

Energy Work Stream: Two Settlement Scenarios and Make-Whole Payment Design Considerations

July 19, 2018

Two Settlement Topics Covered Today

- Today's session will provide stakeholders with:
 - Two-settlement revenue vs. profit scenario when balancing energy and reserve schedules in real-time
 - Considerations for developing guidelines for the real-time make whole payment during detailed design

REVENUE VS. PROFIT SCENARIO FOR DISPATCHABLE RESOURCES

Two-Settlement Scenarios

- Scenarios were originally presented in May to highlight two settlement outcomes for changes to day-ahead energy and operating reserve schedules
 - Only revenues were considered which can be misleading without considering a resource's offer costs
- One of these scenarios are being revisited today to show revenue vs. profit outcomes
 - Shows that resources should benefit from two settlement when their DAM schedules change due to a real time price change

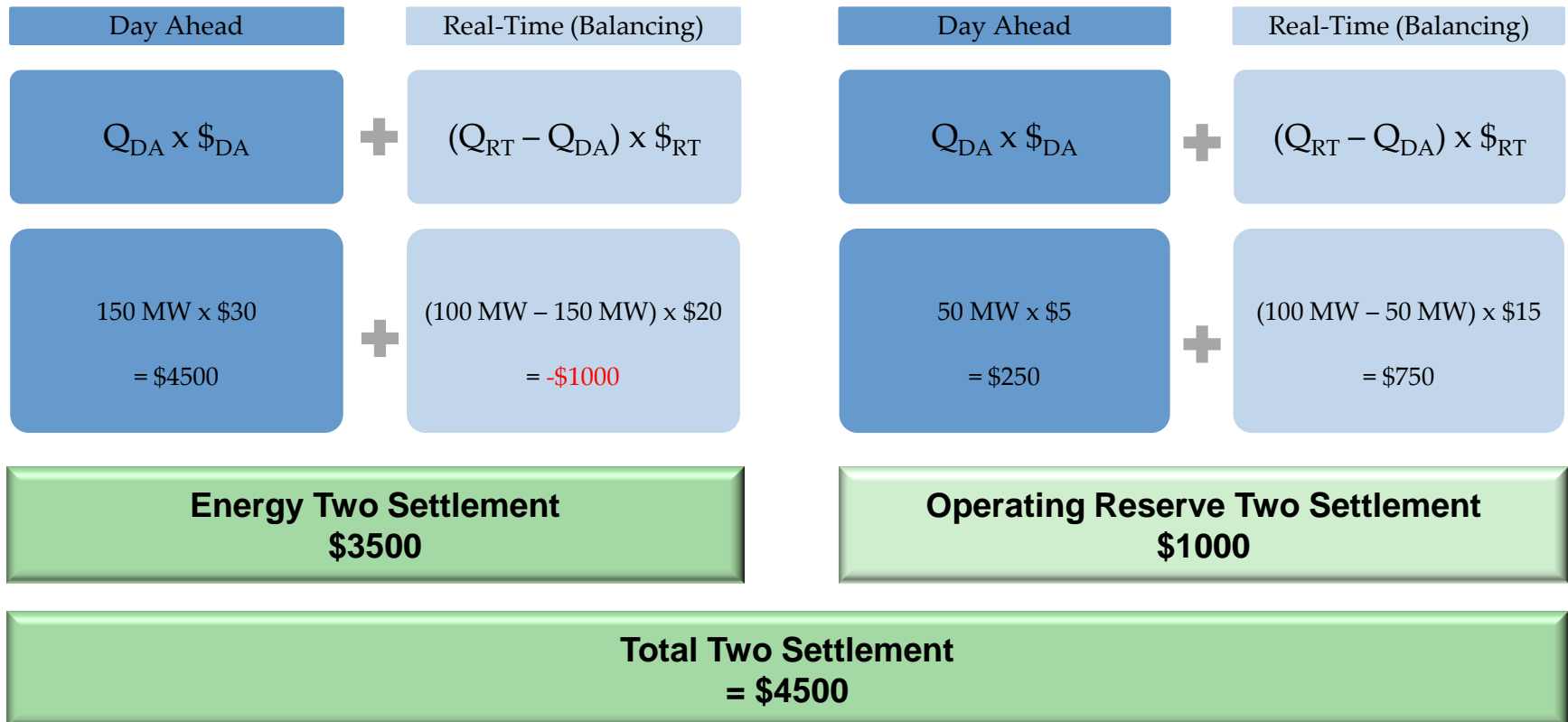
Scenario: Real-Time Energy Reduced and Reserve Schedule Increased

