

Residential DR: Participation in Synchronized Reserves M&V for Energy and Load Management

August 27, 2014

Demand Response Subcommittee

1. Participation of residential DR in SR
2. Update M&V for residential DR in Energy and Load Management

- **Statistical sampling**
 - Use a statistical sample of interval meters to represent a population of residential customers for residential customers with non-interval meters

- Direct load control (DLC) – ability of CSP to directly curtail end use device at end use customer without intervention from end use customer
- Contract – agreement between end use customer and CSP for CSP to perform DLC and offer it as DR in the relevant PJM market
- Enrolled customer – A customer who has a contract with CSP, and for whom CSP has the physical ability to perform DLC
- Registered Customer – An enrolled customer who is registered with PJM
- Sample – customers selected from the registered population of non-interval metered customers who have interval meters installed for the purpose of settling all registered customers
- Population – registered customers
- e.g. A CSP may have 50,000 enrolled customers, but only 45,000 registered customers

- Deemed Savings Report

- Compliance calculations
- Non-performance penalties
- Flexible/inflexible rules
- Meter accuracy requirements – 2%
- Data submission – within 2 business days of event
- DR limitation in SR – 33%
- Meter level – entire EDC account number, no submetering

- **Load Management**
 - Residential DLC
 - qualifies for load management
 - No interval metering (hourly or better)
- **Economic Energy**
 - Residential DLC
 - Qualifies for economic energy markets
 - No interval metering (hourly or better)
- **Synchronized Reserves**
 - Residential DLC
 - Qualifies for SR
 - No interval metering (1 minute or better)

- Stratified simple random sample
- Must achieve less than 10% error at 90% confidence

- **Sample size determination**
 - Less than 10% error at 90% confidence level
 - Based on variance study for each sample
 - Based on variance of meter data
 - PJM may amend requirements for variance study after more experience is gained
- **Approximate sample size**
 - Energy & Load Management: 150
 - SR: 300

- At least 75 randomly selected participants
- Data collection during season that end use device is in use/will be curtailed
 - e.g. June – September for Acs
- Load Management/Energy
 - At least 4 weeks of contiguous hourly meter data
- SR
 - At least 2 weeks of contiguous 1 minute meter data

- **Separate samples**
 - End use device/device grouping
 - e.g. AC, water heater, both
 - Curtailment algorithms
 - e.g. 50% cycling, 100% cycling, thermostat set point
 - Different switches with same curtailment algorithm
 - Necessary if switch capability is substantially different
 - SR: SR Subzone, Dispatch group or registration
 - Energy/Load Management: EDC, CSP

- **Sample stratification**
 - Control device size in 2 groups roughly at median
 - e.g. median AC size is 3.1 kW, stratification by AC size < 3.1 kW and > 3.1 kW
 - Based on sum of device sizes at EDC account level
 - **Geographic Stratification**
 - PJM discretion, based on size, variability within region, etc.
 - e.g. AEP wide program would likely require geographic stratification, RECO probably not
 - CSP may propose alternate stratification to reduce variance
 - PJM will adjust stratification requirements as experience is gained to reduce sample size

- Annual sample calibration

- Based on annual sample variance update
- Proportion of each stratum in the sample must be within +/- 1 sample of population proportion
 - e.g. Sample size = 150 customers
 - Population proportion stratum A= 20%
 - Stratum A should be 30 customers
 - does not need to be recalibrated if 29 – 31 customers
- Replacements if necessary must be randomly selected, maintain strata integrity, etc.
- If population is expanded in non-random manner, sample must be expanded appropriately

- NAESB Validating, Editing & Estimating (VEE) Protocol
 - EEI Uniform Business Practices for Unbundled Electricity Metering Volume II, 12/5/2000
- Must follow NAESB VEE protocol.
 - NAESB VEE protocol is intended for hourly data
 - Replace “hour” with “interval” in NAESB protocol
- If X intervals or more are missing for 1 meter
 - $X = 5$ for SR; $X = 2$ for Energy & Load Management
 - If still enough meters to satisfy sample size: do not submit data from meter
 - If less than sample requirement - data from that meter must be submitted as all 0's for that event

- 2 way communication
 - Performance factor for each event based on actual population operability
 - Inoperable switch in sample
 - Sample size $> M$: do not report load data from in-operable switch
 - Sample size $< M$: must report load data from switch
 - Can repair faulty switch in sample or population at any time

