Energy storage and distributed energy resources (ESDER) stakeholder initiative

Revised Draft Final Proposal

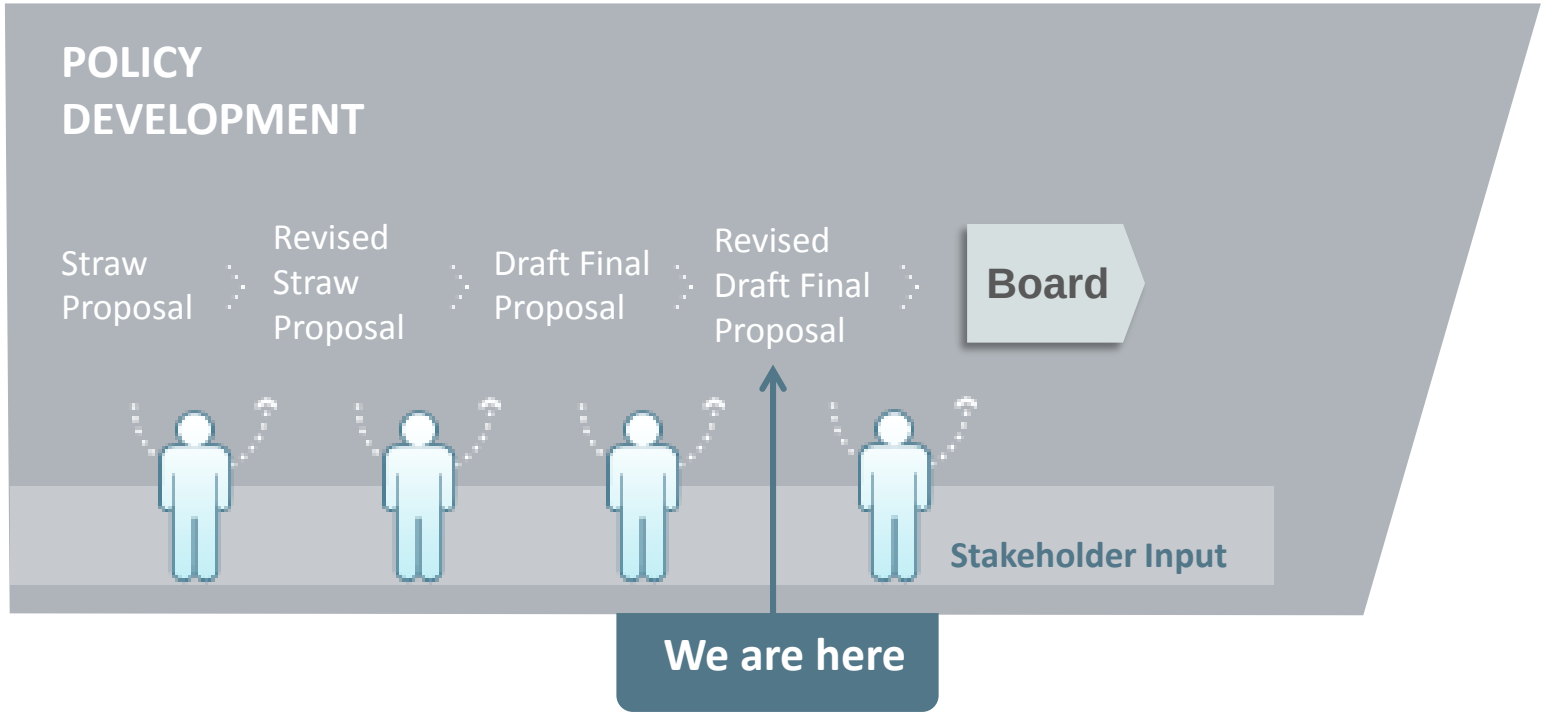
Stakeholder web conference
January 7, 2016
1:00 p.m.-4:00 p.m.

