OCTOBER 3, 2023

Market Renewal Program Implementation

Market Rules and Market Manuals: Market and System Operations

Q&A Session for GOG-Eligible Non-Quick Start Resources

Amir Rouhi, Advisor Market Development, Market Renewal Program

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- Ways to interact in today's webinar:
  - Questions encouraged at any point during the presentation
  - 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
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Meeting Purpose

To provide stakeholders looking to participate in Ontario's energy markets as GOG-eligible non-quick start resources (NQS) with an overview of their participation in the future day-ahead market (DAM), pre-dispatch (PD) and real-time market (RTM) in accordance with the Market and System Operations (MSO) and Calculation Engines batches of market rule and market manual amendments

Engagement Timeline

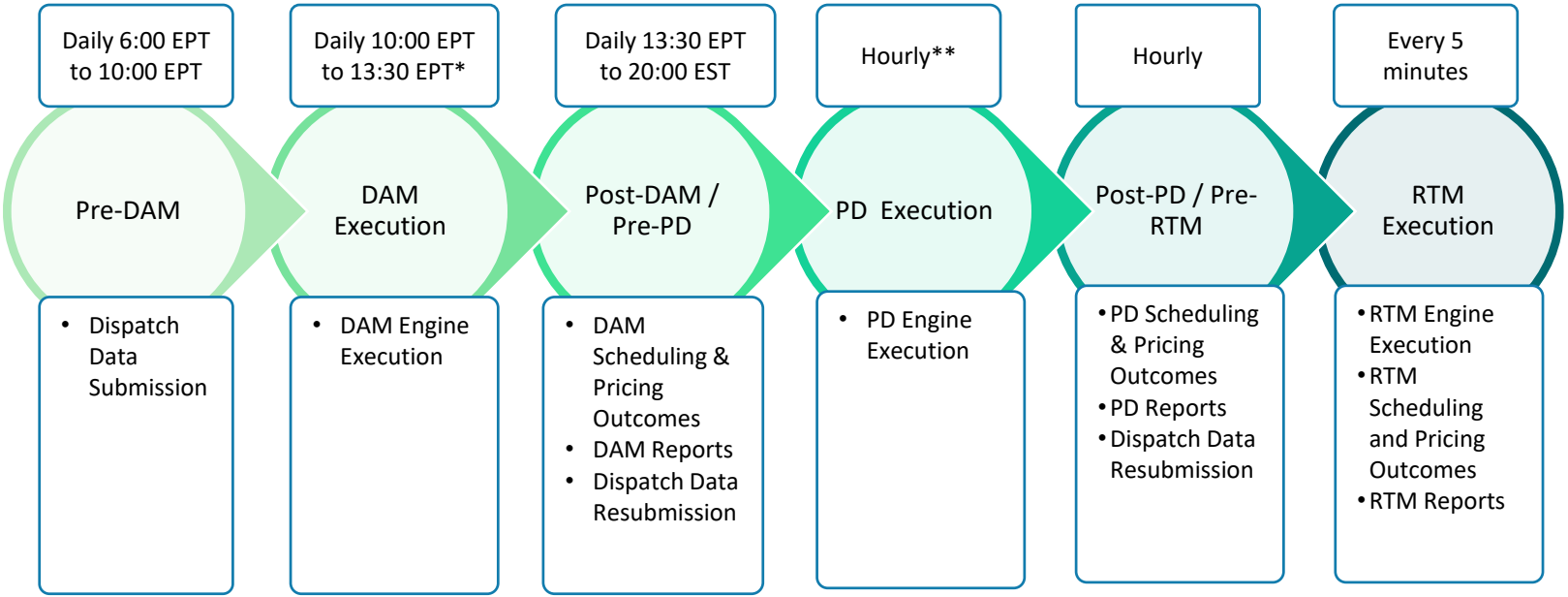
July 14: Draft MSO batch documents published for stakeholder review

July 27 & 28: Webinars conducted to prepare market participants for their review of the MSO batch content

Today: Q & A session that focuses on GOG-eligible NQS resources navigating dispatch data submission and scheduling/pricing outcomes from day-ahead to real time

November 8: Feedback on MSO batch market rule and market manual amendments due to the IESO

Q&A Session Scope for GOG-Eligible NQS Resources



* DAM execution can be extended until 15:30 EPT

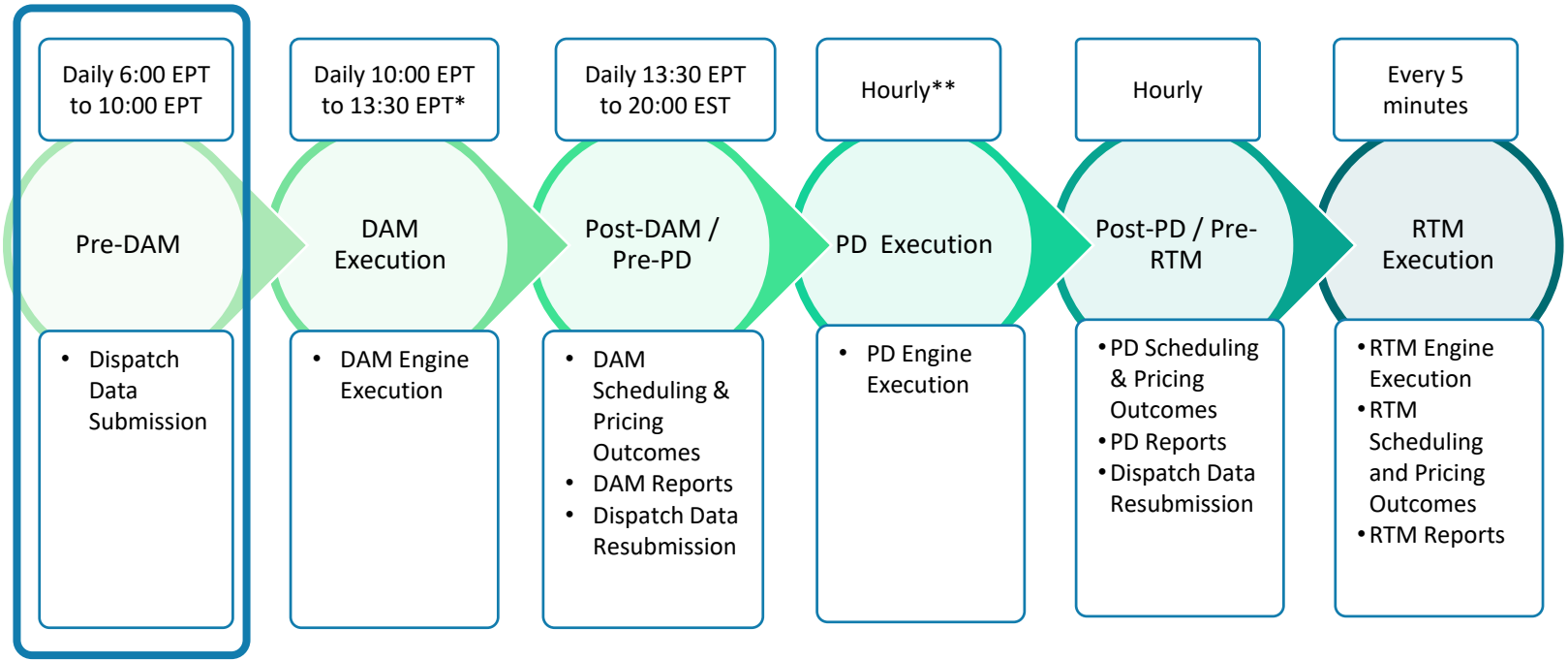
** PD execution occurs hourly on rolling basis with first run starting 20:00 EST on the day prior to the dispatch day and the last run starting at 19:00 EST the next day

Assumptions

Stakeholders are already familiar with:

- the relevant MSO batch materials that pertain to the participation of their NQS resources in the future DAM, PD and RTM
- the future authorization, registration and settlement market rules and manuals that pertain to GOG-eligible NQS resources
- the timelines and general mechanics of the future DAM, PD and RTM engines
- the dispatch data applicable to GOG-eligible NQS resources, what it represents and the purpose it serves (as described in Offers, Bids and Data Inputs Detailed Design)
- the pseudo-unit (PSU) model

Pre-DAM



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Dispatch Data Submission Considerations

Market participants (MPs) should be mindful of the following when submitting dispatch data for GOG-eligible NQS resources:

- Dispatch data parameters and their applicability within each engine
- Relevance of the thermal state dispatch data parameter in DAM
- Availability Declaration Envelope (ADE)
- Dispatch data validations
- Implications of ex-ante market power mitigation (MPM)
- DAM engine initialization features
- Pre-DAM reports

Hourly Dispatch Data Parameters and Engine Applicability

Dispatch Data Type	Dispatch Data Parameter	New or Existing	No PSU (Stand Alone NQS)	PSU Registered			DAM	PD	RTM
				CT	ST	PSU			
Hourly	Energy offer	Existing	✓			✓	✓	✓	✓
Hourly	Hourly energy ramp rate	Existing	✓			✓			✓
Hourly	Operating reserve offers	Existing	✓			✓	✓	✓	✓
Hourly	Operating reserve ramp rate	Existing	✓			✓	✓	✓	✓
Hourly	Reserve loading point	Existing	✓			✓	✓	✓	✓
Hourly	Start-up offer [1]	Existing	✓			✓	✓	✓	
Hourly	Speed no-load offer	Existing	✓			✓	✓	✓	

[1] Requires three values to be submitted to reflect thermal status of hot, warm and cold

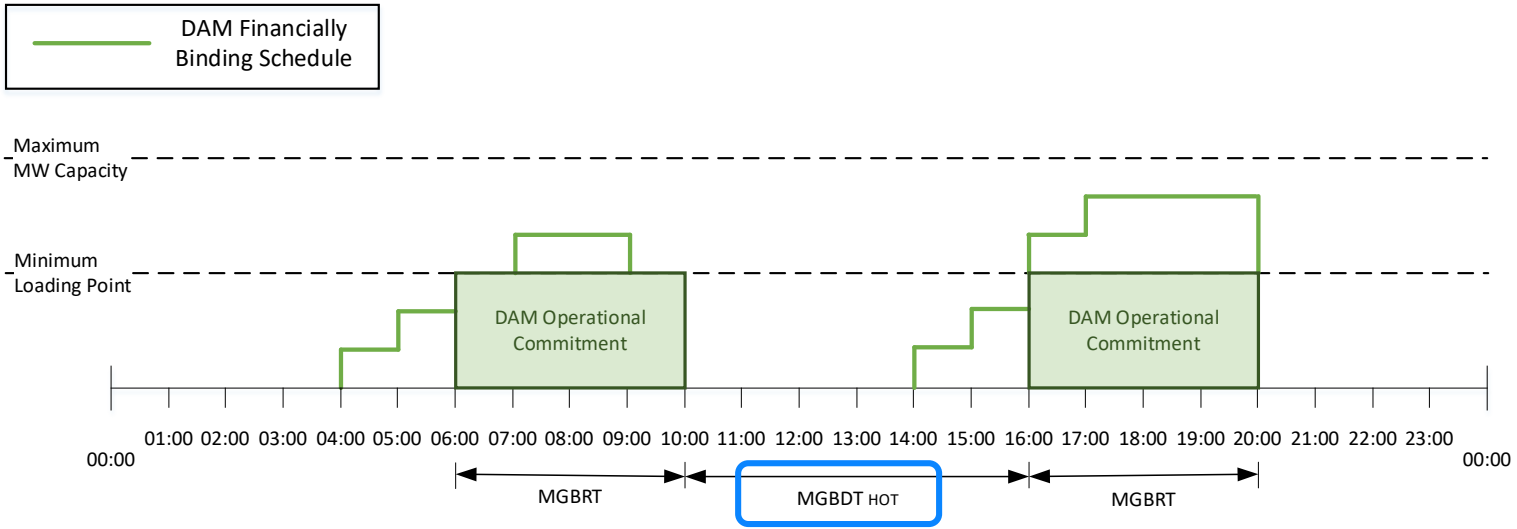
Daily Dispatch Data Parameters and Engine Applicability

Dispatch Data Type	Dispatch Data Parameter	New or Existing	No PSU (Stand Alone NQS)	PSU Registered			DAM	PD	RTM
				CT	ST	PSU			
Daily	Daily energy ramp rate	New	✓			✓	✓	✓	
Daily	Thermal state [1]	New	✓			✓	✓		
Daily	Minimum loading point (MLP)	Existing	✓	✓	✓		✓	✓	✓
Daily	Lead time [2]	New	✓	✓				✓	
Daily	Ramp up energy to MLP (ramp hours and profile) [2]	New	✓	✓	✓		✓	✓	
Daily	Minimum generation block run-time (MGBRT)	Existing	✓	✓			✓	✓	✓
Daily	Minimum generation block down time (MGBDT) [2]	Existing	✓	✓			✓[3]	✓	
Daily	Single cycle mode	Existing		✓			✓	✓	✓
Daily	Maximum daily energy limit (MaxDEL)	Existing	✓			✓	✓	✓	
Daily	Maximum number of starts per day (MNSPD)	Existing	✓	✓			✓	✓	

[1] Thermal state is a submitted parameter used only by DAM with possible values of hot, warm or cold
[2] Requires three values to be submitted to reflect thermal status of hot, warm and cold
[3] For DAM the MGBDT hot value is used for multiple DAM commitments (illustrated in a future slide)

Example: $MGBDT_{HOT}$ Respected for Multiple Commitments

Scenario: DAM engine decides two commitments required based on a selected thermal state of hot, warm or cold. $MGBDT_{HOT}$ respected between commitments regardless of thermal state selected



Example: Ramp Up Energy to MLP Applied for PSU

The ramp up energy to MLP parameter consists of two sub-parameters:

