Day-Ahead Margin Assurance Payments for ESRs

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Agenda

- **Energy Level Management**
  - Background
  - Scheduling examples
- **Day-Ahead Margin Assurance Payments (DAMAP)**
  - DAMAP Eligibility for ESRs
  - DAMAP Calculations and Examples for Self-managed ESRs
- **Next Steps**

Previous Discussions

Date	Working Group	Discussion points and links to materials
05-05-17	MIWG	Proposed modeling enhancements as the cornerstone of the Energy Storage Integration
07-19-17	MIWG	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 managing
05-23-18	MIWG	ESR Participation Model: Settlements
06-19-18	MIWG	ESR Metering
06-25-18	MIWG	ESR Settlements: withdraws for deviating from NYISO Base Points
07-10-18	MIWG	Energy Mitigation Measures for ESRs
07-24-18	MIWG	1) ESR Settlements: Examples and detailed formula 2) ESR: Market Design Update
07-31-18	MIWG	ESR Operating Characteristics

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NYISO Energy Level Management

Energy Level Management - Review

- **ESRs will be able to toggle between Self and NYISO-managed modes between markets.**
  - ESRs will be able to offer as Self-managed in the DAM and NYISO-managed in RTM.
  - ESRs will be able to offer as NYISO-managed in the DAM and Self-managed in RTM.
- **ESRs will not be able to change modes between hours of the DAM.**
  - Because the DA optimization window is 24 hours and only one evaluation per day, the State of withdraw (SoC) constraint will be optimized over a 24 hour horizon. Therefore, an ESR will not be able to toggle between modes in the DAM.
- **ESRs will be able to change modes between hours in the RTM.**

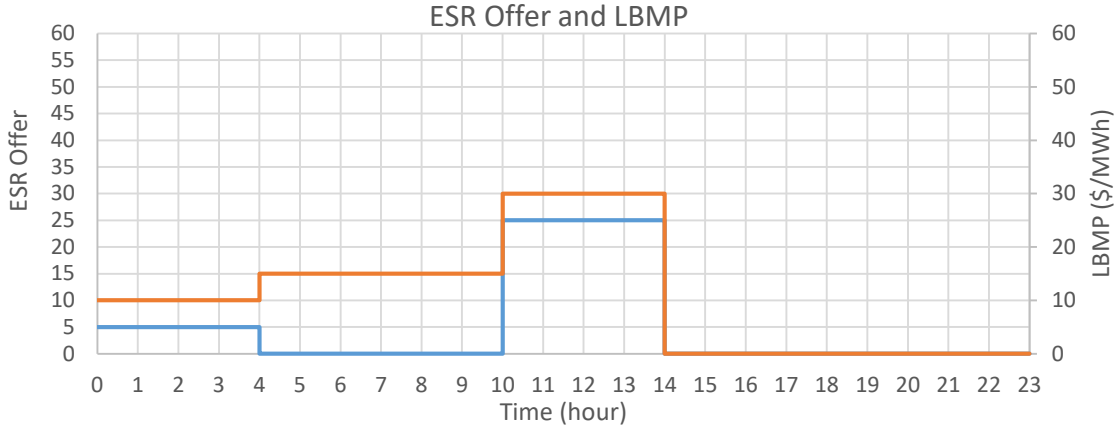
NYISO Energy Level Management in the DAM

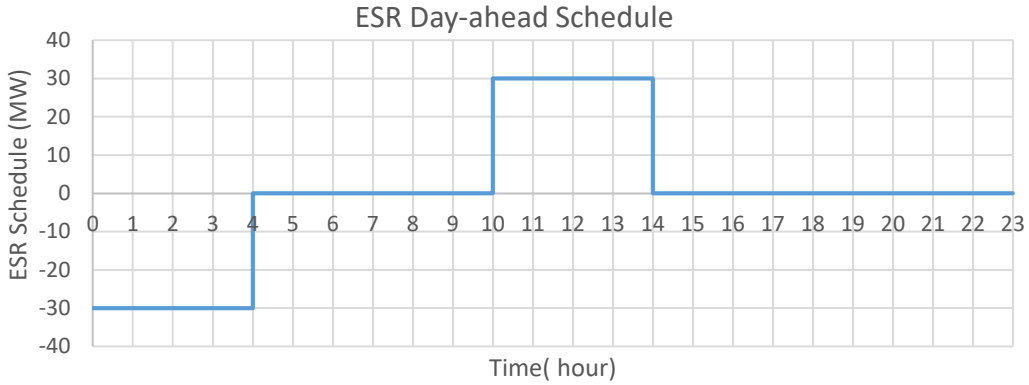
- **SCUC will optimize the spread between ESRs' offers to withdraw and inject over the 24 hour DAM time horizon.**
  - Example: An ESR offers to withdraw when LBMPs are less than or equal to $5/MW, and inject when they are $25/MW or greater.
    - SCUC will ensure that the margin of $20 between withdrawing and injecting offers is preserved over the day.

