ESR Settlements: Charges when deviating from NYISO Base Points

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Energy Market Design

MIWG

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Agenda

- **Existing Undergeneration and Overgeneration Charges**
  - Persistent Undergeneration Charges
  - Overgeneration Charges
  - Equations
- **Charges for ESRs**
  - Examples
- **Next Steps**

Previous Discussions

Date	Working Group	Discussion points and links to materials
08-04-16	(MIWG)	Initial discussion on alternatives for Energy Storage in the NYISO markets
09-29-16	MIWG	Market Design ideas discussion
11-29-16	MIWG	Presentation providing more detail on the Market Design that the NYISO will pursue
05-05-17	MIWG	Presentation addressing the proposed modeling enhancements as the cornerstone of the Energy Storage Integration phase
07-19-17	MIWG	Presentation delving into the eligibility criteria and RT scheduling logic for Energy Storage Resources ("ESRs").
08-25-17	MIWG	Discussion on the Settlements logic for ESRs.
10-03-17	MIWG	Day-Ahead scheduling logic and Mitigation framework
11-02-17	MIWG	Aggregations in the ESR model
12-20-17	MIWG	Market Design Concept Proposal Summary
02-21-18	MIWG	Ancillary Services Treatment in the ESR Participation Model
04-26-18	MIWG	ESR Energy Level Monitoring
05-23-18	MIWG	ESR Participation Model: Settlements
06-19-18	MIWG	ESR Metering

Existing Persistent Undergeneration and Overgeneration Charges

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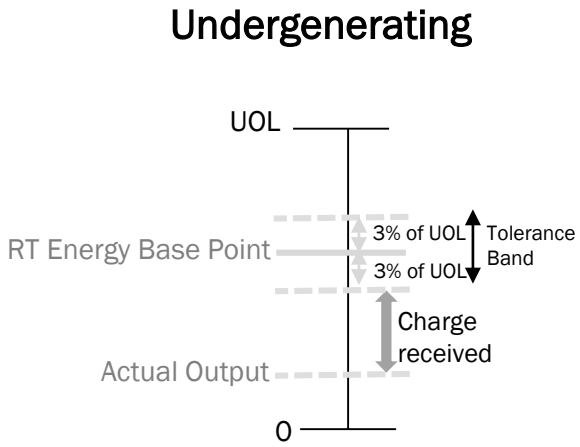
Persistent Undergeneration and Overgeneration charges

- **Under/overgeneration settlement structure was devised to deter suppliers from deviating from the NYISO's real-time dispatch instructions.**
  - Each energy provider is expected to operate within a 3% of Upper Operating Limit(UOL) tolerance from its Base Point.
  - Deviations from this tolerance band result in penalties or disincentives.

Persistent Undergeneration Charge

- **Undergeneration results in an explicit penalty.**
  - Suppliers are charged when they produce less energy than 3% of UOL tolerance band of their RT base points.
  - This penalty is intended to deter suppliers from failing to meet their dispatch instructions.
  - Helps ensure system reliability.



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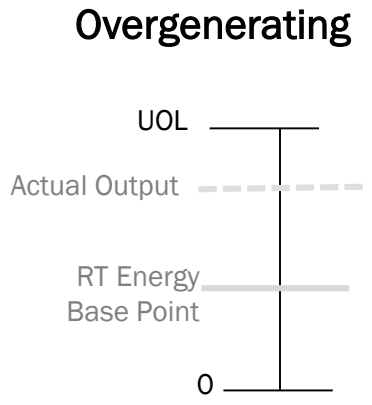
Overgeneration Charges

- **Explicit Overgeneration charges do not apply to traditional generators; they only apply to wind resources.**
  - Overgeneration carries an implied penalty for generators with non-zero fuel costs.
    - The implied penalty is that suppliers are not compensated for the output in excess of [RT basepoint + tolerance]. (tolerance: 3% of UOL)
  - Wind resources are not implicitly incentivized to curtail output due to fuel costs.
    - An explicit overgeneration charge is applied to wind generators that fail to respond to the NYISO's curtailment instructions.
    - The NYISO has proposed that a similar penalty be applied to solar generators in the future.



