Firm Service Level Adjustment – Proposed Solutions
PJM DR Subcommittee

May 29, 2012
Issue Statement

• Under the **FSL compliance construct**, the PLC baseline from which load must be reduced is **weather normalized**\(^{(1)}\), whereas the real-time load during the emergency event is **not weather normalized**
  – During extreme weather conditions characteristic of emergency events, highly weather sensitive load is **substantially above its PLC**
  – This weather normalization inconsistency **penalizes highly weather sensitive DR load**, i.e., residential load
  – Residential load is over **100% more sensitive** to weather throughout the summer season than C&I load in the Baltimore Zone
  – Historically, PJM stakeholders’ DR market development process has **focused almost exclusively on C&I** customer segment
  – Smart grid deployment across the PJM footprint is bringing **substantial residential load into the DR market**
    • By summer of 2015, **100% of BGE residential load** will be participating in DR under the FSL compliance construct

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\(^{(1)}\) Zonal PLC is weather normalized by PJM by adjusting the actual peak load(s) to a standard peak weather condition
Highly weather sensitive load is substantially above the weather-normalized PLC baseline during extreme weather conditions characteristic of PJM emergency events.
Solution 1: Weather/Load Regression

**Proposed Solution 1:** Adjust the FSL by the amount of load increase attributable to the actual WTHI being higher than the PLC standard WTHI

– Achieves weather comparability between PLC and actual load
– Eliminates the unfair disadvantage highly weather sensitive, residential load has under the FSL compliance construct
– Adjustment determined after each emergency event

**Methodology to Determine FSL Adjustment**

• Determine relationship between summer load and weather (WTHI) through regression analysis (i.e., load increase per degree increase in WTHI)
• Apply relationship (slope of regression line) to the difference between actual WTHI and the PLC standard WTHI

\[ \text{Adjusted FSL} = \text{FSL} + \text{Regression slope} \times (\text{Actual WTHI} - \text{PLC Standard WTHI}) \]
Solution 1: Weather/Load Regression

Revised example of Weather/Load Regression *using average of hours* (noon to 6 pm) instead of single hour

- 2011 PLC Standard WTHI = 83.4; example of actual WTHI = 85
- FSL Adjustment = 0.13 kW/WTHI * (85 Actual WTHI − 83.4 PLC Standard WTHI)
  FSL Adjustment = 0.21 kW [using single hour results in 0.21 kW]
- Adjusted FSL = FSL + 0.21 kW
Measuring Compliance for BGE Residential DR

Solution 1: Weather/Load Regression

- Compliance for FSL customers will be determined by comparing actual load during the event to the Adjusted FSL.

Where:

- Adjusted FSL = FSL + Regression slope * (Actual WTHI – PLC Standard WTHI)
Roles & Responsibilities to Calculate Compliance with Weather/Load Regression (Solution 1)

January prior to DY:
- **PJM** issues Weather Standard WTHI for each Zone
- Example -> 83.4 WTHI

Registration for DY:
- **CSP** submits PLC & FSL data to **PJM**
- **CSP** requests resource to be considered weather sensitive
- **CSP** provides **PJM** data to determine weather sensitive resource
- **PJM** determines if **CSP** customer(s) are weather sensitive

45 days after event month:
- **CSP** submits event day load data
- **PJM** gathers event WTHI

November of DY:
- **PJM** calculates Weather/Load Regression (using data from **CSP**)
- **PJM** determines compliance using Weather/Load Regression
Solution 2: FSL Adjustment (PRD w/distinctions)

**Proposed Solution 2:** Adjust the FSL in a like-manner to the Maximum Emergency Service Level (MESL) adjustment under the Price Responsive Demand (PRD) construct with some noted distinctions

- Achieves comparability between actual and forecasted non-DR load
- Separate adjustments factor for residential and non-residential FSL DR, avoiding the *socialization* between residential and non-residential classes that results from using a single, system-wide adjustment factor (distinction)
- Adjustment derived coincident with RTO peak load, therefore *determined post-summer season*
- Quantity (MW) adjustment to the FSL derived by applying the factor from the actual/forecasted load deviation to the PLC (distinction)

Adjusted FSL = FSL + \((\text{Adjustment Factor} – 1)\times\text{PLC}\)
Solution 3: FSL Adjustment (PRD)

**Proposed Solution 3:** Adjust the FSL in a like-manner to the Maximum Emergency Service Level (MESL) adjustment under the Price Responsive Demand (PRD) construct

- Achieves comparability between actual and forecasted non-DR load
- Single adjustment factor for all FSL DR, using system-wide load causing socialized (among customer classes) results
- Adjustment derived coincident with RTO peak load, therefore determined post-summer season
- Quantity (MW) adjustment to the FSL derived by applying the factor from the actual/forecasted load deviation to the FSL