NYISO Energy Level Management in the DAM

- **ESRs could be scheduled to withdraw or inject uneconomically for individual hours in the DAM.**
- **Example: An ESR offers to withdraw for four hours at less than or equal to $5/MW, and inject for four hours at $25/MW or greater.**
    - SCUC could schedule the ESR to withdraw uneconomically at $10/MW and inject economically at $30/MW.
    - SCUC could also schedule the ESR to withdraw economically at $0/MW and inject uneconomically at $20/MW
    - In either case, the ESR's DA schedule would be economic over the entire day.

NYISO Energy Level Management – DAM Example





- In hours 0-4, an ESR offers to withdraw when LBMPs are less than or equal to $5/MW.
- In hours 10-14, the ESR offers to inject (generate) when the LBMPs are greater than or equal to $25/MW.
- The ESR receives uneconomic schedules in hour 0-4.
- The ESR received economic schedules in hour 10-14.

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NYISO Energy Level Management in the RTM

- **The same paradigm of preserving ESRs' bid spreads will be applied by RTC and RTD in Real Time.**
- **Even when given the exact same set of initial conditions, SCUC, RTC and RTD will produce different schedules for short-duration ESRs because:**
  - SCUC will optimize fuel use (energy level) and other operational and economic constraints over a 24-hour period.
  - RTC will optimize fuel use (energy level) and other operational and economic constraints over a 2.5-hour period.
  - RTD will optimize fuel use (energy level) and other operational and economic constraints over a 1-hour period for online, dispatchable units.

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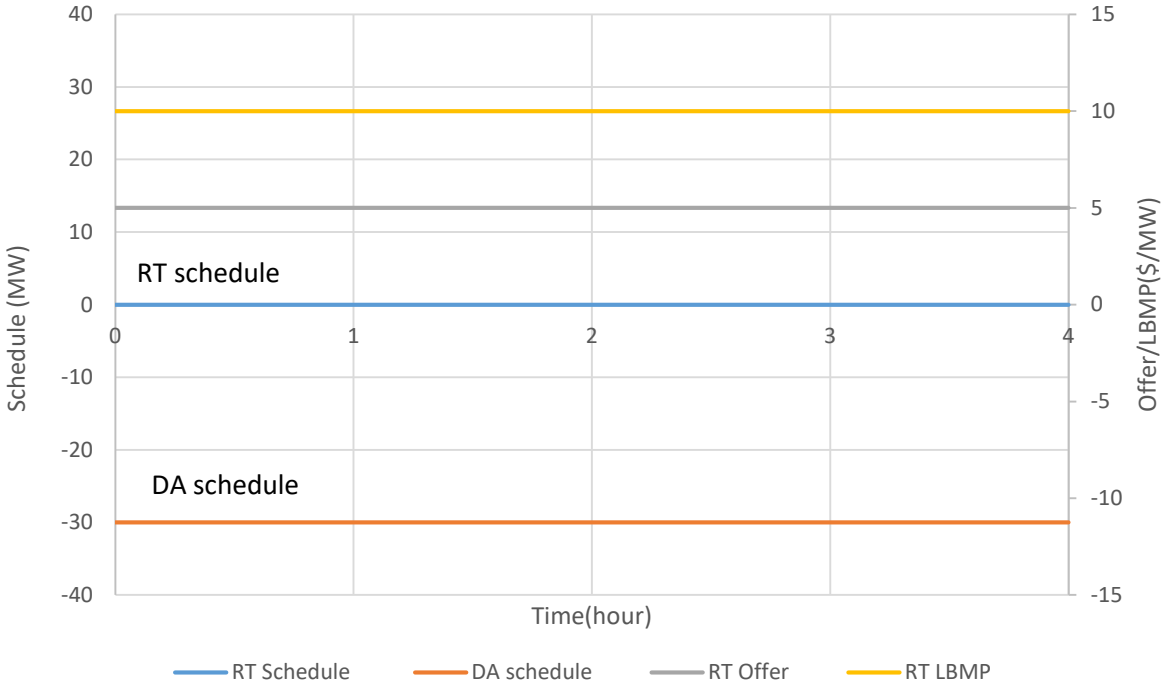
NYISO Energy Level Management – RTM Example



- In hours 0-4, an ESR offers to withdraw when LBMPs are less than or equal to $5/MW.
- The LBMP is $10/MW. Therefore, this ESR is not scheduled to withdraw in RTC as the RTC optimization only looks 2.5 hours ahead.

NYISO Energy Level Management – Example

Description	Values
DA offer = RT offer	For hour 0-4 (-30 to 0)MW at $5 For hour 10-14 (0 to 30)MW at $25
DA LBMP	For hour 0-4; LBMP = $10/MW For hour 10-14 ; LBMP = $30/MW
DA schedule	For hour 0-4; Schedule = -30 MW For hour 10-14; schedule = 30 MW
RT schedule	For hour 0-4; schedule = 0 MW

- SCUC will preserve the $20 spread between withdrawing and injecting over the day.

