

NYISO Meter Data Study: Final Report

Paul M. Sotkiewicz, Ph.D

President

E-Cubed Policy Associates, LLC

December 13, 2017

Disclaimer

The thoughts, analysis, and opinions expressed are my own, and not necessarily those of the NYISO, or any other ISO/RTO market referenced herein.

Why the Meter Data Study

- NYISO DER Roadmap
- NYPSC REV and recent VDER Tariff
- DER increasing penetration even prior to REV
- Just one piece of the DER Roadmap

Meter Data Study in the Context of the DER Roadmap

- Metering for DER as may be required;
- Baselines for DER as required and modification to existing baselines if needed;
- Potential for the sampling of a subset of DER for establishing baselines and for market settlement in the energy, capacity and ancillary services markets;
- Meter data policies and the role of entities providing meter services;
- Interactions of baselines and DER aggregation; and
- Simultaneous participation in both retail and wholesale markets.

Presentation Outline

1. Metering Institutions and Policies for Wholesale Market Participation
2. Energy Market Baselines
3. Capacity Market Baselines
4. Ancillary Service Considerations
5. Statistical Sampling of Demand Side Resource Aggregations

Metering Institutions and Policies for Wholesale Market Participation

Analysis of Meter Institutions and Policies for Wholesale Market Participation

- All the ISO/RTOs surveyed allow third party meter installation and meter data providers
- All the RTOs/ISOs surveyed rely on at minimum ANSI c12 standards, though each has its own set of requirements for interval metering
- Monitoring of meter data takes various forms
- Two approaches to ensuring accurate meter data reporting:
 - Command and control mechanisms with a heavy ISO/RTO presence in approving third party providers of auditing services (e.g., CAISO)
 - Decentralized mechanisms requiring the market participant to follow standards otherwise may no longer be able to participate in the market (e.g., PJM, ISO-NE)

Recommendation: Continue to Allow Third Party Entities to Provide Metering Services for Wholesale Demand Side Resource and DER Participation

- Continues what has already been permitted by the NYISO
 - Demand Side Resources and DER providers be allowed to self-supply these services for NYISO market participation.
- Potentially more responsibility for NYISO staff
 - If NYISO revises its Tariffs to remove reference to NYPSC MSP/MDSP rules, standards required of providers of metering services will need to be directly incorporated into the Tariffs and Manuals.
 - NYISO can develop all new requirements, or can base requirements on existing rules in other ISO/RTOs or governing bodies.
 - Requires development of incentives to ensure market participants adhere to the standards directly incorporated by the NYISO.

Recommendation - Short-term M&V and Monitoring: Explore the Potential to Work with Incumbent Utilities

- Most Demand Side Resources and DER will still have at minimum a revenue quality meter for the purposes of retail billing
- Distribution utilities will have meter data access to that meter data that may also be used for NYISO market participation
- In the short-term this would place minimal additional requirements on the NYISO staff and leverages the work the distribution utilities may already be doing today to support REV

Recommendation - Long-term M&V and Monitoring: Develop an Automated Monitoring Tool and Protocols

- This will place a greater burden on NYISO staff up front to develop the IT infrastructure and protocols for monitoring data.
- But once in place automation would reduce the needed staff time to engage in effective monitoring and M&V of metering and meter data.
- With this long-term solution, there may be a smaller role for the incumbent distribution utilities in the monitoring and M&V for wholesale market participation functions in the future.

Recommendation: Use Incentives Rather than Administrative Mechanisms to Enforce Metering and Meter Data Standards

- Incentives, such as penalties and the inability to participate in the NYISO markets, can be more efficient than NYISO staff enforcement and administration of standards.
- NYISO should have the authority to audit third party entities providing metering services for compliance with standards, but this should not be the primary tool to enforce standards as it can become costly.
- To opt for a more administrative construct, as exists in the CAISO market, would require additional staff and infrastructure to carry out than an incentive construct.