- Ramp hours to MLP and energy per ramp hour

	Ramp hours to MLP	Energy per ramp hour		
		HE1	HE2	HE3
CT	3	30	60	100
ST	3	10	30	55
PSU	3	40	90	155

	Ramp Hours to MLP	Energy per ramp hour		
		HE1	HE2	HE3
CT	3	30	60	100
ST	2		30	55
PSU	3	30	90	155

- For ramp hours to MLP, the largest value from those submitted for the individual CT and ST resources is used for the PSU
- For energy per ramp hour, the sum of the values submitted for the individual CT and ST resources is used

Availability Declaration Envelope (ADE)

- ADE will continue to apply in the renewed market
- MPs must submit energy offers into the DAM for every hour they intend to participate in the RTM
- The allowance to expand the ADE in the RTM is being increased **from** the lesser of **2%** of the ADE or 10 MW **to** the lesser of **15%** of the ADE or 10 MW

Dispatch Data Validations

- Dispatch data submissions must adhere to a number of rules documented within the MSO batch in order to be accepted as valid. Examples for GOG-eligible NQS resources include:

Validation	Description	Example
General	Dispatch data format aligns with how the engines read the data	Offer laminations must be monotonically increasing
Registration	Non-financial dispatch data submissions fall within registered quantities	Daily and hourly energy ramp rates must be less than or equal to their maximum registered ramp rate
MPM	Non-financial dispatch data submissions are within permissible reference level thresholds	Submitted MLP must be less than or equal to two times the registered MLP reference level
Cross validations	Related dispatch data do not conflict	Lead time (hot) must be less than or equal to MGBDT (hot)
Market event based	Based on specific market events such as receiving a DAM or PD commitment, or the first PD run that includes the next day	Energy offers for quantities up to and including MLP may not increase above the offers submitted to the DAM for the hours of a DAM commitment

- If one or more validations fail, error issued and resubmission required

Implications of Ex-Ante MPM

- Ex-ante MPM applies for energy and operating reserve offers in the DAM and PD engines for dispatchable resources
  - Mitigation decisions from PD are carried forward into RTM
- MPs may submit energy and operating reserve offer prices above their registered reference levels with an understanding that such offer prices are subject to ex-ante mitigation by the DAM and PD engine (ex-ante MPM overview discussed next)

Overview of Ex-Ante Mitigation

1	Existence of market power condition restricting competition	Ensures mitigation is only performed if required
2	**Conduct Test**: Check if submitted offer prices are within the acceptable tolerance	**If 'pass':** no mitigation is needed **If 'fail':** submitted offers are replaced with *reference levels*
3	**Price Impact Test**: Ensure the difference between LMP calculated with submitted offer and the one calculated using *reference levels* is within acceptable tolerance	**If 'pass':** no mitigation is needed **If 'fail':** the resulting LMPs and schedules are based on *reference levels*

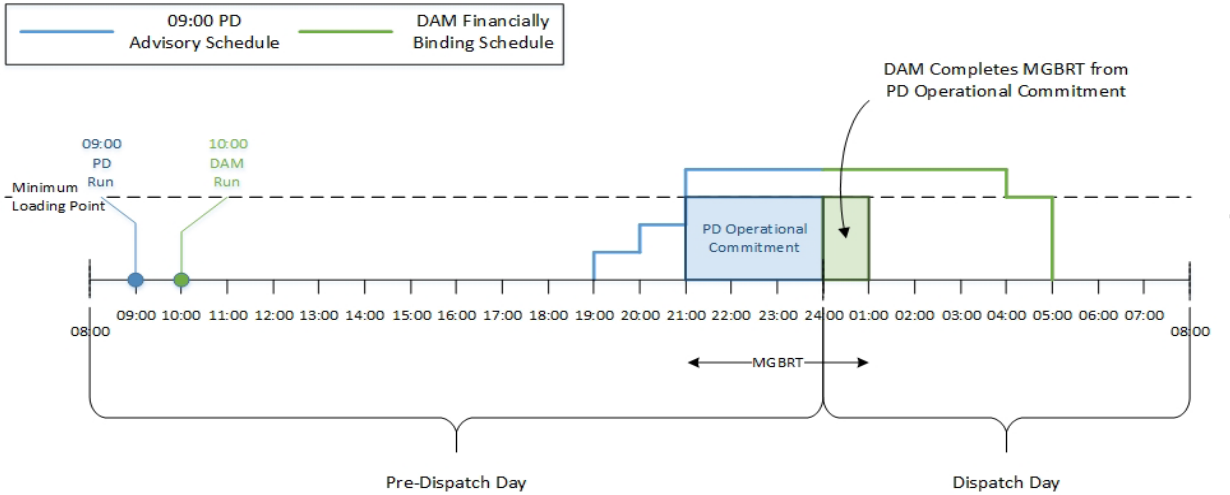
DAM Initialization: Treatment of Commitments at Midnight

- MPs should consider whether their dispatch data needs to be adjusted to respect their resource's operating characteristics from one day to the next for the following commitment scenarios:

PD Commitment Scenario (current dispatch day)	Is MGBRT Satisfied in HE24 of PD?	DAM Scheduling Treatment (for next dispatch day)
Resource is operationally committed in HE24	No	• Will not evaluate start-up offer for hour ending (HE) 01 • Will commit the additional hours required to complete MGBRT
	Yes	• Will not evaluate start-up offer for HE01 • May schedule additional hours beyond MGBRT if economic
Resource is not operationally committed in HE 24	N/A	• Will evaluate start-up offer for HE01 • Will not respect MGBDT implied by most recent PD schedule • May schedule the resource as a new start if economic; will apply a truncated ramp up energy to MLP if committed at the start of the day (e.g., commitment starts HE02 but ramp to MLP hours = 3)

Example: Resource is Operationally Committed in HE24

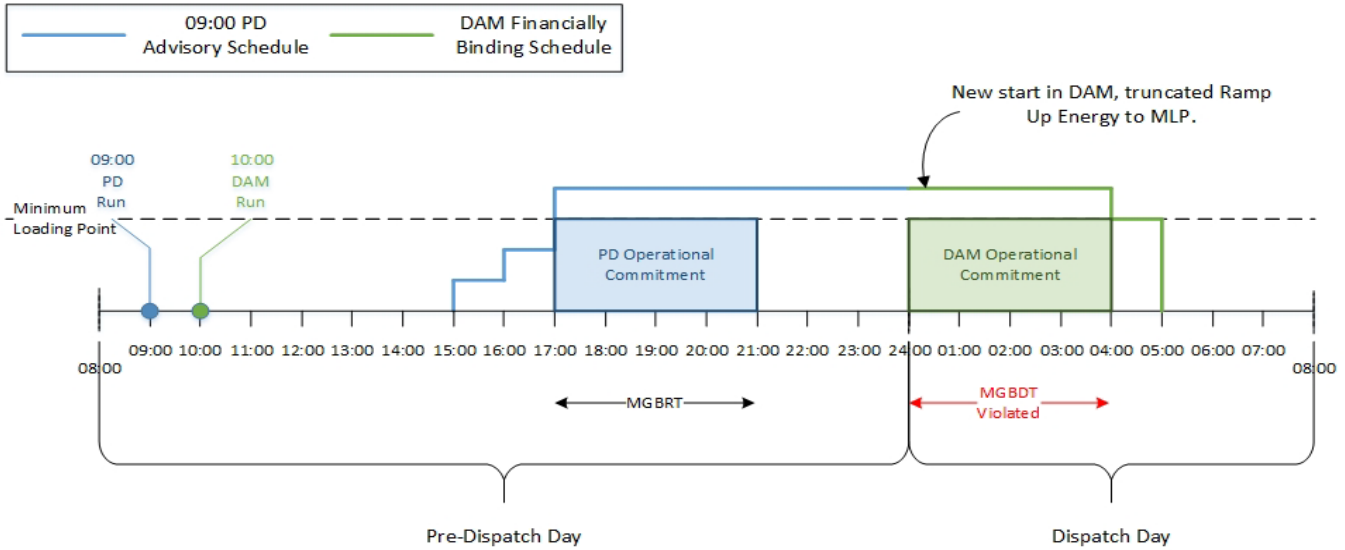
Scenario: PD operational commitment until midnight with uncompleted MGBRT



- DAM will schedule additional hours to complete the MGBRT assuming valid offers are present in the hours required to satisfy the MGBRT
- DAM will not evaluate the start-up offer for HE01

Example: Resource Not Operationally Committed in HE24

Scenario: PD schedule until midnight without a commitment

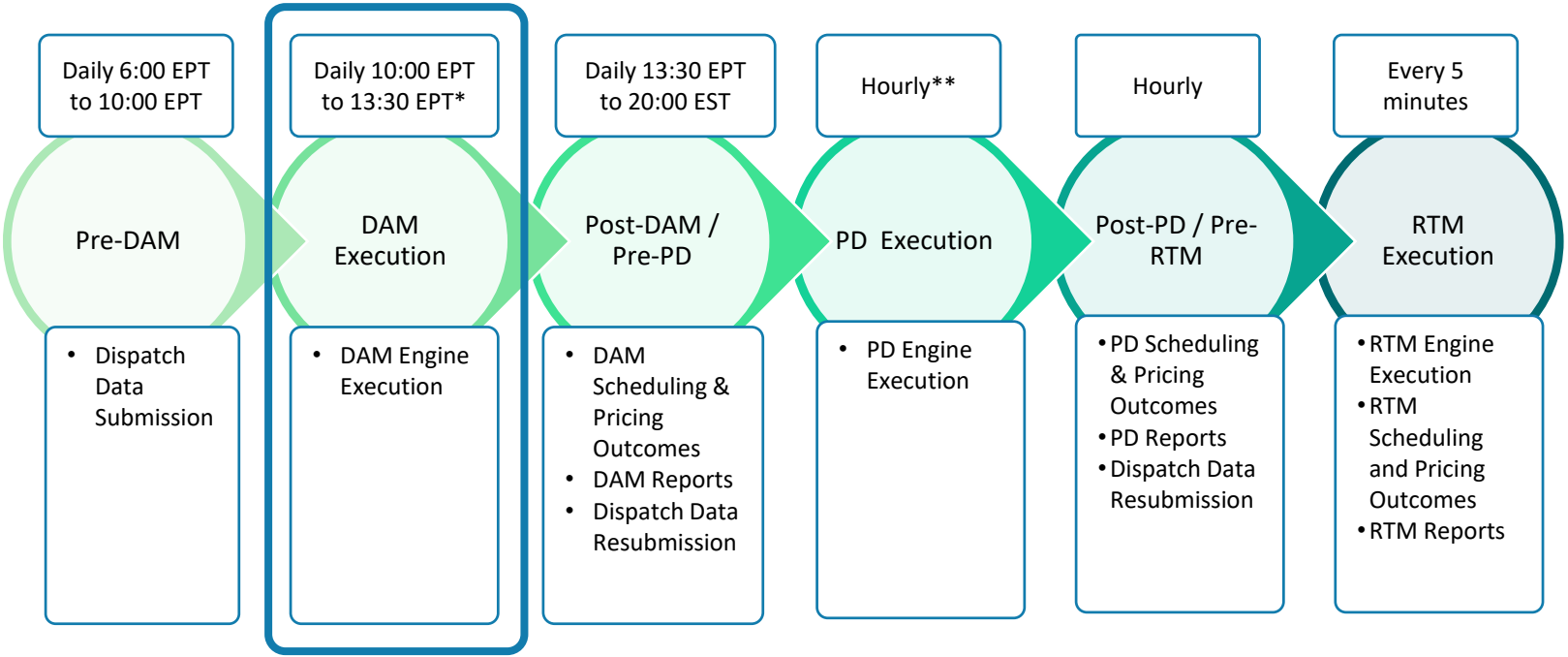


- DAM evaluates HE01 start-up offers and may commit the resource if economic as early as HE01
- MGBDT may not be satisfied based on most recent PD schedule from previous day
- Ramp up energy to MLP not applied or truncated if committed at start of day

Pre-DAM Reports

Report	New or Existing	Public or Private	Description
Adequacy Report	Existing	Public	Provides overall system conditions including any expected surplus/shortfalls, published at varies times throughout the day-ahead and pre-dispatch timeframes
Day-Ahead Area Reserve Constraints Report (Pre-DAM)	Existing	Public	Hourly maximum and minimum constraints for the area operating reserve regions expected to be used by the DAM engine, published daily at approximately 9:00 EPT
Day-Ahead Financial Reference Level Value Report	New	Private	Reference level values applicable for each resource to be used by the DAM engine, issued by approximately 6:00 EPT Updated at approximately 09:30 EPT, reflecting changes provided by the MP for the dispatch day

DAM Execution



* DAM execution can be extended until 15:30 EPT

** PD execution occurs hourly on rolling basis with first run starting 20:00 EST on the day prior to the dispatch day and the last run starting at 19:00 EST of the dispatch day

DAM Engine Execution

Pass 1: Market Commitment and Market Power Mitigation

- Determines an initial set of schedules and prices, including GOG-eligible NQS commitments to meet average demand
- Energy and operating reserve offers subject to ex-ante MPM, if required

