Black Start, Critical Load, and Estimated Online Capacity
Supplemental Information – Follow-up

SRSTF Meeting
December 10, 2012
(Updated after 12/10/12 SRSTF Meeting)
1. What about the 4 to 8 hour generation that’s removed from the critical load definition in the PJM/MMU proposal?
2. What is the total available est. online capacity at 8 hours?
3. What is the net difference between the 0 to 4 hour and the 4 to 8 hour in terms of est. online capacity?
4. What is the impact of delayed cranking of the 4 to 8 hour units?
5. Provide TO-specific details on critical load difference by going from 8 hr to 4 hr units.
RTO Black Start vs. Critical Load

PJM/MMU Proposal

(MW)

<table>
<thead>
<tr>
<th></th>
<th>BS (current BS + Est. 2,000 MW more)</th>
<th>CL (all units &lt;= 4 Hr)</th>
<th>Estimated Online CAPat6Hrs (4 Hr Gen started after 90 min. BS + 30 min. switching time)</th>
<th>Cranking Power for All Units 4 to 8 Hours Removed from CL Definition</th>
<th>Estimated Online CAPat14.5Hrs (worst case start-up of all units 4 to 8 hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>7,980</td>
<td>4,898</td>
<td>47,808</td>
<td>1,169</td>
<td>5,303</td>
</tr>
</tbody>
</table>

* Data based on actual and projected retirements through 2015

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RTO Black Start vs. Critical Load

PJM/MMU Proposal
(Unit Counts)

BS
(current BS + est. growth (53 units))

CL
(all units <= 4 Hr)

All Units 4 to 8 Hours
Removed from Current CL Definition

* Data based on actual and projected retirements through 2015

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Impact of shifted focus on 0 to 4 hour generation to be cranked rather than 4 to 8 hour generation:

- Impacts appear minimal and dwarfed by the gains of the 0 to 4 hour generation focus.
  - More than sufficient est. online CAPat6Hrs to crank the critical load.
  - Significantly less estimated online capacity as compared to the 0 to 4 hour generation
  - Significantly less quantity of units cranked.
  - Coping power requirements would be served based on the GO’s needs.
Concern about the transitional states and associated lags that result from the focus away from the 4-8 hour generation to be cranked:

- Units transition from temperature states (hot->intermediate->cold) and each sequential state comes with a startup time impact.
- RTO Averages:
  - 19 hours to transition from hot to intermediate states.
    - 12 hours of buffer time (power at station within 6.5 hours)
  - 41 hours for these units to transition from intermediate to cold states.
Response to Question 5

PJM/MMU 0to4 Hr Units and 4to8Hr Units
(Unit Count)

• Data based on actual and projected retirements through 2015
• Black start and hydro are included in blue and orange bars
Response to Question 5

PJM/MMU 0to4 Hr Units and 4to8Hr Units (CAPat6Hrs & CAPat14.5Hrs)

- Data based on actual and projected retirements through 2015
- Black start and hydro ICAP are included in blue and orange bars
Response to Question 5

(Updated after 12/10/12 SRSTF Meeting)

PJM/MMU 0 to 4 Hr Units
as Compared to 0 to 8 Hr Units
(Cranking MW = CL)

- Data based on actual and projected retirements through 2015
- 5% of (Black start and hydro ICAP) are included for cranking power estimates in blue and orange bars
- Nuclear offsite (~1,000 MW for RTO) and critical gas infra. (~12 MW for RTO) are not included in any bars
Comparing (0-4 hr units) cranked to (4-8 hr units) cranked:

- Slide 7: By unit count, we have at least double the amount of (0-4 hr units) in all zones. Most have significantly more than double.
- Slide 8: By CAPat14.5Hrs (worst case start-up all units 4-8 hrs), we have at least double the amount of (0-4 hr units) in all zones.
- Slide 9:
  - Added Current 0-8 hr steam and non-steam cranking MW
  - By cranking power (CL), the majority of zones have double the amount of (0-4 hr units). There are a few exceptions where (4-8 hr units) = (0-4 hr units), or (4-8 hr units) > (0-4 hr units), but the estimated CAPat6Hrs from (0-4 hr units) is still more than sufficient for CL of (4-8 hr units).