



# Black Start / System Restoration

October 5, 2015  
TOA-AC Meeting

- Background
- Five Year RTO Wide RFP Summary
- Black Start RFP Review and Implementation Process
- Challenges & Solutions
- Remaining Work / Next Steps

- System Restoration Strategy Task Force (SRSTF) assembled to review restoration planning process
- SRSTF Deliverables
  - Critical load definition and Black Start Requirements
  - 5 Year RTO Wide Black Start RFP process
  - Incremental RFP Process
  - Cross-zonal Black Start Solutions
  - Reliability Back Stop



- Minimum Critical Black Start Requirements for each transmission zone consist of:
  - Cranking power load to units with a “hot” start-up time of 4 hours or less
  - Off-site nuclear unit safe shutdown load
  - Critical gas infrastructure



- Successful implementation of new methodology for critical load requirement
- Sufficient black start megawatts to serve critical load requirements in all transmission owner zones post-2015 retirements
- Cross zonal solutions utilized in some transmission owner zones
- Potential termination of some existing excess black start units where appropriate

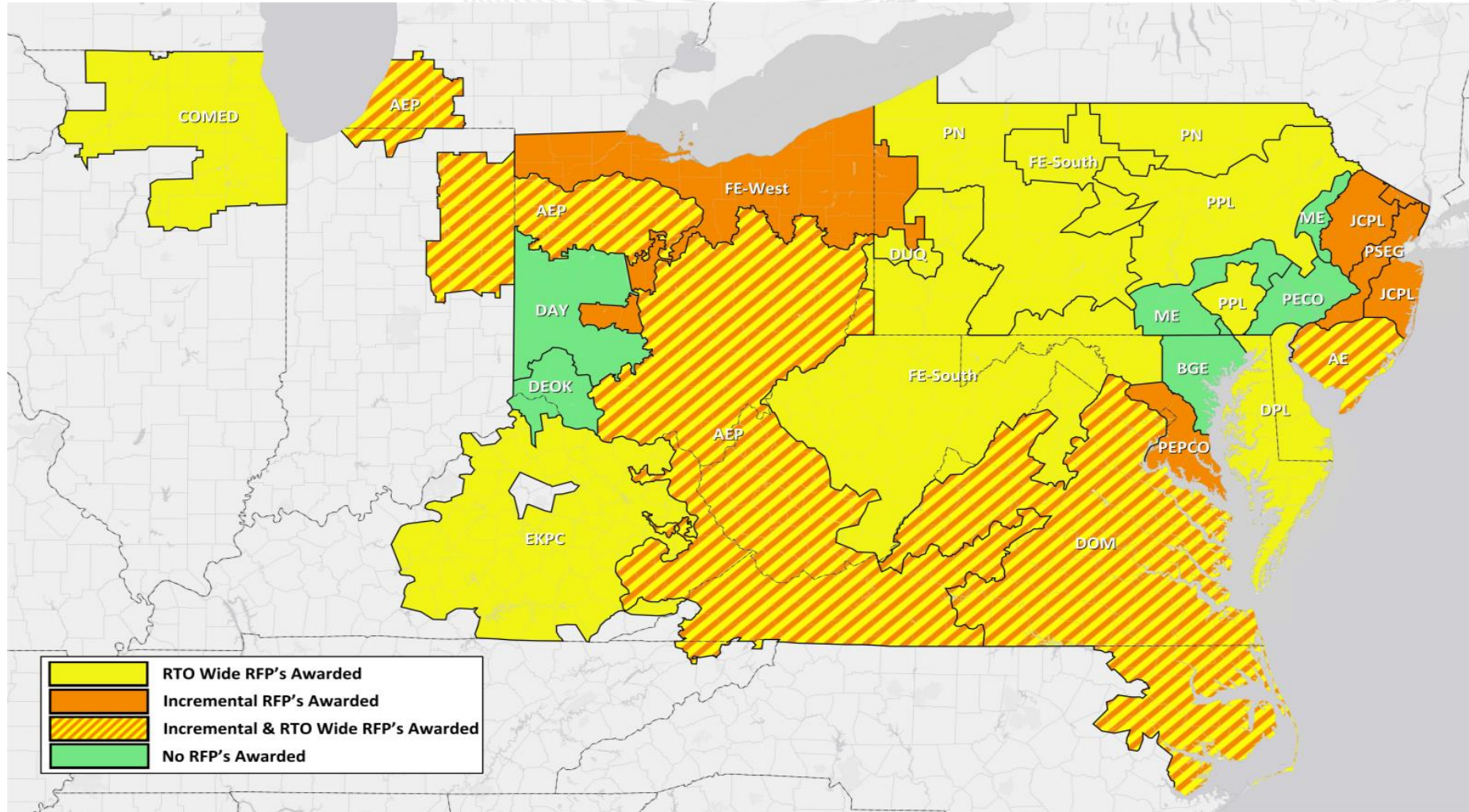


# RTO Wide RFP Awards Summary

Black Start Sites Awarded	26
Black Start Units Awarded	36
Black Start MWs Awarded	3,914
TO Zones Awarded Black Start	13
Number of Cross-zonal Solutions	5

- Overall less black start megawatts, with fewer black start units, cranking a lower amount of critical load but a higher quantity of critical load units
- Surplus of black start to critical load requirement varies across RTO - driven by:
  - Larger units / multiple units per plant for RFPs
  - Ensuring cranking power for all critical load units
  - Geographic diversity

# Incremental and RTO Wide RFP Process (RFP Awards since 2012)

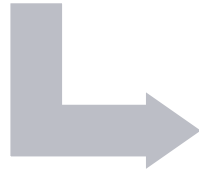




# Black Start RFP Review & Implementation

RFP  
Proposal  
Review

GO: Reactive Capability, Ramp Rates, Environmental/Operational Limits  
TO: Cranking Paths, Minimum Gen. Reqmnts.

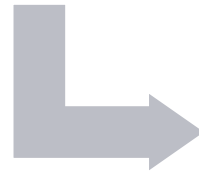