DAMAP Eligibility for ESRs

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NYISO-managed ESRs: DAMAP Eligibility-Review

- **DAMAP is intended to reimburse a Supplier for any lost Day-Ahead Margin that may result from actions taken by the NYISO in real-time that reduce a Resource's Day-Ahead Margin.**
  - Protecting Generators' Day-Ahead Margins incentivizes them to respond to NYISO instructions in RT.
  - Generators that offer as ISO-Committed Flexible or Self-Committed Flexible for the same hours in the DAM and RTM are eligible for DAMAP (among certain other categories of Suppliers)
  - DAMAP is generally reduced or eliminated when Generators decrease their availability in RT.
- **ESRs participating as NYISO-managed resources in either the DAM or RTM will not be eligible to receive DAMAP.**
  - However, if an ESR is committed OOM for reliability, it will be eligible for DAMAP during that time period.

1. See NYISO MST Attachment J, Section 25.3.3

NYISO-managed ESRs: DAMAP Eligibility

- Offering DAMAP to NYISO-managed resources could result in perverse incentives for ESRs to be paid to do nothing in Real Time (Example provided on slide 16) and/or not to respond to changing Real Time conditions.
- The addition of state of charge (SoC) constraints undermines the purpose of NYISO's DAMAP Settlements calculations.
  - The NYISO expects resources to adjust RT offers to reflect opportunity costs and manage DA balancing obligations.
  - RT offers as NYISO managed resources are subject to RTC and RTD's decisions about how best to use the available fuel over a different, and shorter, time horizon than DA.
- A "DAMAP-like" payment for NYISO-managed ESRs would more closely resemble a lost opportunity cost payment.
  - Lost opportunity cost payments are not available to other Generators.
  - The need for a lost opportunity cost settlement is negated because ESRs and other Generators will be allowed to identify Opportunity Costs in their offers.
- LESRs receive NYISO energy level management[1] today and are also ineligible for DAMAP except under special circumstances when NYISO energy level management is turned off.

1. See NYISO MST Attachment J, Section 25.3.3

NYISO-managed ESRs: DAMAP Eligibility

- **Example 1: An ESR offering as NYISO-managed in the DAM receives a DA schedule to withdraw for the early morning hours of the next day (HB 0 – HB 4).**
  - During the prior day, the ESR operates in RT as Self-managed from HB 0-12 and NYISO-managed from HB 13-24.
  - At HB 0, the ESR is fully depleted and cannot meet its DA schedule.
  - The NYISO must determine whether ESR is unable to meet its DA schedule as a result of NYISO instructions.
    - The ESR's state of charge at HB 0 is a result of NYISO energy level optimization from HB 13-24 during the prior day.
    - The ESR's schedule during HB 13 is a result of the energy that was available at the end of the Self-managing period from HB 0-12 during the prior day.

NYISO-managed ESRs- DAMAP Eligibility

Consider the following conditions for hour beginning HB 0:

Description	Value	Units
DA schedule	-30	MW
RT schedule	0	MW
EOP	0	MW
Actual output	0	MW
RT LBMP	10	$/MW
DA bid	20	$/MW
Lower Limit (LL)	0	MW

- If DAMAP were to be allowed in this scenario, the DAMAP Calculation would be as follows:
  = (DA schedule – LL)* RT LBMP – DA bid from LL to DA schedule
  = (-30-0)*10 – 20*(-30+0) = -300+600 =$300
- The ESR would receive a DAMAP of $300 in addition to its balancing energy payment of $300 for being idle in RT.
- The ESR is incentivized to do nothing rather than modifying its offers to provide its full capabilities in RT.

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Self-managed ESRs: DAMAP Eligibility- Review

- ESRs participating as Self-managed will be eligible to receive DAMAP
  - When offering as Self-Committed Flexible or ISO-committed Flexible Generators that are either online and dispatched by RTD or available for commitment by RTC.
- If an ESR offers as Self-managed in the DAM, it will be ineligible for DAMAP for any hours in which it offers as NYISO-managed in RT, as well as the two hours preceding and two hours following that hour.

DAMAP Eligibility for ESRs- Review

DAM Energy Level Mode	RTM Energy Level Mode	Eligible for DAMAP?
NYISO-managed	Self-managed	No
	NYISO-managed	No
Self- managed	Self-managed	Yes
	NYISO-managed	No (for that hour, previous two hours and next two hours)

DAMAP Calculations for Self-managed ESRs

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Existing DAMAP formula

- **Currently, DAMAP for generators in any RTD interval is determined by:**

$$\text{CDMAP} = \text{CDMAPenergy} + \sum \text{CDMAP}_{\text{reserves}} + \text{CDMAPregulation}$$

Where,
CDMAPenergy = Energy contribution of RTD interval to the DAMAP payment for supplier
CDMAPreserves = Operating Reserve contribution of RTD interval to the DAMAP payments determined separately for each reserve product for supplier
CDMAPregulation = Regulation service contribution of RTD interval to the DAMAP payments for supplier