Recommendation: Dual Participation under VDER Tariff and the NYISO Energy and Capacity Markets Should not be Permitted

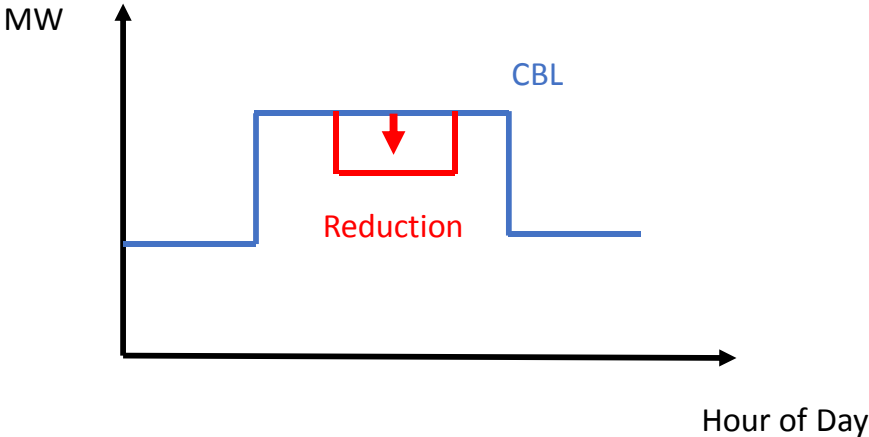
- DER may be eligible to receive compensation for energy injections and capacity under the NYPSC VDER Tariff at the applicable wholesale LBMP and capacity spot market auction clearing price .
- DER receiving compensation under the NYPSC VDER Tariff should not also receive compensation for participation in the NYISO energy market
 - DER should be indifferent between the VDER Tariff compensation and NYISO energy and capacity market participation.
 - NYISO should evaluate if there is a legitimate means to compensate DER for ancillary services without compensating it twice for energy and capacity if the DER is also being compensated under the VDER Tariff.

Energy Market Baseline

Energy Market Baselines in a Commodity Market Context

- In most commodity markets, there must be ownership control of the commodity being sold or the ownership of the means of production for that commodity.
- The utility and customer agree upon a customer baseline load (CBL) for which the customer pays a fixed price, and then deviations from the CBL are paid for at the agreed upon “spot price.”
 - If on-site generation is embedded into the customer load site, running that on-site generation to reduce load is simply a comparison of cost to run the on-site generator versus the cost of buying energy at spot market prices.

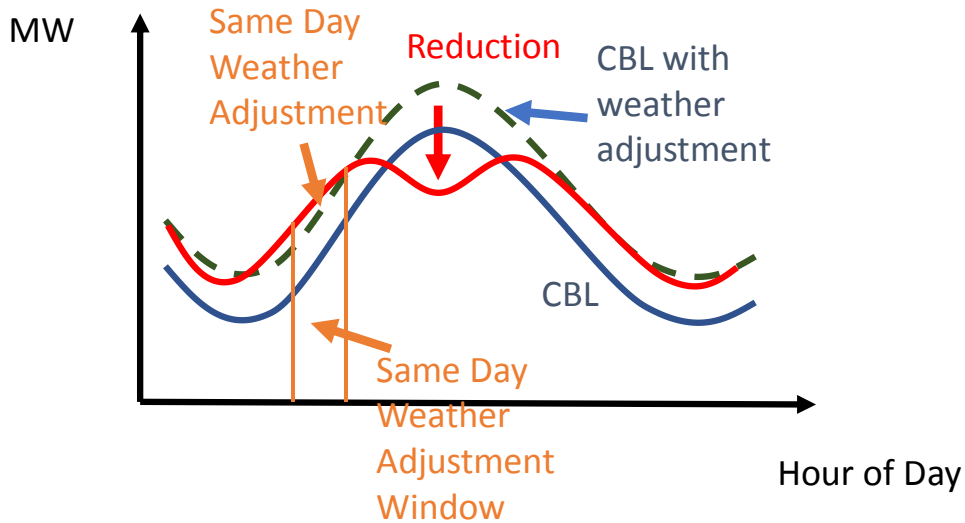
Simple Example of a CBL with a Reduction



