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Get More From Energy

Profile Baseline Methodology

EnerNOC Relevant Demand Proposal

Pablo Campillos 8 April 2011

Current Approach

The Relevant Demand level is

- *intended to reflect the normal operating level during intervals when the DSP is most likely to be dispatched*

Current (and 2010_29 proposed) RD employ **static** baseline

- Cannot predict CL/DSP load
  - usage at different times of day, different days of the week, or different seasons of the year
  - Load growth or reduction in past year
  - No adjustment based on actual dispatch event conditions
  - Inaccurate measure of actual performance
- Rewards incidental performance, end-users who haven't curtailed load
- Penalises end-users who have curtailed load but operating above baseline
- Leads to question marks over DSM's contribution to system reliability

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What are we measuring, and why?

Usage during peak periods from the previous Hot Season is appropriate for **system planning purposes**, which by their very nature, must take place in advance.

But…such a measurement cannot be expected to provide an accurate assessment of demand response capacity, as needed for **operational purposes**

The Relevant Demand level should intend to

- *reflect the normal operating profile during all intervals when the DSP is forecast to be, or was, dispatched*

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a better way

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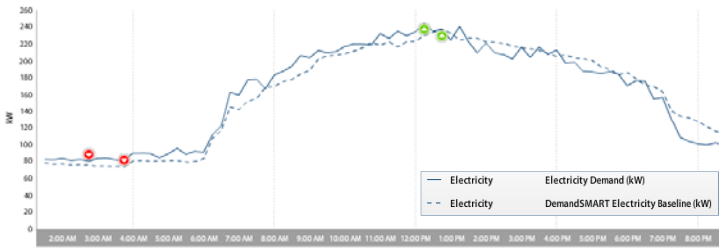
Profile Approach

- Popular in other markets and utility programs with significant Demand Response participation
- Average of actual demand interval by interval over recent period of time prior to dispatch
- Shaped baseline that closely follows a site's load profile



Actual EnerNOC customer meter data and profile baseline – University student center – 28 January 2011

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How Does it Work?

- High X of Y methodology
  - Look back from event/test over a specified number of days – Y
  - Use meter data from the highest X (5) days within those Y (10) days to build profile
- Selecting Y (the "look-back window"):
  - Short enough to capture recent trends, long enough to combat gaming
  - Only includes relevant days (i.e. non-event, Business Days)
- Selecting X:
  - Dispatches are most likely to occur on days with high temperature/demand
  - Using all days in Y would result in an understated baseline
  - Using subset (X) with the highest energy usage offsets downward bias
- Average usage during *each interval* on X days is then averaged together to create a forecast for each interval on the current/future day

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Example: High 5 in 10

In this case, Y = 10 days and X = 5 days with the highest average demand. As denoted by the blue coloring, the five highest days are days 2, 4, 6, 7, and 9.

Day	Interval 1 (kW)	Interval 2 (kW)	Interval N (kW)	Average usage (kW)
1	2,000	2,100	2,000	2,033
2	2,100	2,200	2,100	2,133
3	2,000	2,100	2,000	2,033
4	2,200	2,500	2,200	2,300
5	2,000	2,100	2,000	2,033
6	2,100	2,200	2,100	2,133
7	2,400	2,300	2,400	2,367
8	2,000	2,100	2,000	2,033
9	2,600	2,700	2,600	2,633
10	2,000	2,100	2,000	2,033
Baseline	**2,280**	**2,380**	**2,280**	

