

# System Restoration Proposal

MRC – January 31, 2013



# Exelon's Footprint

## Distribution

- Exelon serves 25% of PJM's 154 GW peak load
  - ComEd
    - 3.8 million electric customers in Illinois
    - 22.8 GW of peak load
  - PECO
    - 1.6 million electric customers in Illinois
    - 8.5 GW of peak load
  - BGE
    - 1.2 million electric customers in Maryland
    - 6.9 GW of peak load

## Transmission

- Exelon maintains 7,350 circuit miles of electric transmission lines

## Generation

- ~17,000 MW of Nuclear capacity at 20 units across 4 states

***Exelon has multiple significant interests in effective system restoration processes***

# The PJM/IMM Proposal is Rushed and Needs Improvement

## Concerns

- Task Force has had limited time to review and propose compromises to the PJM/IMM proposal
- The PJM/IMM proposal fails to properly address the following critical concerns:
  - Coordination during system restoration
  - Potential increase in restoration times
  - Achieving state obligations and expectations

***Despite many areas of consensus, two critical components for an effective System Restoration policy require modification:***

- ***Black Start unit start time requirement***
- ***Cross-zonal coordination***

# SRSTF Timeline

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- Feb 8, 2012 – Task Force kick off meeting
- Feb 14 – Oct. 17, 2012 – 19 stakeholder meetings
- Oct 23 – PJM/IMM package presented
- Nov 13 – PJM/IMM presented details of 5 year selection process
- Nov 30 – Exelon package presented
- Dec 4 – PJM/IMM added 4 new design components to matrix, including Cross Zonal
- Dec 10 – Opt Out provision added as a design component in matrix
- Dec 13 – Nuclear Owners User Group has discussion with PJM around BS start time
- Dec 13 & 14 – stakeholder meetings
- Dec 18 – stakeholder meeting
- Dec 19 – voting opened and closed on Jan. 11, 2013
- Dec 21 – PJM spoke directly with BGE around the critical load definition changes
- Jan 3, 2013 - PJM spoke directly with PECO and CE around the critical load definition changes
- Jan 18 – PJM stakeholder meeting to review voting results and next steps

# Areas of Consensus

Matrix Line #	Design Component	Status Quo	PJM - IMM Proposal (NEW)
1	Restoration Time (Target)	24 hours	No time goal; conditions-based
5	Maximum Number of Black Start Units at one site	Currently, only 3 black start units are allowed at one sight without an exception approved by PJM.	Allow more than 3 BS units per site.
11	Entity responsible for executing the restoration plans and overall coordination	Restoration performed at TO zonal level with PJM coordination of interconnection of areas and EHV system.	Status Quo
13	Initial Restoration: Clear Assumption on Outside Assistance	Complete PJM blackout with no outside assistance available: working hours.	Status Quo
14	Initial Restoration: Weather/Load	Normal weather pattern, intermediate to peak load, minimal equipment damage and Hot Unit time to start from the Markets database. (Time to start is Notification time + Hot Startup time)	Status Quo
15	Scenarios in Restoration Drills	Plan for worst case, but focus training & analysis on a variety of scenarios	Status Quo
16	Units Eligible to be Black Start	Any resource capable of meeting minimum requirements should be eligible to be considered as a BS resource	Status Quo
17	TO's may optionally procure additional BS through bilateral contracts outside PJM OATT	TO can optionally acquire additional or different BS if desired through bilateral contracts (outside of PJM OATT)	Status Quo
19	Reactive and Voltage Concerns Addressed	Ensure Reactive & Volt / VAR sufficient based on testing and simulations	Status Quo
20	Cranking Path Issues Addressed	Cranking path availability tested during simulations	Status Quo
21	Fuel Reliability/ Fuel Diversity Addressed	Not Considered in Current Restoration Planning	Ensure not too many BS units tie to the same gas pipeline. PJM would

# Consensus - Critical Load Definition

## Exelon adopts PJM/IMM proposal

- Until very recently, Exelon could not support the PJM/IMM change until we fully understood the impacts
- After one-on-one discussions with PJM and each TO in late December and early January was it better understood how the definition change will impact each TO
- PJM's proposed amendments address our remaining concern of allowing other units to be classified as critical if needed to support System Restoration