- **If the Real-Time energy schedule is lower than its Day-Ahead Energy schedule**

$$\text{CDMAP}_{\text{energy}} = ((\text{DA}_{\text{schedule}} - \text{LL}) * \text{RT LBMP} - \int_{\text{LL}}^{\text{DA}_{\text{schedule}}} \text{DA Bid}\ ) * \text{seconds}/3600$$

- Where Lower Limit (LL) =
  a) if RT schedule < EOP; LL = min(max(RT schedule, min(AEI, EOP)), DA schedule) ; or
  b) if RT schedule >= EOP ; LL = min(RT schedule, max(AEI, EOP), DA schedule)

  Where
  [$\text{DA}_{\text{schedule}}$ –Lower Limit (LL)] term determines the MWs that will be protected through DAMAP payments
  EOP = Economic operating Point calculated without regards to ramp rate
  AEI = Average Actual Energy injection but limited to RTschedule + Compensable overgeneration

1. See NYISO MST Attachment J, Section 25.3.1

Existing DAMAP formula- Contd.

- **If the Real-Time Energy schedule is greater than its Day-Ahead Energy schedule then:**

$$\text{CDMAP}_{\text{energy}} = \min[((\text{DA}_{\text{schedule}} - \text{UL}) * \text{RT LBMP} - \int_{\text{DA}_{\text{schedule}}}^{\text{UL}} \text{RT Bid}\ ) * \frac{\text{seconds}}{3600}, 0]$$

Where Upper Limit (UL) =

a) if RT schedule >= EOP >= DA schedule; UL = max(min(RT schedule, max(AEI, EOP)), DA schedule) ; or

b) Otherwise ; UL = max(RT schedule, min(AEI, EOP), DA schedule)

Where,

[$\text{DA}_{\text{schedule}}$ – Upper Limit (UL)]- term determines the MWs that will be offset from DAMAP payments

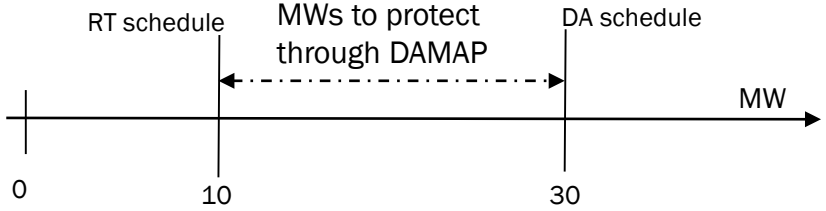
DAMAP Scenarios for ESRs

- **Self-managed ESRs will be eligible for DAMAP both in the injecting and withdrawing states.**
- **The DA state (injecting/withdrawing) will be used to determine which formula to use to calculate DAMAP.**
- **When an ESR is scheduled to inject in the DA market, the DAMAP calculations will be similar to current DAMAP calculations .**
  - If an ESR's RT schedule is to inject
    - The existing DAMAP construct works (Scenario 1).
  - If an ESR's RT schedule is to withdraw
    - The lower limit (LL) will be limited to "0" to account for intervals when the ESR is scheduled to withdraw in RT (Scenario 2).
- **When an ESR is scheduled to withdraw in the DA market, the Lower limit and Upper limit calculations used in the DAMAP formulation need to be revised.**
  - ESR's RT schedule is to withdraw (Scenario 3)
  - ESR's RT schedule is to inject (Scenario 4)

Scenarios for DAMAP – DA Schedule to Inject

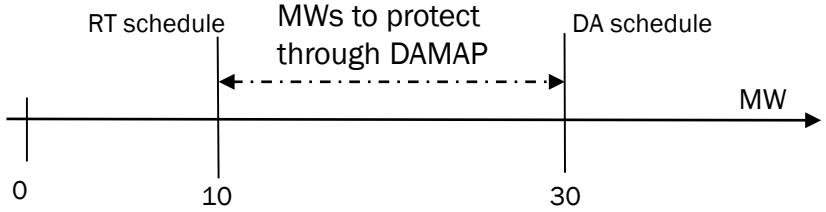
- RT schedule < DA schedule

Generator

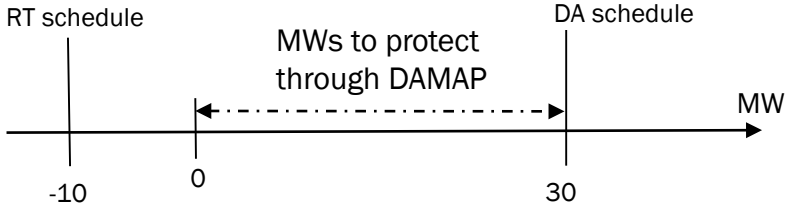


ESR

Scenario1



Scenario 2

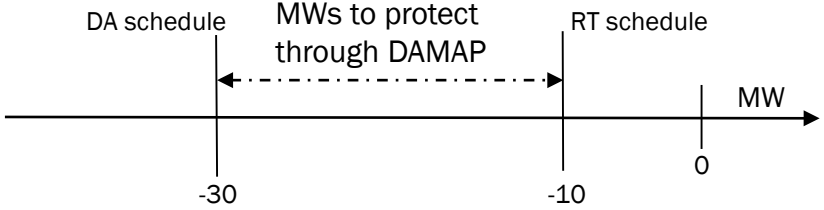


When an ESR's DA schedule is to inject, and the RT schedule is to withdraw, the maximum number of MWs to protect through DAMAP are from 0 to DA schedule.