Revised

Agenda [Revised]

Time	Agenda Item	Speaker
1:00-1:10	Introduction, Stakeholder Process	Tom Cuccia
1:10-1:30	NGR enhancements	Peter Klauer
1:30-1:50	PDR/RDRR enhancements – MGO	Jill Powers
1:50-2:15	Proposed modification to MGO	SCE
2:15-2:45	PDR/RDRR enhancements – Statistical Sampling	Jill Powers
2:45-2:55	Multiple use applications	Lorenzo Kristov
2:55-3:00	Next Steps	Tom Cuccia

ISO Stakeholder Initiative Process



Stakeholder process schedule

Step	Date	Event
Education Forum	April 16 & 23	Hold education forums
Proposed ESDER Scope & Schedule	May 13	Post proposed scope & schedule
	May 21	Stakeholder web conference
	May 29	Stakeholder comments due
Revised ESDER Scope & Schedule	June 10	Post revised scope & schedule
	June 17	Stakeholder comments due
Issue Paper & Straw Proposal	July 30	Post issue paper and straw proposal
	August 6	Stakeholder web conference
	August 18	Stakeholder comments due
ESDER Working Group	August 27	ESDER working group web conference
	September 3	Stakeholder comments due
Revised Straw Proposal	September 17	Post revised straw proposal
	September 28	Stakeholder web conference
	October 9	Stakeholder comments due
ESDER Working Group	October 12	ESDER working group meeting
	October 19	Stakeholder comments due
ESDER Working Group	October 27	ESDER working group web conference
	October 29	Stakeholder comments due
Draft Final Proposal	November 2	Post draft final proposal
	November 9	Stakeholder web conference
	November 16	Stakeholder comments due
Revised Draft Final Proposal	December 23	Post revised draft final proposal
	January 7	Stakeholder web conference
	January 14	Stakeholder comments due
Board Approval	February 3-4	ISO Board meeting

2015 scope of issues addresses three topic areas

- Enhancements to the non-generator resources (“NGR”) market participation model.
- Enhancements to demand response performance measures and statistical sampling for the proxy demand resource (“PDR”)/reliability demand response resource (“RDRR”) market participation models.
- Clarifications to rules for non-resource adequacy multiple-use applications (provision of retail, distribution and wholesale services by the same resource).

Only certain proposals in two of the three topic areas will require tariff changes and ISO Board approval

- Enhancements to the non-generator resources (“NGR”) market participation model:
  - Allow resource to provide its initial state of charge (SOC) as a bid parameter in the day-ahead market.
  - Provide option for resource to self-manage its energy limits and SOC.
- Enhancements to demand response performance measures for PDR/RDRR:
  - Metered Generator Output (MGO) methodology

Enhancements to the non-generator resources (NGR) market participation model

Enhancements to the NGR model benefit both grid-connected storage and distributed energy resources

- Update NGR documentation in the BPMs.
- Clarify how the ISO uses state of charge (SOC) in the market optimization.
- Allow resources to submit the initial state of charge as a day-ahead parameter.
- Allow option for resource owners to self-manage energy constraints and not use constraints in ISO co-optimization and dispatch.

NGR documentation

- The ISO proposes to follow established method of utilizing BPMs to provide detailed rules, procedures and examples consistent with the ISO tariff.
- The ISO does not create stand-alone model specific documentation but relies on BPMs.
- The ISO will include content that distinguishes differences in requirements between NGR and NGR Regulation Energy Management (REM).
- Relevant BPMs may include Market Operations, Market Instruments, Direct Telemetry, Metering, Outage Management, Reliability Requirements, and Settlements and Billing.

Clarification about how the ISO uses state of charge in the market optimization

- ISO proposes to provide clarity by updating ISO BPMs
- Describe how state of charge
  - influences model optimization
  - impacts mathematical formulation of economic dispatch
  - impacts the interplay of capacity and energy over several market intervals
  - is used in AGC calculations for NGR REM resources
- Clarify use and timing of the telemetered state of charge values

Allow initial state of charge (SOC) as a daily bid parameter in the day-ahead market

- The initial day-ahead SOC value used for the trading day is the ending SOC from the previous day's day-ahead awards.
- If there are no previous day-ahead awards, the ISO assumes the initial SOC is 50%.
- This requires the resource to be at this initial SOC value or risk being awarded bids that create infeasible dispatches in the trading day.
- The ISO proposes to allow the ability to submit a daily SOC bid parameter to initialize the ISO day-ahead market system.