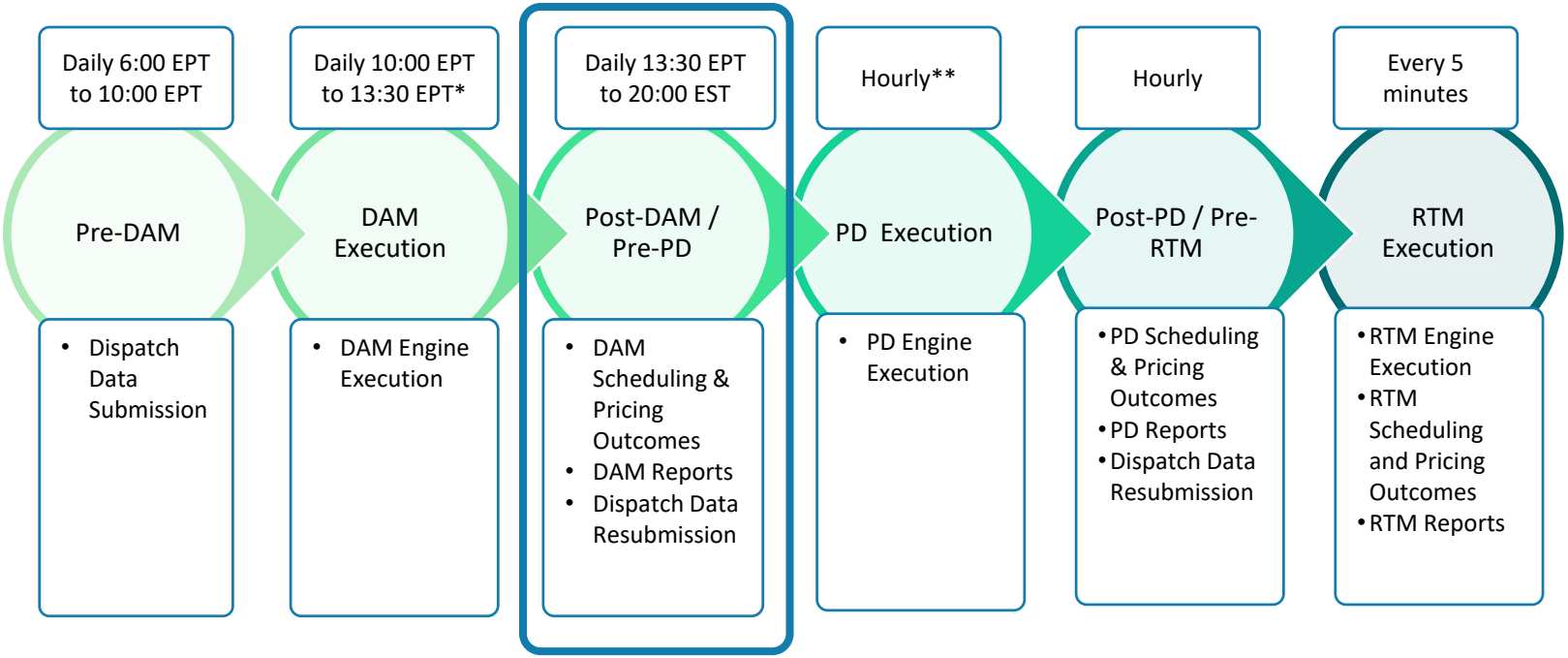
Pass 2: Reliability Scheduling and Commitment

- Determines whether additional GOG-eligible NQS commitments are required to meet peak demand
- Reference levels from Pass 1 used if mitigation applied

Pass 3: Day-Ahead Market Scheduling and Pricing

- Determines a final set of schedules and prices to meet average demand
- Reference levels from Pass 1 used if mitigation applied

Post-DAM / Pre-PD



* DAM execution can be extended until 15:30 EPT

** PD execution occurs hourly on rolling basis with first run starting 20:00 EST on the day prior to the dispatch day and the last run starting at 19:00 EST of the dispatch day

DAM Scheduling and Pricing Outcomes

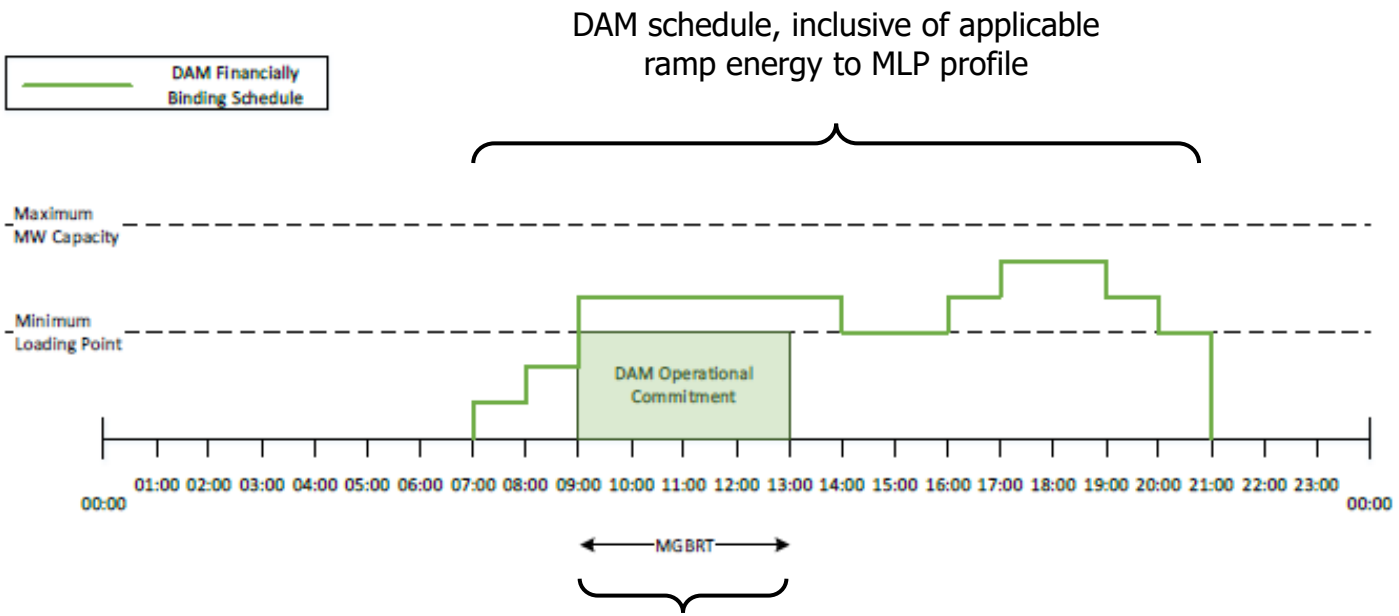
- DAM energy and operating reserve schedules and commitments for GOG-eligible NQS resources are produced hourly similar to today's DACP
- Corresponding prices are produced hourly as locational marginal prices (LMPs) at each resource location (i.e., the same location as the schedule)
- Key input factors that may influence differences in outcomes relative to DACP include:
  - Evaluation of new dispatch data for various resources
  - Application of ex-ante MPM
  - Constraint violation prices
- DAM schedules, corresponding LMPs, and commitments are used for settlement

DAM Scheduling and Pricing Outcomes (cont'd)

DAM Hourly Schedule	Outcomes	GOG-eligible NQS Resources
Energy	Schedule and commitments produced [1]	✓
	LMP produced	✓
	Subject to ex-ante offer mitigation	✓
	Schedule, LMP and commitments used for settlement [2]	✓
Operating reserve	Schedule produced [1]	✓
	LMP produced	✓
	Subject to ex-ante offer mitigation	✓
	Schedule + LMP used for settlement [2]	✓

[1] PSU schedule and commitments are translated to physical resource equivalents
[2] Translated PSU to physical resource schedules and commitments used for settlement

Example: DAM Schedule and Operational Commitment



DAM operational commitment starts after the ramp hours to MLP. The commitment duration is the MGBRT and the commitment value is the MLP.

Example: PSU Schedule Translation to Physical Resources

- DAM schedule at PSU level is translated to physical resource equivalents using registration and dispatch data

	Hour Ending DAM Schedule for Pseudo Unit																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
PSU								35	75	150	150	150	150	150	100	100	150	175	175	150	100			

	Hour Ending DAM Schedule for Associated Physical Resources																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
CT								35	50	90	90	90	90	90	60	60	90	105	105	90	60			
ST									25	60	60	60	60	60	40	40	60	70	70	60	40			

Ramp to MLP Hours MGBRT Hours

Example: PSU Commitment Translation to Physical Resources

- DAM operational commitment at PSU level is also translated to physical resource equivalents using registration and dispatch data

	Hour Ending DAM Commitment for Pseudo Unit																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
PSU										100	100	100	100											

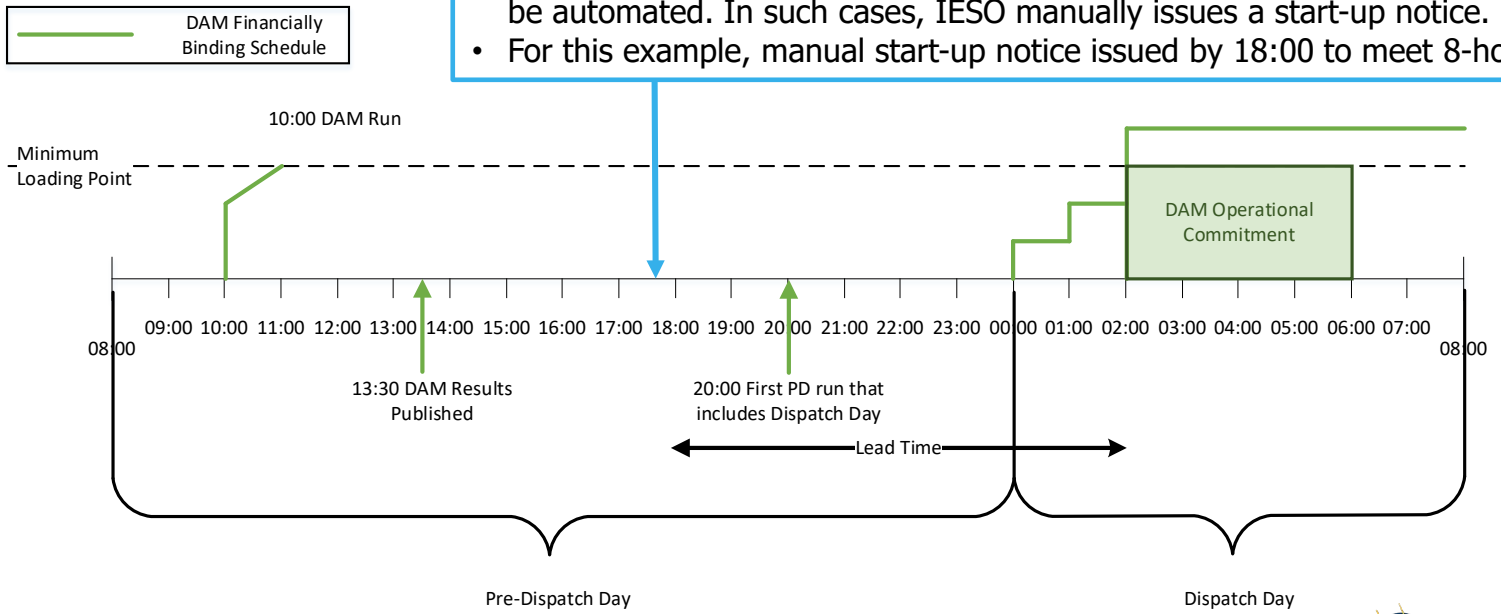
	Hour Ending DAM Commitment for Associated Physical Resources																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
CT										60	60	60	60											
ST										40	40	40	40											

Ramp to MLP Hours

MGBRT Hours

Manual Start-up Notices Before PD Process for Next Day

- Start-up notices will normally be automated via the PD process when lead times for DAM commitments fall within the PD look-ahead period
- Start-up notices for long lead-times coupled with early DAM commitments may not be automated. In such cases, IESO manually issues a start-up notice.
- For this example, manual start-up notice issued by 18:00 to meet 8-hour lead time



DAM Constraint Violation Prices

- Constraint violation prices are currently used in DACP to determine schedules
- For MRP, a new and separate set of constraint violation prices will be used to determine LMPs

Constraint Violation Prices for DAM Scheduling	Constraint Violation Prices for DAM Pricing
• Informational only • Constraint violation prices are used to prioritize which violations to resolve first where multiple constraints are violated and insufficient MP resources are available to resolve	• Used for settlement • Used to determine LMPs that reflect the value of resolving a constraint violation where insufficient MP resources are available to do so

- The methodology for determining both sets of constraint violation prices are documented in the market manual 4.2 and 4.3 appendices. While the actual values used for scheduling are documented, the actual values to be used for pricing will be determined before go-live

DAM Reports

Report	New or Existing	Public or Private	Description
DAM Hourly Energy LMP Report	New	Public	LMPs for energy, including LMP components[1] for all generator and load schedule locations, issued after DAM completion
DAM Hourly Operating Reserve LMP Report	New	Public	LMPs for operating reserve, including LMP components[1] for all eligible generator and load schedule locations, issued after DAM completion
Day-Ahead Area Reserve Constraints Report	Existing	Public	Hourly maximum and minimum constraints for the area operating reserve regions used by the DAM engine, published at approximately 13:30 EPT

[1] For energy LMP, components include loss and congestion prices. For operating reserve LMP, components include congestion price.

