eDART Black Start Application

SOS-Joint Meeting
August 28, 2013

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Presentation Focus

• Background

• Drivers & Process Improvements

• **Quick preview** of eDART application screens
  
  – We’ll review and revisit details in future SOS meetings as needed
  
  – Additional training (user guide, breeze presentations, etc.) will be made available and can be tailored for GOs, NGOs, and TOs
Background – Recent Work

• ‘Planning Time Horizon’

  • Issues
    – Black start terminations
    – Generator retirements (black start and cranked units)
    – *could be actual or theoretical changes in either of the above*

  • Analysis
    – GO data updates & GO Survey
    – PJM exchanging Excel black start calculators with TOs
    – Black start studies by PJM and TOs
    – Big data exchange of sensitive information through email
    – Identifying critical load needs unserved by current/remaining black start

  • Solutions
    – Incremental black start replacement RFPs
    – RTO-wide black start RFP
• ‘Planning Time Horizon’

  • Issues

    – Cranking path extraction via TO system restoration plans
    – Model translation between TO and PJM models
    – Email and PERCs submittal of SRPs and file management – does Dispatch have the latest approved version.

  • Solutions

    – Cranking path submittal via eDART
    – System restoration plan via eDART
Background – Recent Work

• ‘Operations Time Horizon’

• Issues
  – Generation and Transmission Outages

• Analysis
  – What are the associated Impacts to:
    » Black start units
    » Cranked units
    » Cranking paths
    » System restoration plans
    » and Nuclear safe shutdown paths (NPIRs)

• Solutions
  – PJM/GO/TO Outage Negotiation and/or
  – Interim Cranking Paths and/or
  – Interim System Restoration Plans
Drivers & Process Improvements

• Can we do this all more efficiently and in a more integrated manner for GOs, NGOs, TOs, and PJM?
  - Yes, by building new functionality in eDART and leveraging existing eDART functionality.
    • Think of the eDART black start application as a highly condensed and simplified version of your SRP that can be adjusted dynamically and in near-time (as needed).
  - For GOs, NGOs, and TOs, offers:
    • Direct data entry by GOs, NGOs, TOs
      - NOTE: PJM already has all of the initial data and will upload to eDART.
    • Notification of Data Changes and Associated Issues (ex: retirements, outages, and hot start times)
    • Convenient Data Reporting
      - Copy and pasting black start, critical loads, and cranking paths into SRPs.
      - Audit reporting
    • Faster data entry and validation means faster analysis and problem resolution for GO, NGO, TOs, and PJM.
Timeline

- Nov. 2013 – eDART Black Start Application released

  - PJM has all of the initial data from the sources below and will upload to eDART on behalf of the GOs, NGOs, and TOs.
    - Excel Black Start Calc. (black start & critical loads)
    - GO Survey Elements
    - Detailed Cranking Path Info. (previously supplied by TOs)

  - After the initial PJM data upload in Nov., GOs, NGOs, & TOs will make direct data updates in eDART.

  - TOs & PJM cutover to black start reviews and responding to issues directly with eDART tools.
Data Flow

Responsible Party

1. Critical Load Report
   - PJM
   - TO

2. Black Start Facilities Form
   - PJM
   - TO

3. Cranking Path Form
   - TO
   - PJM

- eMkt File (Hot Start Time)
- GO
- Nuke GO
- Daisy Chain Form
- Critical Gas Form
- Exception Form

Responsible Party

(Forms or Reports)
Data Entry (GOs/NGOs)

- GOs enter the required start-up MW
- Nuclear GOs enter the safe-shutdown MW
- Used for critical load determination in TO system restoration plans.
• **Data Entry (GOs)**
  - GOs enter the # of units that can simultaneously start
  - GOs enter the daisy chain (series) cranking capability
  - TOs may use this for determining cranking arrangements in the system restoration plans
• **Data Entry (TOs)**
  - TOs enter the critical gas requirements
  - TOs can enter a station and/or a voltage level
  - GOs can also share any critical gas info. directly with TOs or PJM to be entered in this form.

