

# Fast Start Pricing – Market Settlement Changes

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Market Settlements Subcommittee

- Dispatch Differential Lost Opportunity Cost Credits
- Day-ahead Scheduling Reserve (DASR) Lost Opportunity Cost Credits
- Day-ahead Transaction Make Whole Payments
- Real-Time Make Whole Credit
- Double Counting of Commitment Costs

- The FERC order accepted PJM's proposal to use lost opportunity cost (LOC) credits to offset the incentive for over-generation or price chasing
  - Incentive can exist when a resource is dispatched down to maintain power balance due to the need to accommodate the inflexibility of fast-start resources as well as the inclusion of commitment costs into the LMP
  - Pool-scheduled and dispatchable self-scheduled resources are eligible to receive this LOC credit

- Objective
  - Minimize incentive for a resource to deviate from dispatch instructions by chasing LMP
- Approach
  - Calculate a Dispatch Differential LOC (DD LOC) that is the difference between additional revenue above cost that a resource would have received if it operated at the Pricing Run MW and the actual revenue above cost the resource earned

- Resources will continue to receive eligible LOC credits if scheduled for:
  - Regulation
  - Synchronized Reserve
  - Reactive Services
  - Reduced or suspended due to a transmission constraint or for other reliability reasons
- For these resources, existing LOC credits cover the differences between the pricing run and the dispatch run and as a result these resources will not be eligible for DD LOC
- Eliminates the potential for duplicate LOC credits for the same MWs

- Dispatch Differential LOC will only be calculated for the Real-time Market
- Dispatch deviations can only occur in the real-time energy market, so this LOC does not apply to the Day-ahead market

- Five-minute interval based calculation
- Dispatch Differential LOC will equal the positive difference between the revenue above cost that a resource would have received if it operated at the Pricing Run MW and the actual revenue above cost the resource earned
- Dispatch Differential LOC credits will be allocated to real-time load plus exports on an hourly basis

- Pricing Run Revenue Above Cost  
(Expected MW Output \*  $LMP_p$ ) – Incremental Energy Offer for Expected MW Output  
Expected MW Output is the MW value of the resource based on the Final Offer at the five minute real-time LMP at the resource bus
- Dispatch Run Revenue Above Cost  
Greater of (Dispatch MW, Actual MW) \*  $LMP_p$  –  
Lesser of (Cost of Dispatch MW, Cost of Actual MW)
- Dispatch Differential LOC = Max(Pricing Run Revenue Above Cost – Dispatch Run Revenue Above Cost, 0)





# Dispatch Differential LOC Calculation

Segment	MW	Price	Cost
1	85	\$20	\$1700
2	95	\$27	\$235
3	100	\$30	\$142.50
Total Cost			\$2077.50

