DR M&V White Paper Recommendations

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Presentation Goals

1. What is M&V?
2. Performance Baselines
3. NAESB M&V Framework
4. Challenges for DR M&V

What is M&V?

- Demand response M&V refers to the capability to quantify and validate that a residential, commercial or industrial customer has reduced or increased load in response to a DR signal
- Fair, Simple and Accurate
- Performance-based vs. Participation-based

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Performance Baselines

- Performance is measured relative to a baseline
- Baselines are estimates of the energy that would have been consumed during a DR event if the event had not occurred
- North American Energy Standards Board (NAESB) has defined the methods used for calculating M&V baselines for US wholesale markets

NAESB M&V Framework

- NAESB M&V Framework for US Wholesale Markets
  - Energy: quantity of electricity (MWh)
  - Capacity: demand over time period (MW)
  - Reserve: available when needed
  - Regulation: real-time load control
- Identifies a range of methods

NAESB M&V Methods

- Maximum Base Load: based on history data
- Meter Before/Meter After: actual load changes
- Baseline Type I: comparable day values, rolling averages, period averages
- Baseline Type II: only aggregated meters available
- Metering Generator Output – for behind-the-meter on-site generation

Baseline Type I

- Widely used
- Can provide simple, fair and accurate M&V but…
- Can lead to inaccurate results if the Type I method variables are not carefully matched to DR program needs and customer energy usage characteristics

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Challenges for DR M&V

1. Flexible DR Framework
2. Bi-directional Energy Flows
3. Increased use of Energy Storage
4. Participation in Multiple Programs
5. M&V Quality Measurements
6. Commissioning Costs
7. Difficulty of Calculating Customer Performance
8. Customer Dynamic Loads
9. M&V for Sub-loads
10. Encouraging Load Shifting

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1. Flexible DR Framework

- NAESB WEQ-015 specifies the data attributes that apply to a method, but not the specifics of how the methodologies address energy provider or customer characteristics and how the different M&V approaches impact DR resource participation.
- *Recommendation*: These factors together indicate the need for best practice application guidelines that can lead to clear M&V practices in wholesale and retail markets for different DR program types.

2. Bi-directional Energy Flows

- Wholesale electrical markets and contract settlement are currently oriented toward generation assets.
- *Recommendation*: M&V methods should explicitly permit metered power flow to go negative when on-site generation is operational.

3. Increased use of Energy Storage

- One of the main attributes of energy storage is the concept of a “charge state” of the resource, important for dispatch. Energy storage has a unique combination of both energy and power capacities and there needs to be new models for how their performance is measured and verified so they can be appropriately compensated.
- *Recommendation*: Develop a clear statement of the requirements for effective participation of storage in DR programs.

4. Participation in Multiple Programs

- Customers can participate in different programs based upon the energy characteristics of their resources. Successful participation requires decoupling the overlapping programs so that the resulting M&V methods accurately reflect individual program participation.
- *Recommendation*: Develop best practice guidelines that define the dependencies and interactions between programs.

5. M&V Quality Measurements

- M&V techniques do not typically incorporate quality of response measurements such as monitoring how well a resource follows the specifications
- *Recommendation*: Evaluate M&V measures and guidelines for the quality of response that are comparable (though not identical) to generation.

6. Commissioning Costs

- Many financial barriers-to-entry exist for demand response resources, including upfront capital costs for meters, telemetry and security .
- *Recommendation*: Develop best practice guidelines for the communication infrastructure for integration of DR resources.

7. Difficulty of Calculating Customer Performance

- Benefits are difficult to clarify due to complex tariffs and DR program M&V techniques which make customer performance calculations difficult in real-time.
- *Recommendation*: Eliminate M&V methods for which the customer cannot know in real-time whether performance is in compliance. Analyze remaining methods in terms of cost to customer (up front and operational).

8. Customer Dynamic Loads

- Customer load curves are often dynamic and change unpredictability.
- *Recommendation*: M&V techniques should be refined to accommodate a wide range of customer load variability. Best practice guidelines would be beneficial.

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9. M&V for Sub-loads

- It is problematic to use a whole-facility meter to perform M&V on a specific sub-load. Using the whole facility's meter has obvious cost benefits and adds flexibility to the mix of loads that may be used within the facility.
- *Recommendation*: Develop best practice guidelines for the M&V of DR sub-loads.

10. Encouraging Load Shifting

- Customers are often not incentivized to dynamically shift load consumption due to M&V baseline calculations.
- *Recommendation*: Analyze M&V techniques and make recommendations for how to encourage load shifting within customer facilities while at the same time preventing customers from "gaming" baselines for advantage.

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Recommendations

- Analysis of existing research and further research to consider solutions to challenges.
- Preparation of M&V best practices guidelines for various DR program types.
- Publication of standards as appropriate.
- Review 4.2 Recommendations for Standards in the white paper to consider SGIP action.

References

- *NAESB report: Business Practices for Measurement and Verification of Wholesale Electricity Demand Response,* March 16, 2009
- *The Demand Response Baseline*, 2011, EnerNOC, Inc, http://www.enernoc.com/images/whitepapers/pdfs/demandresponsebaseline.pdf
- *PJM Empirical Analysis of Demand Response Baseline Methods*, 2012, KEMA, http://pjm.com/markets-and-operations/demand-response/~/media/markets-ops/dsr/pjm-analysis-of-dr-baseline-methods-full-report.ashx

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Thank You!

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