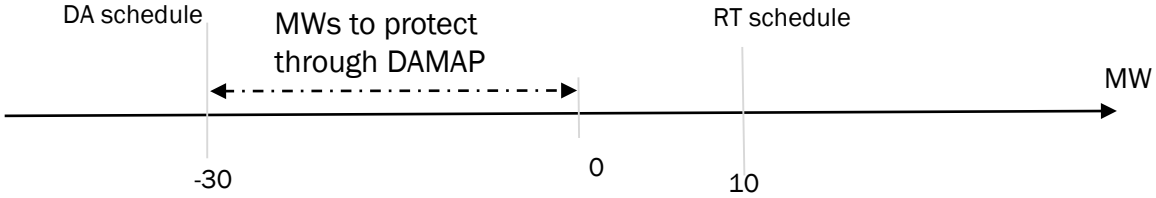
Scenarios for DAMAP – DA Schedule to withdraw

- When the magnitude of an ESR's RT schedule to withdraw is lower than the magnitude of its DA schedule to withdraw

Scenario 3



Scenario 4



- When an ESR's DA schedule is to withdraw, and the RT schedule is to generate, the maximum number of MWs to protect through DAMAP are from 0 to DA schedule.

DAMAP construct for ESRs

- If an ESR is scheduled to inject in the DAM, its DAMAP will be calculated similar to today.

$$\text{CDMAP} = \text{CDMAPenergy} + \sum \text{CDMAP}_{\text{reserves}} + \text{CDMAPregulation}$$

- The CDMAPreserves and CDMAPregulation terms will be calculated similar to today.
- The CDMAPenergy term will be calculated as follows:
  - If the Real-Time energy schedule is lower than the Day-Ahead energy schedule to inject

$$\text{CDMAP}_{\text{energy}} = ((\text{DA}_{\text{schedule}} - \text{LL}) * \text{RT LBMP} - \int_{\text{LL}}^{\text{DA}_{\text{schedule}}} \text{DA Bid}\ ) * \text{seconds}/3600$$

Where Lower Limit (LL) =
a) if RT schedule < EOP
LL = max(min(max(RT schedule, min(AEI, EOP)), DA schedule),0) ; or
b) if RT schedule >= EOP
LL = max(min(RT schedule, max(AEI, EOP), DA schedule),0)

- The lower limit is limited to '0'

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DAMAP construct for ESRs Contd.

- **If the Real-Time Energy schedule is greater than the Day-Ahead Energy schedule to inject then:**

$$\text{CDMAP}_{\text{energy}} = \min[((\text{DA}_{\text{schedule}} - \text{UL}) * \text{RT LBMP} - \int_{\text{DA}_{\text{schedule}}}^{\text{UL}} \text{RT Bid}\ ) * \frac{\text{seconds}}{3600}, 0]$$

Where Upper Limit (UL) =

a) if RT schedule >= EOP >= DA schedule

UL = max(min(RT schedule, max(AEI, EOP)), DA schedule) ; or

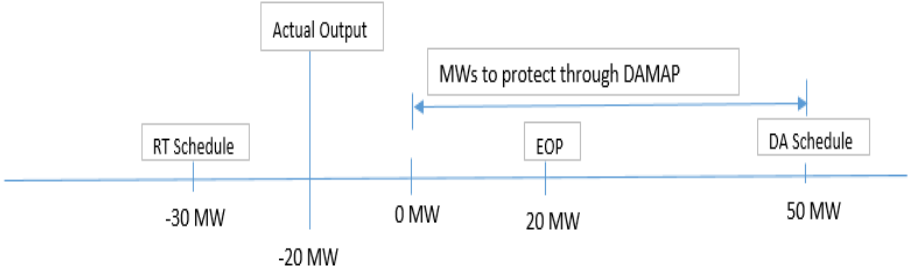
b) Otherwise

UL = max(RT schedule, min(AEI, EOP), DA schedule)

DAMAP Construct for ESRs- Example 1

- Scenario 2: RT schedule is lower than DA schedule to inject and;
- RT schedule < EOP

Parameters	Values	Units
DA schedule	50	MW
RT schedule	-30	MW
Actual Output	-20	MW
AEI	-20	MW
EOP	20	MW
RT LBMP	20	$/MW
DA Bid	40	$
Length of interval	0.08	hour
Results	**Values**	**Units**
Lower Limit	0	MW
Bid cost	2000	$
DAMAP	**-83.33**	**$**