Baseline for interval 1: (2,100 + 2,200 + 2,100 + 2,400 + 2,600) / 5 = 2,280

Baseline for interval 2: (2,200 + 2,500 + 2,200 + 2,300 + 2,700) / 5 = 2,380

And so on…

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Day of Adjustment

- Dispatch of DSPs is often correlated to spikes in demand due to temperature
- Important to ensure that the RD accurately reflect such periods
- Multiple studies (KEMA, Lawrence Berkley National Laboratory, et al) identify a day of adjustment as crucial to ensuring baseline accuracy.
- Timing - with advanced dispatch notification important to apply adjustment at time of notification and not the event start time (penalises early curtailment actions and creates gaming opportunity)
- Direction
  - If dispatch likely to occur during shoulder periods, loads equally likely to be above or below their unadjusted baseline (symmetric adjustment)
  - If dispatch likely to occur during extreme weather / demand periods, loads likely to be above their baseline (asymmetric adjustment)
  - Length of the notification period important , if dispatch call comes at 8am for 12pm start, many loads at this time are likely to be below normal (asymmetric adjustment)

Method – Adjust by additive (kW) or scalar (%).

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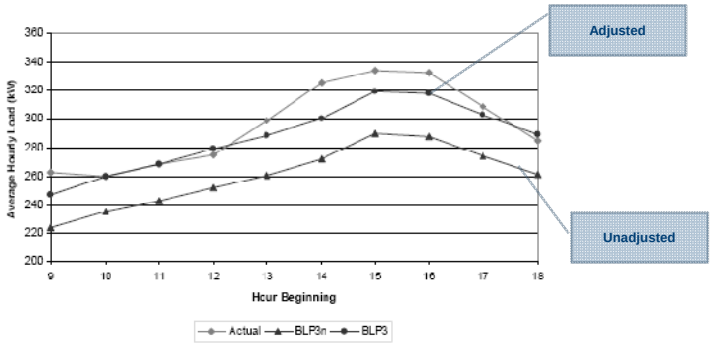
Illustrative Example: LBNL Study



The unadjusted baseline (BLP3n) understates Actual metered load.

The adjusted baseline (BLP3) closely tracks to Actual metered load.

Lawrence Berkeley National Laboratory, "Estimating Demand Response Load Impacts: Evaluation of Baseline Load Models for Non-Residential Buildings in California", January 2008

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Recommended RD measure

High 5 in 10

- Last 10 non-event, business days short enough to capture recent trends, long enough to combat gaming
- Top 5 days brings baseline forecast more in line with expected conditions during a dispatch.

Asymmetric Adjustment

- Asymmetric reflects likely dispatch patterns in WEM
- Symmetric problematic with long lead time
- Applied at the time of dispatch to ensure baseline integrity,
- Additive (kW)

Calculated Individually and summed to create the DSP RD

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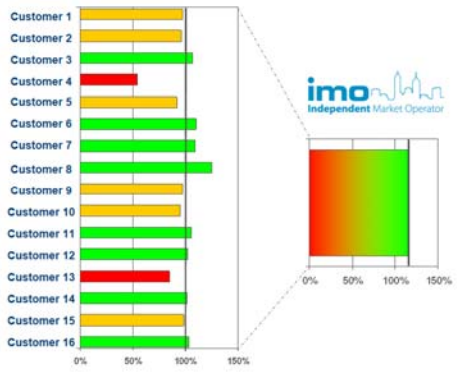
Individual RDs ≠ Individual Performance

- Baselines should be calculated individually, since end-user loads can vary greatly. A baseline methodology based on the coincident peak of a portfolio will never be able to accurately predict usage on a dispatch day.
- Performance should be calculated on a portfolio basis to allow for aggregation:



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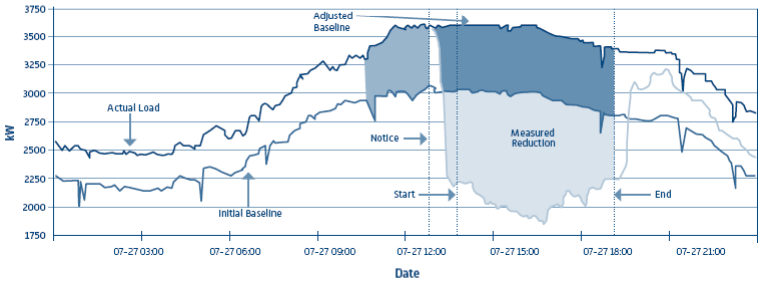
Putting it all together