Allow an option to not provide energy limits or have the ISO co-optimize an NGR based on state of charge (SOC)

- NGRs that do not have SOC energy limits or choose to self-manage the SOC within resource energy limit constraints may choose to not use energy limit constraints and SOC in co-optimization or dispatch.
- NGRs will self-manage the resource's available energy within any energy limit constraints to avoid uninstructed imbalance energy settlements.
- Although not required to provide its SOC through telemetry, it would have to provide all other telemetry data required by existing rules.
  - However, if the ISO determines that resources under this option are not self-managing their NGR within energy limits, the ISO reserves the right to require SOC telemetry.
- This option is not available to NGRs participating under Regulation Energy Management (REM).

PDR/RDRR Enhancements

Proxy Demand Resource and Reliability Demand Response Resource

Proposed enhancements to performance evaluation methodologies and statistical sampling will facilitate increased PDR/RDRR participation

- Develop an alternative performance evaluation methodology based on North American Energy Standards Board (NAESB) metering generator output (MGO) concepts.
- Develop additional detail in deriving load meter data using statistical sampling.
  - Applicability
  - Sample fraction

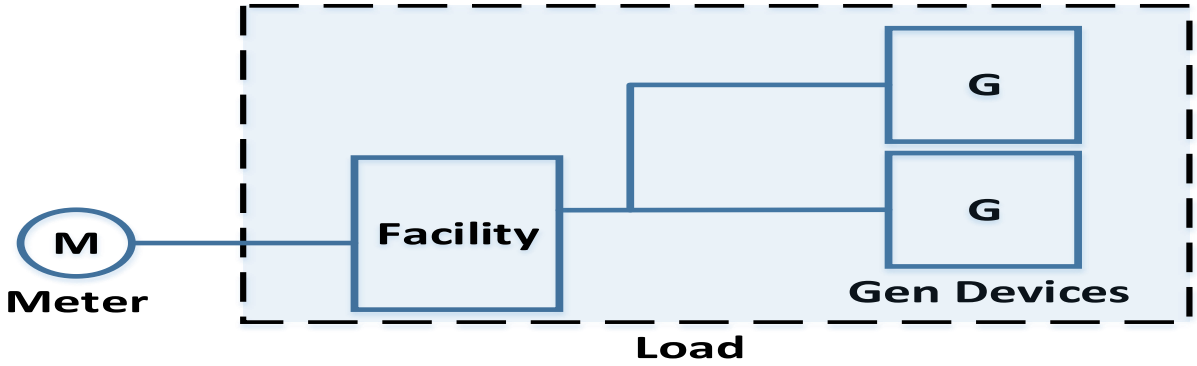
Options proposed required additional metering configuration considerations

- New metering configurations provide a means to separate load from generation.
  - This allowed for new PDR/RDRR performance evaluation options and use cases to be supported.
- A specific sign convention was used in developing the proposals.
  - Load is expressed as a positive quantity.
  - The output of the generation device – or energy storage in discharging mode – is a negative quantity.

Enhancements proposed maintain current PDR and RDRR load curtailment only resource requirements

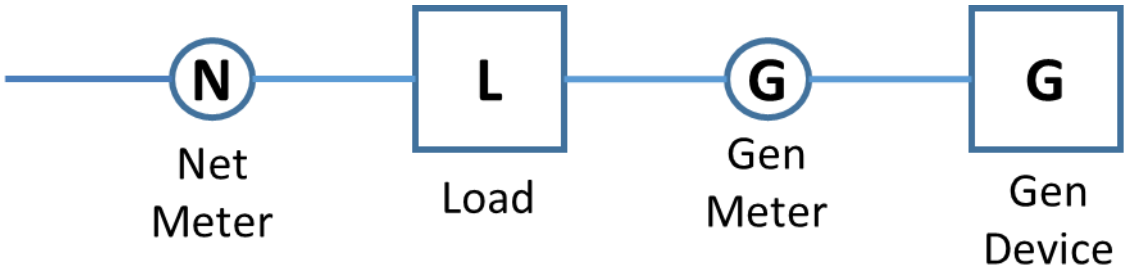
- Must not include measured export of energy from any of the resource's underlying locations. (non-export rule)
  - Any metered quantity representing a net export must be set to zero by the SC prior to summing individual location meter data.
  - Performance is an aggregate based on individual location load curtailment only.
- Resource performance less than zero will be set to zero for settlement purposes. (non-negative condition)
  - Actual load is higher than the baseline
  - Load consumption determined at an aggregated resource level.

