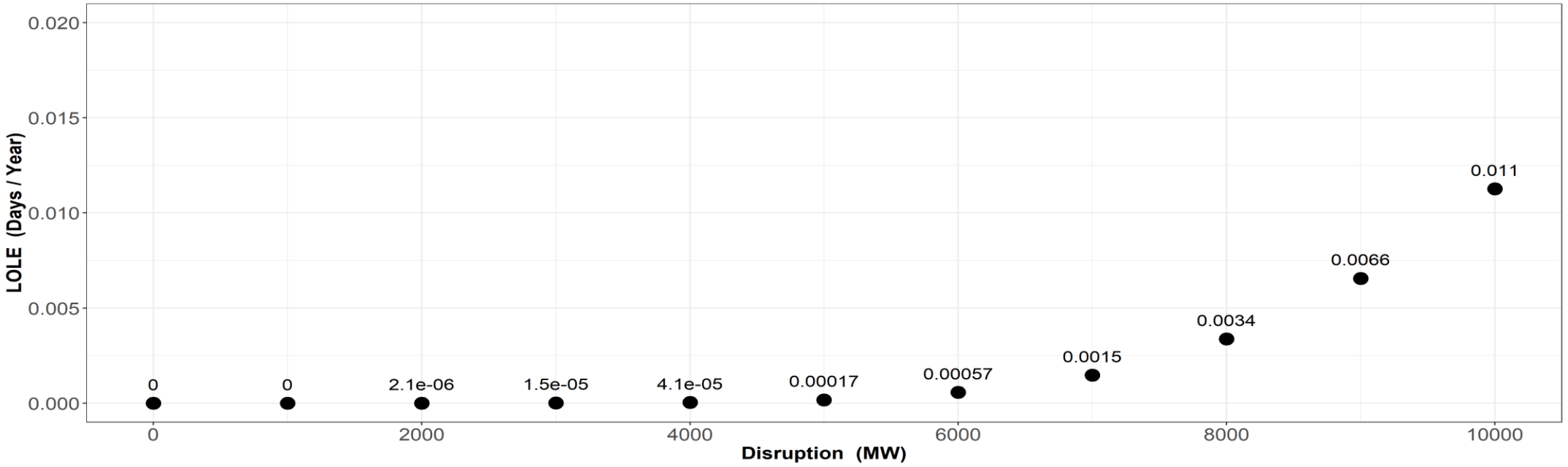
- Data supported a focus on winter peak period given the potential for high forced outage levels and high peak loads
- Load Shapes consistent with historical cold snaps
- Table shows range of scenarios simulated for each portfolio

Cold Snap #	Type	Duration (days)	Random Forced Outages Scenarios	Relevant Risk Scenarios	Disruption Timing Scenarios	Total Scenarios by Cold Snap
1	Recent	10	1000	1	14	14000
2	Recent	13	1000	1	17	17000
3	Recent	8	1000	1	12	12000
4	Recent	5	1000	1	9	9000
1	Older	17	1000	4	21	84000
2	Older	11	1000	4	15	60000
3	Older	5	1000	4	9	36000
4	Older	8	1000	4	12	48000
5	Older	14	1000	4	18	72000
6	Older	8	1000	4	12	48000
7	Older	5	1000	4	9	36000
8	Older	7	1000	4	11	44000
9	Older	6	1000	4	10	40000
10	Older	7	1000	4	11	44000
11	Older	7	1000	4	11	44000
12	Older	5	1000	4	9	36000
13	Older	6	1000	4	10	40000
14	Older	7	1000	4	11	44000
15	Older	5	1000	4	9	36000
16	Older	10	1000	4	14	56000
17	Older	6	1000	4	10	40000
18	Older	7	1000	4	11	44000
19	Older	6	1000	4	10	40000
20	Older	9	1000	4	13	52000
21	Older	5	1000	4	9	36000
22	Older	5	1000	4	9	36000
23	Older	5	1000	4	9	36000
24	Older	5	1000	4	9	36000
25	Older	6	1000	4	10	40000
					Total Scenarios	**1,180,000**