DAM Reports (cont'd)

Report	New or Existing	Public or Private	Description
Dispatch Data Report for DAM Scheduling Process	New	Private	Daily confirmation of an MP's daily and hourly dispatch data submitted into the DAM, issued after DAM completion
Real-time Financial Reference Level Values Report	New	Private	Reference level values to be used by the PD and RTM engines based on DAM results, issued daily at 14:00 EPT
Day-Ahead Scheduled Energy and Operating Reserve Report	Existing	Private	Hourly DAM energy and operating reserve schedules, issued after DAM completion. Also indicates whether mitigation was applied and the relevant constrained area condition.
Day-Ahead Commitments Report	Existing	Private	Indicates which of an MP's resources have commitments for the next day and are eligible for the Day-Ahead Generator Offer Guarantee, and show the MLP and hours committed
Day-Ahead Pseudo-Unit Generator Data Computed Values Report	Existing	Private	The values used by the DAM calculation engine for pseudo-units and corresponding combustion turbine generation units and steam turbine generation unit

Dispatch Data Resubmission Considerations

After DAM completion and moving into the PD timeframe, MPs should be mindful of the following when revising dispatch data for GOG-eligible NQS resources:

- Dispatch data revision restrictions
- Impact of DAM results on PD
- PD engine initializing conditions

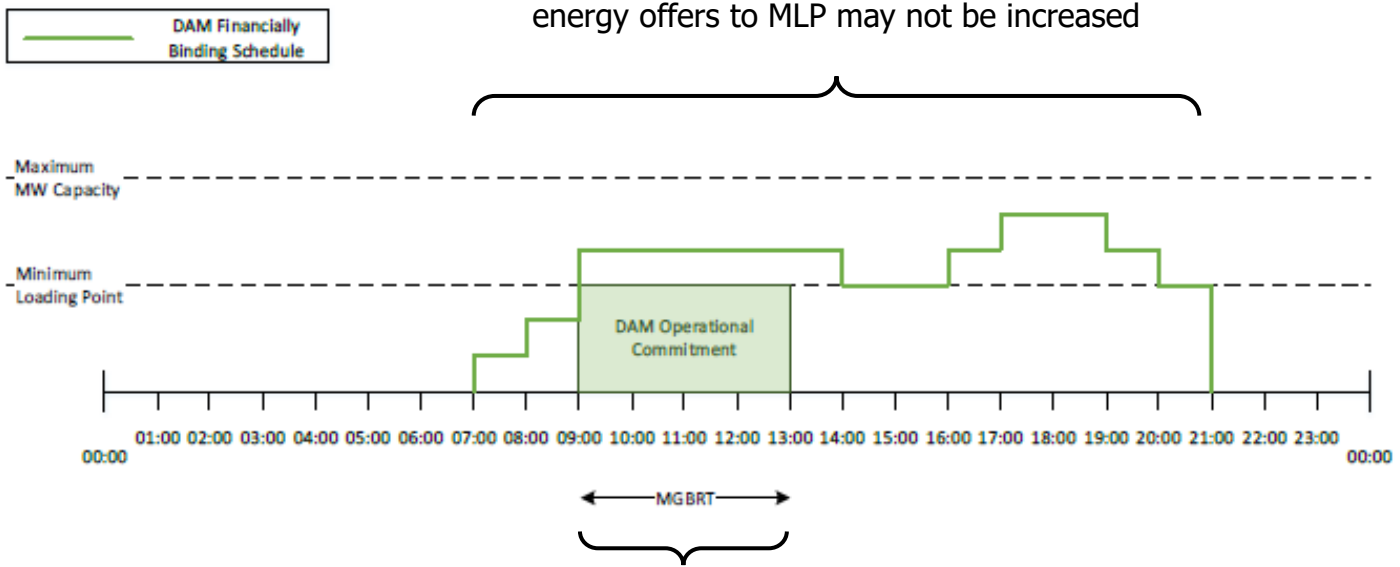
Dispatch Data Revision Restrictions

- All MPs are restricted from revising their submitted dispatch data during DAM engine execution (i.e., the DAM restricted window). After DAM completion, MPs with GOG-eligible resources are restricted as follows:

Dispatch Data Type	Parameter(s)	From DAM Completion to 20:00 EST		After 20:00 EST
		With a DAM Schedule	Without a DAM Schedule	With or Without a DAM Schedule
Hourly	Energy offer price up to and including MLP	Must not be increased for any scheduled hour	No restrictions	Must not be increased for any hours
Hourly	Speed-no-load offer	Must not be increased for any scheduled hour	No restrictions	Must not be increased for any hours
Hourly	Start-up offer	Must not be increased during MGBRT hours of DAM commitment	No restrictions	Must not be increased for any hours
Daily	MGBRT & MLP	No changes permitted		
Daily	Single Cycle Mode	Changes permitted with IESO approval		

Example: Offer Restrictions DAM Completion to 20:00 EST

During all DAM **scheduled hours**, speed no-load and energy offers to MLP may not be increased



During all DAM **operational commitment hours**, start-up offers (hot, warm or cold) may not be increased

Dispatch Data Revision Restrictions (cont'd)

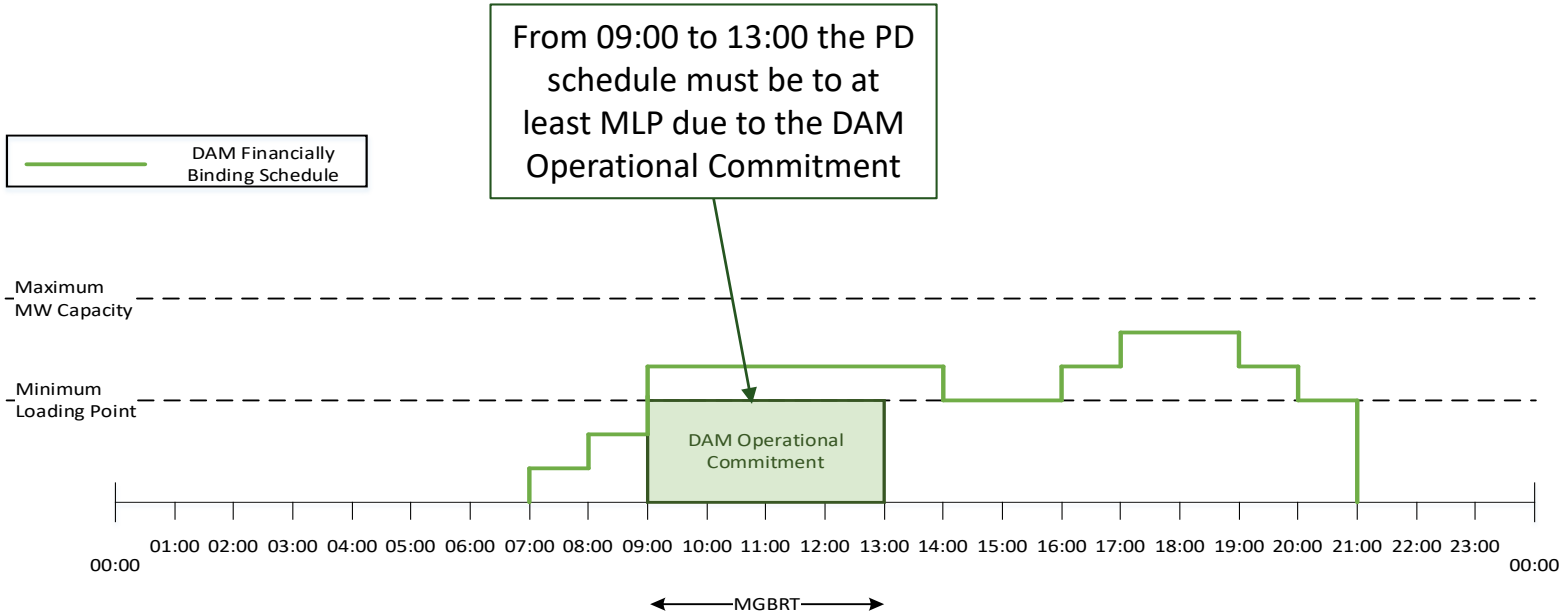
- Subject to the previously mentioned restrictions, the following restrictions apply to other all other dispatch data revisions after DAM:
  - Hourly dispatch data may be revised ahead of the first PD run and subsequent PD runs, up until the same two-hour mandatory window that MPs are familiar with in today's market; and
  - Daily dispatch data may be revised up to and within the two-hour mandatory window as long as a valid reason code is submitted, i.e. safety of any person, damage to equipment and violation of any applicable law (SEAL)

Impact of DAM Results on PD

The following DAM outcomes are carried forward as inputs to the PD engine:

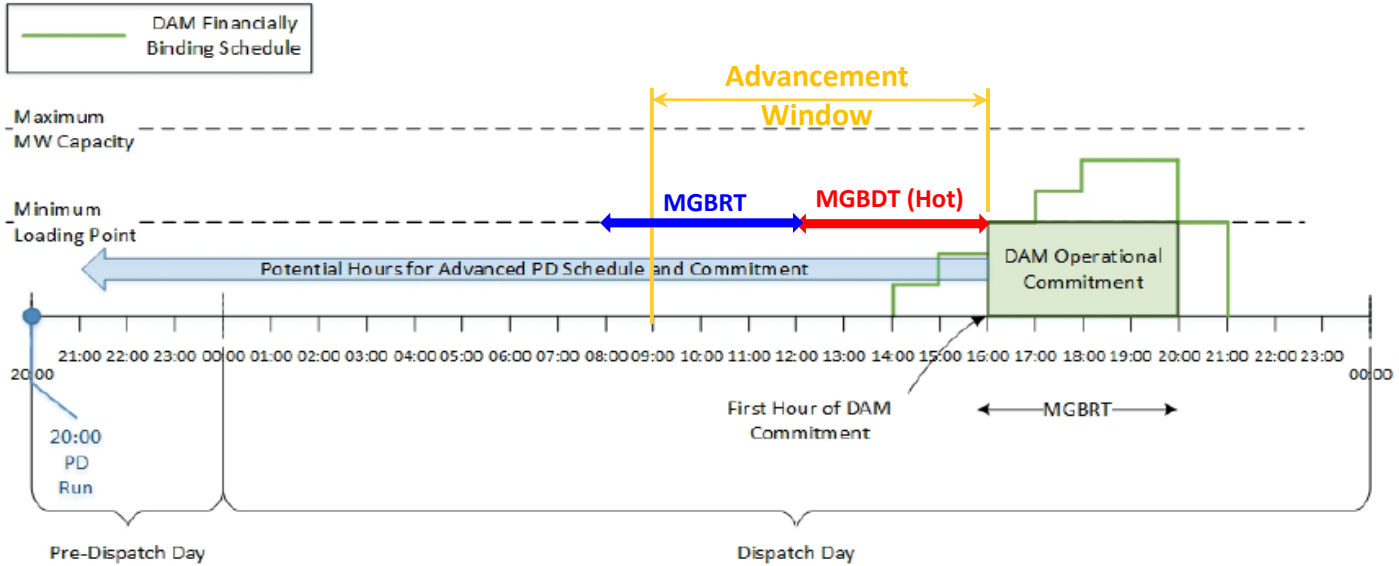
- DAM operational commitments
- Start-up offers used when evaluating whether to advance a DAM commitment

Example: DAM Operational Commitments in Pre-Dispatch



Example: Evaluating Advancement of DAM Commitment

Scenario: PD engine evaluating start-up offers when considering whether to advance a DAM commitment



- Within advancement window, higher value of DAM or PD start-up offer evaluated
- Prior to advancement window, PD start-up offer always evaluated

Note: Advancement window = MGBRT + MGDBT (hot) – 1

PD Engine Initializing Conditions

Initializing Condition	PD Scheduling Treatment
Determination of thermal state	Thermal state is determined by the PD engine and is used to select which of the hot, warm or cold values to use for: start-up offer, ramp energy to MLP and lead time
Selection of daily dispatch data across two days	For PD engine runs where the PD look ahead period spans two days there is a protocol that determines which values of daily dispatch parameters to use for each day
Using tracked values	Tracked values of starts and energy production are respectively used to respect max number of starts per day and MaxDEL submitted
Scheduling to MLP after an outage or grid incapability	Special treatment applies for scheduling NQS resources after an outage/grid incapability

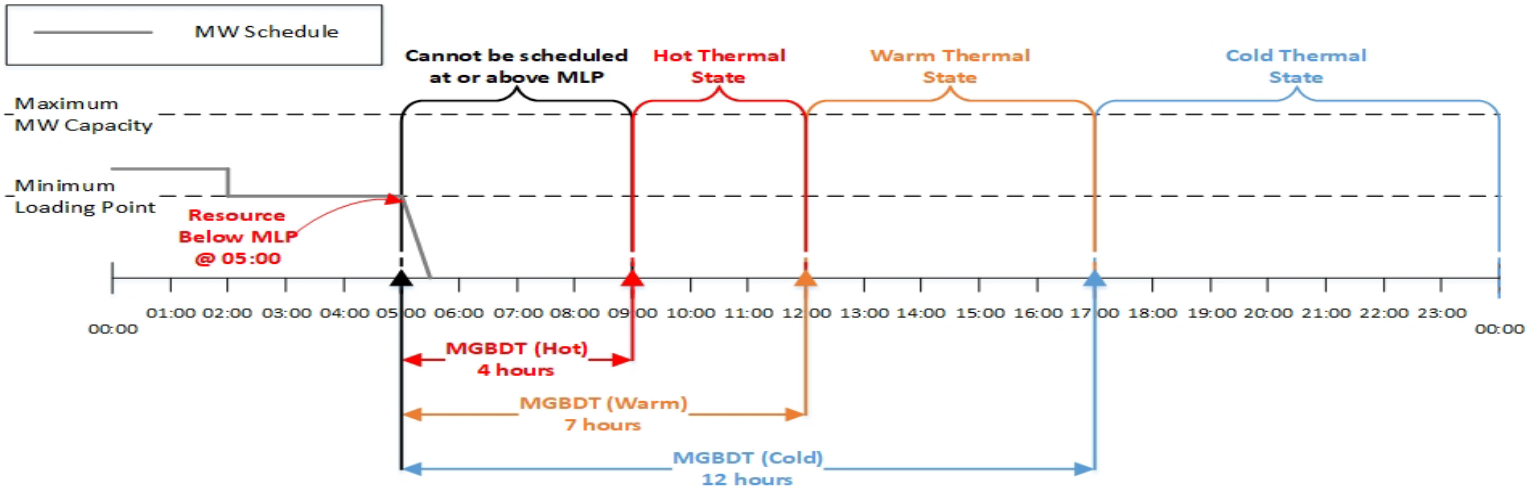
PD Determination of Thermal State

Unlike DAM, where one of the three thermal states submitted by the MP tells the DAM engine which thermal state to assume, PD determines which thermal state a GOG-eligible NQS resource is in and selects the applicable thermal status values (hot, warm or cold) to use when evaluating dispatch data for each hour