Matrix Line #	Design Component	Status Quo	PJM - IMM Proposal (NEW)
2	Amount of black start MW required	Aux power for critical steam that can be restored in 8 hours + nuclear safe shutdown power + gas infrastructure load + margin on a zonal level	(Aux power for all generation that can be restored in <b>four</b> hours + nuclear safe shutdown power + gas infrastructure load) * 110%
3 (ADDED)	Coping Power for units 4-8 hour start	TO Specific	Address on case by case basis. Identify units and coping MW required to include in Restoration plan. Supply coping power within required timeframe. May or may not need to commit BS generation to meet these requirements

# Areas of Conditional Consensus

**Exelon agrees in concept with the below , however, only with modifications per Exelon's Recommendations on the following pages**

Matrix Line #	Design Component	Status Quo	PJM - IMM Proposal (NEW)
4	Redundancy	Minimum of 3 black start units per TO zone ( with Exceptions)	A minimum of 2 black start units assigned to each restoration zone that has a critical load requirement (restoration zone could be TO zone or aggregated zone (see 'Cross Zonal Coordination' Level 1, 2, and 3 & 'Restoration Zone (Geography)' design components below))
6	Restoration Zone (Geography)	Plans based on a TO zonal basis with PJM M-36 defining common elements.	PJM, in consultation with TOs, to use proactive approach in identifying areas of the system where it would be beneficial to employ cross TO zonal coordination for restoration purposes (i.e. BS shortages, increased efficiency, availability of BS resources, or increased in speed of restoration). See 'Cross Zonal Coordination' level 1, 2, and 3 design components below)
10	Entity responsible for BS identification	TO; with PJM approval	PJM with TO input (PJM as the TOP has ultimate responsibility though will look to collaborate and coordinate with the TO in the development of the plan including the amount and placement of BS) TO has "opt out" provision to acquire BS outside PJM OATT. TO has Dispute Resolution Process if disagreement.
12	Area for Restoration Assumption (Design Comp H)	Plans based on a TO zonal basis with PJM M-36 defining common elements.	Proactive approach to identifying areas of the system where it would be beneficial to aggregate TO Restoration plans; M-36 defining common elements (See Cross-Zonal Coordination design components)
18 (Added)	Opt Out	TO can acquire BS through bilateral contracts outside of PJM OATT.	If TO does not agree with PJM's selection of BS units, inclusive of level of cross-zonal coordination, TO can opt out of the RFP for Black Start and acquire additional or different BS through bilateral contracts. This will occur outside of PJM OATT. Costs will not be collected or distributed through PJM's Tariff. TO will need to provide PJM evidence that the BS selected by the TO can meet PJM's BS requirements.
23	Procurement Option	RFP	5 Year Selection Process with Incremental RFP if needed for interim shortages
24	Reliability Backstop?	Exceptions to reliability criteria	Detailed exception process and other options
22	Black Start Compensation	OATT Sched 6A, 13 month test required	OATT Sched 6A, 13 month test required (to be discussed further in the System Restoration Strategy TF)

# PJM/IMM and Exelon Differences

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- There are a total of 24 design components in the matrix
- PJM Members should not support the PJM/IMM proposal absent modifications of the following components:
  - Black Start unit start time requirement
  - Cross Zonal coordination



# Black Start Unit Start Time Requirement

## PJM/IMM Proposal

Matrix Line #	Design Component	Status Quo	PJM - IMM Proposal (NEW)
12	BS Start Time Requirements	90 minutes close to a dead bus	Start time for BS resources to <b>four</b> hours or less (Nuclear or other critical loads with specific timing requirements will be prioritized in the selection of black start units)

## Exelon Recommendation

- **Change** - start time requirement to three hours or less
  - Acquires faster responding resources
  - Proposal still allows up to an additional 64,000 MW of resources to potentially supply Black Start
- **Add** - faster start time to the list of “Other Preferred Options Considered” within the “Selection Process”
  - Prioritizes faster responding resources