	Offer Costs	Day Ahead	Real-Time
Energy	<p>150MW at \$30</p> <p>100MW at \$20</p>	<p>Generator Cleared 150 MW</p> <p>DAM price \$30</p>	<p>Actual Production 100 MW</p> <p>RT Price \$20</p>
Operating Reserve	<p>100MW at \$10</p> <p>50MW at \$0.5</p>	<p>Generator Cleared 50 MW</p> <p>DAM price \$5</p>	<p>Generator Cleared 100 MW</p> <p>RT price \$15</p>

Scenario: Real-Time Energy Reduced and Reserve Schedule Increased

Energy

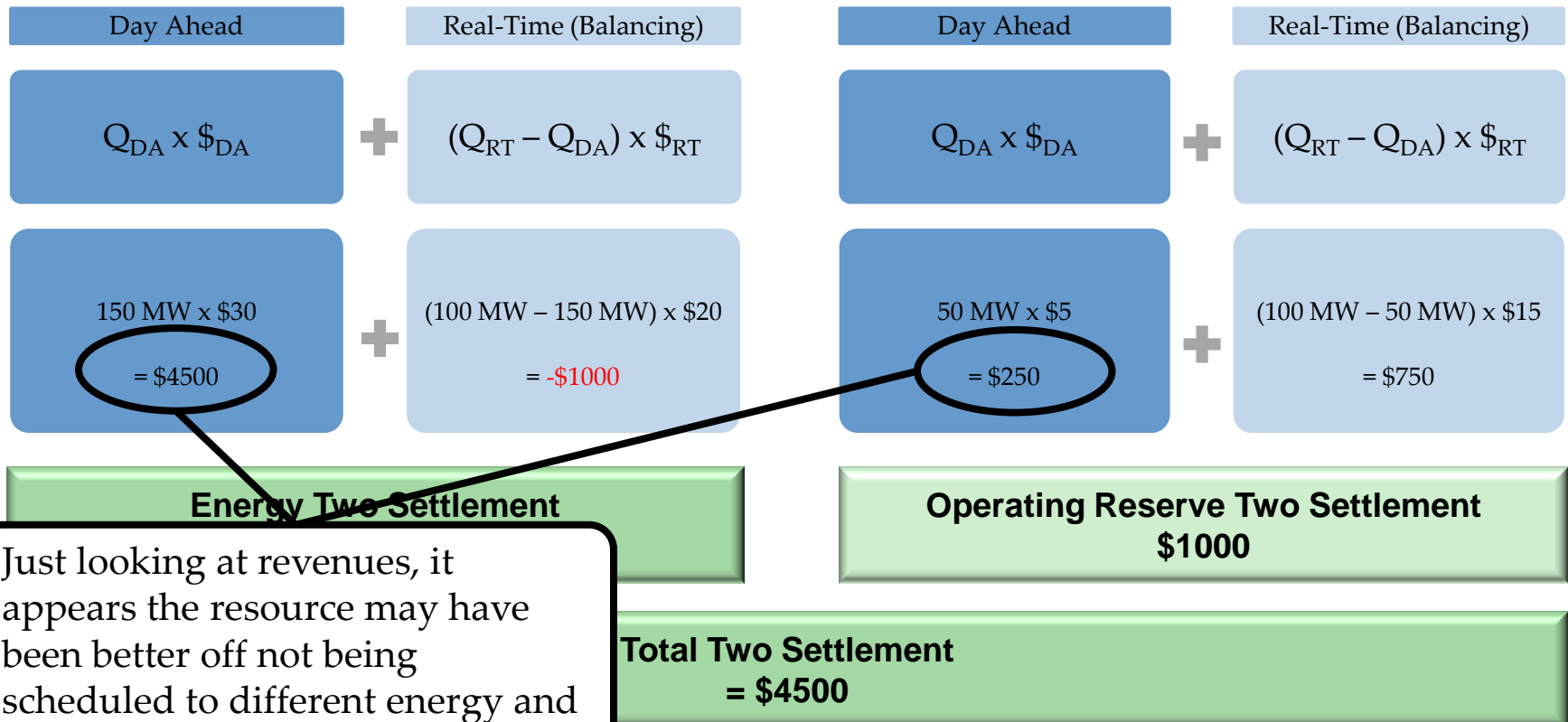
Operating Reserve



Scenario: Real-Time Energy Reduced and Reserve Schedule Increased

Energy

Operating Reserve



Just looking at revenues, it appears the resource may have been better off not being scheduled to different energy and reserve quantities in real-time.