	Dispatch Run	Pricing Run
Energy	85 MW	95 MW
Reserves	0 MW	5 MW

	Value
Dispatch MW	85 MW
Actual MW	85 MW

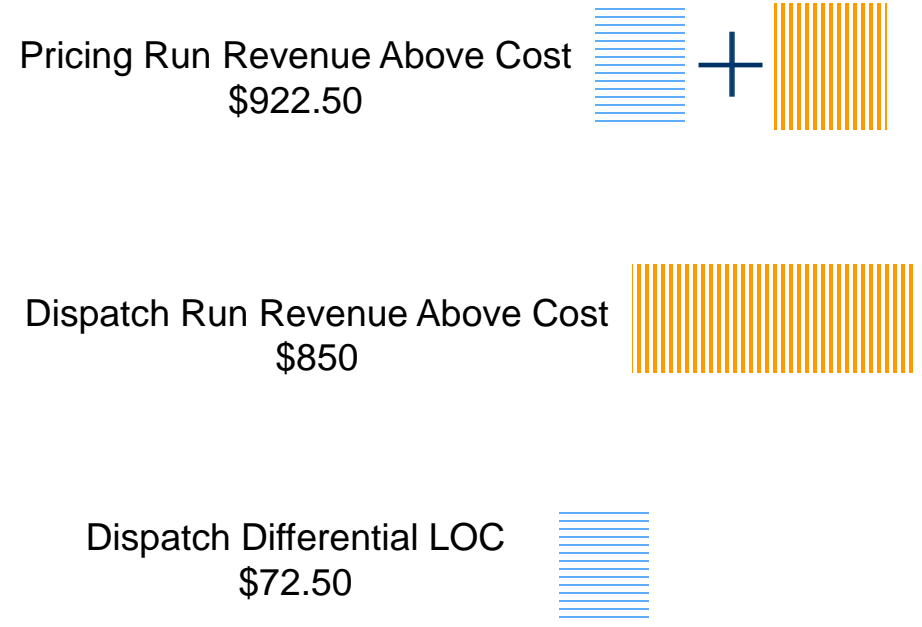
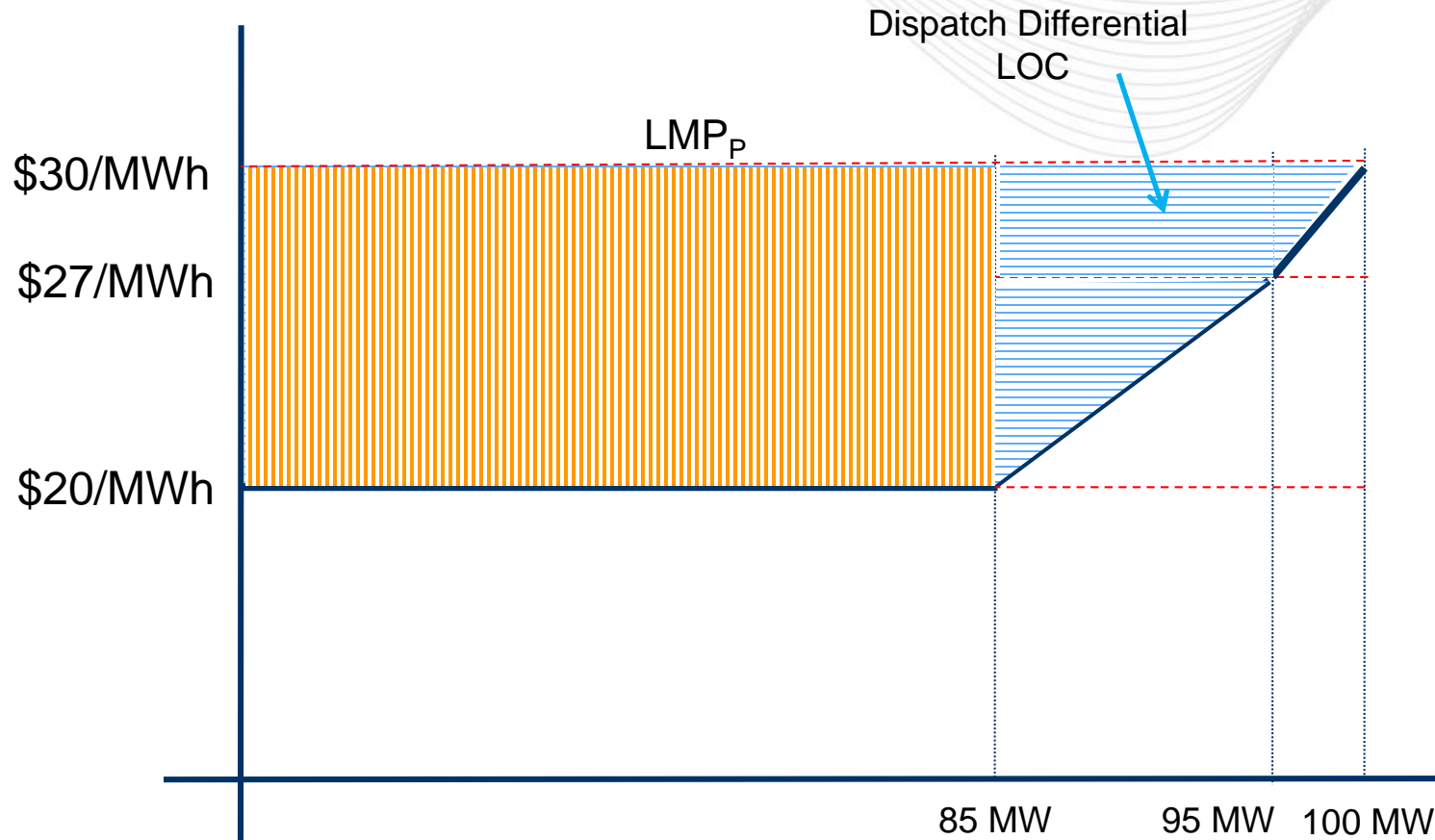
$$\begin{aligned}
 \text{Pricing Run Revenue Above Cost} &= (\text{Expected MW Output} * \text{LMP}_p) - \text{Incremental Energy Offer for Expected MW Output} \\
 &= (100 \text{ MW} * \$30/\text{MW}) - \$2077.50 \\
 &= \$3000 - \$2077.50 \\
 &= \$922.50
 \end{aligned}$$

