

Summary of Reserve Quantities and Clearing Across Markets

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Day Ahead Reserves

Addresses uncertainty DA that does not need to be carried into RT.
Inclusive of the need to have energy and reserve commitments to meet the next day load forecast (energy gap)

30-Min Reserves – Updated

Addresses net-load ramping, net-load forecast uncertainty and the need for replacement reserves for system recovery.

30-Min Online Reserves

Addresses net-load ramping and net-load forecast uncertainty

10-Min Ramp/Uncertainty Reserves – Up and Down Reserves

Addresses net-load ramping and net-load forecast uncertainty

Primary Reserves (PR) (10-minute reserves) – 150% SR

Contingency reserves and ACE recovery

Synchronized Reserves (SR) (10-minute reserves) – 100% MSSC*

Contingency reserves and ACE recovery

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Contingency reserves and ACE recovery

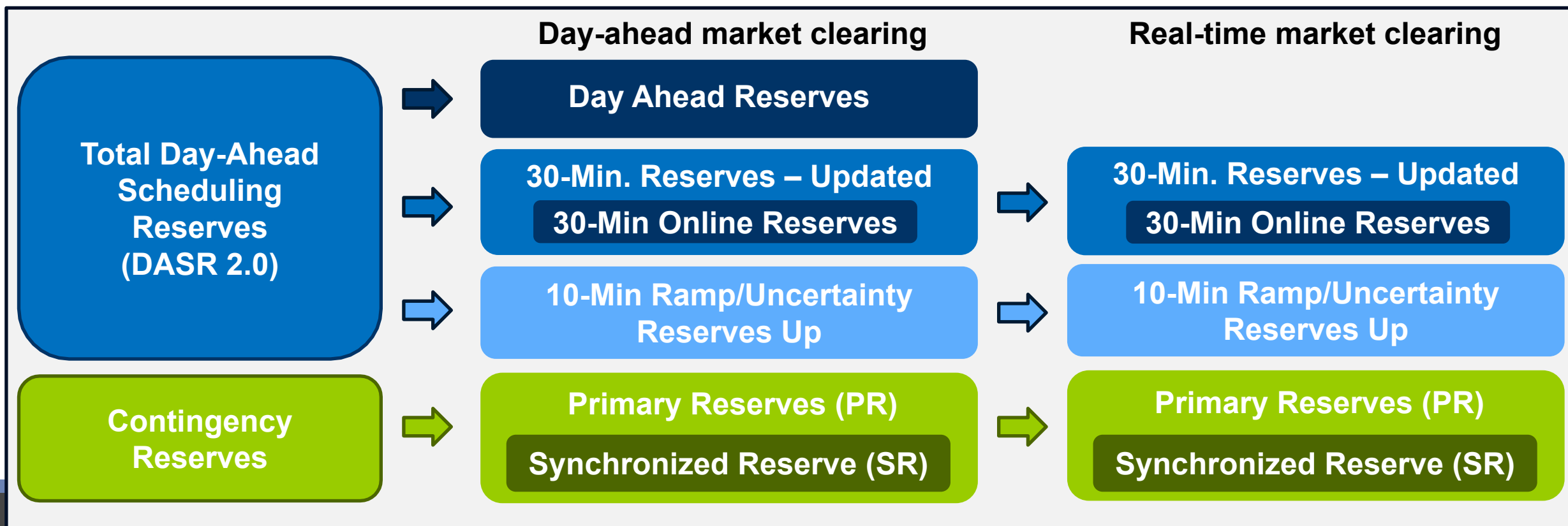


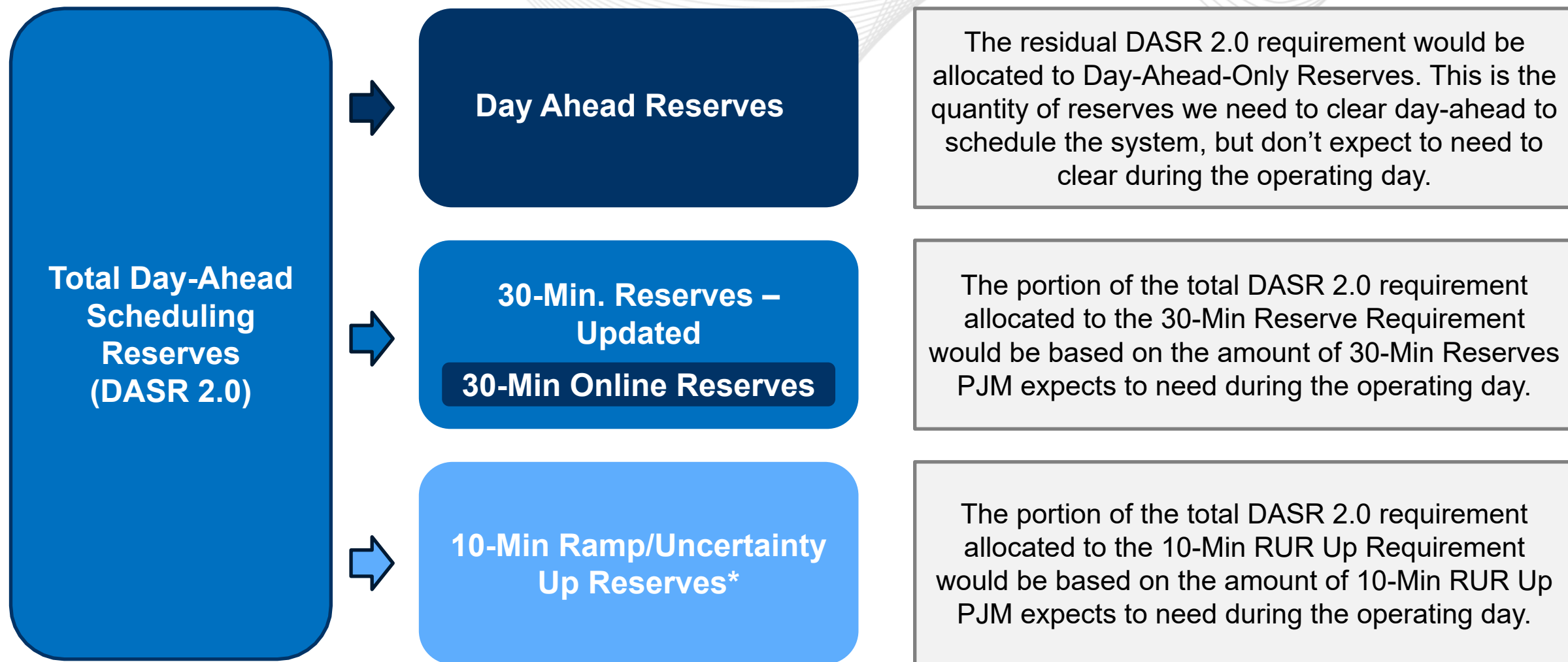
Reserve Requirement Overview

DASR 2.0 is the total reserve quantity PJM needs to carry day-ahead to schedule the system for reliability above the reserves needed for unit loss.

The total DASR 2.0 quantity would be divided across reserve products to reflect the services needed and what would be carried into real-time based on expected real-time reserve needs.

The real-time reserve quantities would be cleared both day-ahead and real-time. The methodology for setting requirements would be the same in both markets, but the numbers may change given new forecast information in real-time.