Adjusted FSL = FSL + ((Adjustment Factor – 1)*FSL)
## Solution 2 & 3 Example

### Example Calculation for BGE Zone

**PJM System Peak 7/21/11 @ HE 17**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
<th>Socialized Adjustment Factor</th>
<th>Non-Socialized Residential Adjustment Factor</th>
<th>Non-Socialized C&amp;I Adjustment Factor</th>
<th>Source of Input for Non-Socialized Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Actual Zonal Load</td>
<td>Unrestricted zonal load</td>
<td>7,237</td>
<td>3,787</td>
<td>3,450</td>
</tr>
<tr>
<td>2</td>
<td>Actual registered DR Load in Zone</td>
<td>Unrestricted load of registered DR customers in zone</td>
<td>2,179</td>
<td>1,212</td>
<td>967</td>
</tr>
<tr>
<td>3</td>
<td>Final Zonal Peak Load</td>
<td>PJM Load Forecast for zone (Table B-10 in Forecast Report)</td>
<td>7,102</td>
<td>3,584</td>
<td>3,518</td>
</tr>
<tr>
<td>4</td>
<td>Final Zonal Expected Peak Load Value total DR zone</td>
<td>PLC of registered DR customers in zone</td>
<td>2,114</td>
<td>1,131</td>
<td>983</td>
</tr>
<tr>
<td>5</td>
<td>Summer W/N Coincident Peak for Zone</td>
<td>PLC of Zone</td>
<td>7,080</td>
<td>3,573</td>
<td>3,507</td>
</tr>
<tr>
<td>6</td>
<td>FSL Adjustment Factor</td>
<td>$(1 - 2)/(3 - (4*(3/5)))$</td>
<td>1.015</td>
<td>1.051</td>
<td>0.981</td>
</tr>
<tr>
<td>7</td>
<td>Socialized Floor Adjustment</td>
<td>1.015</td>
<td>1.031</td>
<td>1.000</td>
<td></td>
</tr>
</tbody>
</table>

**Solution 2:** Adjusted FSL = FSL + ((Adjustment Factor - 1)*PLC)

**Solution 3:** Adjusted FSL = FSL + ((Adjustment Factor - 1)*FSL)
Measuring Compliance for BGE Residential DR

**Solution 2: FSL Adjustment (PRD w/distinctions)**

- Compliance for FSL customers will be determined by comparing actual load during the event to the Adjusted FSL.

Where:

- Adjusted FSL = FSL + ((Adjustment Factor – 1) * PLC)

**Numerical Example (Hypothetical Single Customer):**

- PLC = 3 MW
- Nominated Capacity = 1 MW
- FSL = 3 MW – 1 MW = 2 MW (ignoring losses)
- Adjustment Factor = 1.051
- Adjusted FSL = 2 MW + ((1.051 – 1) * 3 MW) = 2.153 MW
- Compliance? Is Actual Load at or below 2.153 MW? Y/N
Measuring Compliance for BGE Residential DR

Solution 3: FSL Adjustment (PRD)

- **Compliance for FSL customers will be determined by comparing actual load during the event to the Adjusted FSL.**

Where:

- Adjusted FSL = FSL + ((Adjustment Factor – 1)*FSL)

**Numerical Example (Hypothetical Single Customer):**

- PLC = 3 MW
- Nominated Capacity = 1 MW
- FSL = 3 MW – 1 MW = 2 MW (ignoring losses)
- Adjustment Factor = 1.015
- Adjusted FSL = 2 MW + ((1.015 – 1)*2 MW = 2.03 MW
- Compliance? Is Actual Load at or below 2.03 MW? Y/N
Roles & Responsibilities to Calculate FSL Adjustment Solutions 2 & 3

November prior to DY:
- **PJM** publishes W/N Coincident PLC for Zone

January prior to DY:
- **PJM** Load Forecast Report is issued (B-10)
- “Final Zonal Peak Load”

Prior to Registration for DY:
- **EDCs** provide CSPs’ customers’ PLCs
- “Final Zonal Expected Peak Load Value”

Registration for DY:
- **CSPs** provide “Final Zonal Expected Peak Load Value” to **PJM**
- **CSPs** submit registration including FSL
- **PJM** calculates “FZEPLY” for the zone

45 days after event month:
- **CSPs** report actual load (service level)
- **PJM** calculates “Actual registered DR Load in Zone”
- **EDC** settles Actual Zonal Load (60 days)

November of DY:
- **PJM** reports RTO system peak day & hour
- **PJM** calculates “FSL Adjustment Factor”
Topics for Discussion

- Reliability
- Applicability to DR Products
- Other?