Engine	Dispatch Data Type	How is Thermal State Determined?	Dispatch Data Impacted by Thermal State
DAM	Daily	Submitted by MP	• Start-Up offer • Ramp profile to MLP
PD	Hourly	Determined based on number of hours resource has been below MLP and MGBDT (hot, warm and cold) values	• Start-Up offer • Ramp profile to MLP • Lead time

Example: PD Determination of Thermal State

Scenario: Resource below MLP at 05:00



- Resource cannot be scheduled at or above MLP during MGBDT(hot) hours
- Once MGBDT(hot) hours have passed resource uses hot thermal state parameters (Start-up offer, lead time and ramp profile to MLP) until MGBDT(warm) hours are reached. Then switches to warm thermal state parameters until the MGBDT(cold) hours are reached and then switches to cold thermal state parameters

PD Selection of Daily Dispatch Data Across Two Days

PD Run	PD Look Ahead Period	Daily Dispatch Data Used
00:00 – 19:00	Hours remaining in the current day	Dispatch data submitted for current day

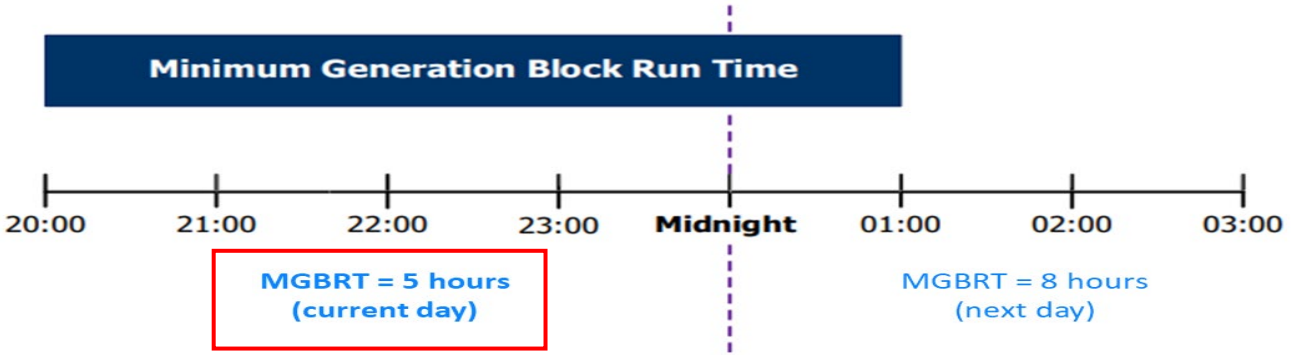
20:00 – 22:00	Hours remaining in the current day and all 24 hours of the next day	• For HE22-HE24 of current day use dispatch data submitted for the current day, except for the following parameters where the next day's data will be used:
		  • MLP [1]
		  • MGBRT [1]
		  • MGBDT
		  • Lead Time
		  • Ramp to MLP
		  • Daily Energy Ramp Rate
		  • Single Cycle Mode [1]
		• For all hours of the next day use dispatch data submitted for the next day

23:00	All 24 hours of the next day	Dispatch data submitted for next day

[1] Some exceptions apply (covered in next slides)

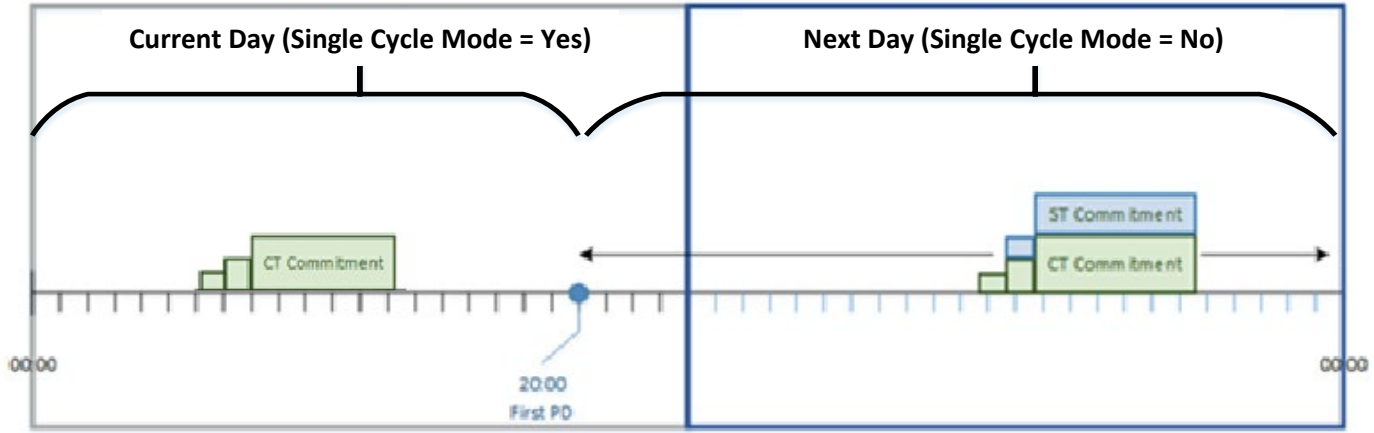
Exception for PD Selection of MLP and MGBRT

Scenario: An NQS resource has a DAM or PD commitment before the 20:00 EST PD run and the commitment is not yet complete. In this case, current day MLP and MGBRT values apply until commitment is complete even if the commitment extends into the next day



Exceptions for PD Selection of Single Cycle Mode

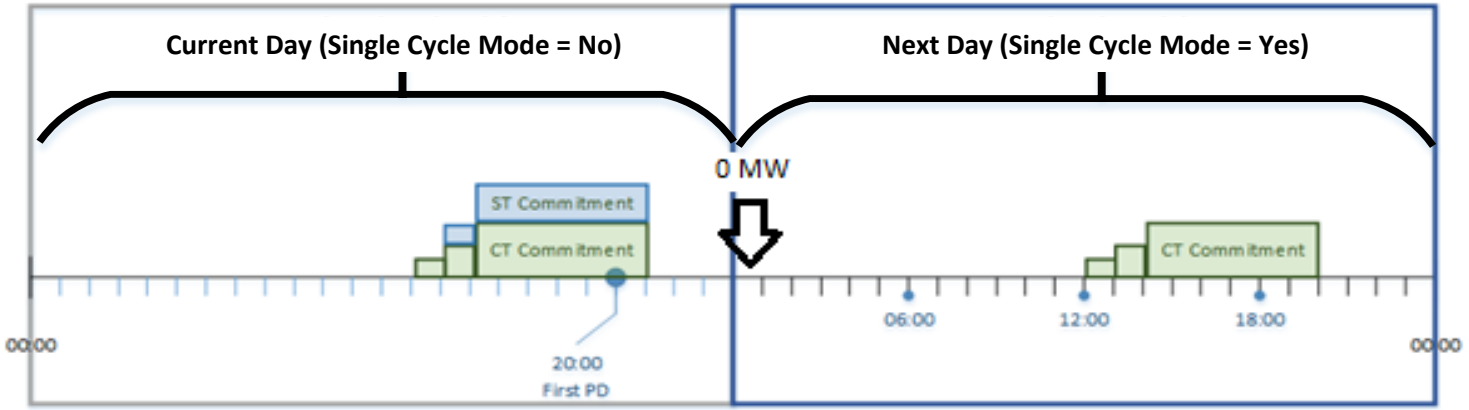
- Like most other daily parameters, the single cycle mode value submitted for the next day is used when the PD look-ahead period spans two days



- Two exceptions apply if the PSU is online or is expected to be online before the end of the current day (discussed next)

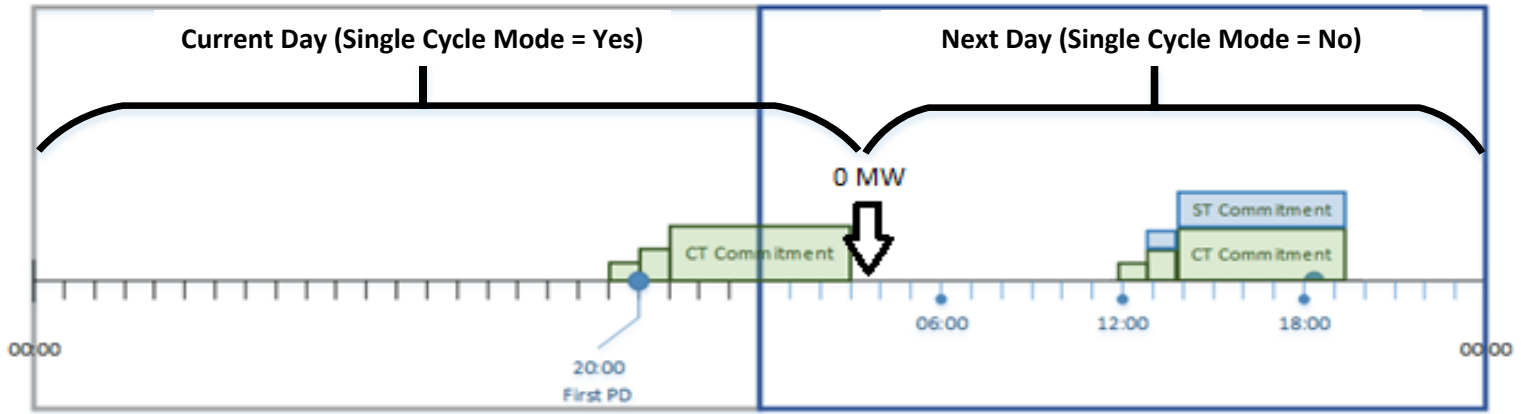
Exception #1 for PD Selection of Single Cycle Mode

If the PSU…	Then the PD engine…
• is in service at the time of the initial PD run or has a future constraint that brings it in service before the end of the current day; and • **does NOT** have a minimum constraint to keep it in service over midnight	• uses the single cycle mode for current day until the end of the current day and schedules the PSU off in the first hour of the next day



Exception #2 for PD Selection of Single Cycle Mode

If the PSU…	Then the PD engine…
• is in service at the time of the initial PD run or has a future constraint that brings it in service before the end of the current day; and • **has** a minimum constraint that keeps it in service over midnight	• uses the single cycle mode for current day until the end of the commitment and schedules the PSU off in the first hour for which there is no commitment



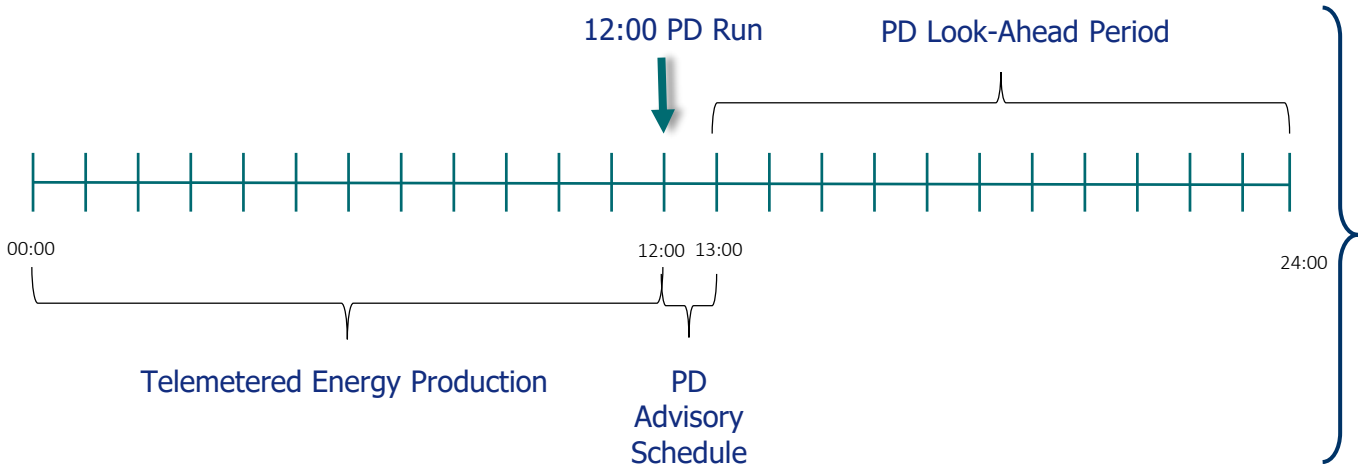
PD Using Tracked Values

- Pre-dispatch tracks energy production and starts in order to produce schedules that respect the submitted dispatch data, including maxDEL and Max Number of Starts per Day (MNSPD)
    - Tracked energy uses a combination of telemetered values and PD advisory schedule

- Market participants will receive the tracked data via confidential reports
- In the rare case where there is a discrepancy between tracked and actual values, market participants should update their dispatch data to correct the discrepancy and notify the IESO

Example: PD Energy Tracking

Scenario: The 12:00 run of PD uses tracked energy production in order to schedule the remaining look-ahead period



The 12:00 PD engine run uses telemetered energy production from 00:00 to 11:59 and the PD advisory schedule value for 12:00-12:59 to establish the total energy production at the start of the PD look-ahead period

