

MARCH 24, 2022

Market Renewal Program Stakeholder Update on Navigating Design Solutions

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Webinar Participation

- Ways to interact in today's webinar:
 - **Raise your hand** (click the "Raise hand" button in the top right corner) to let the host know you'd like to verbally ask a question or make a comment. The host will let you know when to unmute
 - **Enter a written question/comment in the chat.** The host will read it out for you
- **Microphones should be muted at all times,** unless the host has called on you to unmute yourself

Background

- Currently, the IESO is drafting the full set of Market Rules and Market Manuals for stakeholder review
- Alongside, the IESO is working on solution development, technical specifications, among other efforts to support IESO and Market Participant readiness
- Within this process of implementing the design, there are issues and opportunities that may need to be resolved, and the IESO wants to be proactive and transparent about how these items are resolved

Background (cont'd)

- One of the goals of MRP Engagement is to use stakeholder time and effort wisely, to focus and draw attention to areas of change and to build on the principles of transparency
 - Example of this approach used in detailed design were the technical sessions to gain stakeholder advice prior to full review of the detailed design

Market Renewal Principles

- Efficiency
- Competition
- Implementability
- Certainty
- Transparency

Approach

- Update stakeholders quarterly if any design integration issues exist, show how they were resolved, and the rationale behind decisions
- Stakeholders are open to provide advice on the solutions, ask questions, or recommend alternatives to resolve these challenges



Design Implementation Solutions

Implementability – Inputs to Day-Ahead Market Engine for Re-Run/Delay

Issue: The IT solution for keeping inputs fixed in the event of Day-Ahead Market (DAM) delays/issues is exceedingly complex

Proposal:

Existing Design

In the event of a DAM Engine re-run or delay, IESO inputs used by the day-ahead market will not be modified to reflect changing system conditions after 10:00 EPT.

New Design

In the event of a DAM Engine re-run or delay, some IESO inputs may be subject to change as a result of changing system conditions. The IESO will issue an advisory notice to market participants when inputs have been revised.

Rationale: By eliminating the requirement to hold all IESO inputs fixed after 10:00 EPT, it removes the need to implement a complex solution to store inputs for a low probability event. The recommended solution may result, depending on timing, in some inputs being updated after 10:00 EPT (see next slide for a list of impacted inputs).

Implementability – Inputs to DAM Engine for Re-Run/Delay (cont'd)

DAM IESO Inputs Subject to Change after 10:00 EPT:

Input	Impact of Change	Frequency of Change	Participant Visibility
Outage Information	-Network Topology -Resource Availability	Ad-hoc	-Planned Transmission Outages Report
Current Day Pre-Dispatch	-Resource Initial Schedule -Initial Hours of Operation	Hourly	-Most recent market participant Pre-Dispatch Schedules Report
Centralized Variable Generation Forecast	-VG Energy Forecast	Hourly	-Variable Generation Forecast Summary Report -Variable Generation Forecast by Resource Report

Efficiency/Transparency – Multiplier for +MMCP Exports

Issue: Exports bid at \$2,000 are scheduled, even during times where there are shortfalls in operating reserve. In these conditions, the IESO will manually curtail these exports, which results in a discrepancy between pre-dispatch and real-time schedules and prices.

Proposal:

Existing Design

Exports bid at Maximum Market Clearing Price (MMCP) will use a 8*MMCP bid in the scheduling algorithm.

If export induces a reserve shortfall, manually curtailed.

New Design

Exports bid at MMCP will use a MMCP bid in the scheduling algorithm.

Export scheduled economically, but will not induce a reserve shortfall.

Rationale:

The proposal avoids manual control actions, reduces the number of export failures in real-time and creates alignment between the day-ahead, pre-dispatch and real-time schedules and prices - all while achieving the same outcome.