$$\begin{aligned}
 \text{Dispatch Run Revenue Above Cost} &= \text{Max} (\text{Dispatch MW}, \text{Actual MW} * \text{LMP}_p) - \text{Min} (\text{Cost of Dispatch MW}, \text{Cost of Actual MW}) \\
 &= (85 \text{ MW} * \$30/\text{MW}) - (85 \text{ MW} * \$20/\text{MW}) \\
 &= \$2550 - \$1700 \\
 &= \$850
 \end{aligned}$$

$$\begin{aligned}
 \text{Dispatch Differential LOC} &= \text{Pricing Run Revenue Above Cost} - \text{Dispatch Run Revenue Above Cost} \\
 &= \$922.50 - \$850 \\
 &= \$72.50
 \end{aligned}$$



# Dispatch Differential LOC Calculation



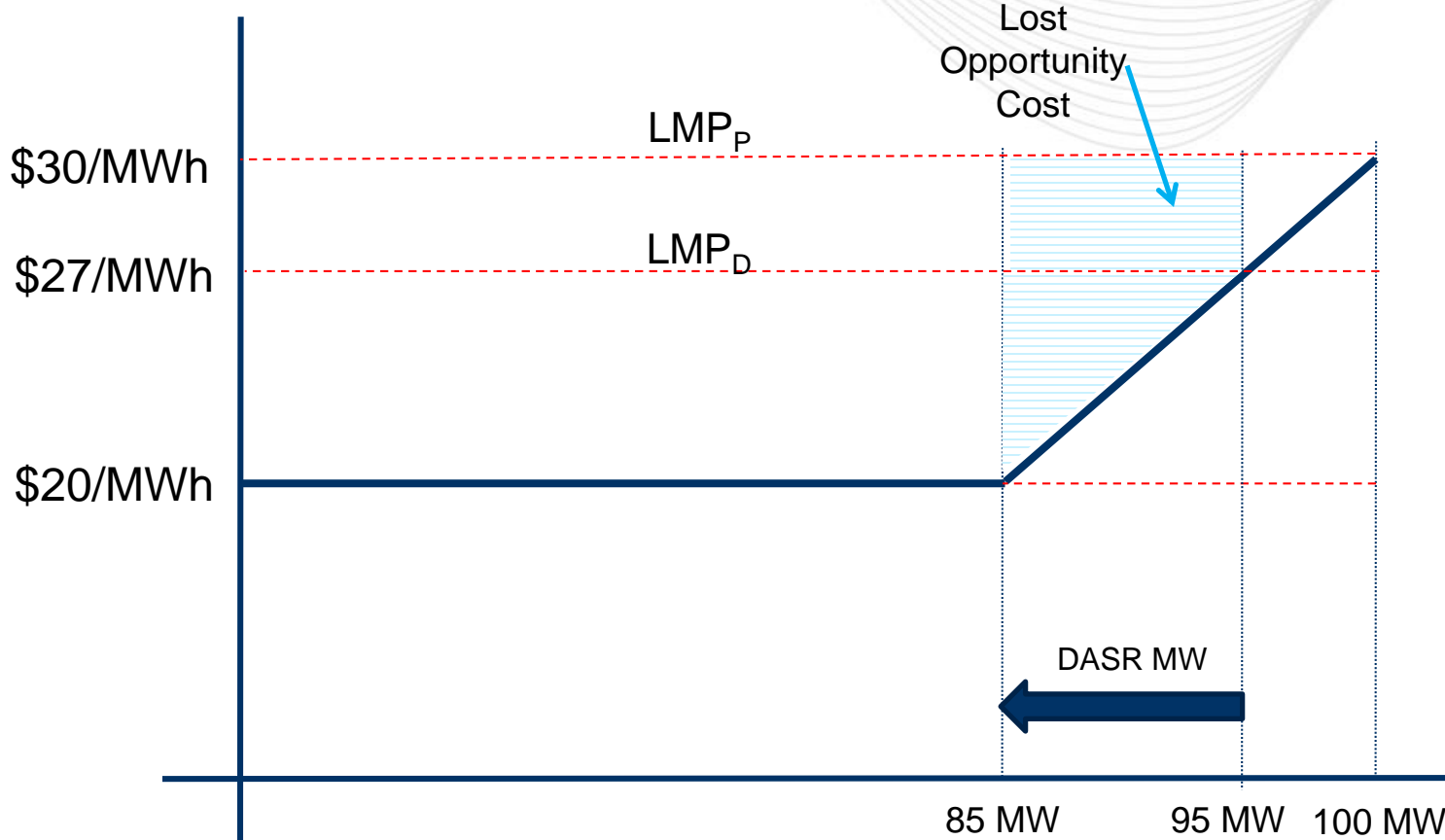
## Day-ahead Scheduling Reserve (DASR) LOC