- 1 way communication
 - Must report data from all switches, even if inoperable
 - Cannot repair failed switches until:
 - Repair faulty switches in population
 - OR Reselect entire sample
 - Includes any system/device that would cause end-use device not to reduce load properly in the population
 - Metering and metering communication
 - Can be fixed in sample
 - Includes only systems/devices that would not affect load reduction in population
 - Component that is related to both metering and switching cannot be repaired
 - Switch failures in sample must be reported to PJM within 2 business days

Residential customers with interval and non-interval metering in Energy, LM and SR:

- **CSP must submit initial list of customers**
 - EDC account number and address
- **Replacement**
 - Customer who moves from their premises
 - Customer who terminates their own contract with CSP for participation in DLC/SR
 - CSP must maintain list of all replacements and furnish to PJM within 2 business days of request

- **Load Management**
 - CSP must maintain list of customers for each event for 2 years from event date
 - CSP may not add/remove customers other than for replacement
 - If number of customers falls below registered number, CSP must report to PJM within 2 business days
 - Interval metering
 - Replacement customer must be randomly selected to maintain load drop and PLC
 - Non-interval metering
 - Replacement customer must be randomly selected to maintain integrity of strata and to maintain load drop and PLC

- **Economic Energy & SR**
 - CSP must maintain list of customers for each offer for two years from date of offer
 - Value on location in eLRS must be accurate every day an offer is made
 - CSP may add/remove customers but must maintain documentation and update value on location in eLRS
 - Interval metering
 - No restrictions on replacement customer
 - Non-interval metering
 - Replacement customer must be randomly selected to maintain integrity of strata

- Economic Energy and SR
- Number of customers offered cannot exceed number of registered customers
- List of offered customers must be finalized at time of offer
- Non-interval metered
 - Offered customers must be randomly assigned from pool of all registered customers

- CSP must maintain list of:
 - registered customers (daily) – determined day before operating day
 - offered customers (for all eMKT offers) – determined before offer is submitted
 - cycled customers – for all events – determined immediately after cycling is initiated based on actual customers who are cycled
- Data to be furnished to PJM within 2 business days of request
- If data cannot be furnished in timely manner, or number of customers falls below registered/committed value without reporting:
 - CSP may referred to MMU for review
 - Deficiency penalties may be assessed
 - Registered value may be reduced and offered value capped

- M&V Plan
 - Annual
 - Details of variance study
 - Meter qualification
 - Meter quality assurance
 - Data validation, error correction protocol
 - Sample selection and stratification detail
 - PJM to publish template

- LSE very difficult to manage for residential customers on registration
- LSE no required on residential registration if not participating in DA market

- Statistical sampling is effective June 1, 2015
- Traditional DLC, Deemed Savings Report, Load Research studies cannot be used after June 1, 2016
- Transition mechanism for MW that cannot meet new requirements for DY16/17 and DY17/18

- **[1 week prior to posting planning parameters for IA]** – CSP to provide PJM cleared MWs from prior RPM auction(s) that cannot be delivered due to statistical sampling requirement by product by zone.
 - 16/17 – CSP must notify based on 3rd IA schedule
 - 17/18 – CSP must notify based on 2nd IA and/or 3rd IA schedule
 - CSP IA offer restriction
 - CSP is not permitted to sell MWs in any modeled LDA (including any modeled sub-LDA of the LDA) for which non-viable DR MWs are declared
- **[planning parameters posting date for IA]** – PJM to publish aggregate non-viable DR MWs

- **[IA start date]** – PJM to aggregate all adjustments (CSP non-viable MWs, forecast adjustment, etc.) and include in 1st or 2nd auction if amount exceeds threshold (lessor of 1% or 500 MW – *as currently defined in tariff*) and if it does not exceed threshold then include in 3rd IA
 - PJM to increase capacity procured (or reduce capacity released) in IA (as necessary)
 - Cost will be allocated *consistent with current tariff* provisions for forecast adjustment
 - Bilateral transactions are subject to review and referral to MMU and/or FERC Office of Enforcement and should not be executed for non-viable MWs for financial gain.
- **[Prior to start of DY]** PJM to reduce CSP capacity commitment in eRPM by product by zone and prorate amount of non-viable MW as necessary if CSP cleared MWs in multiple auctions
- **[Prior to start of DY]** CSP responsible to register enough DR to cover final capacity commitment or receive daily deficiency charge.
- **[normal bill cycle during DY]** PJM to only pay capacity revenue based on final CSP capacity commitment

- PJM will report results 1 year after participation for transparency