Work Stream 2: Scenario Analysis Summary: Relevant Risk Assessment

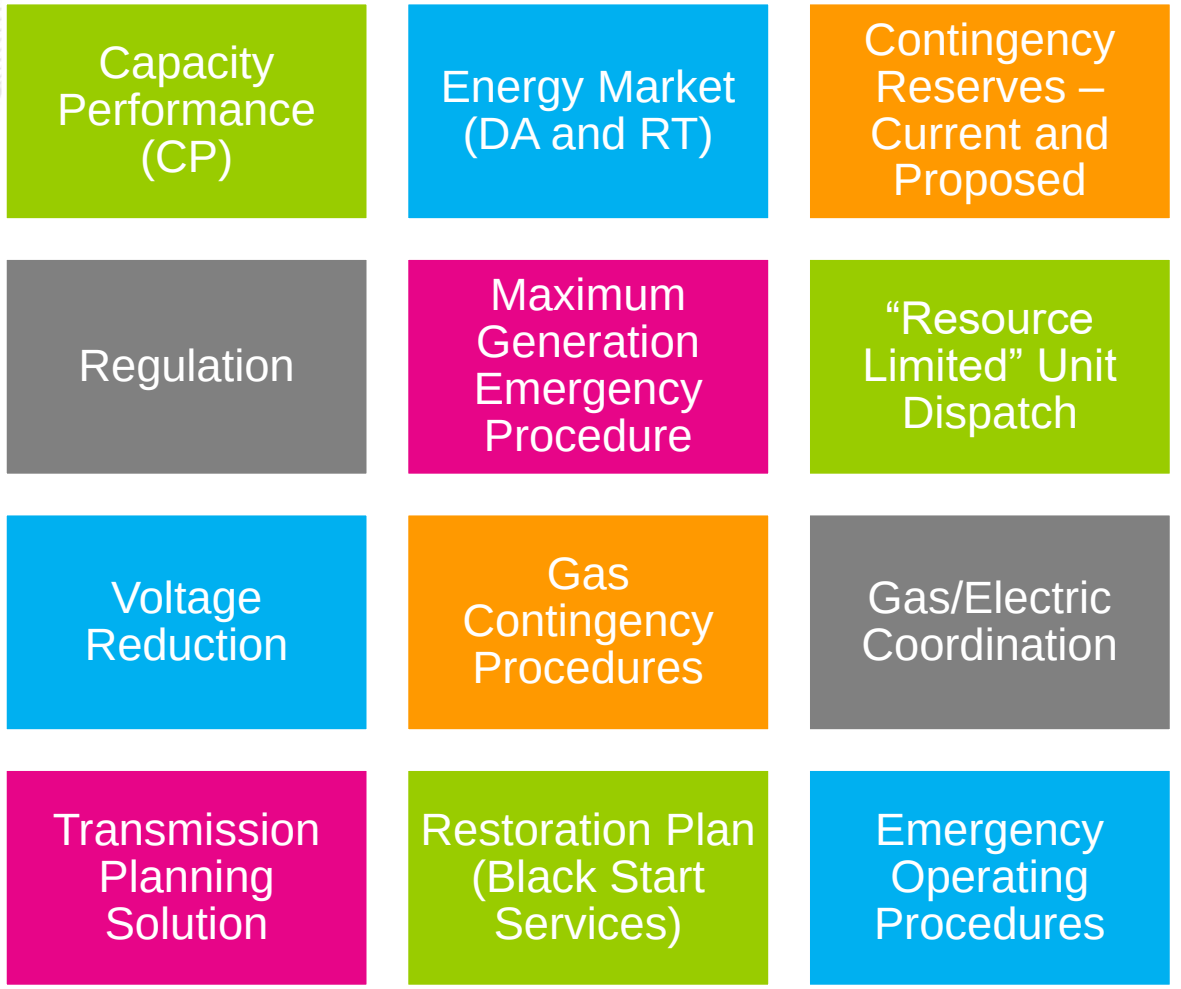
Graph represents summary of 1.18 million scenarios for Escalated 1 portfolio

- Average of all scenarios by disruption size
- The LOLE values are conditional on the occurrence of a disruption of size X fully or partially coincident with a cold snap (the probability of such an event is not estimated) and are in addition to the LOLE of each portfolio due to random forced outages and load uncertainty



Work Stream 3: Gaps in Existing Mechanisms

- Existing Mechanism Assessment
  - Determined if any gaps in uncertainties/risks and procurement period
  - Determined if any gaps in the compensation and incentives
- Results
  - There may not be sufficient compensation and incentives with existing mechanisms for a resource to increase its fuel/energy/resource security.
    - Measured using penalties and lost revenue for not performing
  - Expected costs vary based on assumption of scenario occurrence