Drivers of Energy Consumption and Consideration for CBL Determination

- Day of the week
- Time of day
- Season
- Temperature variations within season
- Macroeconomic conditions

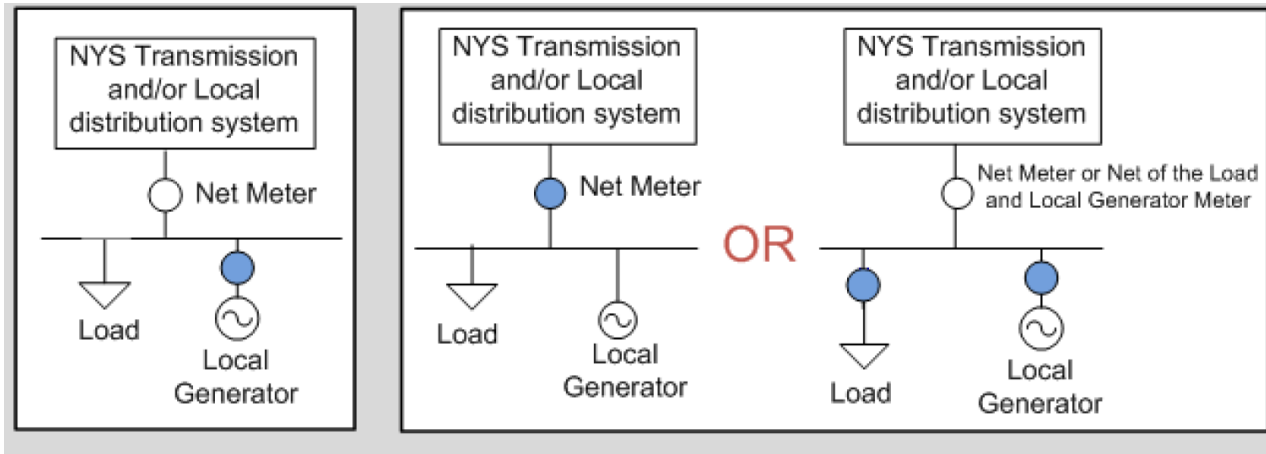
Example of a Weather Adjustment



CBL Considerations: Metering Considerations for On-site Generation and Storage

- Often customer sites that engage in demand reductions utilize on-site generation or storage to facilitate demand reductions and potentially even net injections into the grid.
 - In many cases the on-site generation is used either on a regular basis to help serve some on-site electric load or is serving on-site steam load that is used by an industrial process.
- There is nothing to prevent a site or facility baseline being determined by any of the available metering configurations, but its accuracy may vary based on the predictability of the use of the on-site generation.
- Historically, this has not been a big issue, but requirements for metering of on-site generation/DER may become necessary when:
 - Energy storage resources-look like load at times, and generation at other times, or
 - With greater penetration of intermittent resources

