

DR M&V and Baseline

Demand Response Working Group
June 3, 2014



- Measurement & Verification (M&V)
 - M&V Plan
 - Meter Data Requirements
 - Evaluation & Discussion
- Baseline Methodology
 - Baseline Methodology in DR3
 - Evaluation & Recommendations by FSC
- Industry Standards & Best Practices
 - 10 of 10 + In-Day Adjustment
 - NAESB Standards
 - Other Jurisdictions
 - Assessment Studies
- Discussion

- **Overview**
 - Participants must submit a M&V Plan for each Settlement Account (SA)
 - Contains information and methodology such as: proposed contract schedules, historical data, meter information, description of how curtailment will reduce demand, etc.
 - All information included should be accurate and verifiable - used to determine delivery of curtailment
- **Submission & Approval**
 - IESO reviews all M&V Plan submissions on behalf of the OPA
 - IESO makes recommendations to the OPA for acceptance of the M&V Plan
- **Submission Frequency**
 - A revised M&V Plan must be submitted when:
 - there is a proposed amendment to any Project in a SA, or,
 - a new DR3 Schedule is added to the Contract

- **Meter Data Requirements:**
 - Two channels of validated raw data (**V0**)
 - One channel of validated, edited, and estimated VEE data (**V1**) if the raw data requires edits for each revenue meter that contributes to a SA
 - V1 data that has been revised further is considered **V2** data
- **Submission Timelines:**
 - For a period of Saturday to Friday of a week ending Friday – a Participant must submit V1 data for each SA no later than 3:00pm (E.S.T) on the first Business Day of the following week:

Sun	Mon	Tues	Weds	Thurs	Fri	Sat
	V1 data due 3:00pm					

- V2 data may be submitted up to 3:00pm (E.S.T) on the last Business Day of the following month **provided that the participant has already submitted the required V1 data by its due date**

- Additional Meter Data Requirements for Aggregators:
 - Two channels of V1 data is required for all contributors to each SA
 - On a monthly basis must submit all interval (V0 & V1) meter data for each contributor, referencing any required Confirmation sent by the Aggregator and associated SA
 - On the last Business Day of the month must submit a log of each contributor by SA that was requested by the Aggregator to curtail, the date/time/duration/amount of the request and contributor's name
- An annual M&V submission and approval calendar is provided to all DR3 participants for planning activities related to M&V process and meeting contract obligations

DR3 Contract Month	Type of M&V Plan	M&V Plan Assessment Period		OPA Approval	Metering Preparation Period		
		Last Date to Receive M&V Plan to Review for Next Contract Month	Last Date to Notify OPA of IESO Rec'n		Last Date to Receive OPA Approval	Create MF in MV90; Export MF to MVSTAR	Build TT in MVSTAR; Request Signed SRR & 20 BD of Meter Data
Business Rules	New	T-28 BD	T-18 BD	T-10 BD	T-8 BD	T-6 BD	T-3 BD
	Updated	T-24 BD	T-14 BD				
Aug-14	New Updated	23-Jun-14 27-Jun-14	08-Jul-14 14-Jul-14	18-Jul-14	22-Jul-14	24-Jul-14	29-Jul-14