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Operational Commitments in Pre-Dispatch: Thermal State Parameters and Start-Up Notifications

Tim Lam

Subject Matter Expert, Market Renewal Program

Purpose

The purpose of this presentation is to provide additional clarification regarding the use of new thermal state (hot/warm/cold) dispatch data parameters, illustrating how the different parameters work together when Pre-Dispatch (PD) schedules Generator Offer Guarantee (GOG)-eligible resources and issues them binding start-up instructions.

The thermal state dispatch data parameters are:

- Start-Up Offers (SUO)
- Ramp-Up Energy to Minimum Loading Point (REM)
- Lead Time (LT)
- Minimum Generation Block Down Time (MGBDT)

Summary

Thermal state parameters specify operational and cost related dispatch data that vary based on when the GOG-eligible resource was last online.

PD calculation engine will determine:

- the first time-step the resource is scheduled to minimum loading point (MLP)
- which Start-Up Offer to apply across all time-steps of the PD look-ahead period
- which Ramp-Up Energy to MLP profile to apply to a commitment

Binding Start-Up Instructions will be issued by the last PD run that respects the lead time relative to the first time-step the GOG-eligible resource can next reach MLP

- This will occur if the commitment starts in the first time-step or in a time-step part of a transition into the subsequent thermal state

Thermal State Parameters

From Offers, Bids and Data Inputs Detailed Design

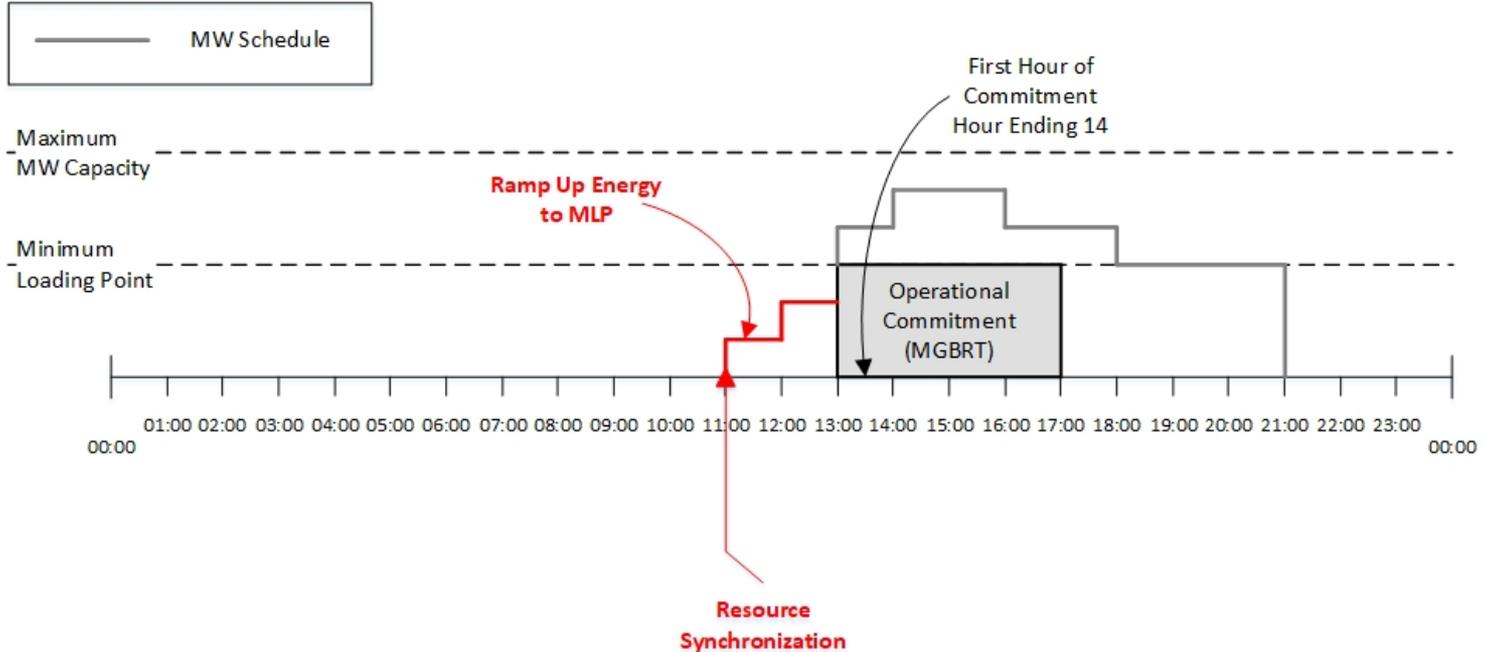
Start-Up Offer (SUO)

