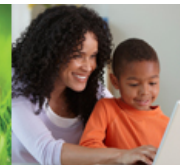


Firm Service Level Adjustment – Proposed Solutions

PJM DR Subcommittee

May 29, 2012

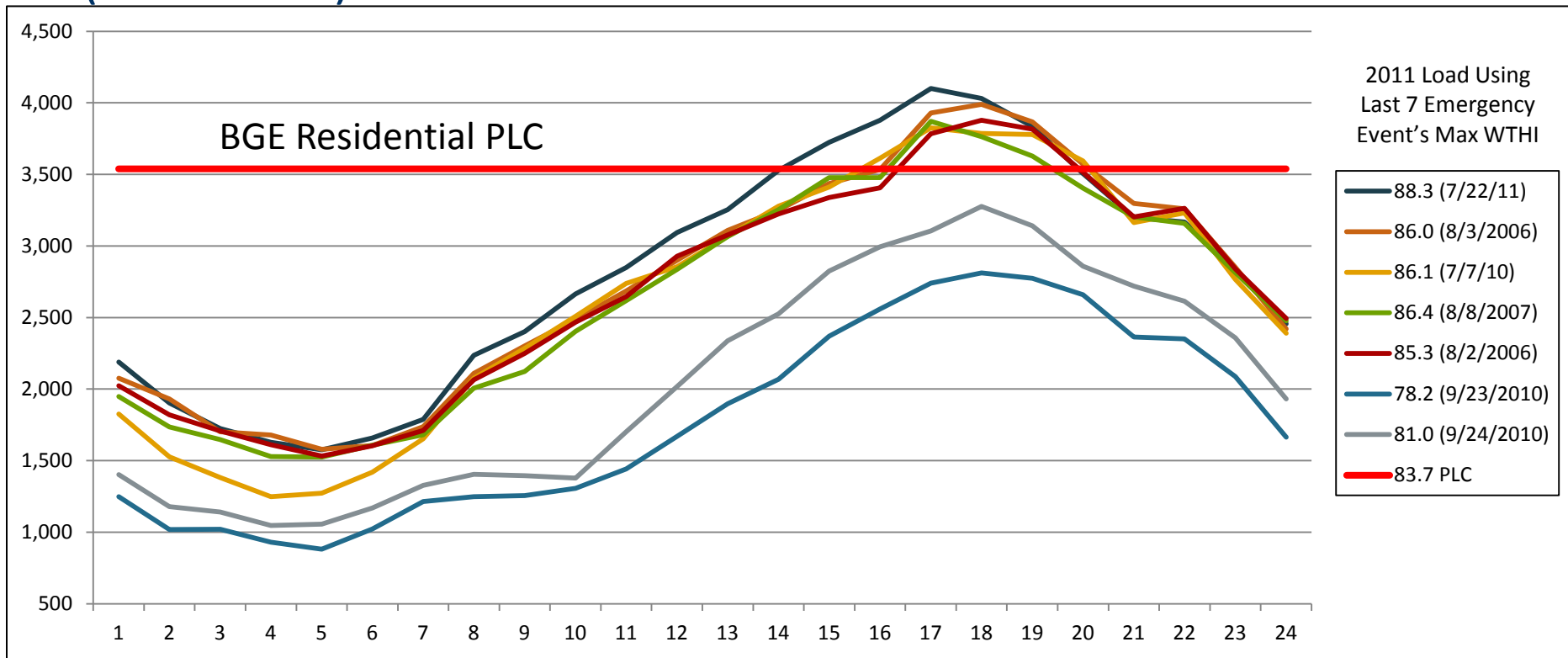


Issue Statement

- 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

(1) Zonal PLC is weather normalized by PJM by adjusting the actual peak load(s) to a standard peak weather condition

BGE Residential Load During Last 7 PJM Emergency Events (2011 Load)



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

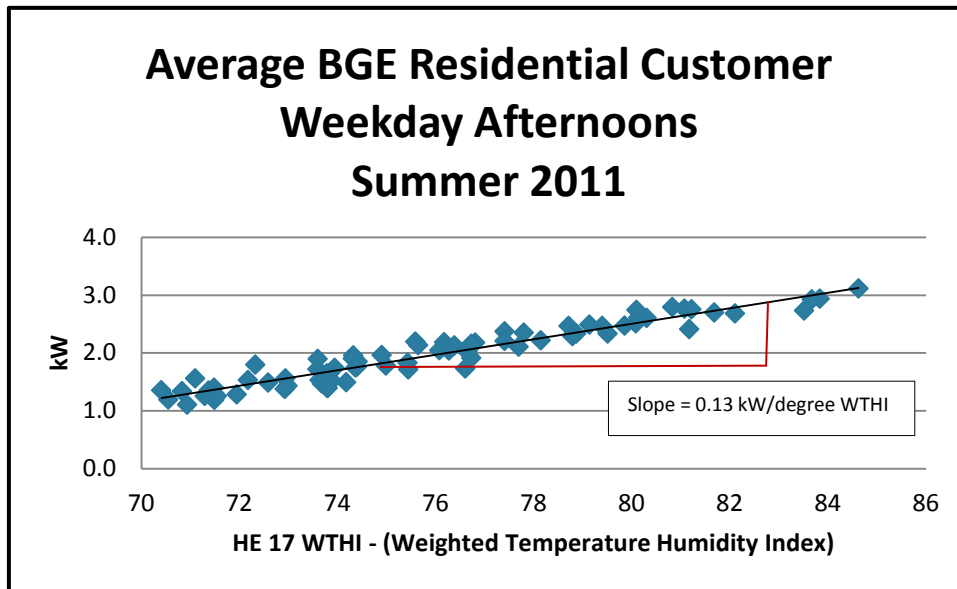
Methodology to Determine FSL Adjustment

- 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

Adjusted FSL = FSL + Regression slope * (Actual WTHI – 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 = $0.13 \text{ kW/WTHI} * (85 \text{ Actual WTHI} - 83.4 \text{ PLC Standard WTHI})$
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:

- $\text{Adjusted FSL} = \text{FSL} + \text{Regression slope} * (\text{Actual WTHI} - \text{PLC Standard WTHI})$

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 + ((Adjustment Factor – 1)*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

		Proposal 3	Proposal 2		
Variable	Description	Socialized Adjustment Factor	Non-Socialized Residential Adjustment Factor	Non-Socialized C&I Adjustment Factor	Source of Input for Non-Socialized Factors
1	Actual Zonal Load	7,237	3,787	3,450	Settled EDC metered load + PJM restriction addbacks
2	Actual registered DR Load in Zone	2,179	1,212	967	Settled EDC metered load for registered DR customers + PJM restriction addbacks
3	Final Zonal Peak Load	7,102	3,584	3,518	Use same proportions as Line 5 (Summer W/N Coincident Peak for Zone)
4	Final Zonal Expected Peak Load Value total DR zone	2,114	1,131	983	DR registration includes PLC and business segment
5	Summer W/N Coincident Peak for Zone	7,080	3,573	3,507	Existing EDC PLC determination process
6	FSL Adjustment Factor	1.015	1.051	0.981	
	<i>(1 - 2)/(3 - (4*(3/5)))</i>				
7	Socialized Floor Adjustment	1.015	1.031	1.000	
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:

- $\text{Adjusted FSL} = \text{FSL} + ((\text{Adjustment Factor} - 1) * \text{PLC})$

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:

- $\text{Adjusted FSL} = \text{FSL} + ((\text{Adjustment Factor} - 1) * \text{FSL})$

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 “FZEPLV” 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?