An illustrative example of a 5 in 10 baseline in action:



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Issues and Considerations

- Sufficient arrangements in place for market start – DSP has enough DR capacity?
  - DR nominations by load. Total nominations equal cap credit level or refunds apply
  - NMI Registration Verification Test provides further validation if required
- Profile approach doesn't match nature of forward Cap Market
  - Other forward capacity markets (eg. PJM and ISO- New England) utilise profile baselines
  - RD needs to provide operational forecast, not a system planning measure
  - Should RD be set 2+ years in advance as well?
- Reliability of the IMO's security of supply forecast.
  - More accurate forecasting of DSP capacity improves supply forecasts.
- Differential Treatment with Generators
  - More accurate and rigorous assessment of DSP capacity aligns with generator accuracy

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Issues and Considerations

- Link with IRCR / Capacity Charge
- RD measures contribution for the provision of capacity
- IRCR measures contribution towards system capacity requirements
  - Key consideration in RCM review
- 2 measures for 2 different things
- Provision of capacity is a dispatchable service
- IRCR reduction lowers system capacity requirements, a non-dispatchable service
- Services are independent and both provide value to the system
- Current and 2010_29 proposed rules support one load providing dispatchable capacity service coincidentally with non-dispatchable IRCR reduction service
  - RD recalculated if load curtailed by SM
  - Load collects capacity payments and retains IRCR reduction savings
- Objections raised to payment and savings when providing services non-coincidentally
  - Inconsistent?

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questions?

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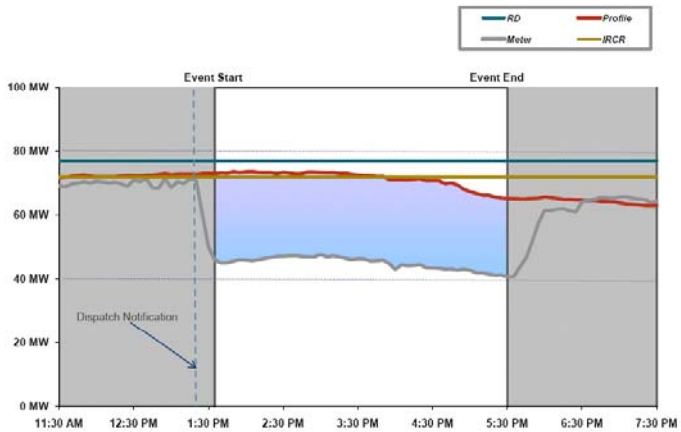
Appendix: Performance Insight



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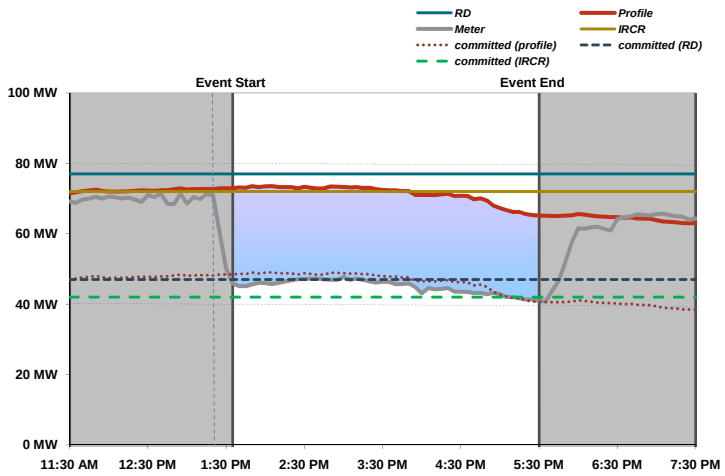
Appendix: Performance Insight



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