Existing ISO performance evaluation methodology supported with Metering configuration A [Revised]



- A baseline is established using the physical meter (M).
  - ISO is unaware of contributors to (facility) load reduction.
  - Measured performance cannot recognize a behind-the-meter generator or device separately.
  - Any negative M metered quantity is set to zero by the SC prior to summing individual location meter data.

Metering configuration B enables refinement of current baseline methodology and use of a MGO performance evaluation method



- Demand response at the location can be separated into a load (facility) response and a behind-the-meter generation device's response.
- Measurement of the load's response would employ a standard ISO Type 1 baseline using N minus G as a derived "virtual" meter quantity.
- Measurement of the load offset by the generation device would use the MGO method using physical meter G.

ISO is proposing to support three demand response participation options under metering configuration B, each with its own performance evaluation method

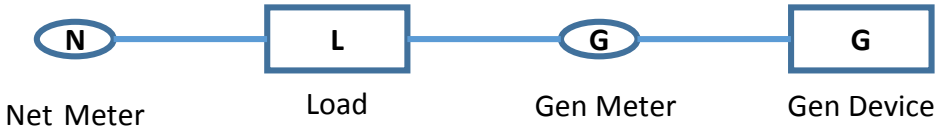
- Option B1 – load reduction only
- Option B2 – generation offset only
- Option B3 – load reduction and generation offset

Proposal for Option B1 – Load Reduction Only

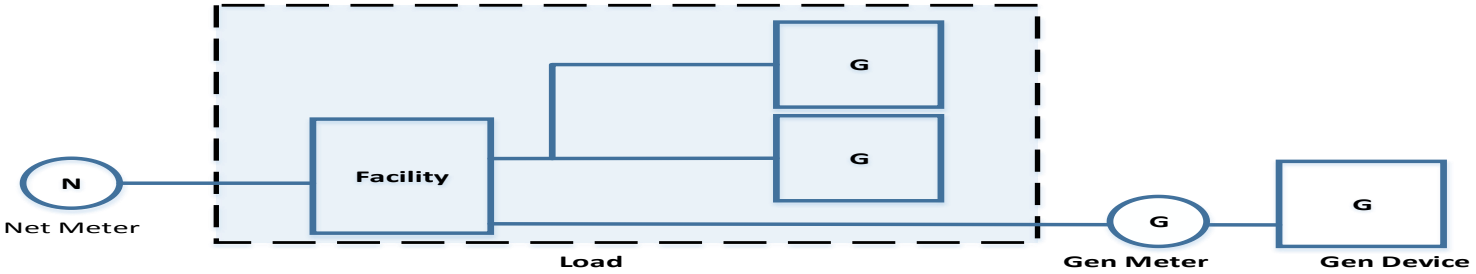
- Only the load is registered in the PDR/RDRR.
- Demand response performance would be evaluated using a load baseline **(B)** determined from **(N-G)** values for comparable non-dispatch hours according to current ISO type 1 baseline methodology.
  - ISO tariff section 4.13.4.1 ten in ten non-event day selection method
- Actual demand reduction of the load in response to an ISO dispatch in interval (t) would be calculated as:

$$\mathbf{DR_{LOAD}(t) = B_{N-G}(t) - [N(t) - G(t)]}$$

Applicability of net export rule for Option B1 proposal clarification [Revised]