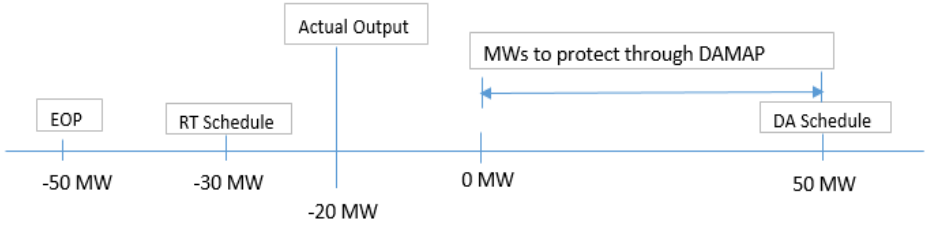


- LL = max(min(max(RT schedule, min(AEI, EOP)), DA schedule),0)
  LL = max(min(max(-30, min(-20,20)), 90),0) = 0
- DAMAP = $((\text{DAschedule} - \text{LL}) * \text{RT LBMP} - \int_{\text{LL}}^{\text{DA}_{\text{schedule}}} \text{DA Bid}) * \text{seconds}/3600$
  $\text{DAMAP}_{\text{energy}}$ = [(50 - 0)*20 – 40*(50 - 0)] *300/3600
  $\text{DAMAP}_{\text{energy}}$ = [1000 – 2000]*0.0833 = - $83.33

DAMAP Construct for ESRs- Example 2

- Scenario 2: RT schedule is lower than DA schedule to inject and ;
- RT schedule > EOP

Parameters	Values	Units
DA schedule	50	MW
RT schedule	-30	MW
Actual Output	-20	MW
AEI	-20	MW
EOP	-50	MW
RT LBMP	5	$/MW
DA Bid	40	$
Length of interval	0.08	hour
Results	**Values**	**Units**
Lower Limit	0	MW
Bid cost	2000	$
DAMAP	**-145.83**	**$**



- LL = max(min(RT schedule, max(AEI, EOP), DA schedule),0)
  LL = max(min(-30, max(-27,-50), 50),0) = 0
- DAMAP = $((\text{DAschedule} - \text{LL}) * \text{RT LBMP} - \int_{\text{LL}}^{\text{DA}_{\text{schedule}}} \text{DA Bid}) * \text{seconds}/3600$

  $\text{DAMAP}_{\text{energy}}$ = [(50 - 0)*5 – 50*(40 - 0)] *300/3600
  $\text{DAMAP}_{\text{energy}}$ = (250 - 2000)*0.0833 = - $145.83

DAMAP construct for ESRs

- If an ESR is scheduled to withdraw in the DAM, its DAMAP will be calculated as follows.

$$CDMAP = CDMAP_{\text{energy}} + \sum CDMAP_{reserves} + CDMAP_{\text{regulation}}$$

- The CDMAPreserves and CDMAPregulation terms will be calculated similar to today.
- The CDMAPenergy term will be calculated as follows:
  - If a) the Real-Time Energy schedule is to inject or b) the magnitude of the Real-Time Energy schedule to withdraw is lower than the magnitude of its Day-Ahead Energy schedule to withdraw

$$\text{CDMAP}_{\text{energy}} = ((\text{DA}_{\text{schedule}} - \text{LL}) * \text{RT LBMP} - \int_{\text{LL}}^{\text{DA}_{\text{schedule}}} \text{DA Bid}\ ) * \text{seconds}/3600$$

Where Lower Limit (LL) =
a) If RT schedule >= EOP >= DA schedule
If Actual < EOP ; LL = min(max(DA schedule, min(Actual Output, EOP)), RT schedule,0)
If Actual > EOP; LL = min(max(DA schedule, Actual Output, EOP), RT schedule,0)

b) Otherwise
LL = min(max(DA schedule, min(Actual Output, EOP)), RT schedule,0)

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DAMAP construct for ESRs Contd.

- **If the magnitude of the Real-Time Energy schedule to withdraw is greater than the magnitude of the Day-Ahead Energy schedule to withdraw then:**

$$\text{CDMAP}_{\text{energy}} = \min[((\text{DA}_{\text{schedule}} - \text{UL}) * \text{RT LBMP} - \int_{\text{DA}_{\text{schedule}}}^{\text{UL}} \text{RT Bid}\ ) * \frac{\text{seconds}}{3600}, 0]$$

Where Upper Limit (UL) =

1) if RT schedule <= EOP

a) If Actual < RT schedule; UL = min(RT schedule, Actual, EOP, DA schedule)

b) If RT schedule < Actual < EOP; UL = min(max(RT schedule, min(Actual Output, EOP), DA schedule)

c) If Actual > EOP ; UL = min(max(RT schedule, Actual Output, EOP), DA schedule)

2) RT schedule >= EOP

a) If Actual < EOP ; UL = min(RT schedule, Actual Output, EOP , DA schedule)