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Existing Equations for Persistent Under and Over Generation Charges

$$Persistent\ undergeneration\ charge^{1} = Energy\ Difference\ x\ Max\ (MPRCDAM, MPRC_{RT})\ x\ Length\ of\ RT\ interval\ in\ seconds/3600$$
$$Overgeneration\ charge^{2} = Energy\ Difference\ x\ Max\ (MPRCDAM, MPRCRT)\ x\ Length\ of\ RT\ interval\ in\ seconds/3600$$

Where:

- $MPRC_{DAM}$: Regulation Capacity Market Price in the DAM ; ($/MW)
- $MPRC_{RT}$: Regulation Capacity Market Price in RT ; ($/MW)
- Energy Difference for Persistent Undergeneration: RT schedule– Actual Energy ; (MW)
- Energy Difference for Overgeneration : Actual Energy – RT Schedule; (MW)
  - Energy Difference calculation uses a 15 minute duration when determining persistent undergeneration charge
  - Energy Difference *will be set to zero* if:
    - » Calculated value is negative (or)
    - » Calculated value falls within a tolerance (i.e. 3% of UOL)

Notes:

- Under and Overgeneration charges are only applicable to suppliers not providing Regulation Service.
- Overgeneration charges are currently only applicable to wind resources.

1. Section 15.3.A.1 of MST
2. Section 15.3.A.2 of MST

See Accounting and Billing Manual- Section I.7 for additional details

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Equating Tariff and Settlements formula

$$Persistent\ Under\ Generation\ Charge^{1} = Energy\ Difference\ x\ Max\ (MPRCDAM, MPRCRT)\ x\ Length\ of\ RT\ interval\ in\ seconds/3600$$

$$Under\ Generation\ charge\ Settlement\ formula\ for\ one\ RTD\ interval^{2}: = [\max(\{PLU_{gi}^{RT} - EI_{gi}^{RT}\}, 0)\ x\ REGMCP_{gi}^{RT}]\ x\ (s_i^{RT} / 3600\ \text{sec})$$

Where,

g= generator
i = RTD interval
RT = Real Time
s_i^{RT} = Length of RTD interval 'i' ; (seconds)
$REGMCP_{gi}^{RT}$ = Greater of DAM or RT Regulation Capacity Market Price; ($/MW)
EI_{gi}^{RT} = RT output of generator 'g' over RTD interval 'i'; (MW)
PLU_{gi}^{RT} = Penalty Limit for under generation for generator 'g' over RTD interval 'i' ; (MW)
Note: PLU is determined on a rolling 15 minute basis to give the generator time to catch up to its schedule

Tariff	Settlements	Units
Energy Difference	$\max(\{PLU_{gi}^{RT} - EI_{gi}^{RT}\}, 0)$	MW
Max ($MPRC_{DAM}$, $MPRC_{RT}$)	$REGMCP_{gi}^{RT}$	$/MW
Length of RT interval	s_i^{RT}	seconds

1. Section 15.3.A.1 of MST
2. Appendix I.7. of Accounting and Billing Manual

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Charges for ESRs

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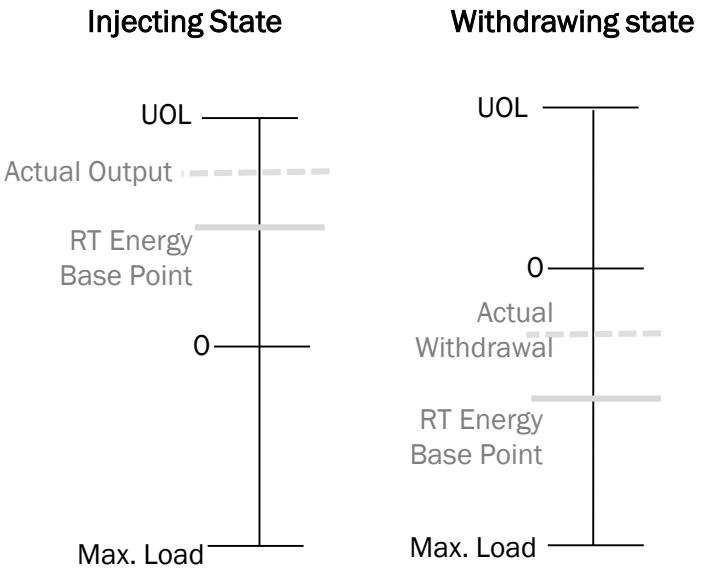
Charges for ESRs

