

PDR-LSR Example

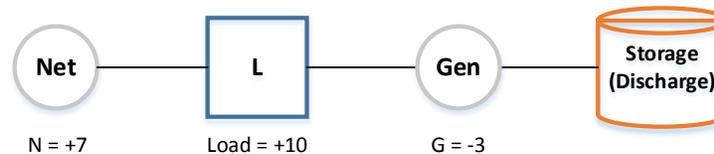
Net Export Rule¹: Deriving the generation value of storage device $G(t)$

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

Where,

- $i = 1, 2, \dots, n$ – location
- $G(i, t)$ – storage device generation metered output at location i during the dispatch interval t
- $N(i, t)$ – net meter quantity at location i during dispatch interval t

Assume²:



- $N(i, t) = +7$
- Load at facility = +10
- BTM storage device Gen = -3

Then apply the net export rule:

$$G(t)^{nx} = (-3) - \min(0, 7)$$

$$G(t)^{nx} = -3$$

Discharge value after applying the net export rule is 3 MW

¹ Applicable when determining performance for PDR-LSR curtailment only.

² A specific sign convention was used in developing the application of the net export rule. Load served by the storage device is expressed as a positive quantity and its output in a discharging mode is a negative quantity. This is used in the application of the net export rule only.

PDR-LSR Example

Typical Use Calculation: Curtailment

Resource ID (Curtailment): PDR_LSE1_01_LSRCURT

Pmax = 3 MW

$G(t)^{nx} = -3$ MW

Dispatched for 3 MW (HE 17 on Tuesday, May 30)

Table 1: Examination of 10 similar day, non-event hours³

	5/1	5/2	5/3	5/4	5/5	5/8	5/9	5/10	5/11	5/12	5/15	5/16	5/17	5/18	5/19	5/22	5/23	5/24	5/25	5/26	5/29
Curtailment ⁴	E	E	0	0	0	E	2	0	0	2	4	E	0	E	0	E	0	2	1	1	E
Consumption ⁵	0	0	-4	E	E	0	0	-2	-2	0	0	0	-2	0	E	0	-2	0	0	0	0

*E represents an event**

Typical use formula:

$$G_{LM} = \text{Max} \{(G_{LMcurt} + G_{LMcons}), 0\}$$

- G_{LM} – Typical use value
- G_{LMcurt} – Typical curtailment value (simple average of 10 non-event hours)
- G_{LMcons} – Typical consumption value (simple average of 10 non-event hours)

³ Event hour is one in which the PDR-LSR was subject to an Outage or previously provided Demand Response Services (other than capacity awarded for AS or RUC).

⁴ Curtailment sign convention is expressed as positive quantity representing energy storage output in a discharging mode. This convention used for both the typical use and performance evaluation calculations.

⁵ Consumption sign convention is expressed as negative quantity representing energy storage input in a charging mode. This convention used for both the typical use and performance evaluation calculations.

PDR-LSR Example

Determine and add the simple hourly average for both the curtailment and consumption values:

$$G_{LM} = \text{Max} \left\{ \left[\left(\frac{1 + 1 + 2 + 0 + 0 + 4 + 2 + 0 + 0 + 2}{10} \right) + \left(\frac{0 + 0 + 0 + (-2) + (-2) + 0 + 0 + (-2) + (-2) + 0}{10} \right) \right], 0 \right\}$$

Then identify the value at or above 0:

$$G_{LM} = \text{Max} \{ [1.2 + (-.8)], 0 \}$$

Load curtailment typical value is evaluated as .4 MW:

$$G_{LM} = .4$$

PDR-LSR Example

Performance Evaluation Methodology: LSR-Curtailment

Resource ID (Curtailment): PDR_LSE1_01_LSRCURT

$P_{max} = 3 \text{ MW}$

$G(t)^{nx} = -3 \text{ MW}$

$G_{LM} = .4 \text{ MW}$

Performance Evaluation (LSR-Curtailment) formula:

$$LSR_{curt} = [|G(t)^{nx}| - G_{LM}]$$

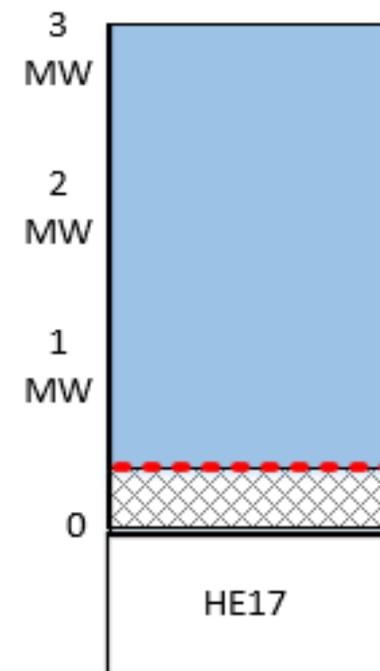
- $|G(t)^{nx}|$ – Generation value of the energy storage device (net export rule applied)
- LSR_{curt} – Curtailment performance of PDR-LSR
- G_{LM} – Typical use value

Calculate the difference between the generation and typical use value:

$$LSR_{curt} = [3 - .4]$$

Resource provided 2.6 MW of load curtailment:

$$LSR_{curt} = 2.6 \text{ MW}$$



PDR-LSR Example

Typical Use Calculation: Consumption

Resource ID (Consumption): PDR_LSE1_01_LSRCONS

Maximum Consumption = -4 MW

$G(t) = -4$ MW

Dispatched for -4 MW (HE 14 on Tuesday, May 30)

Table 2: Similar day non-event hours⁶

	5/1	5/2	5/3	5/4	5/5	5/8	5/9	5/10	5/11	5/12	5/15	5/16	5/17	5/18	5/19	5/22	5/23	5/24	5/25	5/26	5/29
Curtailment ⁷	E	E	0	0	0	E	2	0	0	2	4	0	0	E	0	E	0	2	0	1	0
Consumption ⁸	0	0	-4	E	E	0	0	E	-2	0	0	E	-2	0	E	0	-2	0	E	0	-3

E represents an event*

Typical use formula:

$$G_{LM} = \text{Min} \{(G_{LMcurt} + G_{LMcons}), 0\}$$

- G_{LM} – Typical use value
- G_{LMcurt} – Typical curtailment value (simple average of 10 non-event hours)
- G_{LMcons} – Typical consumption value (simple average of 10 non-event hours)

⁶ Event hour is one in which the PDR-LSR was subject to an Outage or previously provided Demand Response Services (other than capacity awarded for AS or RUC).

⁷ Curtailment sign convention is expressed as positive quantity representing energy storage output in a discharging mode. This convention used for both the typical use and performance evaluation calculations.

⁸ Consumption sign convention is expressed as negative quantity representing energy storage input in a charging mode. This convention used for both the typical use and performance evaluation calculations.

PDR-LSR Example

Determine the simple average of the typical curtailment/consumption values:

$$G_{LM} = \text{Min} \left\{ \left[\left(\frac{0 + 1 + 2 + 0 + 0 + 4 + 2 + 0 + 2 + 0}{10} \right) + \left(\frac{(-3) + 0 + 0 + (-2) + (-2) + 0 + 0 + (-2) + 0 + (-4)}{10} \right) \right], 0 \right\}$$

Then identify the typical value at or below 0:

$$G_{LM} = \text{Min} \{ [1.1 + (-1.3)], 0 \}$$

Resource is typically consuming load at -.2 MW

$$G_{LM} = -.2$$

PDR-LSR Example

Performance Evaluation Methodology: LSR-Consumption

Resource ID (Consumption): PDR_LSE1_01_LSRCONS

$$G(t) = -4 \text{ MW}$$

$$G_{LM} = .4 \text{ MW}$$

Performance Evaluation (LSR-Consumption) formula:

$$LSR_{cons} = [G(t) - G_{LM}]$$

- LSR_{cons} – Consumption value of PDR-LSR
- $G(t)$ – Load value of the energy storage device
- G_{LM} – Typical use value

Calculate the difference between the generation and typical use value:

$$LSR_{cons} = [-4 - (-.2)]$$

Resource provided -3.8 MW of load consumption:

$$LSR_{curt} = -3.8 \text{ MW}$$