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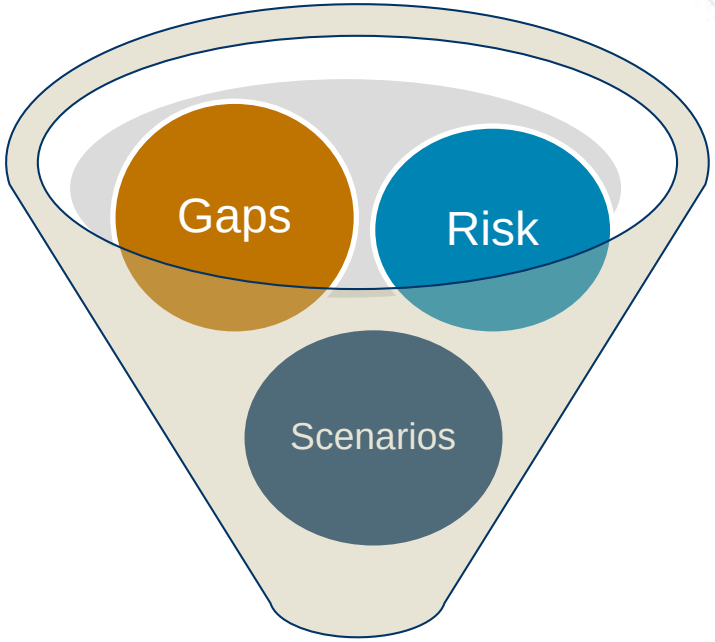

Multiple Potential Paths Forward

4,720,380 Scenarios

- Phase 1 (324)
- Phase 2 (4,720,056)

Analysis demonstrated there may be gaps in existing mechanisms in compensation and incentives

Cost impacts derived from expectations of scenarios and perceived value of loss load.

- Provided potential costs derived from historical independent sources

Potential Paths Forward

Path 1: Status Quo

PJM continue to monitor and re-visit with stakeholders if risk increases.

- Included in a stakeholder work plan
- Guidelines provided to stakeholders with opportunity to provide feedback

74% task force poll support

Path 2: Pre-defined Criteria

PJM and stakeholders develop criteria, but do not develop solution until criteria is met

- *Criteria to be developed in 2020*

24% task force poll support

Path 3: Solution developed

Stakeholders develop a solution mechanism to automatically be triggered based on an embedded criteria

- *Criteria and solution mechanism to be developed in 2020*

19% task force poll support

*All Paths include incorporation of potential NERC guidelines/standards or FERC orders if applicable

Phase 2 MRC Vote: December 19, 2019

MRC Required Action Needed:

1. A recommendation to the MRC on whether market or operational changes are needed to ensure current or future fuel/energy/resource security.
   - Task Force poll results: Yes: 35%, No: 48%, Maybe: 17%
   - Support for Status Quo: 74%

Based on poll, is the recommendation to keep Status Quo as follows?

- Sunset Task Force
- PJM continue to monitor and re-visit with stakeholders if risk increases
- Include in a Operations Committee work plan
- Guidelines provided to stakeholders with opportunity to provide feedback

Appendix A
Key Work Activities #1-4

Status: Key Work Activities

KWA	Description	Status
1	Provide education, at a minimum, on the following: a. Fuel security study recently completed by PJM. b. Work other ISO/RTOs are doing relative to fuel/energy/resource security. c. PJM mechanisms and products from both the supply side and demand side that contribute to fuel/energy/resource security. d. NERC Assessments that may support this initiative. e. The primary risks to fuel/energy/resource security in PJM and the impact and likelihood of such risks.	• Reviewed Phase 1 • ISO-NE and MISO provided status • Mechanisms identified • NERC provided status • Risks identified • Relevant period identified 
2	Quantify the risk of occurrence of selected scenarios that might present a risk of fuel/energy/resource insecurity.	• Risks identified 

Status: Key Work Activities (cont.)

KWA	Description	Status
3	Determine what it means from a PJM system and/or resource level to be fuel/energy/resource secure. This determination should include all aspects of fuel supply characteristics, resource type characteristics, location of the fuel supply, roles of demand response and demand side management, location and characteristics of non-fuel generation (e.g., renewable and energy storage resources), and other alternative options that can ensure fuel/energy/resource security in the coming years.	• Reviewed impact of existing mechanisms • Identified Gaps in Incentive and Compensation 
4	Determine whether there is a quantifiable and/or locational requirement for fuel/energy/resource security in PJM.	• Risk assessment incorporated locational aspect • Scenarios results demonstrated a locational aspect quantifiable requirement.