- **ESRs will be subject to charges in both injecting and withdrawing states.**
  - ESRs will be expected to follow their Base Point Signal within a tolerance of 3% of their maximum capability (UOL/Max. Load- for injecting and withdrawing respectively).
- **ESR injections will be subject to existing under and over generation settlement treatment for generators.**
- **ESR withdrawals:**
  - When an ESR is underwithdrawing, the conditions are equivalent to overgenerating.
  - Symmetrically, when an ESR is overwithdrawing, the conditions are equivalent to undergenerating.

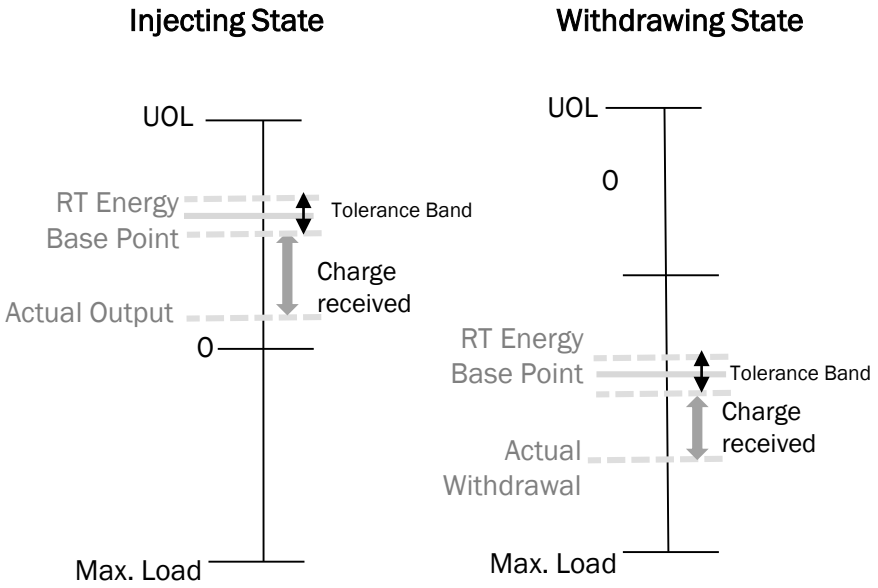
Overgeneration charges for ESRs



- **ESRs will not incur explicit Overgeneration charges:**
  - When an ESR is scheduled to inject and operates above its basepoint (*i.e., overgenerating*) there is an implied penalty embedded in the operational costs.
  - When an ESR is scheduled to withdraw and operates above its basepoint (*i.e., underwithdrawing*) there is an implied penalty in the sense that the ESR will be settled at their scheduled RT Energy Base Point + tolerance.

Assume the ESR has no transition constraints for purpose of this illustration

Persistent Undergeneration charges for ESRs



- **ESRs will incur explicit Undergeneration charges:**
  - When an ESR is scheduled to inject and operates below its basepoint (*i.e.*, undergenerating) there is an explicit undergeneration charge.
  - When an ESR is scheduled to withdraw and operates below its basepoint (*i.e.*, overwithdrawing) *there will be* an explicit overwithdrawing charge.
    - The equation will be the same as the Persistent undergeneration equation used in the tariff[1].
    - Note* : PLU function will need to be modified to reflect the withdrawing state.