Evaluation

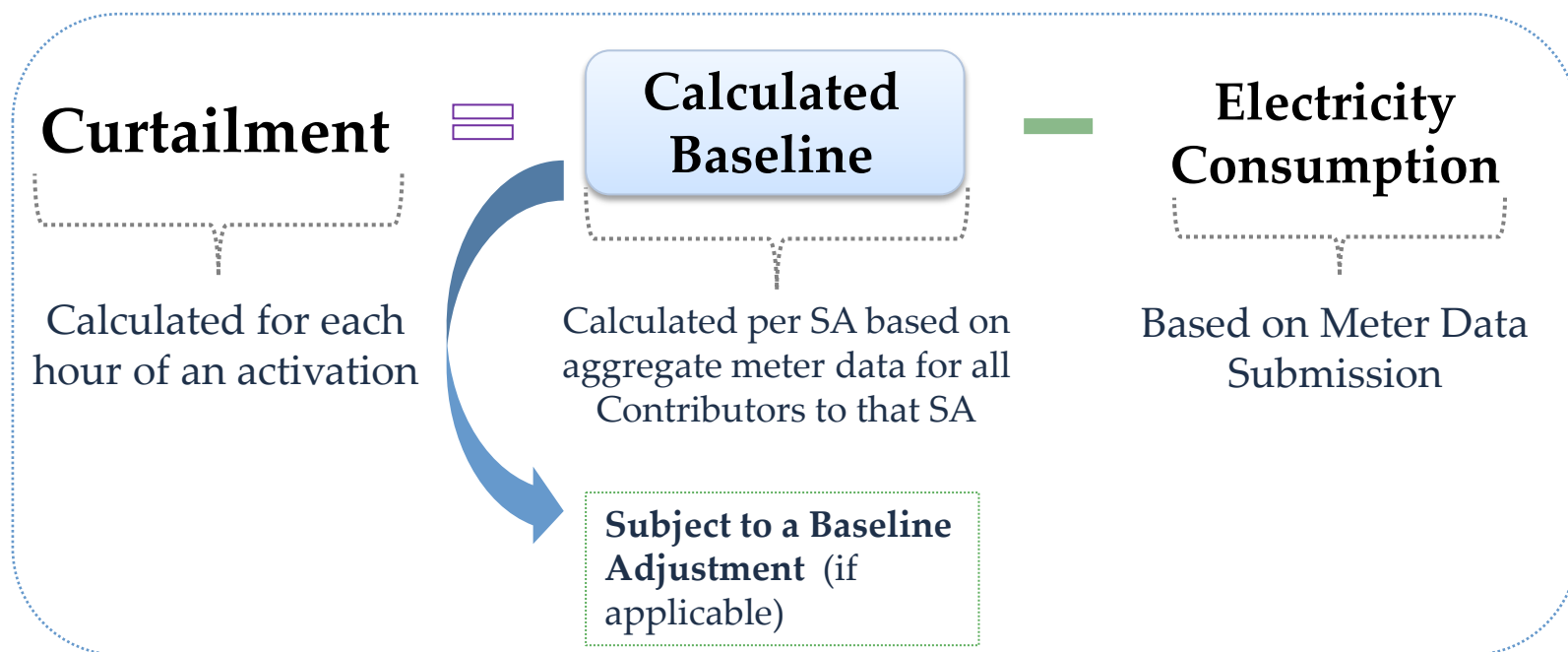
- **Frequency of M&V Plan Submissions**
 - Can be reduced by allowing 'Plan Amendments' where changes to plan information are deemed to not be impactful enough to require a new Plan
 - DR3 Evaluation report recommended improving the data tracking and collection process
- **DR3 registration process**
 - Automation through the IESO Online Tool
- **Monthly data submissions by aggregators for OPA audit**
 - The relevance and necessity of this process will be evaluated/determined

Discussion

- Other known or perceived barriers in the areas of M&V Plans and/or Meter Data submission requirements?

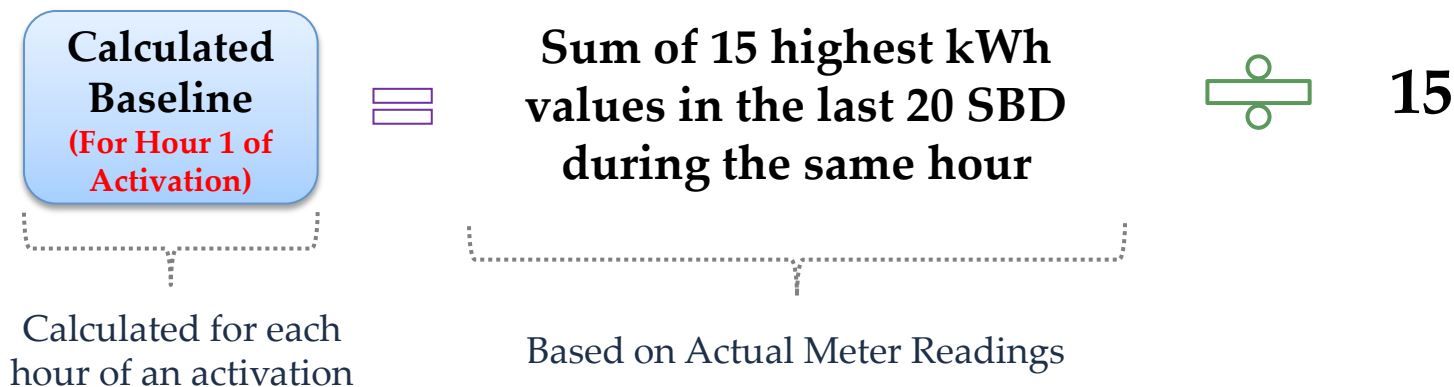
What is a Baseline?