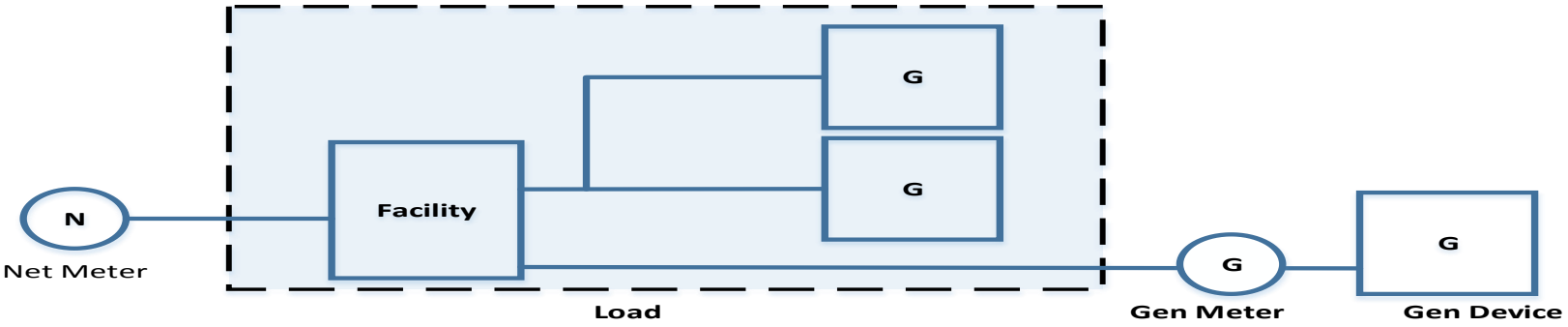
- In cases where all behind the meter generation is metered at one point, a net export rule is not relevant because performance is derived based on true load measurements (N-G) that can never be less than zero in this metering configuration.



- In cases where behind the meter generation is not all metered, the net export rule will apply when deriving true load measurements (N-G) ensuring it is never less than zero.

Therefore, in both cases N-G = max {[N(t) – G(t)], 0}

Examples applying the net export rule to determine N-G for Option B1 [New Slide]



- Example 1: N = +1 G= -7

  N-G = max {[N(t) – G(t)], 0} = max {[1 – (-7)],0} = max {8,0} = **8**

- Example 2: N = -12 G= -7

  N-G = max {[N(t) – G(t)], 0} = max {[-12 – (-7)],0} = max {-5,0} = **0**

- Example 3: N = 0 G= -7

  N-G = max {[N(t) – G(t)], 0} = max {[0– (-7)],0} = max {7,0} = **7**

Applicability of “non-negative” condition for Option B1 proposal

- If $DR_{LOAD}(t) < 0$, then the performance measurement is set to zero for ISO settlement purposes.
  - Indicates that there was load consumption instead of curtailment in response to an ISO award/dispatch.
  - Consistent with current ISO type 1 settlement

$$\mathbf{DR_{LOAD}(t) = \max \{B_{N\text{-}G}(t) - [N(t) - G(t)], 0\}}$$

Proposal for Option B2 – Generation Offset Only

- Only the generation device is registered in the PDR/RDRR.
- Demand response performance is the demand reduction resulting from the metered generator output of the generation device **G(t)**, for dispatch interval **t**, adjusted by an estimate of typical energy output used for retail load modifying purposes and benefits $\mathbf{G_{LM}}$.
- The demand response performance $\mathbf{DR_{SUPPLY}(t)}$ attributed to a PDR/RDRR supply dispatch would be calculated as:

$$\mathbf{DR_{SUPPLY}(t) = - [G(t) – G_{LM}]}$$

Details on adjustment for typical retail load modifying behavior, G_{LM}

- The adjustment, G_{LM}, is established through a look back of MGO values during similar ISO non-event hours.
- A 10-in-10 non-event hour selection method is employed utilizing a look back window of 45 calendar days.
- Process involves iterating backward to find the target number of non-event hours for the same event hour and same day type.
  - An “event hour” is any ISO market award, dispatch or outage recorded for the PDR/RDRR for the full hour or any 5 minute interval during the ISO hour ending interval
  - Charging a device used for MGO is not categorized as an event.

Details on adjustment for typical retail load modifying behavior, G_{LM} *(continued)*

- Two different day-types are recognized:
  - Weekday (Monday through Friday)
  - Weekend/Holiday (Saturday, Sunday, or any NERC holiday)
- Once the target number of hours is reached, selection ends.
- Target and minimum hours will adhere to existing ISO Type 1 rules:
  - Weekday = 10 hour target; 5 hour minimum
  - Weekend/Holiday = 4 hour target; 4 hour minimum

Details on adjustment for typical retail load modifying behavior, G_{LM} *(continued)*

- Only when the minimum hours are not reached will G_{LM} be set to zero.
  - Upon exhaustion of a 45-calendar day search to obtain a similar non-event hour, it is reasonable to assume that there is no typical energy output for retail load modifying purposes and that the generation device is being used solely in response to ISO wholesale participation.
- In developing G_{LM} , the ISO is only interested in the average energy output, the metered quantity for any interval in which the device is charging shall be set to zero when establishing the non-event hour value used in developing G_{LM}.