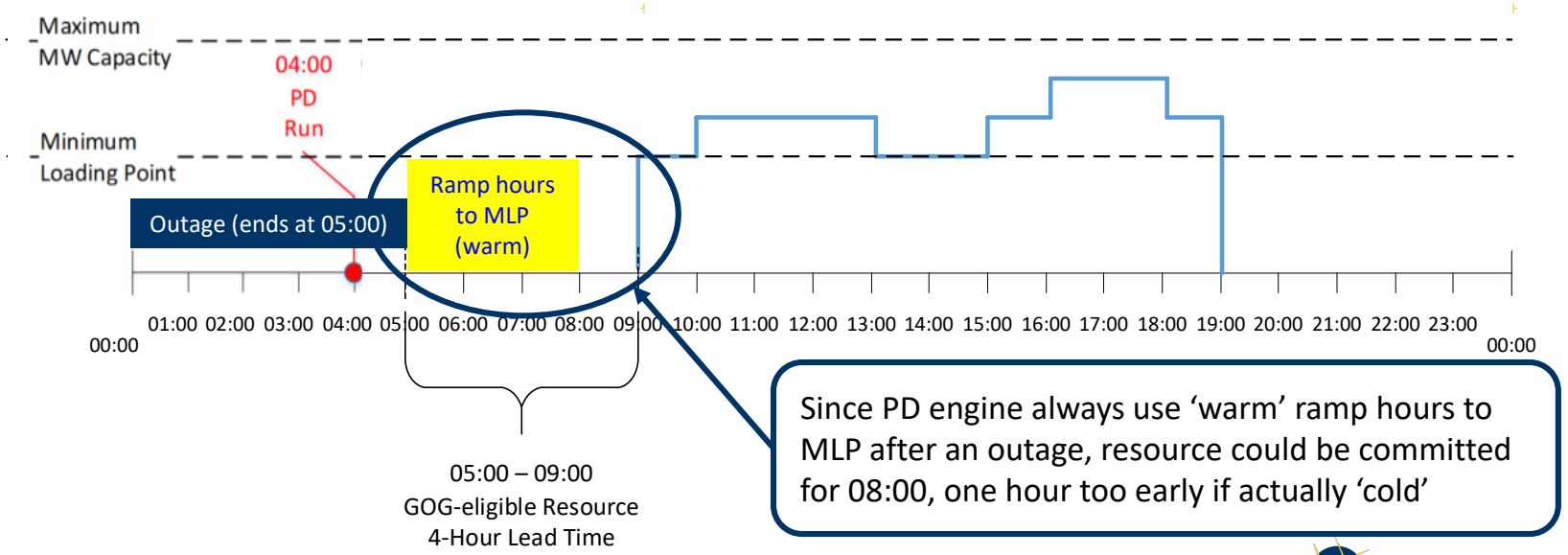
PD Scheduling After an Outage / Grid Incapability

- Following a GOG-eligible NQS resource outage or transmission outage that makes the resource grid incapable, the PD engine only respects the resource's warm thermal state, meaning the resource may receive a commitment to MLP following the outage that could either be:
  - too early if the MP considers the resource 'cold'; or
  - too late if the MP considers the resource 'hot'

- This logic does not apply if there is an existing commitment in these hours

Example: PD Scheduling After an Outage

Scenario: Outage ends at 05:00 and MP expects resource to be 'cold' with 4 ramp hours to MLP, implying the earliest time it can reach MLP is 09:00. Submitted hours to MLP (warm) = 3



MP Actions Available for a Feasible Ramp After Outage

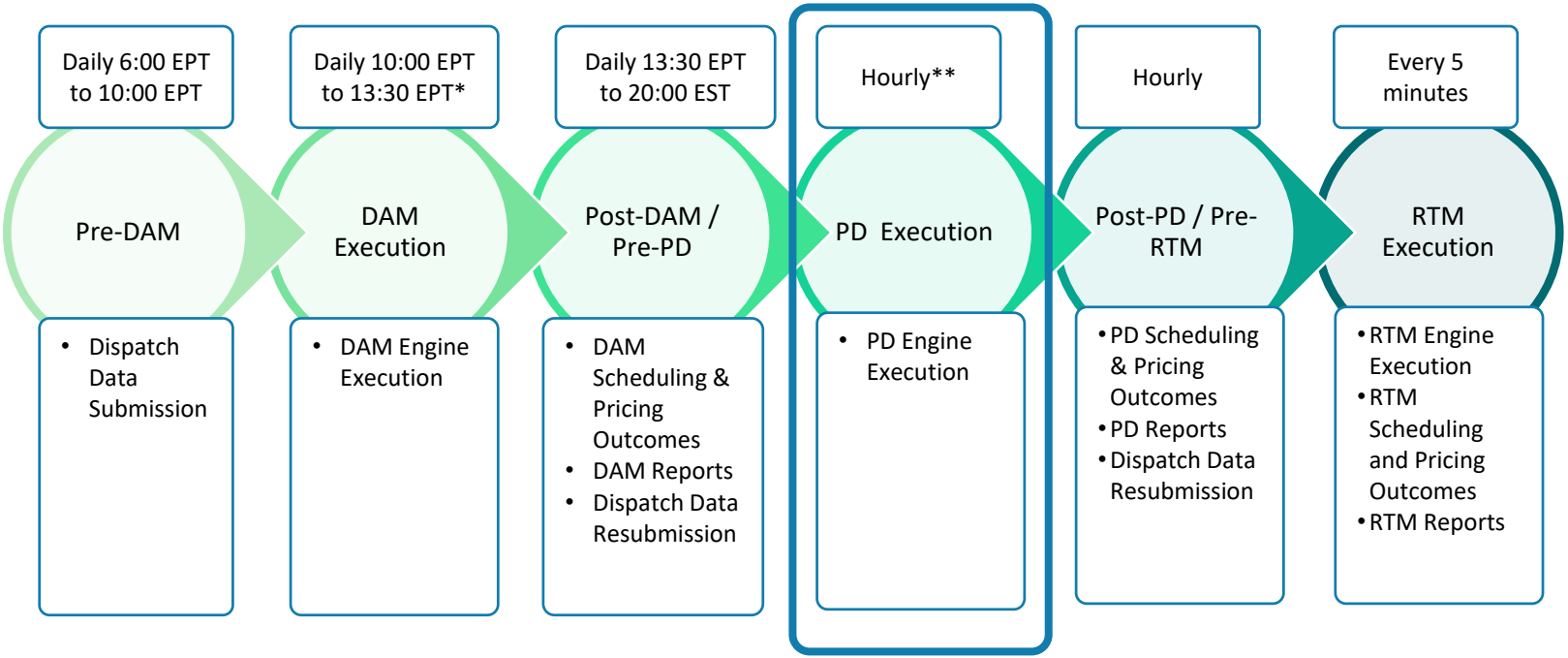
- If the resource is 'hot' and capable of reaching MLP earlier than the number of warm ramp hours to MLP, reduce warm ramp hours to MLP to reflect 'hot'

- If the resource is 'cold' and not capable of reaching MLP when the number of warm ramp hours to MLP has passed, increase warm ramp hours to MLP to reflect 'cold'

- If increasing ramp hours to reflect 'cold' fails validation (e.g. MPM validation rules reject because the increase is too large), MPs can also submit a derate to less then the resource's MLP for the hours that it is incapable of reaching MLP (effectively prevents resource from receiving too early a commitment)

- If actions above are not feasible contact IESO

PD Execution



* DAM execution can be extended until 15:30 EPT

** PD execution occurs hourly on rolling basis with first run starting 20:00 EST on the day prior to the dispatch day and the last run starting at 19:00 EST of the dispatch day

PD Engine Execution

PD Engine

- Determines schedules and prices to meet composite demand
- Determines new GOG-eligible NQS resource commitments
- Dispatch data subject to ex-ante MPM, if required

Subsequent Runs of the PD Engine

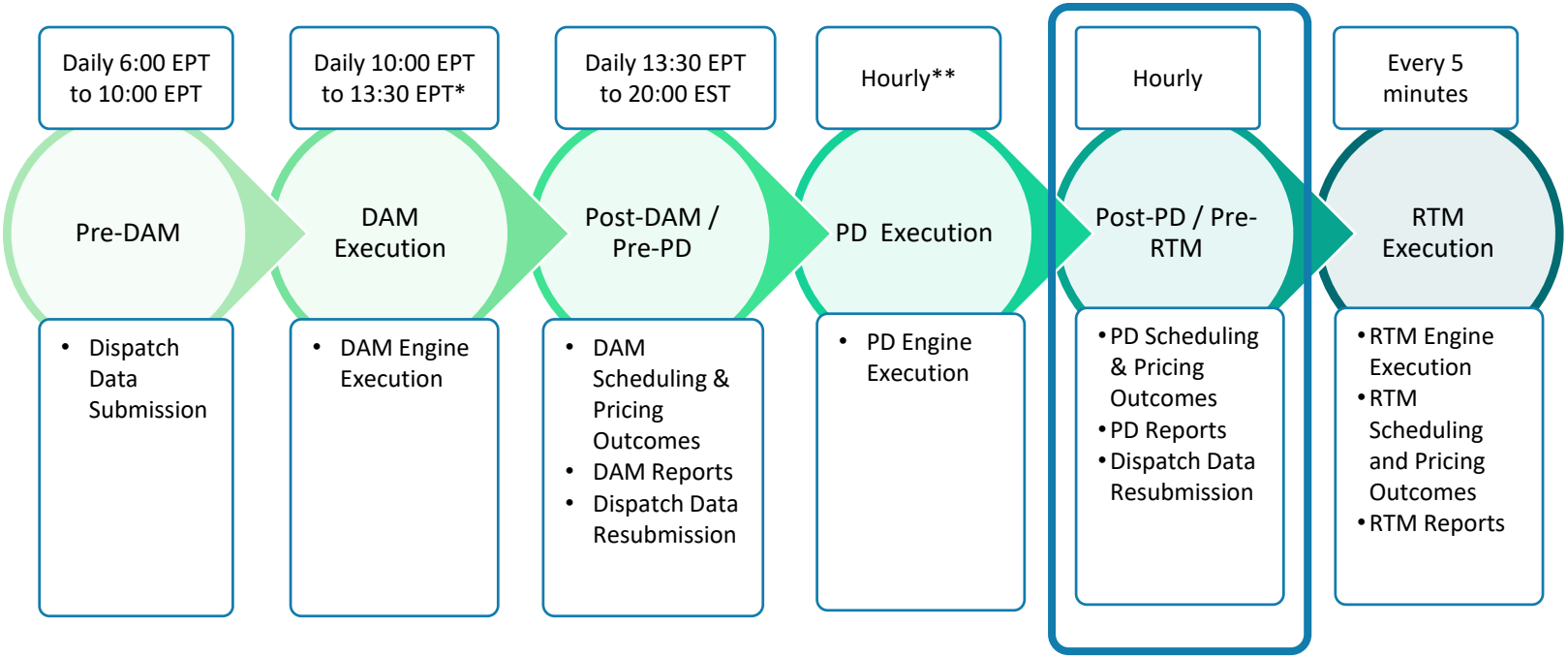
- Continues to determine schedules and prices to meet composite demand
- Continues to determine if new GOG-eligible NQS resource commitments are needed
- Mitigated energy and operating reserve offers are passed from one PD run to the next

PD Engine Execution (cont'd)

- If energy and/or operating reserve offers are mitigated by the PD engine, reference level values are used in lieu of offer values for all subsequent PD runs

- MPs may request updates to their reference level values between PD runs if their fuel costs change as per MPM market manual 14.2. Updated reference level value will be used by subsequent PD runs

Post-PD / Pre-RTM



* DAM execution can be extended until 15:30 EPT

** PD execution occurs hourly on rolling basis with first run starting 20:00 EST on the day prior to the dispatch day and the last run starting at 19:00 EST of the dispatch day

PD Scheduling and Pricing Outcomes

- PD energy and operating reserve schedules for GOG-eligible NQS resources are produced hourly similar to today
- Corresponding prices are produced hourly as LMPs at each resource location
- As discussed for DAM, key input factors that may influence differences in scheduling and pricing relative to today's PD include:
  - Evaluation of new dispatch data for various resources
  - Application of ex-ante MPM
  - Constraint violation prices (informational for PD, not used in settlement)
- While PD schedules and corresponding LMPs for GOG-eligible NQS resources are NOT used for settlement, PD commitments are used for settlement

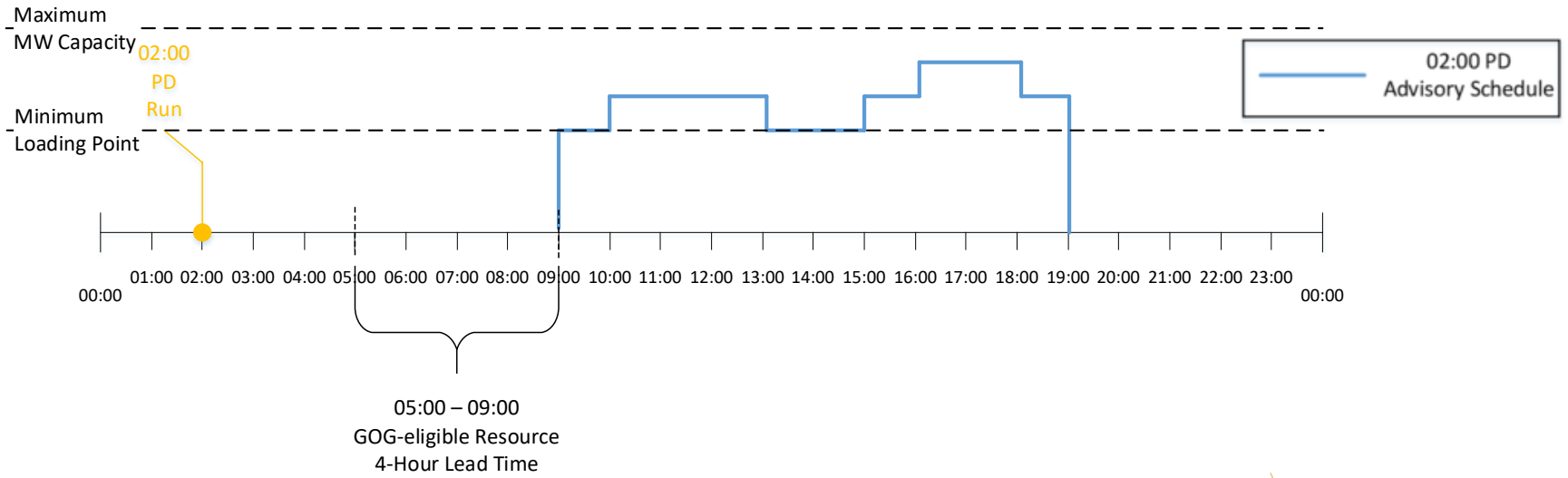
PD Scheduling and Pricing Outcomes (cont'd)