- Hourly dispatch data
- Cost to bring an off-line resource in the hot/warm/cold thermal state to the first hour of the operational commitment at MLP

Ramp-Up Energy to MLP (REM)

- Daily dispatch data
- Energy (in MWh) expected to be produced from synchronization to the first hour of the operational commitment at MLP; for an offline resource in the hot/warm/cold thermal state

Ramp-Up Energy to MLP

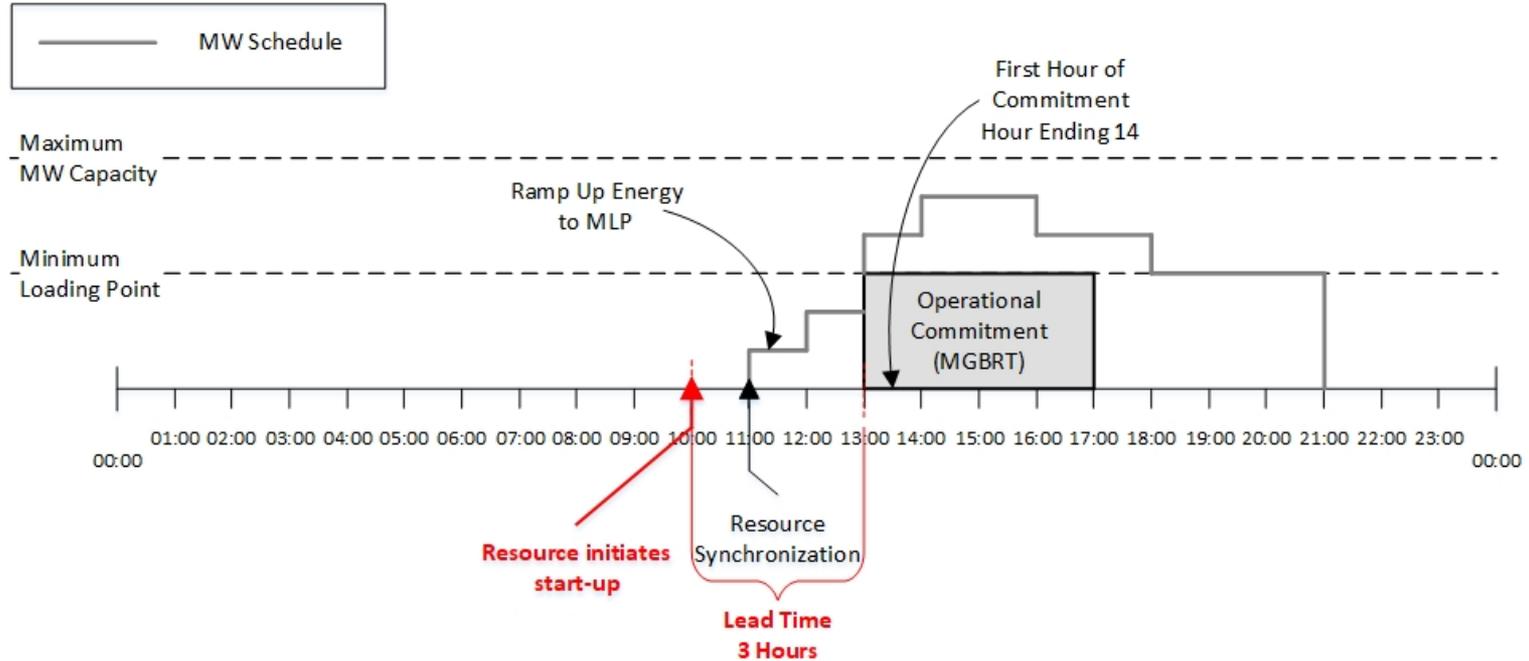


Thermal State Parameters

From Offers, Bids and Data Inputs Detailed Design

- Lead Time (LT)
 - Daily dispatch data
 - Time (in hours) needed to start-up and reach MLP for the first hour of the operational commitment at MLP; for an offline resource in the hot/warm/cold thermal state