Applicability of net export rule condition for Option B2 proposal

- The net export rule would apply under the following conditions:
  - If N< 0, then the MWh amount settled in that interval is the MWh delivered up to N=0
  - Rule is applied at the location level not at the PDR/RDRR aggregate level.
  - ISO retains the authority to audit both the N and G meter data values to evaluate accuracy of SQMD submitted to ensure compliance with the net export rule

Applicability of net export rule for Option B2 proposal

To recognize inclusion of the net export rule application **at the location level**, the DR_{SUPPLY} equation becomes:

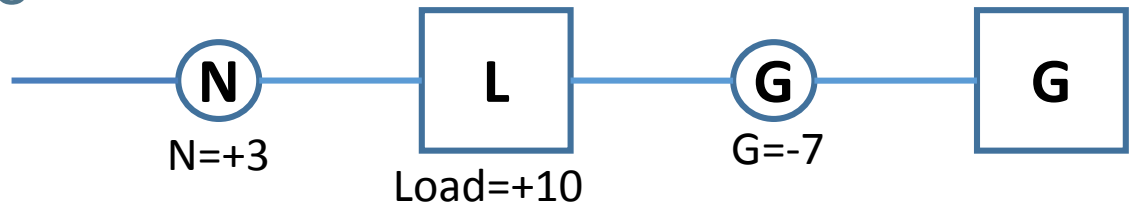
$$DR_{SUPPLY}(t) = \max\{ - [G(t)^{nx} - G_{LM}(t)], 0\}$$

Where the net export adjusted generation quantity $G(t)^{nx}$ is calculated as:

$$G(t)^{nx} = \sum_{i=1}^{n} G(i,t) - \min\{0, N(i,t)\}$$

When, *i* = 1,2,…*n* denotes the location, G(i,t) is the generator/device metered output at location *i* during dispatch interval t, and N(i,t) is the net meter quantity at location I during dispatch interval t.

Example 1 – applying net export rule to an Option B2 scenario



Values shown are for interval t

Example:

Assuming G_{LM} (t) = -1 G(t) = -7 and N(t) = +3*

Then applying the net export rule:

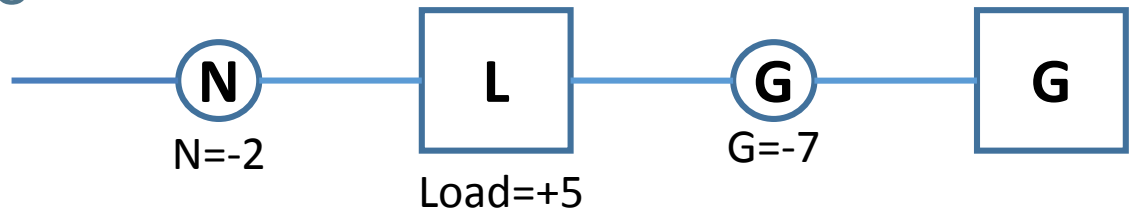
$$G(t) = -7 - \min(0, 3) = -7 - 0 = -7$$

Thus:

$$DR_{SUPPLY}(t) = \max\{-[-7-(-1)], 0\} = +6$$

*** No net export at this location**

Example 2 – applying net export rule to an Option B2 scenario



Values shown are for interval t

Example:

Assuming G_{LM} (t) = -1 G(t) = -7 and N(t) = -2*

Then applying the net export rule:

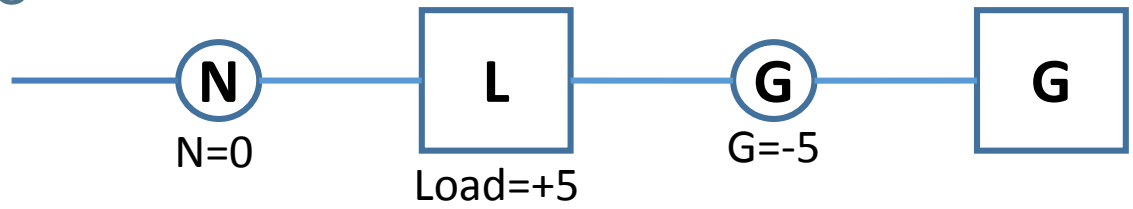
$$G(t) = -7 - \min(0, -2) = -7 - (-2) = -7 + 2 = -5$$