Power Flow  
& Dynamic  
Studies

(EOP-005)

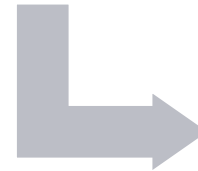


RFP Awards



Implementation

GO: Construction Updates  
**Black Start Test**  
Cost Submittal  
TO: **Restoration Plan Update**  
IMM: **Cost Review & Approval**



Black Start  
Service

Challenges	Impacts	Solutions
<p>Uncertainty of Black Start In-Service Dates</p>	<ul style="list-style-type: none"> <li>• Permitting / Construction / Equip. Delivery</li> <li>• Black Start Test Date uncertainty</li> <li>• Cost Submittals / IMM Review</li> <li>• EOP-005 Studies</li> </ul>	<ul style="list-style-type: none"> <li>• Regular status updates</li> <li>• Multiple scenarios included in EOP-005 studies</li> </ul>
<p>Coordination of TO Restoration Plan updates</p>	<ul style="list-style-type: none"> <li>• PJM restoration plan process</li> <li>• TO restoration plan process</li> <li>• Nuclear Safe Shutdown definition and NPIR coordination</li> </ul>	<ul style="list-style-type: none"> <li>• Multiple restoration plans versions</li> <li>• Increased PJM / TO coordination</li> <li>• NGOUG coordination</li> </ul>
<p>Unanticipated Black Start Terminations</p>	<ul style="list-style-type: none"> <li>• Black Start Shortage</li> <li>• Cranking Path Issues</li> </ul>	<ul style="list-style-type: none"> <li>• Incremental RFP</li> <li>• Short Term / Long Term Cross Zonal Solutions</li> </ul>
<p>Cross Zonal Black Start Solutions</p>	<ul style="list-style-type: none"> <li>• Increased complexity of restoration</li> <li>• TO/GO communications</li> <li>• Additional PJM Manual M36 form submittals</li> </ul>	<ul style="list-style-type: none"> <li>• Effective TO-TO collaboration on cranking path solutions</li> <li>• Increased focus on detailed documentation in restoration plans</li> <li>• Training on cross zonal during Restoration Drills</li> </ul>

- Second Incremental RFP - W. PA / NE Ohio
- Implementation of remaining RFP solutions
- TO System Restoration Plan updates
- Termination of Surplus Black Start
- Planning for next RTO wide RFP
  - Starting process in 2017
  - 2020 implementation