Lead Time

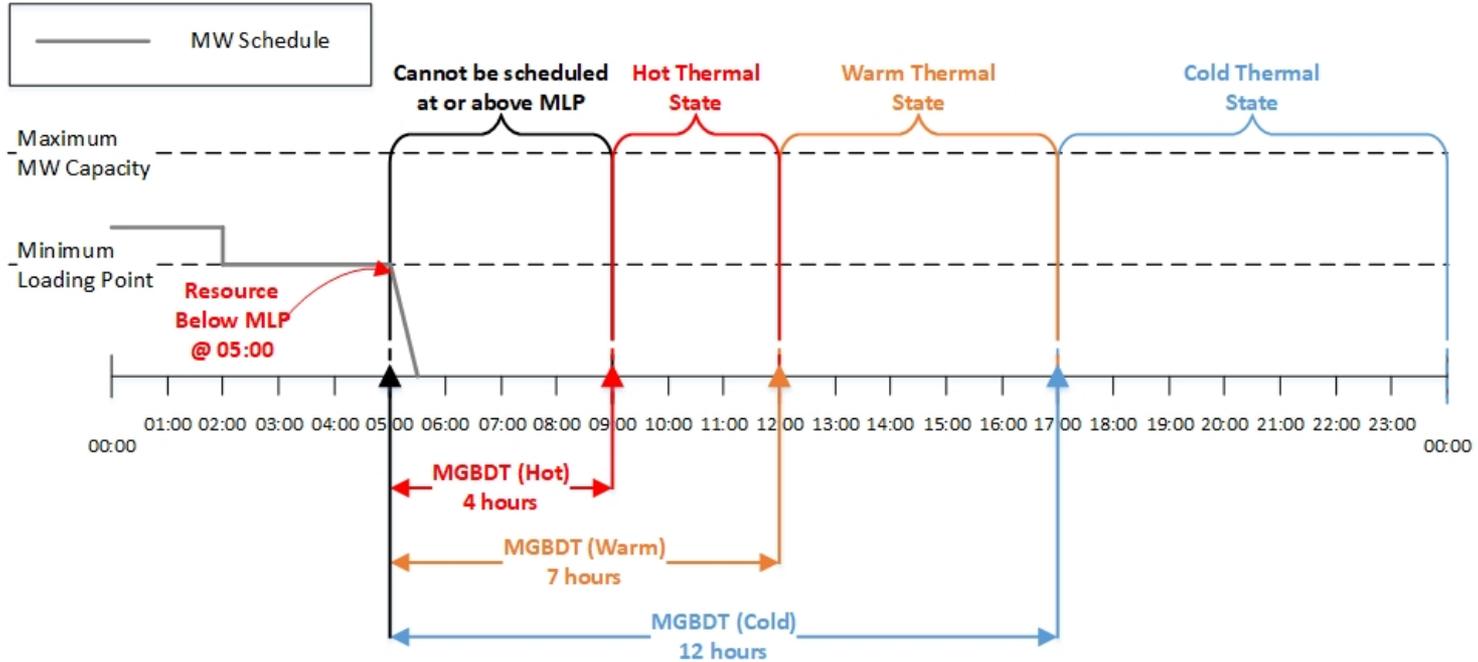


Thermal State Parameters

From Offers, Bids and Data Inputs Detailed Design

- Minimum Generation Block Down Time (MGBDT)
 - Daily dispatch data
 - MGBDT (Hot):
 - establishes lower bound for the hot thermal state, relative to the last hour at MLP
 - minimum # of hours required between resource schedules MLP
 - MGBDT (Warm): establishes upper bound for hot thermal state and lower bound for warm thermal state, relative to the last hour at MLP
 - MGBDT (Cold): establishes upper bound for warm thermal state and lower bound for cold thermal state, relative to the last hour at MLP

Minimum Generation Block Down Time (MGBDT)