- With Fast Start Pricing, LOC is calculated to ensure that the DASR MW the resource is backed down in the Day-ahead dispatch run receives the same revenue above cost the resource could have received if it had been assigned energy for that same quantity
  - Goal is to maintain indifference between providing energy and reserves
- If DASR Clearing Price Credits  $<$  (Offer + Lost Opportunity Cost), resource is eligible for DASR LOC credit
- Introduces new Billing Line Item for DASR LOC credit



# Day-ahead Scheduling Reserve (DASR) LOC

Dispatch Run	
Energy MW	DASR MW
85 MW	15 MW assignment (backed down 10 MW)



Lost Opportunity Cost = \$65  
 This value is the foregone revenue, not the Lost Opportunity Cost Credit.

The LOC Credit is based on the difference between the DASR credits and (Offer + LOC)

LOC not paid for MW from 95 to 100 MW. This is the equivalent of DD LOC, which is not being paid in the Day-ahead market.

# Day-ahead Transaction Make Whole Payments

- Day-ahead Transactions include:
  - Virtual Transactions
    - Increment Offers
    - Decrement Bids
    - Up-to Congestion Transactions
  - Price Responsive Demand
  - Dispatchable Exports
- Transactions that clear in the Day-ahead dispatch run but are not economic in the Day-ahead pricing run will be made whole to their offer

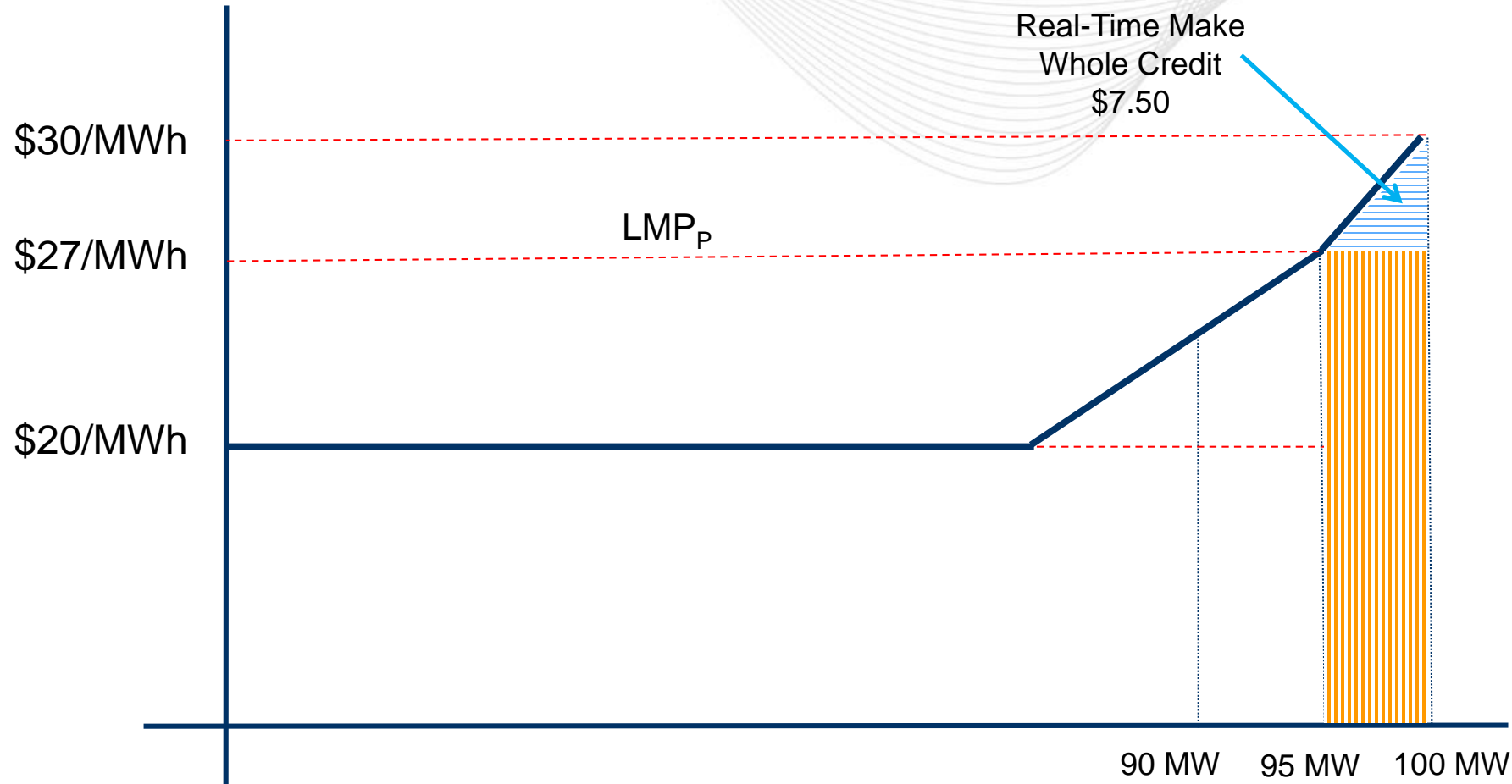
- These credits represent the cost of MWs that are provided in real-time in excess of the resource's day-ahead assignment that are not compensated by real-time LMP
- Credits only apply to pool-scheduled or dispatchable self-scheduled resources