**10-Min RUR Down Requirements would be set using the same methodology as described in this presentation for 10-Min RUR Up. However, none of the DASR 2.0 quantity would be allocated to 10-Min RUR Down reserves as DASR 2.0 only quantifies day-ahead up scheduling reserve needs.*

Total Day-Ahead Scheduling Reserves (DASR 2.0)

DASR 2.0 is the total quantity of reserves PJM needs to procure day-ahead to schedule the system for reliability in advance of the operating day. As currently envisioned, DASR 2.0 is a daily value based on the peak load hour. This quantity is calculated based on:

- Historical load, wind and solar forecast error
- Historical generator performance

During elevated risk days, an adder will be used to increase this quantity to reflect the expected “Energy Gap.”

For this example, assume the total DASR 2.0 quantity is 6,000 MW.

Total Day-Ahead Scheduling Reserves (DASR 2.0)

6,000 MW

For this example, assume the 10-Min RUR Requirement in the Day-Ahead Market is 900 MW for the example hour.

10-Min Ramp/Uncertainty Up Reserves

The 10-Min Ramp/Uncertainty Reserve Up Requirement would be set based on:

- Expected 10-minute up ramp
- Net-load forecast uncertainty

In the Day-Ahead Market, because the forecast is hourly, the expected ramp component of the requirement would be the difference in the hourly net-load forecast divided by 6 to interpolate to 10-minute expected net-load ramp.

Total Day-Ahead Scheduling Reserves (DASR 2.0)

6,000 MW

For this example, assume the total 30-Min Reserve Requirement in the Day-Ahead Market is 2,800 MW for the example hour, 1,200 MW of which would need to be online.