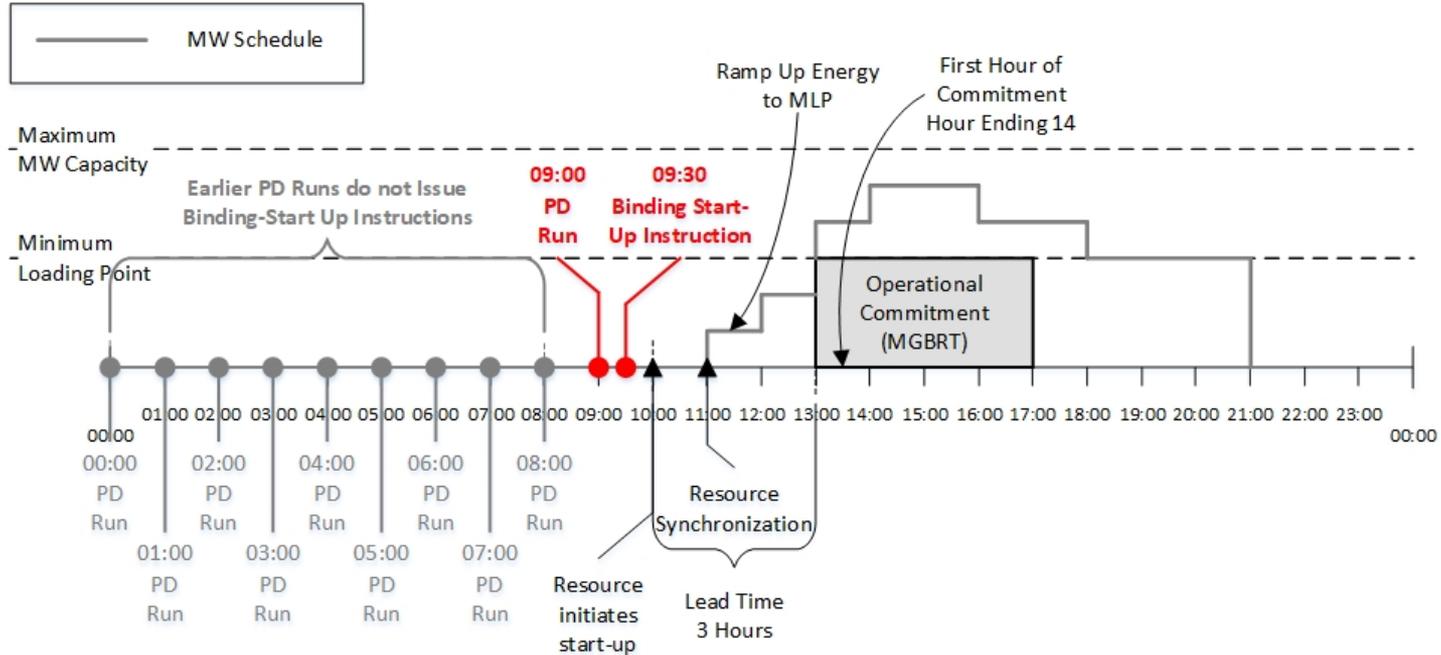


Pre-Dispatch Scheduling and Commitments

From Grid and Market Operations Integration Detailed Design

- Binding Start-Up Instructions for GOG-Eligible Resources
 - Binding Start-Up Instruction will be issued by the last pre-dispatch run that respects the lead time dispatch data parameter of a GOG-eligible resource
 - Respecting the lead time ensures that resource will achieve its MLP for the first hour of its operational commitment
 - Binding Start-Up Instruction shall be sent no later than 30-minutes past the hour of the PD calculation engine run that issues the commitment