- Eligibility rules:
  1. Real-time dispatch MW greater than day ahead assignment
  2. Real-time dispatch MW greater than the output level of the resource based on the intersection of RT LMP with the offer curve

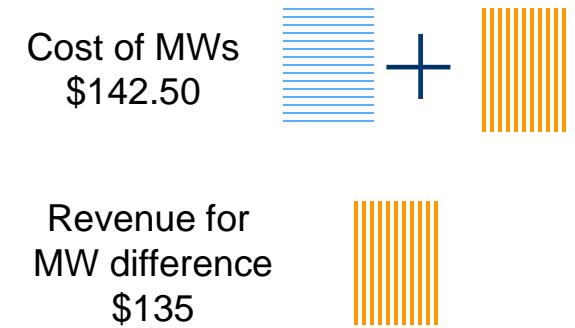
- A. Using Final Offer, calculate the cost of the MWs between the:
  - (1) Greater of DA Schedule MW and expected MW output at RT LMP
  - AND
  - (2) Lesser of RT Dispatch MW and actual MW output
- B. Calculate the revenue for the MW difference between (1) and (2) at RT LMP
- C. The Real-Time Make Whole Credit is equal to the positive difference between the cost and revenue:  $A - B$ .



# Real-Time Make Whole Credit Calculation



DA Schedule = 90 MW  
 Expected MW at RT LMP = 95 MW  
 RT Dispatch = 100 MW  
 Actual Output = 100 MW



- Status Quo
  - Balancing Operating Reserve segments
- Changes
  - Real-Time Make Whole Credit is an additional revenue component to offset Balancing Operating Reserve credits

A resource is dispatched higher in real-time than in day-ahead  
(positive balancing MW)

**AND**

The resource is made-whole for 100% of its startup and  
no-load costs in day-ahead.

*When these are true, the resource has an opportunity to collect revenues in real-time to cover costs that have already been compensated via day-ahead uplift.*

*This situation can occur today and is not unique to Fast-Start Pricing.*

- Costs recovered via uplift in the Day-Ahead Market that are subsequently recovered in Real-time Market revenues are subtracted from Day-ahead uplift
- Implemented by calculating Operating Reserve Targets:
  - Day-Ahead Operating Reserve Target = Total DA Offer Cost\* – DA Revenue
  - Balancing Operating Reserve Target = Total RT Offer Cost\* – Total Revenue\*\*

\*Total Offer Cost includes Incremental Offer + Startup + No Load

\*\*Total Revenue includes DA Credits + Balancing Credits + Ancillary Service Revenue + Real-time Make Whole Credits

- The total Operating Reserve Credits are capped to ensure no over payment
  - $DA\ OR\ Credit\ Offset = \text{MAX}(DA\ OR\ Target - Bal\ OR\ Target, 0)$
  - $Bal\ OR\ Credit = \text{MAX}(Bal\ OR\ Target - DA\ OR\ Credit, 0)$ 
    - The balancing credit is equal to the portion of balancing uplift that wasn't recovered via Day-Ahead uplift (Status quo)
- This calculation will apply to all resources, not only Fast-Start

DA OR Target	Bal OR Target	Day-ahead OR Credit Offset	Day-Ahead OR Credit	Bal OR Credit	
\$90	\$100	\$0	\$90	\$10	Status Quo
\$100	\$100	\$0	\$100	\$0	Status Quo
\$110	\$100	\$10	\$100	\$0	Over Payment Resolved
\$50	\$0	\$50	\$0	\$0	Over Payment Resolved