CBL Considerations: Metering Considerations for DER and On-site Generation



Source: NYISO Emergency Demand Response Program Manual

Summary of Baseline Methods in Use or Proposed

	Weekday Baseline	Weekday Lookback	Weekend & Holiday Baseline	Weekend Lookback	Weather Adjustment	Weather Adjustment Bandwidth
NYISO	Average of highest 5 of last 10 non-event days	30 days	Highest 2 of last 3 non-event days	30 days	2 hour window starting 4 hours prior the event	+/- 20%
PJM (tariff)	Average of the last 5 non-event days	45 days	Average of last 3 non-event days	45 days	Regression defined permitted	None defined
ISO-NE (current)	Average of the last 10 non-event days for each 5 minute interval	30 days	None defined. All days treated the same	Not applicable	2 hour window 2.5 hours prior to the start of the event	Adjusted CBL no greater than max facility load
ISO-NE (6/1/18)	Average of the last 10 non-event days for each 5 minute interval	30 days	Saturday, Sundays, and Holidays treated individually. Average of last 5 non-event days	42 days	25 minutes prior to the start of the event to 10 minutes before the event.	Adjusted CBL no greater than max facility load
CAISO (current)	Average of last 10 non-event days	45 days	Average of last 4 non-event days	45 days	3 hour window 4 hours prior to the event	+/- 20%
CAISO (proposed C&I)	Average of last 10 non-event days	Not defined		Not defined	2 hour window starting 4 hours before event	+/- 20%
CAISO (proposed residential)	Average of highest 5 of last 10 non-event days	Not defined	Average of highest 3 of last 5 non-event days	Not defined	2 hour window starting 4 hours before event	+/- 40%

Recommendation: Maintain the Current “5 of 10” CBL Construct

- The 2014 DNV KEMA study indicates the NYISO’s 5 of 10 CBL including the weather adjustment was one of the better performers.
 - The recent study by Nexant for the CAISO BAWG also indicted the “5 of 10” baseline with weather adjustments worked well for California residential customers.
 - DNV KEMA study indicated the so-called “10 in 10” or the average of the last 10 non-event days being used by the CAISO and ISO-NE also performed well.
 - NYISO may wish to consider adding these as a potential CBL option to achieve even better accuracy.
 - The energy market CBL can be used for either day-ahead market or real-time energy market participation since the CBL is measured based on real-time loads as opposed to only financially settled loads day-ahead.

Recommendation: Baselines for Highly Variable Loads Must Meet Applicable Accuracy Requirements

- As the DNV KEMA study indicated, there may be a need to limit the ability of highly variable loads to participate in the NYISO's Demand Response programs if there are no effective or accurate baselines available.
- For loads that do not fit well with the standard or default CBL approaches, other CBL methods could be introduced that more accurately reflect what load would have consumed absent the demand reduction as has been the case in PJM.
- Recommendation that any CBL used must meet an accuracy standard of a relative root mean square error (RRMSE) of no more than 20 percent following PJM practice.

Recommendation: Require On-Site Generation or Storage to be Directly Metered

- Directly metering on-site generation or storage can help in discerning whether the generation/ storage is being used regularly to help meet facility load, or whether it is only used to reduce load during emergency or high price events. This is primarily about characterizing predictability of the DER operations. Some scenarios include:
 - DER for “distribution solutions”
 - Storage and intermittent resources
- On-site generation baselining should initially follow the CAISO model of the average output over the last 10 days to cover what would be “normal operations” versus operations for primarily facilitating demand reductions.
 - While this differs from the NYISO highest 5 of 10 baseline, it will provide a better sense of overall patterns of output. This need for metering will also be essential if some DER wishes to participate in the NYISO markets while also receiving compensation for distribution system activity under retail tariffs.

Recommendation: Use of Control Groups is Not Recommended at This Time

- The use of control groups to determine CBLs and weather adjustments has great appeal if it mirrors the resources actually participating in the market.
- However, the use of control groups also requires a larger roll out of interval metering, and requires interval metering for the control group in spite of the fact they do not participate in the market.
- But until interval metering becomes more widely deployed, the use of control groups is not recommended.

Recommendation: Continue the Practice of Adding up the CBLs from each Site to get to the Aggregate Resource CBL.

- The aggregation's baseline should equal the sum of the baselines of all the sites of which the aggregated resource is comprised.
 - This issue does not come up in PJM, which uses a most recent 5 non-event day baseline for the energy market, nor does it come up in the CAISO or ISO-NE which uses the last 10 non-event days as the baseline. All the sites in the aggregated demand resource in these cases would all have the same non-event days that go into the baseline since none of them would be called separately from the other sites.
 - But since the NYISO uses the highest 5 days, out of the last 10 non-event days for the energy market baseline, the days counting toward the baseline may differ and the sum of the baselines may not equal the aggregate baseline.