Pre-Dispatch Binding Start-Up Instruction

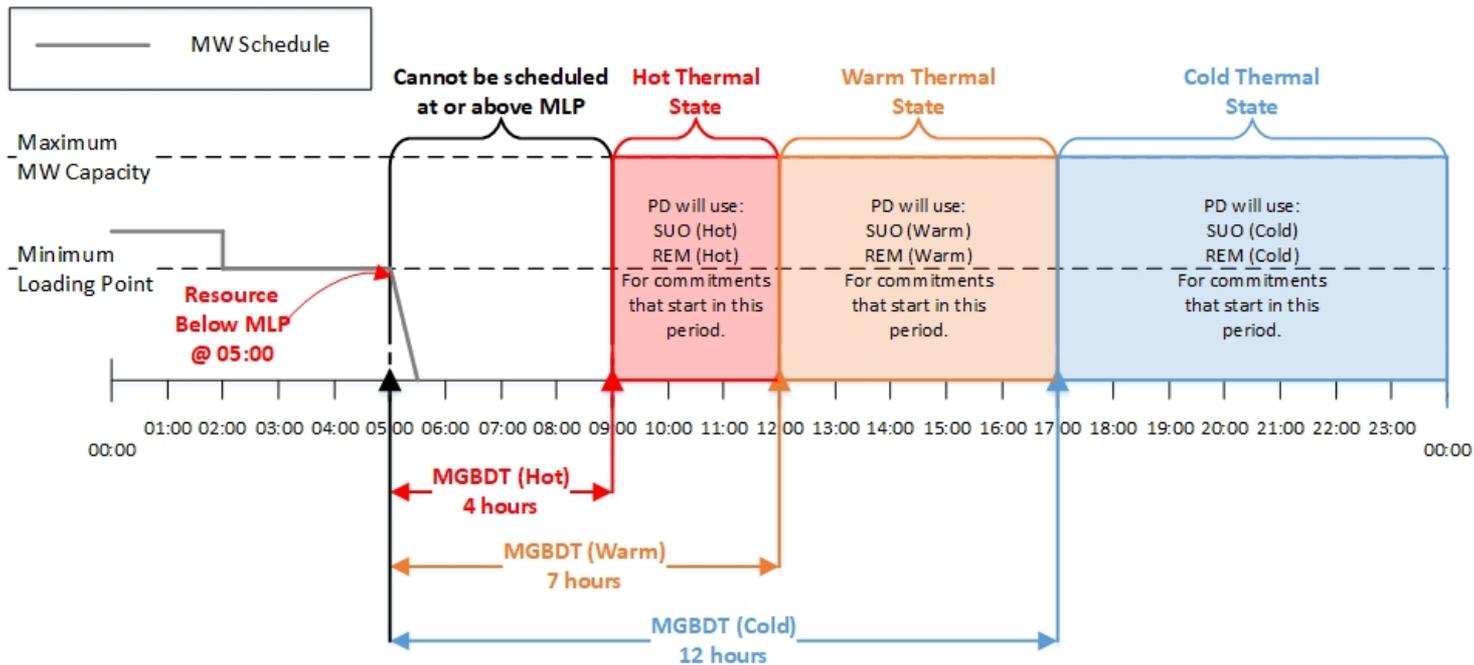


Thermal State Parameters in PD Calculation Engine

From Pre-Dispatch Calculation Engine Detailed Design

- Modelling of GOG-Eligible resource Thermal State
 - For offline resources, each run of the PD calculation engine can assign each time step (forecast hour) a thermal state for that resource, based on the number of hours the resource has been offline (i.e. below MLP)
 - This thermal state assignment is used to determine which thermal state (hot/warm/cold) start-up offer (SUO) and the ramp-up energy to MLP (REM) to use for each time step