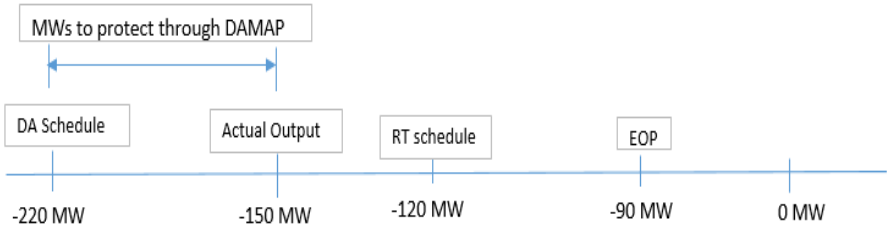
b) If EOP < Actual < RT schedule ; UL = min(RT schedule, max(Actual Output, EOP), DA schedule)

c) If Actual > RT schedule ; UL = min(max(RT schedule, Actual Output, EOP), DA schedule)

DAMAP Construct for ESRs- Example 3

- Scenario 3: Magnitude of RT schedule to withdraw is lower than the magnitude of the DA schedule to withdraw and;
- RT schedule < EOP

Parameters	Values	Units
DA schedule	-220	MW
RT schedule	-120	MW
Actual Output	-150	MW
EOP	-90	MW
RT LBMP	5	$/MW
DA Bid	2	$
Length of interval	0.08	hour
Results	**Values**	**Units**
Lower Limit	-150	MW
DA Bid cost	-140	$
DAMAP	**-17.50**	**$**



- LL = min(max(DA schedule, min(Actual, EOP)), RT schedule)
  LL = min(max(-220, min(-150, -90)), -120) = -150
- DAMAP = $((\text{DAschedule} - \text{LL}) * \text{RT LBMP} - \int_{\text{LL}}^{\text{DA}_{\text{schedule}}} \text{DA Bid}) * \text{seconds}/3600$
  $\text{DAMAP}_{\text{energy}}$ = [(-220 +150))*5 – 2*(-220 +150)] *300/3600
  $\text{DAMAP}_{\text{energy}}$ = [-350 +140]*0.0833 = - $17.50

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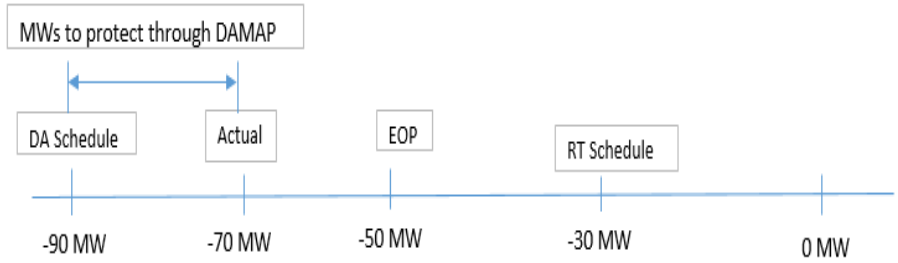
DAMAP Construct for ESRs- Example 4

- Scenario 3: Magnitude of RT schedule to withdraw is lower than the magnitude of the DA schedule to withdraw and;
- RT schedule > EOP and Actual Output < EOP

Parameters	Values	Units
DA schedule	-90	MW
RT schedule	-30	MW
Actual Output	-70	MW
EOP	-50	MW
RT LBMP	8	$/MW
DA Bid	5	$
Length of interval	0.08	hour
Results	**Values**	**Units**
Lower Limit	-70	MW
DA Bid cost	-100	$
DAMAP	**-5.00**	**$**



- LL = min(max(DA schedule, min(Actual, EOP)), RT schedule)
  LL = min(max(-90, min(-70, -50)), -30) = -70
- DAMAP = $((\text{DAschedule} - \text{LL}) * \text{RT LBMP} - \int_{\text{LL}}^{\text{DA}_{\text{schedule}}} \text{DA Bid}) * \text{seconds}/3600$
  $\text{DAMAP}_{\text{energy}}$ = [(-90 + 70))*8 – 5*(-90 + 70)] *300/3600
  $\text{DAMAP}_{\text{energy}}$ = [-160 +100]*0.0833 = - $5

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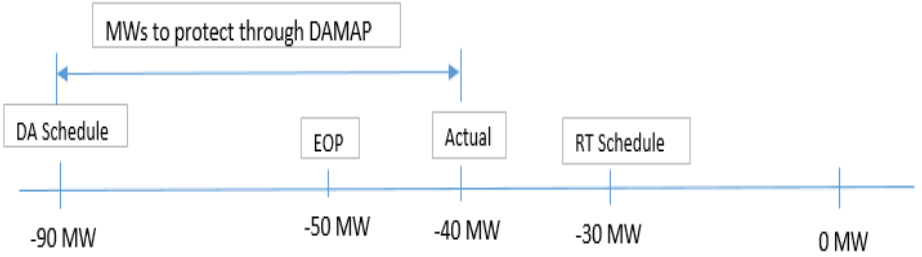
DAMAP Construct for ESRs- Example 5

- Scenario 3: Magnitude of RT schedule to withdraw is lower than the magnitude of the DA schedule to withdraw and;
- RT schedule > EOP and Actual Output > EOP

Parameters	Values	Units
DA schedule	-90	MW
RT schedule	-30	MW
Actual Output	-40	MW
EOP	-50	MW
RT LBMP	8	$/MW
DA Bid	5	$
Length of interval	0.08	hour
Results	**Values**	**Units**
Lower Limit	-40	MW
Bid cost	-250	$
DAMAP	**-12.50**	**$**