30-Min Reserves

10-Min Ramp/Uncertainty Up Reserves

900 MW

The 30-Min Reserve Requirement would be set based on:

- Expected 20-minute up ramp
- Net-load forecast uncertainty
- The largest contingency

In the Day-Ahead market, because the forecast is hourly, the expected ramp component of the requirement would be the difference in the hourly net-load forecast divided by 3 to interpolate to 20-minute expected net-load ramp.

The expected ramp and uncertainty components would set the online 30-Min Reserve Requirement.



Total Day-Ahead Scheduling Reserves (DASR 2.0)

6,000 MW

Day-Ahead Reserves

30-Min Reserves

2,800 MW total
1,200 MW online

10-Min Ramp/Uncertainty Up Reserves

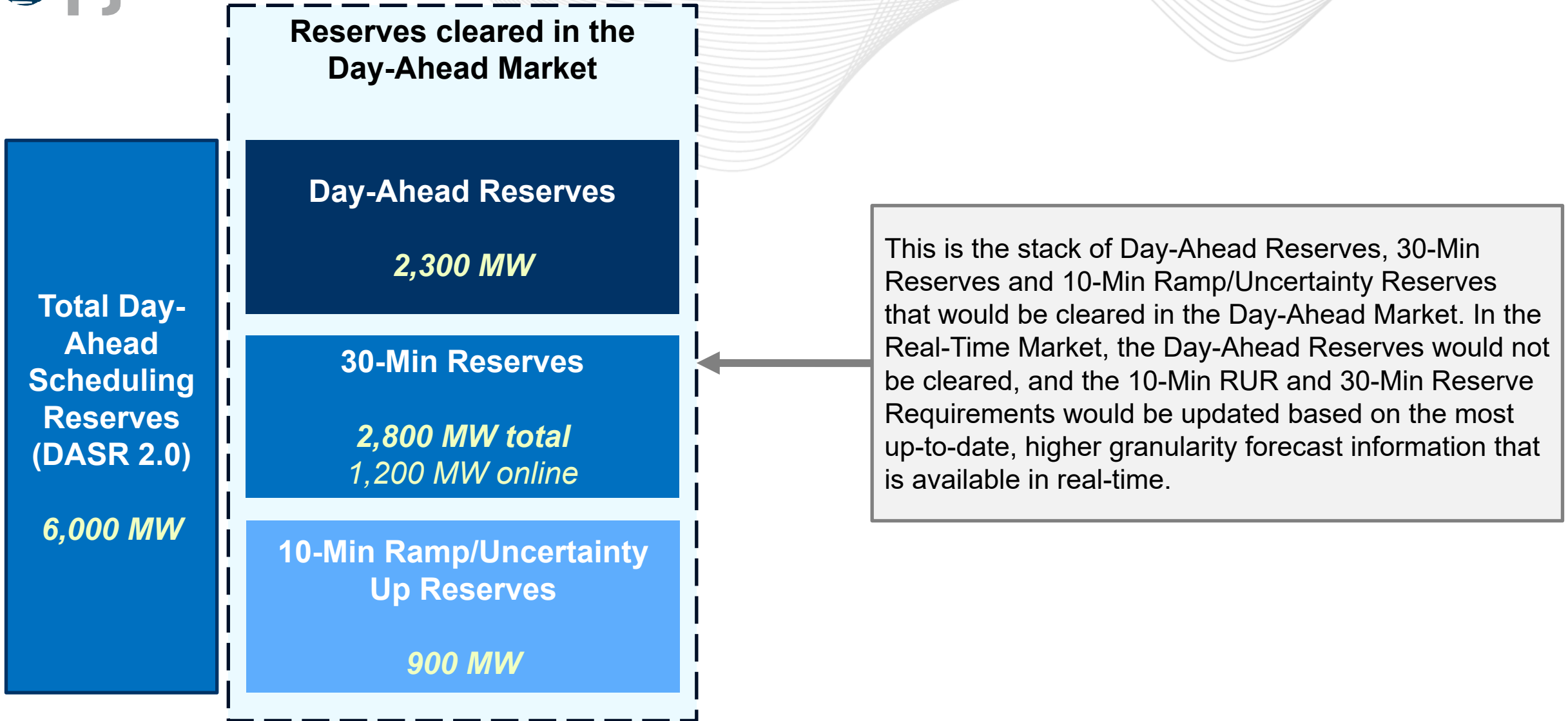
900 MW

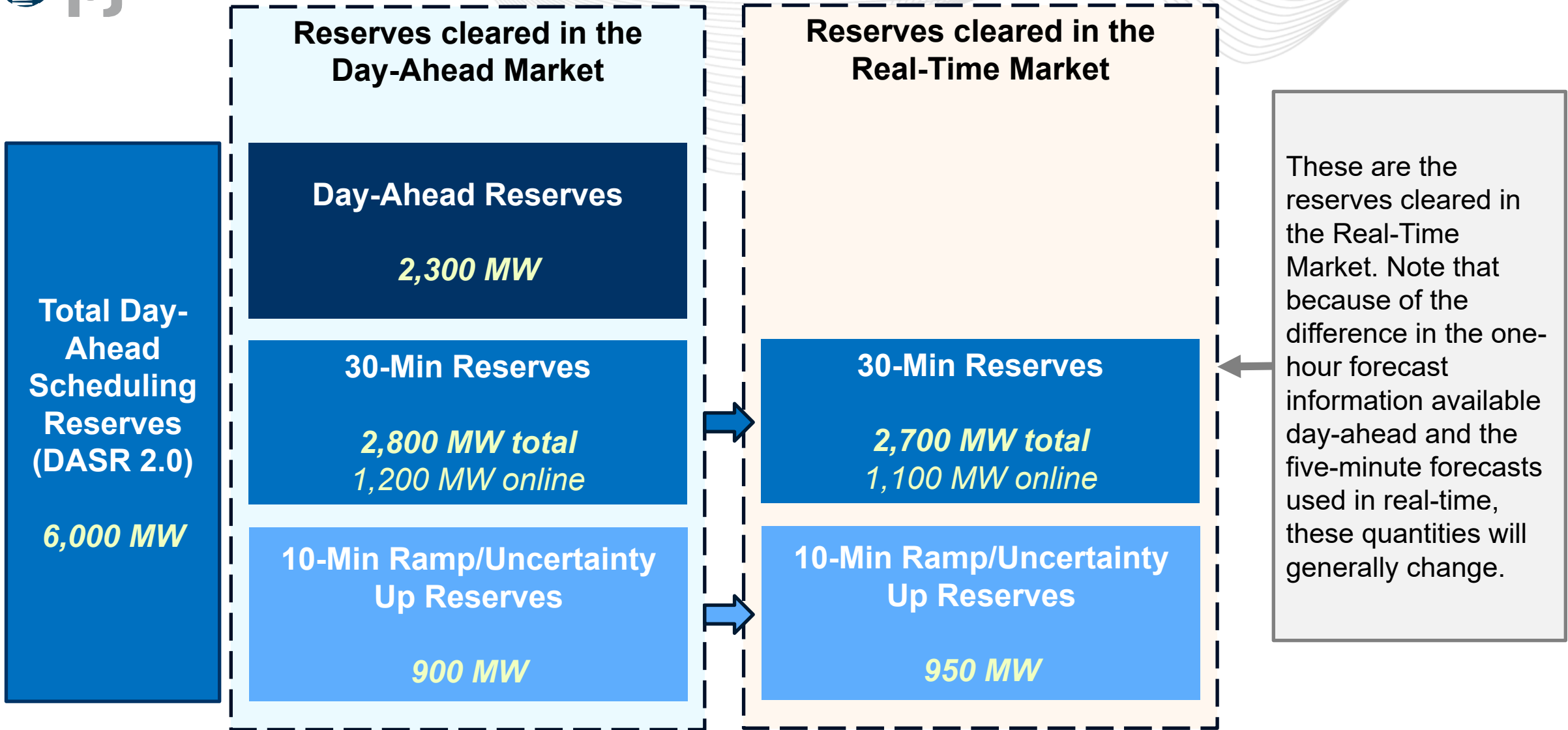
The Day-Ahead Reserves are the remaining reserves to be cleared in the Day-Ahead Market to meet the DASR 2.0 quantity that PJM does not expect to need to clear in the Real-Time Market. In other words, the Day-Ahead Reserve Requirement is the residual DASR 2.0 quantity beyond what is cleared in 10-Min RUR Up and 30-Min Reserves.

For this example, the Day-Ahead Reserves would be equal to:

DA Res. = DASR 2.0 – 10-Min RUR – 30-Min Res.
DA Res. = 6,000 MW – 900 MW – 2,800 MW

DA Res. = 2,300 MW





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**Summary of Reserve Quantities and Clearing
Across Markets**



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Acronym	Term & Definition
SR	Synchronized Reserves are reserves provided by resources that are synchronized to the grid and can respond within 10 minutes.
PR	Primary Reserves are reserves provided by resources that are either synchronized or not synchronized to the grid and can respond within 10 minutes.
RUR	Ramping/Uncertainty Reserves are reserves that would be procured to manage forecasted ramp and uncertainty operational flexibility needs.
MW	A Megawatt is a unit of power equaling one million watts (1 MW = 1,000,000 watts) or one thousand kilowatts (1 MW = 1,000 KW).

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