PD Modelling of Thermal State (SUO and REM)

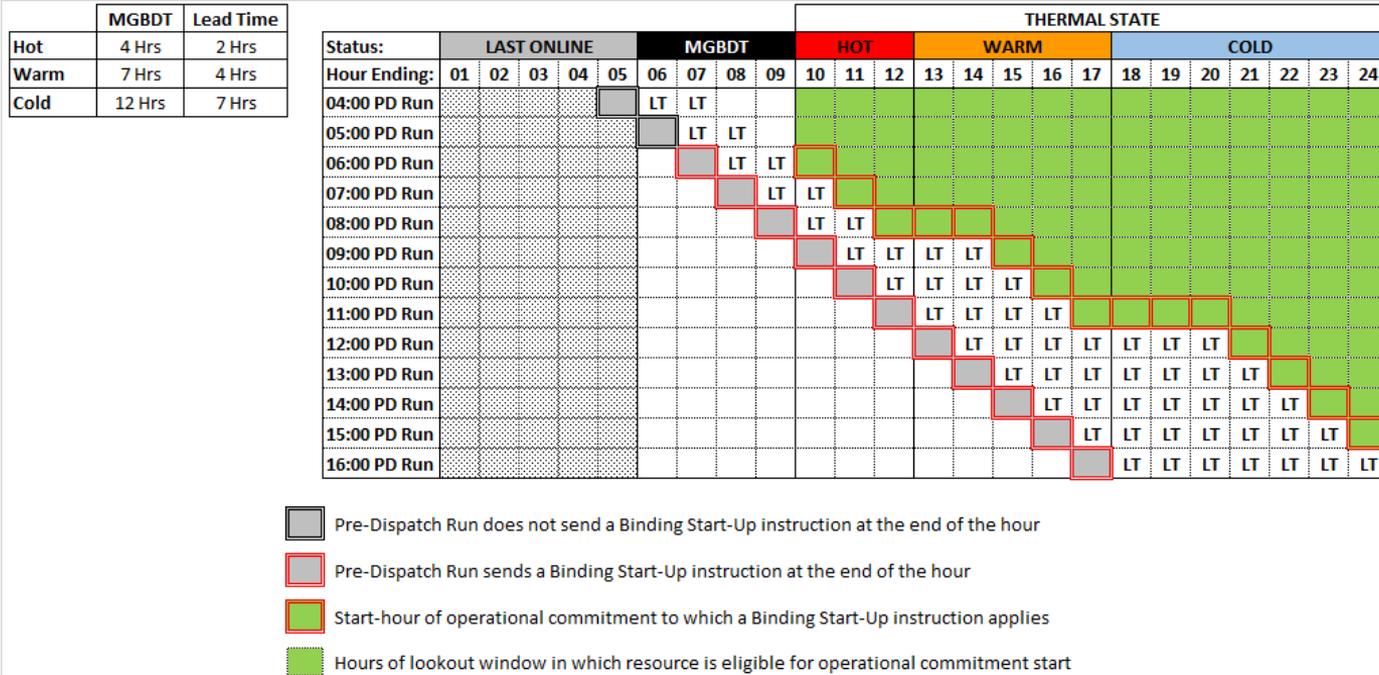


Thermal State Parameters in PD Calculation Engine

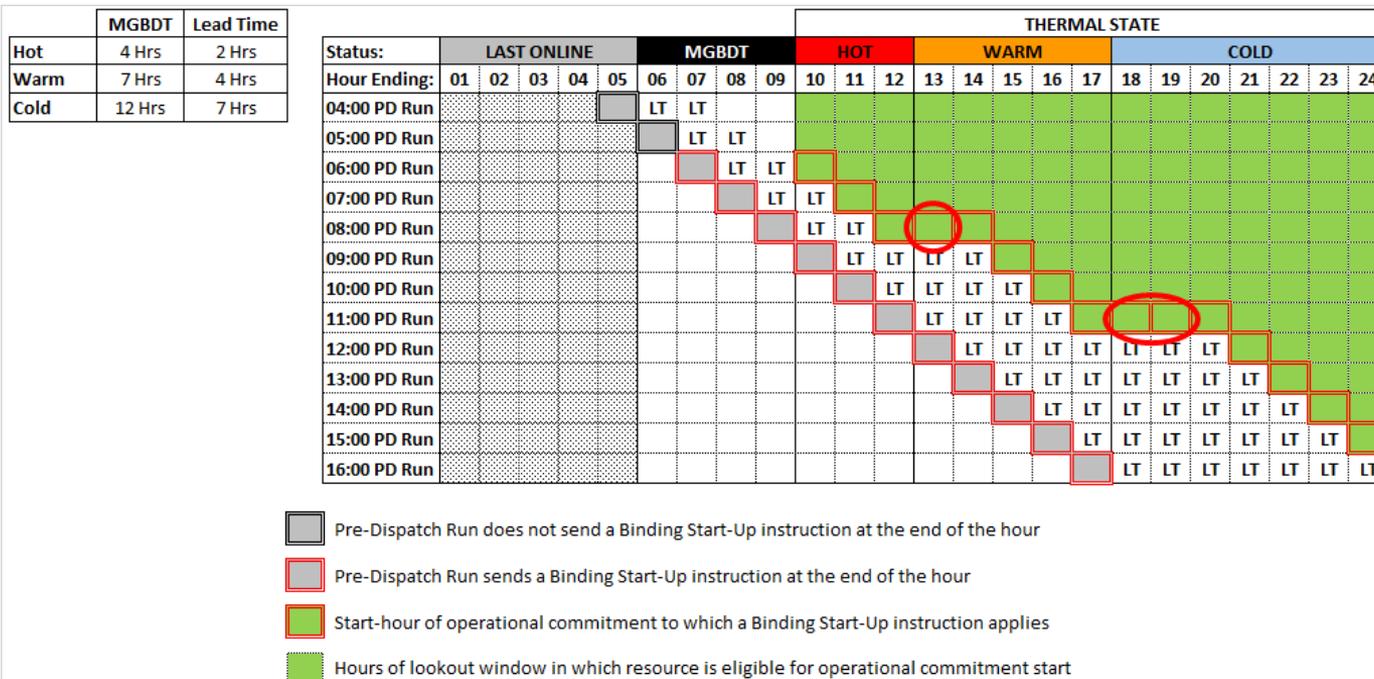
From Pre-Dispatch Calculation Engine Detailed Design

- Evaluation of First Time-Step Available to Start (Binding Start-Up Instruction)
 - Each run of the PD calculation engine will determine the first time-step the GOG-eligible resource can next reach MLP
 - This time-step will respect the resource's MGBDT (Hot) (i.e. minimum # of hours between schedules)
 - This time-step will respect the lead time associated with the warmest feasible thermal state applicable within the PD look-ahead period

PD Binding Start-Up Instructions



PD Binding Start-Up Instructions



Next Steps

- April 15, 2022: Deadline for stakeholder feedback on the design implementation solutions
 - Feedback deadline for Calculation Engine Market Rules
- April Engagement Days Forecast: Detailed discussion on Economic Operating Point in the renewed market

Thank You

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