Scenario: Real-Time Energy Reduced and Reserve Schedule Increased

	Energy		Operating Reserve	
	Day Ahead	Real-Time (Balancing)	Day Ahead	Real-Time (Balancing)
Revenue	150 MW × \$30 = \$4500	-\$1000	\$250	(100 MW – 50 MW) × \$15 = \$750
Cost	100MW × \$20 + 50MW × \$30 = \$3500	+ - (50MW × \$30) = -\$1500	50MW × \$0.5 = \$25	+ 50MW × \$10 = \$500
Net Profit	\$4500 - \$3500 = \$1000	-\$1000 - (-\$1500) = \$500 (Saving)	\$250 - \$25 = \$225	\$750 - \$500 = \$250
	Two Settlement Energy Profit \$1500		Two Settlement Operating Reserve Profit \$475	

However, when looking at the resource's offer costs, the net two settlement profit is actually higher

CONSIDERATIONS FOR REAL TIME MAKE WHOLE PAYMENT DESIGN

Recap: Make Whole Payment Design

DAM Make-Whole

Apply when DAM revenues < DAM as-offered costs

Encourages suppliers and loads to bid/offer their actual expected costs.

Pre-Dispatch Make-Whole

For NQS Resources Only
Apply when RTM revenues < Pre-Dispatch as-offered costs

Encourage NQS to make offers that reflect their underlying costs.
Energy offers above MLP need not account for start-up costs.

Real-Time Make-Whole

Apply when resource are constrained-up or constrained-down

Provides appropriate incentives for resources to follow IESO dispatch instructions & better operational certainty for IESO.

Real-Time Make Whole Payment Scenarios

- As done in previous engagement sessions, IESO was looking to bring forward make whole payments interactions between the DAM and real-time balancing markets
 - To provide stakeholders with a consolidated view of preliminary design decisions made within SSM, ERUC and DAM
- Working assumptions were that real-time make whole payment guidelines would be valid for DAM and real-time

Real-Time Make-Whole Payment Guidelines

- Real-time make whole payment may be required during:
 - Constrained-Up Events
 - Eligible when a resource is dispatched to produce more energy than the quantity implied by LMP
 - Would make a resource whole to its operating cost
 - Constrained-Down Events
 - Eligible when a resource is dispatched to produce less energy than the quantity implied by LMP
 - Would make a resource whole to its potential operating profit

Real-Time Make-Whole Payment Guidelines when Considering Two Settlement

- Looking at DAM and real-time in isolation, these make whole payment guidelines would provide the correct incentives for resources to follow their dispatches
- Under two settlement however, these same guidelines could result in unnecessary overpayments when constrained up and down events occur in both DAM and real-time
- Alternate guidelines are therefore required to maintain dispatch incentives without generating unnecessary uplift costs in the form of make whole over-payment

Two Settlement Make Whole Payment Analysis

- The scenarios being presented today will demonstrate instances where the real-time make-whole payment guidelines would make sense and where they would not, respectively:
 - **Scenario 1:** shows a resource only constrained-up in real-time and receives a real-time make-whole payment to cover its costs.
 - **Scenario 2:** shows a resource constrained-up in both DAM and real-time and receiving a real-time make-whole payment resulting in a potential overpayment.