PD Hourly Schedule	Outcomes	GOG-eligible NQS Resources
Energy	Schedule and commitments produced [1]	✓
	LMP produced	✓
	Subject to ex-ante offer mitigation	✓
	Schedule, LMP and commitments used for settlement [2]	Only commitments
	Notices (start-up, extension, de-commitment)	✓
Operating reserve	Schedule produced [1]	✓
	LMP produced	✓
	Subject to ex-ante offer mitigation	✓
	Schedule + LMP used for settlement	✗

[1] PSU schedule and commitments are translated to physical resource equivalents
[2] Translated PSU to physical resource commitments used for settlement

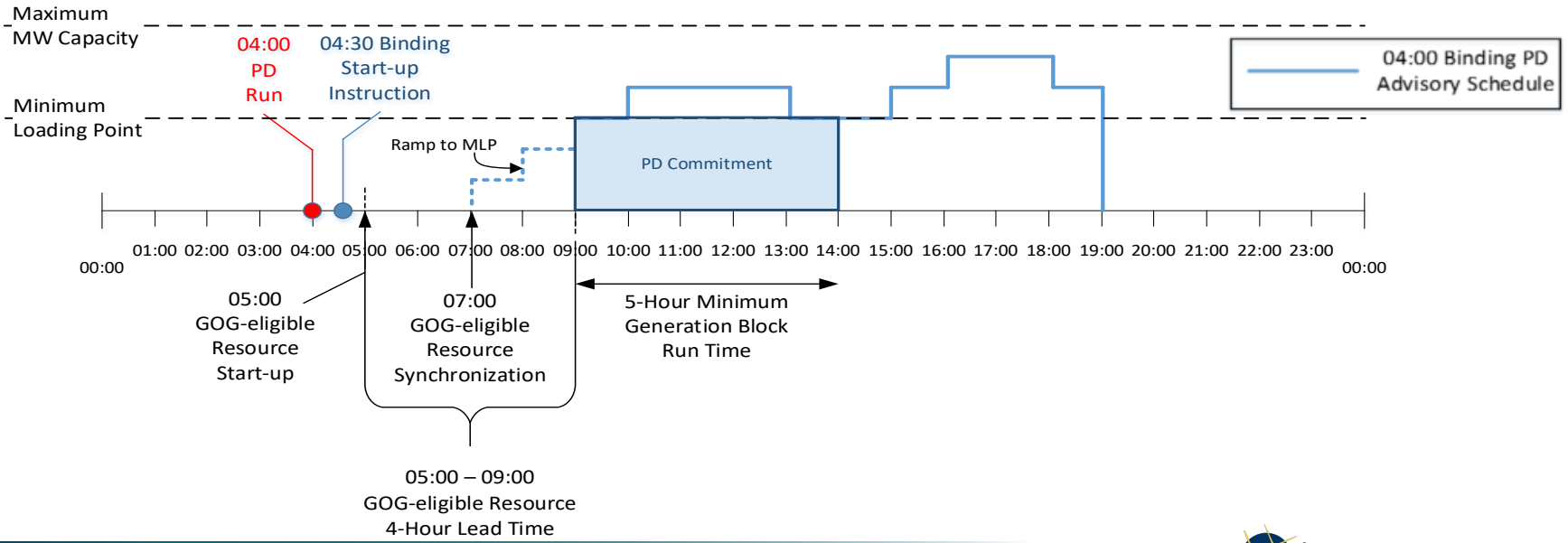
Example: Non-Binding PD Advisory Schedule

Scenario: GOG-eligible resource has a schedule to MLP starting in 6 hours from the current PD run. Schedule is non-binding (i.e., no commitment created) as the minimum 4 hour lead time can still be met by a future PD run



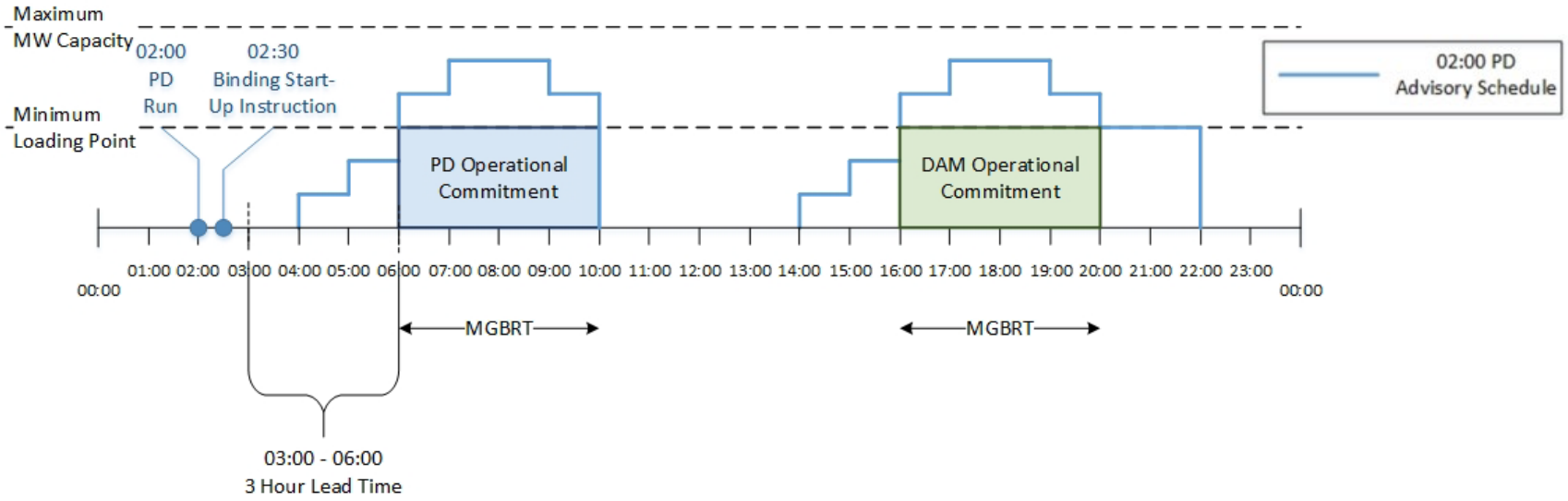
Example: Binding PD Advisory Schedule

Scenario: GOG-eligible resource has a schedule to MLP starting in 4 hours from the current PD run. Schedule is binding and creates a PD commitment as the 4-hour lead time cannot be met by a future PD run



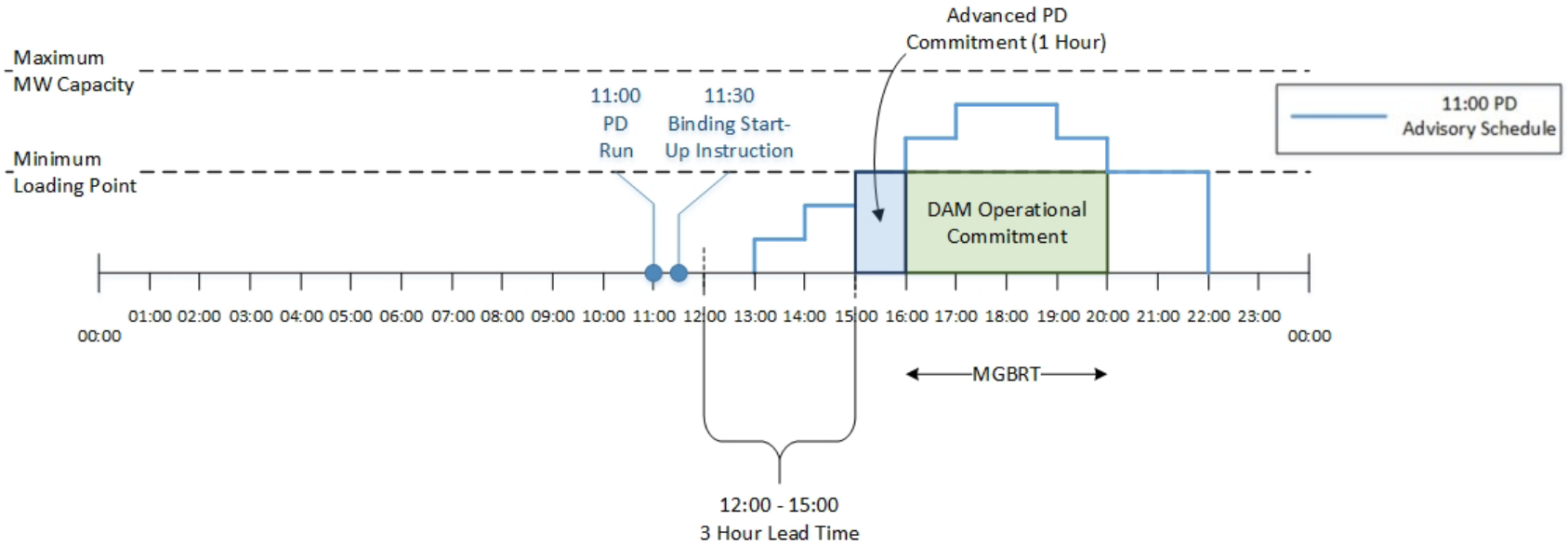
Example: Binding PD Schedule with DAM Commitment

Scenario: A DAM operational commitment was previously created, the PD engine creates a separate stand alone PD operational commitment



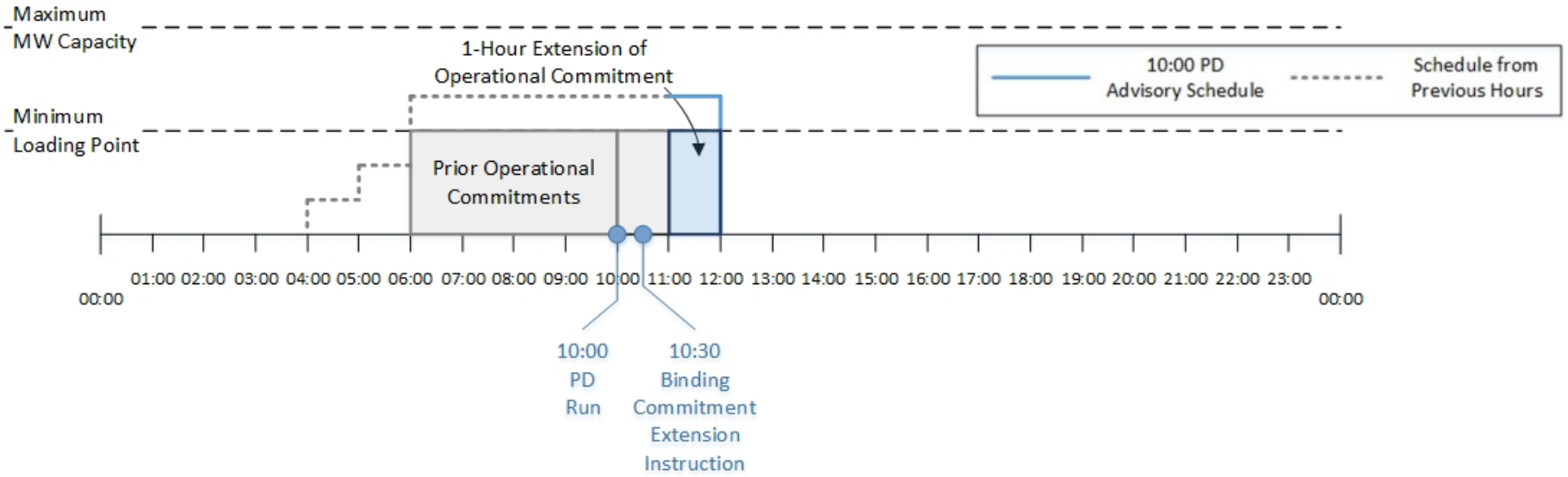
Example: PD Advancement of a DAM Commitment

Scenario: PD engine advances a GOG-eligible resource's DAM commitment by one hour since this is the last opportunity for the lead time to be met