In order to measure curtailment in response to a DR event there must be a methodology to measure what a resource would have consumed had a DR activation not occurred – this consumption pattern is estimated using a baseline.



High 15 of 20 with Option of Weather-Sensitive Adjustment

- Established in 2008 – all DR3 Participants currently use this methodology
- Uses an average of the highest **15** consumption values during the same hours as those of the Activation, in the last **20** Suitable Business Days prior to the Activation
 - Suitable Business Day (SBD): any business day excluding Planned Non Performance Event Days, Outage Days, Activation Days, or if the Participant responds with a Confirmation Notice for less than the Monthly Contracted MW and/or Contracted Dispatch period
 - Calculation may go back to a maximum of 35 Business Days prior to establish the 20 Suitable Business Days
 - Where a project consists entirely of sub-metered generators, baseline uses the ‘lowest 15’



Weather-Sensitive Adjustment

- Applicable if a Participant justifies in their M&V Plan that a significant portion of the Curtailment delivered by a SA can be heavily influenced by **Weather**
- **If so** - Baselines are adjusted using measured demand **prior** to the Activation hour

The Baseline calculation is derived as follows:

$$\text{Adj Baseline} = \text{BSL1} + 80\% \left(\text{Avg4} - \text{BSL1} \right)$$

Diff Must be > 0

BSL1 = Average of the highest 15 kWh values in the last 20 SBD during the 4 hours prior to actual curtailment hour

Avg4 = Average of actual consumption during the 4 hours prior to actual curtailment hour

- **Evaluation & Recommendations by Freeman, Sullivan & Co. (FSC)**
 - High 15 of 20 baseline presents an “upward baseline bias”
 - Overestimated demand reduction by approx. 25% on average in 2009 – 2011
 - Baseline bias results in over payments to some SAs and under payment to others and explains a large portion of the difference between the scheduled and delivered demand reductions
 - Distorts price signals for participants
 - Results in weakened price response, a possible reduction in cost-effectiveness of the program, and/or a shifting in benefits and costs among stakeholders
 - The degree of bias has not decreased as the program has grown and the participant mix has evolved
 - **Recommendation from FSC:** Modify the current standard baseline in order to minimize bias given the current participant mix

10 of 10 with In-Day Adjustment

- Added to DR3 Contracts in March 2011 as a result of Evaluation studies which pointed to inaccuracies of the high 15 of 20 method
- Has yet to be adopted by program participants
- Calculates the baseline using the average of the highest 10 values during the same hours as those of the Activation in the last 10 Suitable Business Days and then applies an In-Day Adjustment factor
- The baseline becomes more heavily influenced by conditions on the actual event day

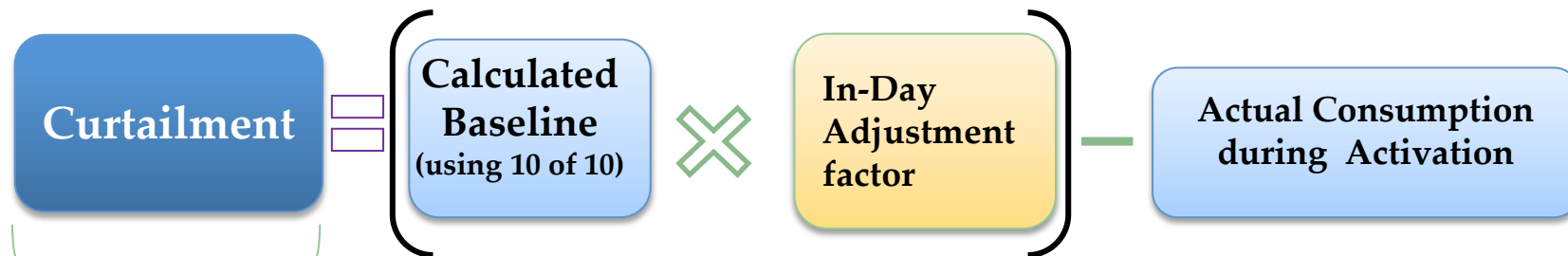
Calculating the In-Day Adjustment:

- The 3 hour window occurring an hour before the Activation event is the **Adjustment Window**

A Value = Average actual consumption during Adjustment Window hours in the past 10 SBD

B Value = Average actual consumption during Adjustment Window hours on the actual Activation day

In-Day Adjustment factor = $\frac{\text{B Value}}{\text{A Value}}$ } *Must be between 0.8 and 1.2



Calculated for each hour of an activation

North American Energy Standards Board (NAESB) Standards

- Tasked by FERC to develop Business Practice Standards for DR Measurement and Verification
- FERC is a proponent of these standards (FERC Order 745)
- Common language and guidance on best DR M&V practices across markets and programs

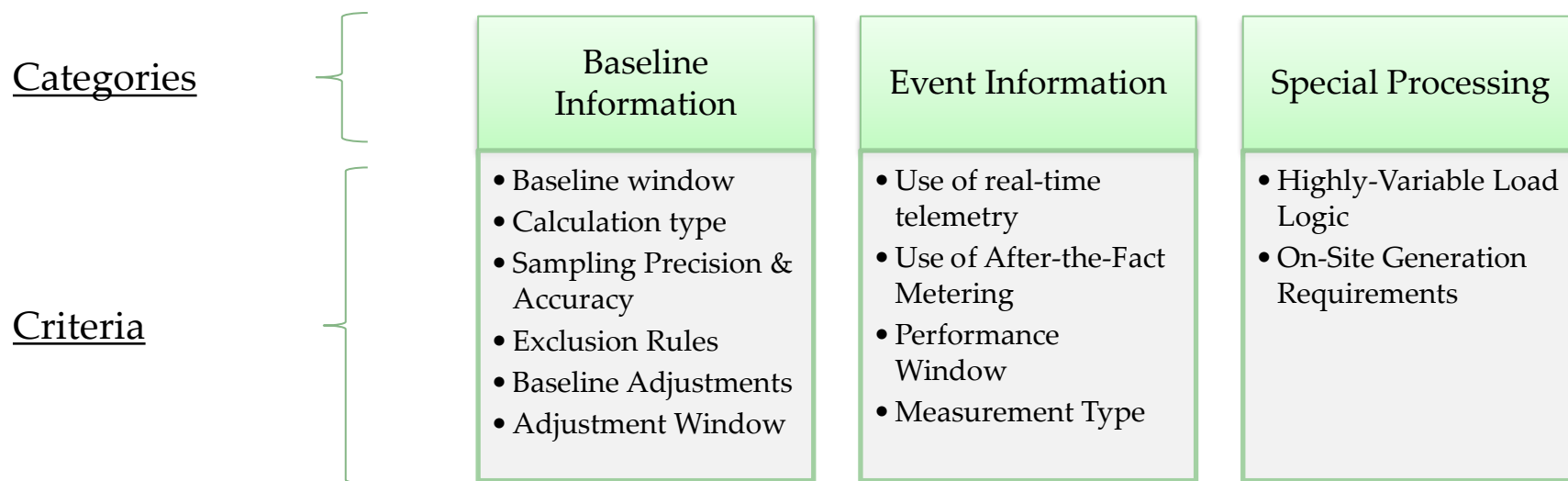
Goals of the M&V standards:

- Transparency – requirements should be accessible and understandable
- Accountability – promote accurate performance measurement in dispatch, operations, and market settlement
- Consistency – methods should be applicable across all wholesale markets