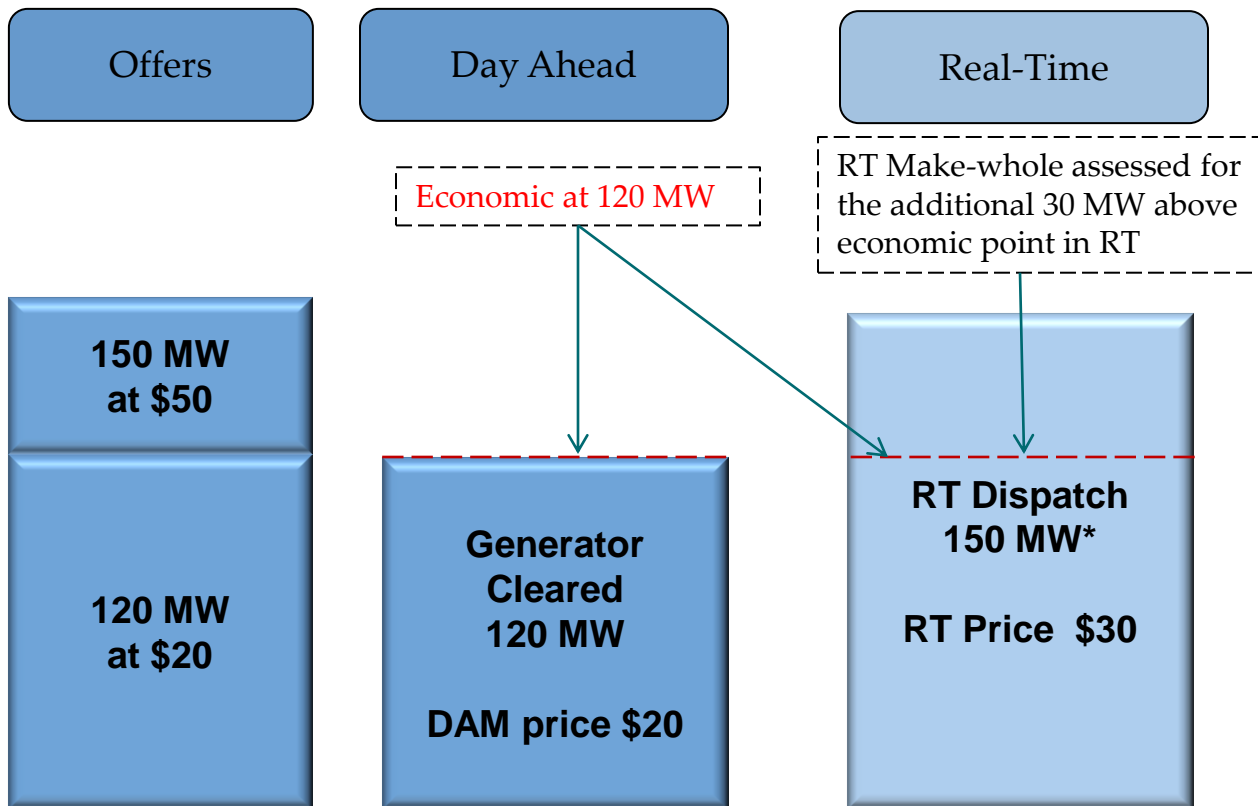
Scenario 1: Scheduled economically in DAM and Constrained-Up in Real-Time

Day-Ahead: The generator is scheduled economically at 120 MW at a price of \$20

Real-Time: The generator is constrained-up to 150 MW above its economic point of 100 MW at a price of \$30

- The generator earns \$30/MW for each additional MW generated above its economic point however it cost \$50/MW to produce the additional MW of energy.

Scenario 1: Scheduled economically in DAM and Constrained-Up in Real-Time



*Assumes Actual Production = RT Dispatch

DAM Component	Total
DAM Revenue	\$2400
DAM Energy Costs	\$2400
DAM Make-Whole	\$0
DAM Settlement	\$2400

RT Balancing Settlement ($Q_{RT} - Q_{DA}$) × \$ _{RT} (150 - 120) × \$30 = \$900

RT Component	Total
Revenue	\$900
Energy Cost	\$1500
RT Make-Whole	\$600

Net Settlement (DAM + RT balancing + RT) \$2400 + \$900 + 600 = \$3900
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Net Profit (Net Settlement - Cost) \$3900 - \$3900 = \$0
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Scenario 1: Observations

- The generator receives a real-time make-whole payment to cover its cost for providing the additional 30 MW above its operating cost.
- The generator breaks-even and is not worse off financially for following IESO dispatch instructions.