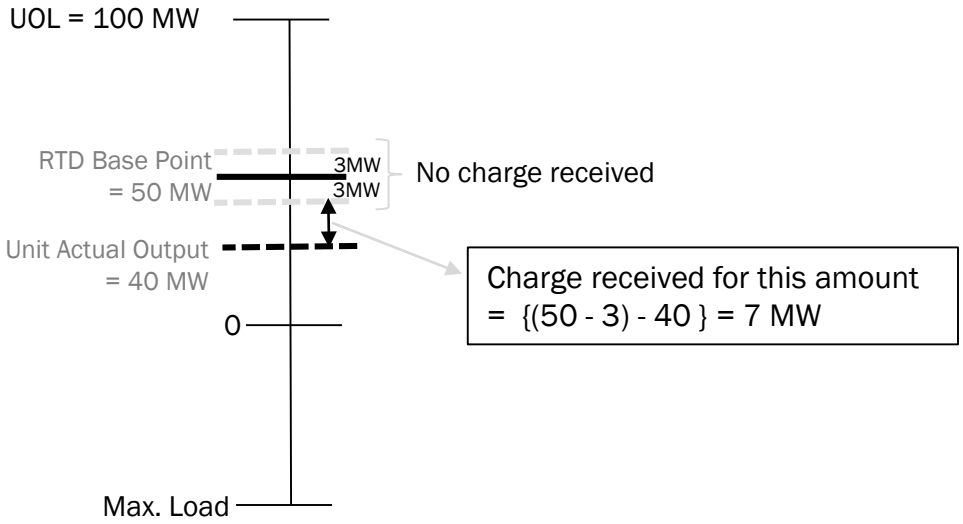
Assume the ESR has no transition constraints for purpose of this illustration

1. Section 15.3.A.1 of MST

Undergeneration Charge for ESRs: Example

- Assume an ESR with:

a) UOL = 100 MW
b) Max Load = -100 MW
c) RTD Base Point = 50 MW
d) Unit Actual Output = 40 MW
e) Length of RT interval = 5 min = 300 sec
f) 3 % of UOL = 3 MW
g) 3% of Max Load = 3 MW



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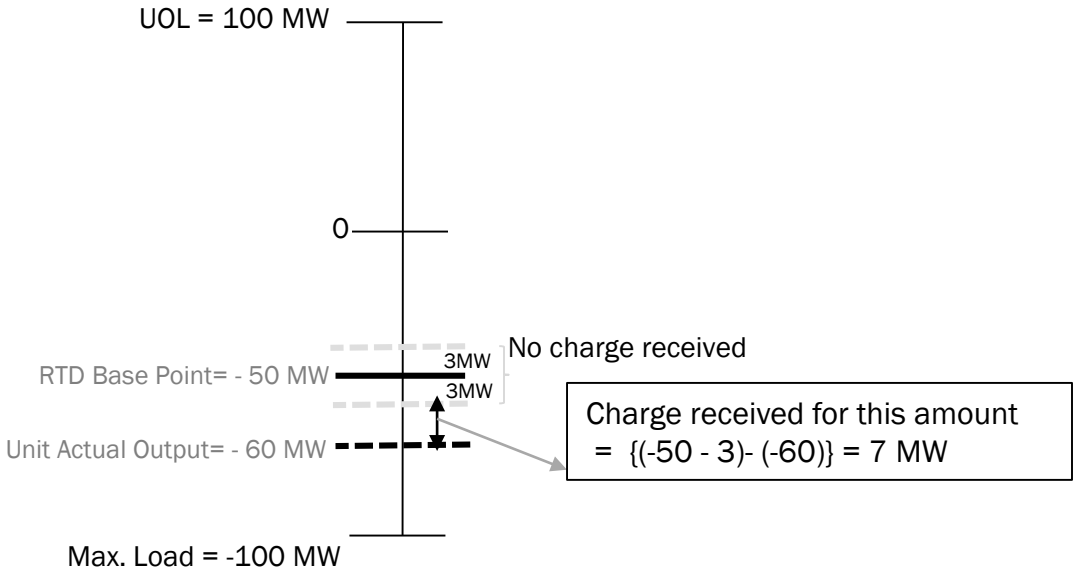
Overwithdrawal Charge for ESRs: Example

- Assume an ESR with:

a) UOL = 100 MW
b) Max Load = -100 MW
c) RTD Base Point = -50 MW
d) Unit Actual Output = -60 MW
e) Length of RT interval = 5 min = 300 sec
f) 3 % of UOL = 3 MW
g) 3 % of Max Load = 3 MW



Next Steps

- July – August 2018:
  - Continue Discussions at MIWG on key topics:
    - Settlements
    - Capacity Market Participation
    - DA and RT market prototyping efforts
    - Mitigation rules
    - Credit implications
    - Consumer impact analysis

- June - September 2018:
  - Draft tariff language and discuss with stakeholders.

- September-November 2018:
  - Prepare and finalize FERC Order No. 841 compliance filing.

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Questions?

We are here to help. Let us know if we can add anything.

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- Planning the power system for the future
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