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
Definitions

• 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
What is changing?

• Deemed Savings Report
What is NOT changing

- 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
Requirements for using statistical sampling

- 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)
Sample requirements

• 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
Variance Study Requirements

• 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
Sample Requirements

• 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

• 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
Switch Operability – 2 way

• 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
Switch Operability – 1 way

- 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 on Registration

- 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
Proposed Transition Mechanism
16/17 and 17/18 Delivery Years (continued)

• **[IA start date]** – PJM to aggregate all adjustments (CSP non-viable MWs, forecast adjustment, etc.) and include in 1\(^{st}\) or 2\(^{nd}\) auction if amount exceeds threshold (lesser of 1% or 500 MW – *as currently defined in tariff*) and if it does not exceed threshold then include in 3\(^{rd}\) 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 transaction 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