Scenario 2: Constrained-Up in DAM and in Real-Time

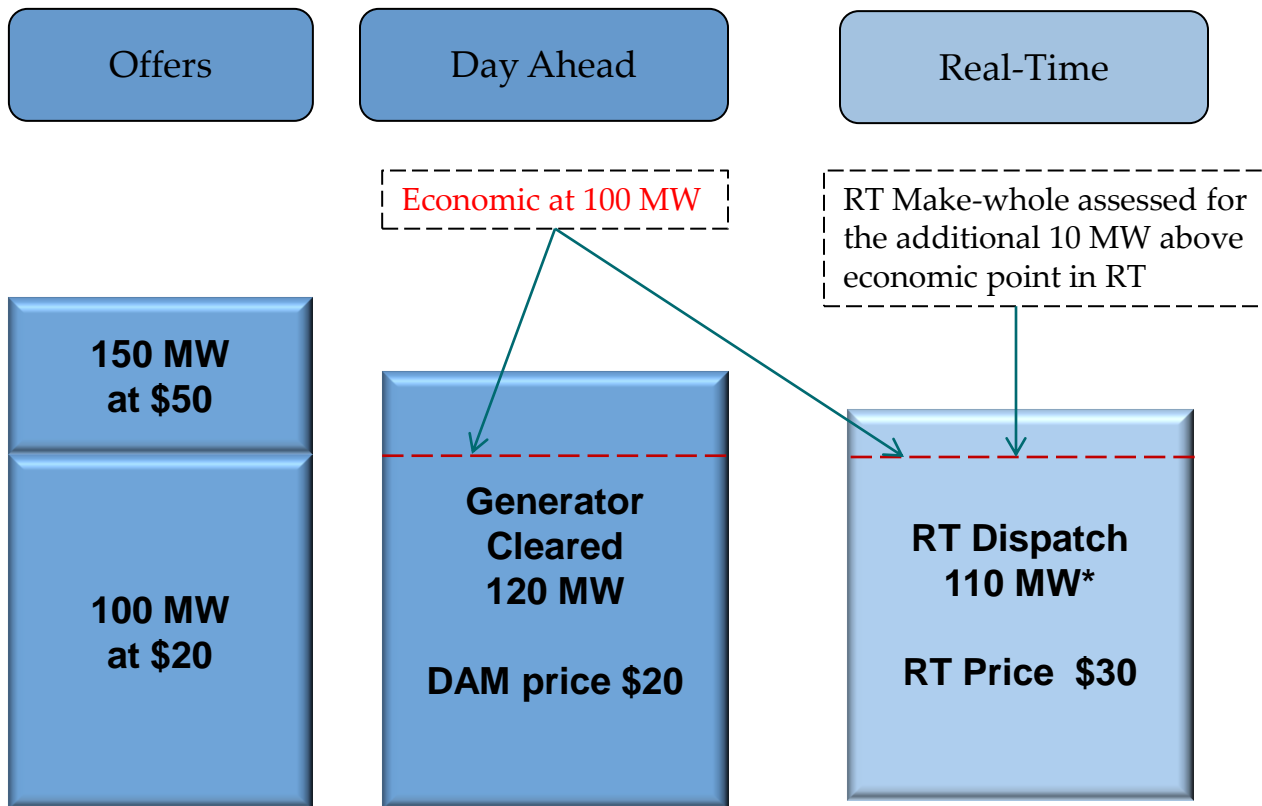
Day-Ahead: The generator is constrained-up to 120 MW above its economic point of 100 MW at a price of \$20

- It receives a DAM make-whole payment to cover its cost for providing 20 MW of energy uneconomically.

Real-Time: The generator is constrained-up to 110 MW above its economic point of 100 MW at a price of \$30

- It buys back 10 MW of its DAM schedule at a higher real-time price
- It receives a real-time make-whole payment for the additional 10 MW constrained above its optimal operating point.

Scenario 2: Constrained-Up in DAM and in Real-Time



*Assumes Actual Production = RT Dispatch

DAM Component	Total
DAM Revenue	\$2400
DAM Energy Costs	\$3000
DAM Make-Whole	\$600
DAM Settlement	\$3000

RT Balancing Settlement ($Q_{RT} - Q_{DA}$) \times \$ _{RT} (110 - 120) \times \$30 = -\$300

RT Component	Total
Revenue	\$300
Energy Cost	\$500
RT Make-Whole	\$200

Net Settlement (DAM + RT balancing + RT) \$3000 - \$300 + \$200 = \$2900
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Net Profit (Net Settlement - Cost) \$2900 - \$2500 = \$400
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Scenario 2: Observations

- The generator has a net savings of \$200 in cost as a result of being dispatch to 110 MW in real-time (i.e. net saving after buying back 10 MW of DAM schedule)
- The cost of generating the 10 MW constrained-on energy in real-time is already covered by the DAM make-whole payment.
- Providing a real-time make-whole payment results in the generator being paid twice for generating 10 MW constrained-on energy in real-time.

Next Steps

- Due to the complexity of the interaction of the make-whole payments when considering two settlement outcomes, high level design will establish guidelines to inform the application of real-time make whole payments for various settlement situations during detailed design.
 - Objective is to preserve dispatch incentives without generating unnecessary uplift costs in the form of make whole overpayment
- Proposed guidelines will be brought forward for stakeholder comment at the September meeting.