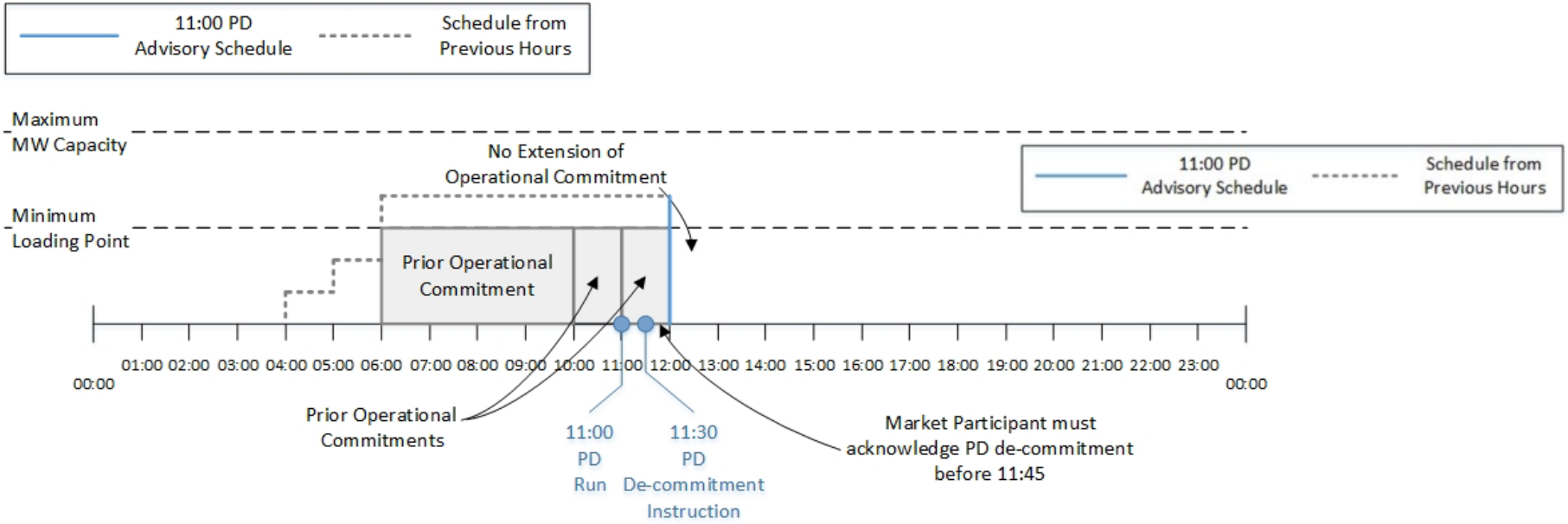
Example: PD Extension of a DAM or PD Commitment

Scenario: PD engine extends a GOG-eligible resource's DAM or PD commitment one hour at time based on most current PD run



Example: PD De-Commitment

Scenario: PD engine decides not to extend a GOG-eligible resource's DAM or PD commitment. With no extension, de-commitment notice issued



PD Commitment Notices

PD communicates start-ups, extensions and de-commitments to MPs via notices

Type of Notice	Description

Start-Up Notice	• Start-up notices inform MPs that their resources are directed to start. Notice contains start time, synchronization time and time to reach MLP.
	  • Issued after the last PD run that satisfies the resource's lead time
	  • Issued at 30 minutes past the hour and must be acknowledged 45 minutes past the hour
	  • MP may provide an alternate synchronization time

Extension Notice	• Extension notices are issued in the last hour of a commitment and inform the MP that its commitment has been extended for an hour • Issued at 30 minutes past the hour and are deemed automatically accepted
De-Commitment Notice	• De-commitment notices are issued in the last hour of a commitment and inform the MP that its commitment is ending • Issued at 30 minutes past the hour and must be acknowledged by 45 minutes past the hour

MP Response to Start-Up Notice

- MP must either accept or reject a start-up notice
- Upon acceptance, an alternate synchronization time may be provided as long as the new time is:
  - No later than the time the resource is scheduled to be at MLP; and
  - Must be within +/- 1 hour of the current synchronization time, except for steam turbine resources which are registered as part of a PSU. For this case the alternate synchronization time can be more than 1 hour after the current synchronization time but must still be before the time to MLP
- A rejection means that the resource will not be starting but does not negate the consequences of withdrawing from a commitment

PD Reports

Report	New or Existing	Public or Private	Description
Pre-Dispatch Hourly Energy LMP Report	New	Public	LMPs for energy, including LMP components[1] for all generator and load schedule locations, issued on an hourly basis
Pre-Dispatch Hourly Operating Reserve LMP Report	New	Public	LMPs for operating reserve, including LMP components[1] for all eligible generator and load schedule locations, issued on an hourly basis
Pre-Dispatch Intertie Transactions and GOG Eligible Extensions Report	New	Private	Extensions to operational commitments and intertie schedules for energy and operating reserve for the first two hours of the PD look-ahead period only, issued 15 minutes past the hour
Pre-Dispatch Commitments Report	New	Private	Commitments for GOG eligible resources, including commitments to maintain reliability
Pre-Dispatch GOG-Eligible Unit Inferred State Report	New	Private	Minimum Generator Block Down Time (MGBDT) values used by the pre-dispatch calculation engine to infer thermal state and the number of consecutive hours that a resource has been below its minimum load point (MLP)

[1] For energy LMP, components include loss and congestion prices. For operating reserve LMP, components include congestion price

PD Reports (cont'd)

Report	New or Existing	Public or Private	Description
Pre-Dispatch Daily Energy Limit Tracking Report	New	Private	Cumulative energy schedules for the dispatch day for the purpose of tracking a resource's operation relative to its submitted minimum and maximum daily energy limit
Pre-Dispatch Number of Starts Tracking Report	New	Private	Actual and forecast number of starts for the dispatch day and the resource's submitted maximum number of starts per day
Pre-Dispatch Pseudo-Unit Generator Data Computed Values Report	New	Private	Values used by the Pre-dispatch calculation engine for pseudo-units and associated generation resources
Real-time Financial Reference Level Values Report	New	Private	Updated reference level values used by the PD and RTM engines based on MP changes to their reference levels, issued as required
Pre-Dispatch Schedules Report	Existing	Private	Hourly energy and operating reserve schedules, issued approximately 30 minutes past each hour. Also indicates whether mitigation was applied and the relevant constrained area condition

Dispatch Data Resubmission Considerations

MPs should be mindful of the following when considering revisions to their dispatch data for GOG-eligible NQS resources ahead of subsequent PD runs and RTM dispatch hour:

- PD and RTM engine initializing conditions
- Dispatch data revision restrictions

PD and RTM Engine Initializing Conditions

PD/RTM Initializing Condition	PD and/or RTM Engine Scheduling Treatment
Mitigated Dispatch Data	As mentioned, any mitigated dispatch data from a previous PD run will carry through to subsequent PD runs and real-time
MaxDEL	RTM engine does not respect MaxDEL. An outage can be submitted if MaxDEL is expected to be reached
Commitments	As long as a commitment is in effect the RTM engine will not dispatch a resource below MLP. Once a commitment ends the RTM engine may dispatch a resource below MLP if economic to do so
Ramp Rate	The RTM engine evaluates dispatch schedules using the hourly energy ramp rate and not the daily energy ramp rate submitted by the MP

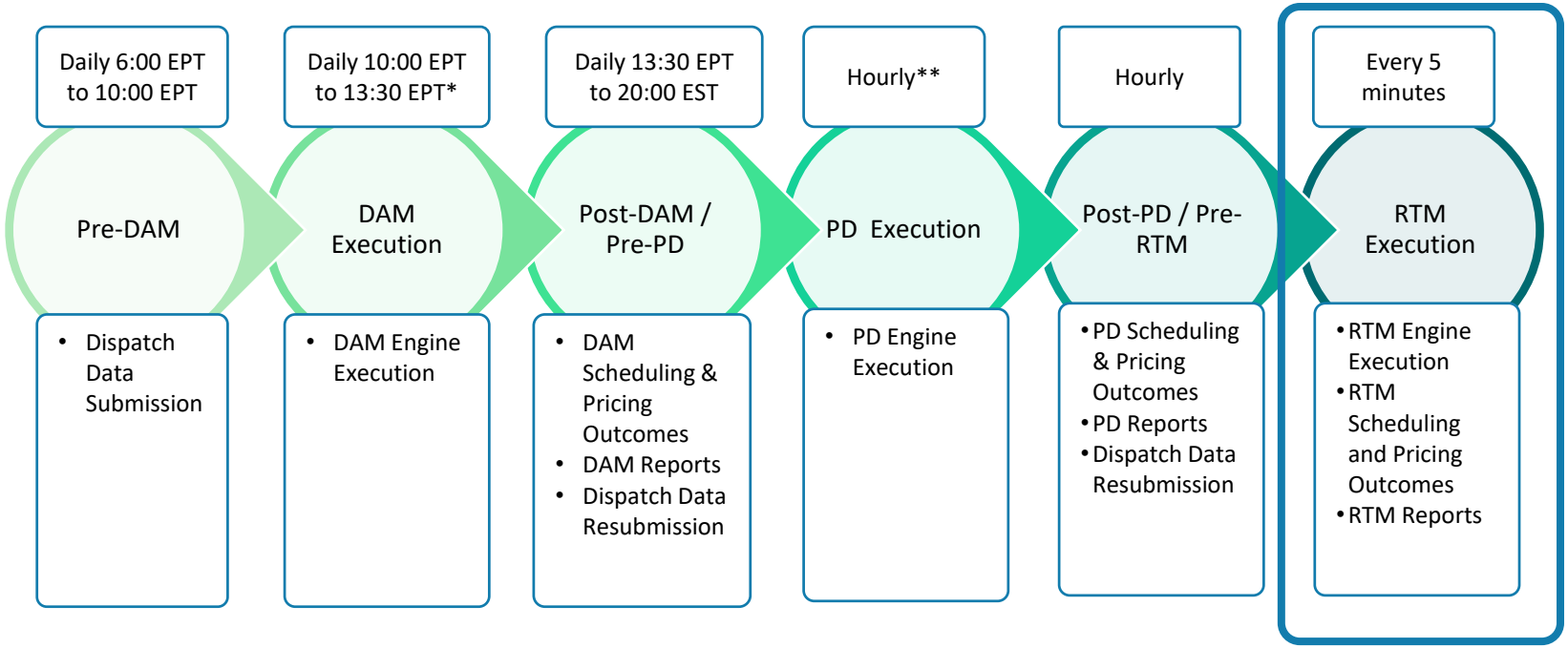
Dispatch Data Revisions Restrictions Post-PD / Pre-RTM

In addition to the dispatch data revision restrictions noted for GOG-eligible resources after DAM and the 20:00 EST PD run, once a PD start-up notice is issued the following restrictions apply:

Dispatch Data Type	Parameter	After Receiving a Binding PD Schedule and Start-Up Notice [1]
Hourly	Energy offer prices for quantities above MLP	Must not be increased for any contiguously scheduled hours above MLP of the PD schedule at the time of the start-up notice, excluding any DAM scheduled hours
Hourly	Operating reserve offer prices	

[1] No longer applies once GOG-eligible resource receives a de-commitment notice

RTM Execution



* DAM execution can be extended until 15:30 EPT

** PD execution occurs hourly on rolling basis with first run starting 20:00 EST on the day prior to the dispatch day and the last run starting at 19:00 EST of the dispatch day

RTM Engine Execution Overview

PD Engine Run
1 hour prior to the RTM dispatch hour

- Determines hourly schedules and prices to meet composite demand
- Determines if new GOG-eligible NQS resource commitments are needed
- Uses ex-ante mitigation decisions accumulated from previous PD runs

RTM Engine

- Determines schedules and prices to meet actual demand every 5 minutes
- GOG-eligible resource commitments passed to RTM as minimum constraints to MLP
- No ex-ante MPM in RTM
- Mitigated energy and operating reserve offers are passed from PD to the RTM engine

RTM Scheduling and Pricing Outcomes

- RTM energy and operating reserve schedules are produced every 5 minutes similar to today (for energy, in the form of dispatch instructions)
- Corresponding LMPs are produced every 5 minutes at each resource location
- Key input factors that may influence differences in scheduling and pricing relative to today's RTM include:
  - Evaluation of new dispatch data constraints passed from PD
  - Ex-ante MPM decisions passed from PD
  - Constraint violation prices (used for settlement in the RTM)
- Actual production and corresponding LMPs are used for settlement

RT Scheduling and Pricing Outcomes (cont'd)

RTM 5-min Schedule	Outcomes	GOG-eligible NQS Resources
Energy	Dispatch produced [1]	✓
	LMP produced	✓
	Subject to ex-ante offer MPM from PD	✓
	Actual production + LMP used for settlement [2]	✓
Operating reserve	Schedule produced [3]	✓
	LMP produced	✓
	Subject to ex-ante MPM from PD	✓
	Schedule + LMP used for settlement [3]	✓

[1] PSU dispatches are translated to physical resource equivalents
[2] Actual physical resource production used for settlement
[3] Translated PSU to physical resource operating reserve schedules produced and used for settlement

RTM Reports

Report	New or Existing	Public or Private	Description
Real-Time 5-min Energy LMP Report	New	Public	LMPs for energy, including LMP components[1] for all generator and load schedule locations, issued every 5 minutes
Real-Time 5-min Operating Reserve LMP Report	New	Public	LMPs for operating reserve, including LMP components[1] for all eligible generator and load schedule locations, issued every 5 minutes
Dispatch Data Report for Real Time Scheduling Processes	New	Private	Confirmation of an MP's daily and hourly dispatch data submitted into the RTM, issued daily at 6:00 EST following the dispatch day
Real-Time Pseudo-Unit Generator Data Computed Values Report	New	Private	Values used by the real-time calculation engine for PSUs and associated physical generation resources
Real-Time Energy and Operating Reserve Schedule Report	Existing	Private	Energy and operating reserve schedules, issued every 5 minutes
Real-Time Energy and Operating Reserve Dispatch Report	Existing	Private	Summary of dispatch instructions for energy and operating reserve for the previous dispatch hour
Dispatch Advisory Report	Existing	Private	Dispatch advisories for energy and operating reserve up to 55 minutes ahead of the relevant dispatch interval

[1] For energy LMP, components include loss and congestion prices. For operating reserve LMP, components include congestion price.

Summary of Today's Discussion

- Relevant dispatch data parameters and their applicability within each engine
- Overview of DAM, PD and RTM engine functionality and relevant scheduling and pricing outcomes
- Requirements and considerations specific to GOG-eligible NQS dispatch data submission and resubmission
- Overview of ex-ante MPM applicability for GOG-eligible NQS resources
- Overview of GOG-eligible NQS operational commitments and notices
- Applicable DAM, PD and RTM reports

Next Steps

- Additional clarifying questions on today's materials may be submitted to engagement@ieso.ca
- November 8: Written stakeholder feedback due on the MSO batch market rules and market manuals

Thank You

ieso.ca

1.888.448.7777

customer.relations@ieso.ca

engagement@ieso.ca

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