![Critical Gas Form](image-url)
• **Restoration Planning (TOs/PJM)**
  – TOs see what the critical loads are:
    – cranking power for units with min. HST <= 4 hours
    – nuclear safe-shutdown
    – critical gas infrastructure
  – TOs can see what cranking paths are associated with the critical loads.
  – TOs can plan for queue (future) critical loads
**Restoration Planning (TOs/PJM)**
- TOs can review the black start units.
- PJM manages the black start unit data based on terminations, retirements, and/or selected RFP responses as appropriate.

<table>
<thead>
<tr>
<th>Company</th>
<th>Unit Type</th>
<th>Black Start Class</th>
<th>Critical</th>
<th>Commercial Name</th>
<th>ICAP</th>
<th>Zone</th>
<th>Restoration Area Location</th>
<th>Restoration Area Critical Load</th>
<th>TO Zone Served</th>
<th>MW Served</th>
<th>% of ICAP</th>
<th>Effective Date</th>
<th>Terminated Date</th>
<th>Retirement Date</th>
<th>Permanent</th>
<th>Duplicate</th>
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**BS Term. & Ret.**  
**Assoc. Cranking Paths**
• **Restoration Planning (TOs/PJM)**
  - High level look at the basic ‘balance’ in a TO zone.
  - For a given zone, what is the balance calculation: Is BS $\geq 110\%$ of CL?
  - Shows high level black start and critical load characteristics.

Are we short on black start now or X years in the future?

What’s the BS surplus/shortage?
• Data Entry (TOs)
  – TOs enter cranking paths from BS to CL
  – Replaces existing cranking path functionality
  – TOs already provided this data. PJM will upload.

New Cranking Path Form

- Cranking Path Name & Type
- Description
- Cranking Path Sequence
- Black start terminations or retirements shown
• **Data Entry (TOs)**
  – **Power Budget** – Shows running capacity as you crank the critical loads.
  – View the black start scenarios (gen. outage mgmt for black start)
**Cranking Path Outage Impacts**

- **Restoration Planning (TOs/PJM)**
  - Are there any outages that impact my ability to crank critical loads?

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<tr>
<th>Category</th>
<th>Class</th>
<th>Type</th>
<th>Station / Unit Type</th>
<th>Voltage</th>
<th>Equipment Name / Commercial Name</th>
<th>Unit Station</th>
<th>Order</th>
<th>Critical Load</th>
<th>ICAP</th>
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**Legend:**
- **Gen Outage causing 50% of BS capacity loss**
- **Trans Outage severing BS feeds to all critical loads in cranking path**
- **Impacted Critical Loads**
- **Parallel Paths**
• **Restoration Planning (TOs/PJM)**
  - For cranking paths, hide the transmission elements & show me just the generators involved in cranking paths.
  - Helpful for determining generator retirements or BS termination impacts to cranking paths

![Stack Report](image)

BS  ➔  Inter. Crank  ➔  Final Crank
• **Restoration Planning (TOs/PJM)**
  – Identifies the outages that impacting cranking paths

```
<table>
<thead>
<tr>
<th>Cranking Path Name</th>
<th>Power Budget</th>
<th>Total Capacity</th>
<th>Restoration Area</th>
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<tr>
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## Stack Report Outage Impacts

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## Stack Report Outage Impacts

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## Stack Report Outage Impacts

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## Stack Report Outage Impacts

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## Stack Report Outage Impacts

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<td>Station</td>
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</table>
Restoration Planning (TOs/PJM)

- What are the cranking paths that have issues, either due to gen./trans. outages or due to data entry issues?
- To oversimplify, does my restoration plan work in real-time?

These are all invalid cranking paths since I don’t have enough capacity to crank CLs. Do I have alternate plans for cranking? TOs should enter a temporary replacement cranking path (slides 15 & 16).
• Please contact:

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