Capacity Market Baseline

Capacity Market Baselines and Maximum ICAP

- From a commodity market perspective, a load or customer site should not be able to sell back more capacity than they have bought or for which they are obligated to pay.
- From this perspective, the maximum quantity that could be offered from a demand response resource should be tied to the allocation of costs (how much capacity is being purchased on behalf of the load or customer site) such as contribution to coincident peak load
- The NYISO uses the ACL for SCRs as a proxy for the customer's contribution toward the coincident system peak and to limit the maximum amount of demand reductions that can be offered, and adjusts the unforced capacity to reflect historical performance.

Capacity Market Baselines and Maximum ICAP

- 2014 study on baselines for SCRs by DNV-KEMA shows that the ACL is sufficiently higher than the load in the top five coincident peak hours by 6-8 percent providing an indication that the ACL methodology may allow the SCR to sell back more capacity than is purchased.
- DNV-KEMA study indicated the use of the NYISO CBL baseline methods matched the loads on peak days better than the ACL measures which were higher than loads on peak days.
 - The reason the energy market baseline looks so appealing from a maximum offer standpoint is that the CBL matches more closely the coincident peak load than the ACL does in the DNV KEMA study.
- What is required is consistency in the methodology.

Recommendation: Use the Coincident Peak Contribution as the Maximum ICAP and Maintain Historic Performance Measures

- In the short term, the recommendation is for the NYISO to first consider treating demand response different from energy supplied from generation, similar to the firm service level concept in PJM
- Alternatively, the NYISO should keep the existing SCR structure for demand response, including the use of historic performance measures to adjust the maximum reductions, in unforced capacity terms, that can be offered, with one change: the maximum reduction offered from demand response resources, even those using on-site generation to facilitate reductions, should be no more than the contribution to coincident peak load
 - DNV KEMA showed the coincident was consistently less than that ACL value by 6-8%.
 - Furthermore, contributions to the coincident peak drive the installed reserve margin determination, capacity procurement, and matches how capacity costs are allocated to load serving entities.
- For DER that does not include any demand response, DER can be treated like a generator with its maximum capacity as the limit on what it can offer into the capacity market
 - Adjustments made for historic performance in the same way as traditional generators are treated.
 - This treatment would be comparable to DER that are net loads offering demand response as described above.

Ancillary Service Considerations

Ancillary Service Market Participation of Demand Side Resources and DER

- There is no uniformity across the surveyed ISO/RTO markets with respect to what ancillary services Demand Side Resources or DER can, though the trend is toward more, not less participation by DER.
- In all the markets, there is testing and pre-qualification that determines the capacity level resources can offer for regulation, and to some extent reserves.
- ISO-NE has provided a template for reserves that while treating Demand Side Resources like a generator, also recognizes that demand response comes from a load by defining a minimum consumption limit so that the load can at least be assured of meeting its most essential consumption needs while committing to providing load reductions when needed to maintain grid reliability.

Recommendation: Use the Energy Market CBL along with a Minimum Consumption Limit to Define Reserve Capability in the Day-ahead Market

- The NYISO should consider if ISO-NE's concept of having a minimum consumption limit for the forward reserve market is appropriate for demand response under its DER participation model to define reserve capability in the Day-Ahead market.
- This would allow demand response to offer reserve further away from real-time.
 - But this should be accompanied by the requirement for separate metering for the load and any generation-based DER at the same location (or aggregation) so that the load is what is baselined and monitored while the generation DER, which is likely intermittent, can remain a separate metered entity even if they are connected to the load facility behind the same utility meter.