- LL = min(max(DA schedule, Actual, EOP), RT schedule)
  LL = min(max(-90, -40, -50)), -30) = -40
- DAMAP = $((\text{DAschedule} - \text{LL}) * \text{RT LBMP} - \int_{\text{LL}}^{\text{DA}_{\text{schedule}}} \text{DA Bid}) * \text{seconds}/3600$
  $\text{DAMAP}_{\text{energy}}$ = [(-90 + 40))*8 – 5*(-90 + 40)] *300/3600
  $\text{DAMAP}_{\text{energy}}$ = [-400 +250]*0.0833 = - $12.50

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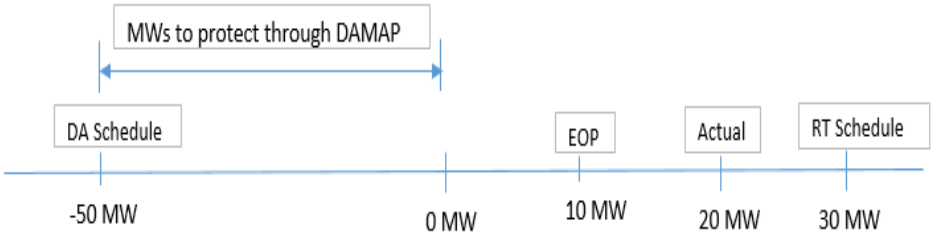
DAMAP Construct for ESRs- Example 6

- Scenario 4: DA schedule is to withdraw and RT schedule is to inject;
- RT schedule > EOP

Parameters	Values	Units
DA schedule	-50	MW
RT schedule	30	MW
Actual Output	20	MW
EOP	10	MW
RT LBMP	20	$/MW
DA Bid	10	$
Length of interval	0.08	hour
Results	**Values**	**Units**
Lower Limit	0	MW
Bid cost	-500	$
DAMAP	**-41.67**	**$**



- LL = min(max(DA schedule, Actual, EOP), RT schedule,0)
  LL = min(max(-50, 20, 10), 30, 0) = 0
- DAMAP = $((\text{DAschedule} - \text{LL}) * \text{RT LBMP} - \int_{\text{LL}}^{\text{DA}_{\text{schedule}}} \text{DA Bid}) * \text{seconds}/3600$
  $\text{DAMAP}_{\text{energy}}$ = [(-50 - 0)*20 – 10*(-50 - 0)] *300/3600
  $\text{DAMAP}_{\text{energy}}$ = [-1000 + 500]*0.0833 = - $41.67

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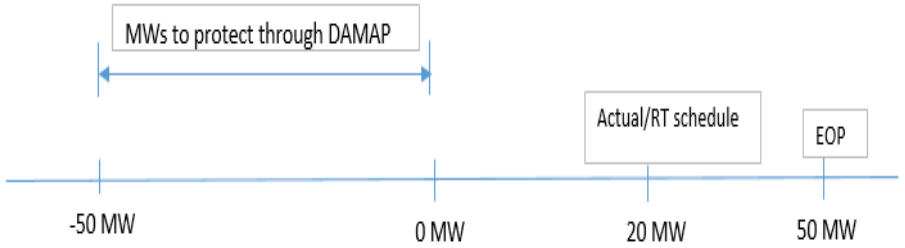
DAMAP Construct for ESRs- Example 7

- Scenario 4: DA schedule is to withdraw and RT schedule is to inject;
- RT schedule < EOP

Parameters	Values	Units
DA schedule	-50	MW
RT schedule	20	MW
Actual Output	20	MW
EOP	50	MW
RT LBMP	25	$/MW
DA Bid	10	$
Length of interval	0.08	hour
Results	**Values**	**Units**
Lower Limit	0	MW
Bid cost	-500	$
DAMAP	**-62.50**	**$**



- LL = min(max(DA schedule, min(Actual, EOP)), RT schedule,0)
  LL = min(max(-50, min(20, 50)), 20, 0) = 0
- DAMAP = $((\text{DAschedule} - \text{LL}) * \text{RT LBMP} - \int_{\text{LL}}^{\text{DA}_{\text{schedule}}} \text{DA Bid}) * \text{seconds}/3600$
  $\text{DAMAP}_{\text{energy}}$ = [(-50 - 0)*25 – 10*(-50 - 0)] *300/3600
  $\text{DAMAP}_{\text{energy}}$ = [-1250 + 500]*0.0833 = -62.50

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Next Steps

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

- July - September 2018:
  - Draft Tariff language and discuss with stakeholders.

- December 3, 2018:
  - FERC Order No. 841 compliance filing.

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Questions?

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

The Mission of the New York Independent System Operator, in collaboration with its stakeholders, is to serve the public interest and provide benefits to consumers by:

- Maintaining and enhancing regional reliability
- Operating open, fair and competitive wholesale electricity markets
- Planning the power system for the future
- Providing factual information to policy makers, stakeholders and investors in the power system

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