# PJM/IMM Cross Zonal Coordination Proposal

Matrix Line #	Design Component	Status Quo	PJM - IMM Proposal (NEW)
7 (ADDED)	Cross Zonal Coordination (Level 1) - Allow BS from outside TO zone to meet TO critical load	Case by case - only in response to RFP if shortages	<p>In collaboration with TO, PJM may select BS outside of a TO zone to serve critical load within that zone based on opportunities to:</p> <ul style="list-style-type: none"> <li>- eliminate BS shortages in zone (reliability requirement)</li> <li>- meet critical load restoration timing requirements (reliability requirement)</li> <li>- improve restoration speed or efficiency (efficiency opportunity)</li> <li>- significantly reduce cost (efficiency opportunity)</li> </ul> <p>TO zones stay in place as the restoration zone.                      Redundancy on TO zone basis (i.e. 2 BS units allocated to each TO zone; though physically may be outside zone)                      Restoration Plans remain on TO level, but coordinated between TOs.                      If TO disagrees with BS unit selection, they may "opt out" of selection and acquire their own BS outside of OATT (see 'Opt out' design component below)</p>
8 (ADDED)	Cross Zonal Coordination (Level 2) - Allow critical load and customer load to be restored across TO zones	Cranking power may be supplied across zones	<p>In collaboration with TO, PJM will look for opportunities to serve critical load or customer load pockets in one TO zone from generation (BS or otherwise) in a <b>nearby</b> TO zone based on opportunities to:</p> <ul style="list-style-type: none"> <li>- eliminate BS shortages in zone (reliability requirement)</li> <li>- meet critical load restoration timing requirements (reliability requirement)</li> <li>- improve restoration speed or efficiency (efficiency opportunity)</li> <li>- significantly reduce cost (efficiency opportunity)</li> </ul> <p>Same BS unit may be used to serve critical load <b>in more than one nearby TO zone</b>.                      TO zones stay in place as the restoration zone.                      Redundancy on TO zone basis (i.e. 2 BS units allocated to each zone; though physically may be outside zone)                      Restoration Plans remain at TO level, but are coordinated between involved TOs.                      Cross zonal coordination may be required by PJM to meet reliability requirements. If TO does not agree, TO may opt out (as defined by the 'Opt Out' Design component below)                      If cross zonal coordination is suggested to increase efficiency (improve restoration speed or reduce cost,) TO may refuse coordination opportunity</p>
9 (ADDED)	Cross Zonal Coordination (LEVEL 3) - Full Aggregation of TO zones for Restoration	Not done	<p>In collaboration with TO, PJM will look for opportunities to fully aggregate TO zones for restoration purposes based on opportunities to:</p> <ul style="list-style-type: none"> <li>- eliminate BS shortages in zone (reliability requirement)</li> <li>- meet critical load restoration timing requirements (reliability requirement)</li> <li>- improve restoration speed or efficiency (efficiency opportunity)</li> <li>- significantly reduce cost (efficiency opportunity)</li> </ul> <p>This could be in the form of merging TO restoration zones and associated restoration plans or creating new Restoration regions (new boundaries) and a new restoration plan for the new restoration region.                      Redundancy requirements would be on a Restoration Region basis (i.e. minimum of 2 BS units for the new Restoration region).                      Any affected TO and PJM would have to agree to this aggregation.                      If there is not agreement, the aggregation will not occur ('opt out' option not needed, just refusal)</p>

# Cross Zonal Coordination - Change Recommendation

- **The PJM/IMM proposal may foster system restoration delays**
  - Complicates restoration by necessitating coordination with another TO zone during the first few hours of a blackout
  - Communication between TOs could be impaired, making cross zonal coordination difficult (e.g., limited by availability of satellite phone communication)
  - A supply and receiving TO of Black Start would have competing priorities and responsibilities on restoration timeframes:
    - Supplying TO – prioritize establishing a cranking path to another TO over actions to restore their own customers
    - Receiving TO – rely on the supplying TO for Black Start and cranking path to restore their own customers
- **Exelon Recommendation**
  - Revise the current PJM/IMM proposal to state that affected TOs must concede to the cross-zonal coordination by adding the passage “**With affected TOs (supplying and receiving) consensus**” to PJM/IMM proposal Cross Zonal Design Components

# Overall Recommendations

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- Revise the PJM/IMM proposal by adopting Exelon's recommendations regarding Black Start unit start time requirement and cross zonal coordination
- Allow the task force to continue discussions on the following topics which were not addressed adequately over the past year, but are recognized to be critical issues:
  - Review in more detail the of 5-year proactive approach procurement method
  - Review in more detail cost-allocation and compensation changes
- Implement tariff/manual revisions for these modifications by June 2013 to support PJM's timeline
- Ensure that PJM and each TO discuss the TO's critical load definition changes and possible impacts