Thus:

$$DR_{SUPPLY}(t) = \max\{-[-5-(-1)], 0\} = +4$$

***Net export at this location**

Example 3 – applying net export rule to an Option B2 scenario



Values shown are for interval t

Example:

Assuming G_{LM} (t) = -1 G(t) = -5 and N(t) = 0*

Then applying the net export rule:

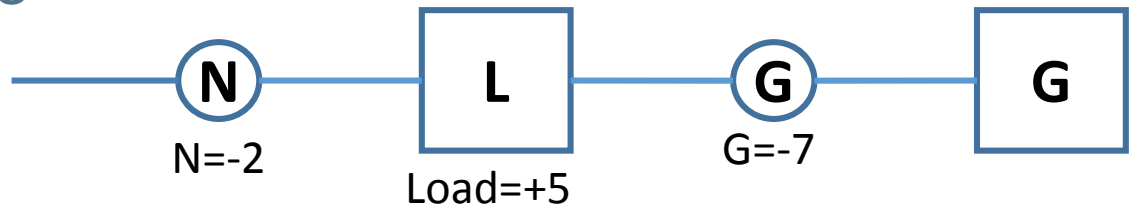
$$G(t) = -5 - \min(0, 0) = -5 - 0 = -5$$

Thus:

$$DR_{SUPPLY}(t) = \max\{-[-5-(-1)], 0\} = +4$$

*** No net export at this location**

Example 4 – applying net export rule to an Option B2 scenario



Values shown are for interval t

Example:

Assuming G_{LM} (t) = -7 G(t) = -7 and N(t) = -2*

Then applying the net export rule:

$$G(t) = -7 - \min(0, -2) = -7 - (-2) = -7 + 2 = -5$$

Thus:

$$DR_{SUPPLY}(t) = \max\{-[-5-(-7)], 0\} = \max\{-2, 0\} = 0$$

***Net export at this location**

Proposal for Option B3 – Load and Generation

- Both the load and generation device are registered in the PDR/RDRR.
- Demand response performance would be the combined demand responses attributed to $DR_{LOAD}(t)$ and $DR_{SUPPLY}(t)$, as detailed under Options B1 and B2, respectively.
- The total demand response reduction would be calculated as:

$$DR_{TOTAL}(t) = DR_{LOAD}(t) + DR_{SUPPLY}(t)$$

- The “non-negative” applicability must be applied to $DR_{LOAD}(t)$ consistent with Option B1.
- The net export rule must be applied to $DR_{SUPPLY}(t)$ consistent with Option B2.

ISO is proposing to support the use of statistical sampling in the following cases:

- For day-ahead energy participation only, when hourly interval metering is not installed at all underlying resource locations. Not applicable for A/S participation.
- For day-ahead energy participation only, when hourly interval metering is installed at all underlying resource locations but RQMD is not derived using the hourly interval meter data for settlement purposes, but is developed using load profiles. Not applicable for A/S participation.
- *For real-time and A/S participation when interval metering is installed at all underlying locations is not recorded in 5- or 15-minute intervals.*

Non-resource adequacy (non-RA) multiple use applications

The ISO has made no changes on this topic since the Draft Final Proposal issued on 11/2/15.

- Revised Draft Final Proposal issued on 12/23/15 is identical to the prior proposal.
- Based on the approach to this topic described in the last two proposals, there is no need for and the ISO will not be filing any changes to the ISO tariff for this topic.
- The ISO anticipates further discussion of multiple-use applications in phase 2 of ESDER in 2016.

Next Steps

Request for stakeholder comments by January 14, 2015

Comments mailbox initiativecomments@caiso.com

Step	Date	Event
Revised Draft Final Proposal	December 23	Post revised draft final proposal
	January 7	Stakeholder web conference
	January 14	Stakeholder comments due
Board approval	February 3-4	ISO Board meeting