Recommendation: Keep the Current Testing and Pre-Qualification Requirements for Regulation for Demand Side Resources and DER

- The provision of regulation service is complicated and requires advanced metering, telemetry, and communication.
 - In some scenarios, it may be unlikely that DER combined with a host load seeking to provide regulation service will be able to be controllable as to qualify for regulation service due to its intermittency, variability of the combined DER output and load consumption, and irregular operation of the DER, such as if the DER is being used for non-wholesale services.
 - Yet, if there is a way for DER combined with a host load to satisfy the existing qualifications for a regulation supplier, then the rules and requirements that are already in place for generators and DSASP and can be applied to DER.

Recommendation: Allow for the Possibility for Dual Participation between the VDER Tariff at Retail and NYISO Ancillary Services Market Participation with the Following Conditions

- DER, to the extent it is eligible to receive compensation under the VDER Tariff, may also still participate in the NYISO ancillary service markets so long as there is no double compensation.
 - For example, if a DER is providing reserves and the DER is called upon to provide energy, there need to be provisions in place to ensure the DER is not paid twice for the energy.
 - DER coming on the system must satisfy the technical requirements
 - Control over dispatch between the NYISO and distribution utilities must be coordinated

Statistical Sampling of Demand Response Aggregations

Statistical Sampling: Observations

- Statistical sampling methodologies are not a substitute for physical metering at each individual resource.
- However, for a certain subset of resources statistical sampling may provide a reasonable alternative when installing appropriate metering infrastructure is either not available or economically burdensome.
 - At least with certain forms of direct load control (DLC) there is sufficient homogeneity in the measures to employ simple random sampling.

Recommendation: Statistical Sampling is not Suitable for Non-Demand Side Resource DER

- Statistical sampling in ISO/RTO markets is primarily related to mass market loads, and where there is homogeneity among those sites.
- However, DERs will have differences over a number of dimensions.
 - Differences between resource types: size, location, tower height, panel positioning, solar tracking, radiance due to tree cover.
 - Given the number of strata that would be required to get sufficient homogeneity in a sample, and that DER aggregation must be behind the same load bus, it would seem impractical and untenable to use sampling for any DER application
 - VDER Tariff compensation treatment.
- Requiring metering for generation-based DER would provide symmetric treatment with current BTM:NG Resources in NYISO.

Recommendation: Adopt Default Sampling Method/Guidelines for Demand Side Resources and Streamline the Approval Process for Statistically Sampled Aggregations

- Given that the NYISO already has the possibility of using sampling for demand response in its tariff, it would make sense to adopt the CAISO and PJM demand response standards to provide some uniformity with other ISO/RTO practices
- ISO/RTOs have the expertise and knowledge to develop appropriate sampling methods and statistical significance requirements for demand response participation in its markets.
 - Once those default methods have been reviewed and approved by stakeholders, statistically sampled aggregation proposals should be approved by ISO/RTO staff.

Recommendation: Statistical Sampling for Ancillary Service Provision is Not Appropriate for the NYISO

- No ISO/RTO surveyed in the study allows for statistical sampling for participation in the market for regulation and frequency response.
- CAISO and PJM allow sampling for the provision of reserves, but
 - CAISO still requires interval metering of all demand response providing reserves, even for sampling purposes. The CAISO samples all sites with interval metering on a 5 or 15-minute basis, but the part of the population that is not sampled may only have hourly interval meters, but otherwise have like characteristics.
 - PJM is a large system and a 10 percent error on reserves could be up to 130 MW on a system with an average load of approximately 88,601 MW in 2016 is only 0.15 percent of load
 - NYISO, in contrast being a smaller system, a ten percent error in response would have much greater impacts on the system since the amount of reserves being held on a MW basis are comparable. A 130 MW error in NYISO, which has an average hourly load of 18,306 MW in 2016 is 0.71 percent of load (5 times the PJM figure)

Questions?

Paul M. Sotkiewicz, Ph.D

drpaulg8r@gmail.com

610-955-2411

352-244-8800