5 Broad Performance Evaluation Methodologies were developed

- **Methodologies:**

- **Maximum Base Load:** based on a resource's ability to maintain electricity usage at or below a specified level during a DR Event (*also called "Firm Service Level"*)
- **Baseline Type-I:** historical interval meter data used to create a profile baseline that may change by the hour (*most common in DR today*)
- **Baseline Type-II:** uses statistical sampling to estimate the electricity usage of an Aggregated Demand Resource (*useful when interval metering is not available for all individual sites*)
- **Meter Before/Meter After:** calculates a baseline using actual consumption data from a time period immediately before an event (*NAESB points out this is mainly used for ancillary services*)
- **Metering Generator Output:** baseline is measured against meter data from behind-the-meter generators. (*Only applicable to facilities with on-site generation*)
- **Capacity Services:** Maximum Base Load & Baseline Type I
- **Energy Services:** Baseline Type I & II



Methodology = Baseline Information criteria + Event Info criteria + Special Processing criteria

According to NAESB Standards:

DR3: Baseline Type-I to establish a baseline, and **Meter Before/After** used to check if a resource is “Not Fully Available for Curtailment”, Average high 15 of the last 20 SBD, Optional Weather Sensitive Adjustment

ISO-NE: Real Time Demand Response

- **Baseline Type I**
- **Baseline Calculation:**
 - Present day: simple average of meter data for each 5 minute interval from the first 10 non-DR Holiday weekdays (the first 10 consecutive days of the same day type with complete interval meter data)
 - Next day: $0.9(\text{present day baseline}) + 0.1(\text{meter data in the same 5-minute interval from the previous day})$
- **Adjustment:** Factor calculated based on average difference between the Actual Metered Demand and the Baseline, for a 2 hour period beginning 2.5 hours prior to activation
 - Added to the Demand Response Baseline in every interval of the day
 - Cannot be <0 or $>\text{resource's max. load}$

NYISO (Standard Customer Baseline)

- **Baseline Type I**
- **Baseline Window:**
 - Weekday Event: Previous 10 weekdays within last 30 days, subject to exclusion rules
 - Weekend Event: Previous 3 weekends – same day type, no exclusions
- **Calculation:**
 - Weekday: hourly simple average of the 5 highest total event period days in the Baseline window
 - Weekend: hourly simple average of the 2 highest total event period load days in the Baseline window
- **Exclusion Rules:** Weekday events: exclude day preceding event, holidays, and any weekdays where a curtailment event occurred within the Baseline window
- **Adjustment:** Optional Weather-Sensitive Adjustment, Symmetrical Proportional Adjustment

NYISO (Capacity)

- **Maximum Base Load**
- **Baseline Window:** contracted maximum demand
- **Calculation Type**
 - **Average Coincident Load:** average of the top 20 out of 40 coincident peak hours from the Prior Equivalent Capability Period (exclude DR event and test hours)

PJM: Economic Customer Baseline

- **Baseline Type I**
- **Baseline Window:** 45 calendar days
- **Calculation Type:** Hourly average based on high 4 of 5 days for weekdays and high 2 of 3 for Saturday/Sunday or Holiday
- **Exclusion Rules:** event days, different day types, low usage days
- **Adjustments:** Weather-Sensitive, or, Symmetric Additive

Refer to Material “Summary of Baseline Assessment Studies”

- **Key findings:**

- Same day adjustment increases baseline accuracy (unanimous amongst studies)
- Average load over a subset period (X of Y baselines) with a same day adjustment performed better than any unadjusted baseline (PJM)
- 10 of 10 baseline with an in-day adjustment is more accurate and performed better than the High 15 of 20 baseline (OPA, FSC)
- No baseline calculation is perfect
- Design of the demand response service/program and the participant’s characteristics should be considered in baseline design

Any perceived limitations and/or potential efficiencies to be gained from adopting the 10 of 10 methodology?

How do the characteristics of your resources align with the various baseline methodologies?

Any foreseen operational characteristics that could be adversely affected by an in day adjustment? (loads with storage capability, heating/cooling prior to event)

What is the impact for Class A GA consumers responding to the 'high 5' peaks on baseline calculations?