

Education and Awareness

Energy Workstream High-Level Designs

Non-Quick Start Generators

December 3, 2018

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Purpose and Approach

- This exercise will provide education and practical understanding of the key aspects of the Energy High-Level Designs (HLDs)
- Focus of today will be on design decisions that are most impactful to Non-Quick Start Generators (NQS)
- The presentation is split into three sections:
 - A. Summary of the relevant core design concepts
 - B. High-level walk through of operational activities to compare new design features to the current design
 - C. Settlement scenarios relevant to the resource group

SECTION A: DESIGN CONCEPTS

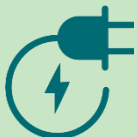
Introduction

- This section will begin with a recap of the rationale for Market Renewal, and summarize the key initiatives in the energy work stream
- The presentation will then outline the key design concepts most relevant for NQS including:
 1. Locational Pricing
 2. Market Power Mitigation
 3. Day-Ahead Market Participation
 4. Pre-Dispatch Process

Market Renewal Overview

- Ambitious set of initiatives that amounts to a fundamental redesign of Ontario's electricity markets and **prepares us for future change**
- Current design has served Ontario well but demands of a modern **grid evolving rapidly**
- **Reforms are required** to allow the IESO to continue to manage the grid reliably & cost effectively

Market Renewal Activities



ENERGY work stream

- Single Schedule Market (SSM)
- Day-Ahead Market (DAM)
- Real-Time Unit Commitment (ERUC)



CAPACITY work stream

- Incremental Capacity Auction (ICA)



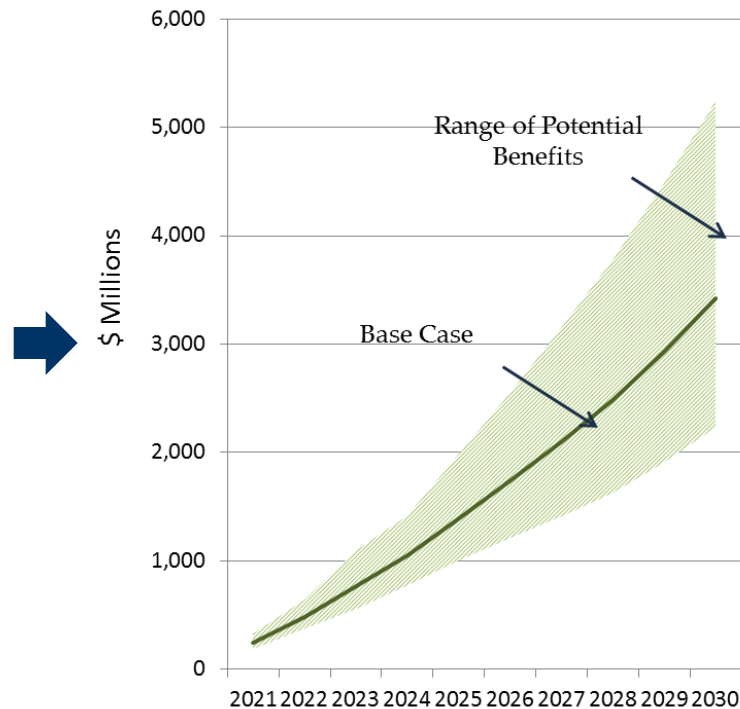
Near-term Projects

Market Renewal

Future Projects

Developing a Benefits Case

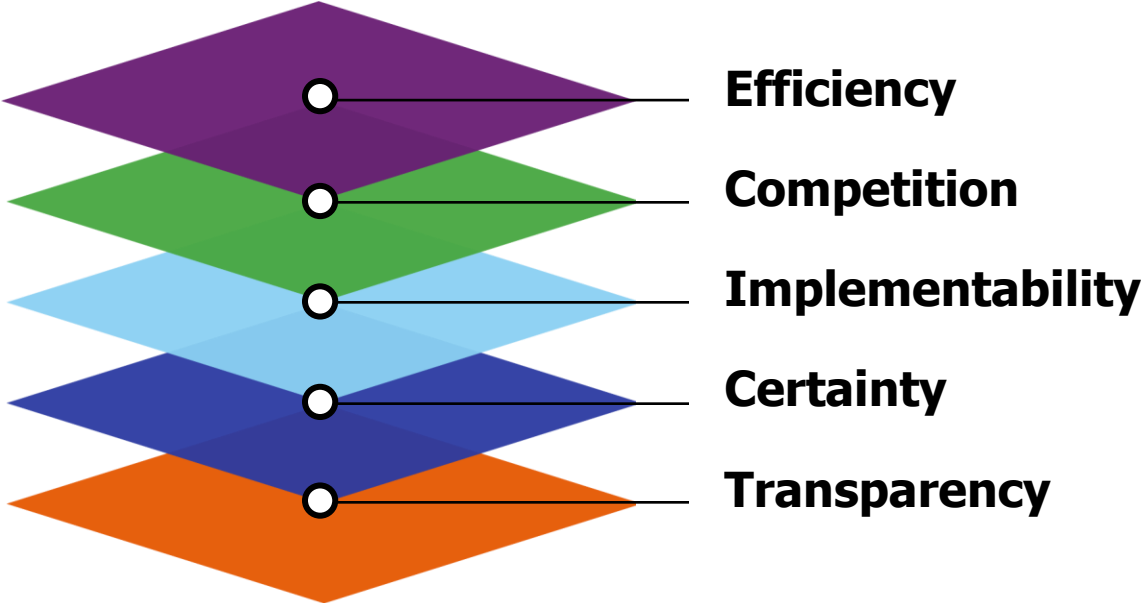
The IESO spent eight months analyzing the potential benefits of market renewal together with stakeholders under a range of future scenarios.



Market Renewal is expected to deliver an average of **\$3.4 billion in efficiency savings** (most of which will flow to Ontario's consumers) over a 10-year period with a potential to reach as high as **\$5.2 billion**.

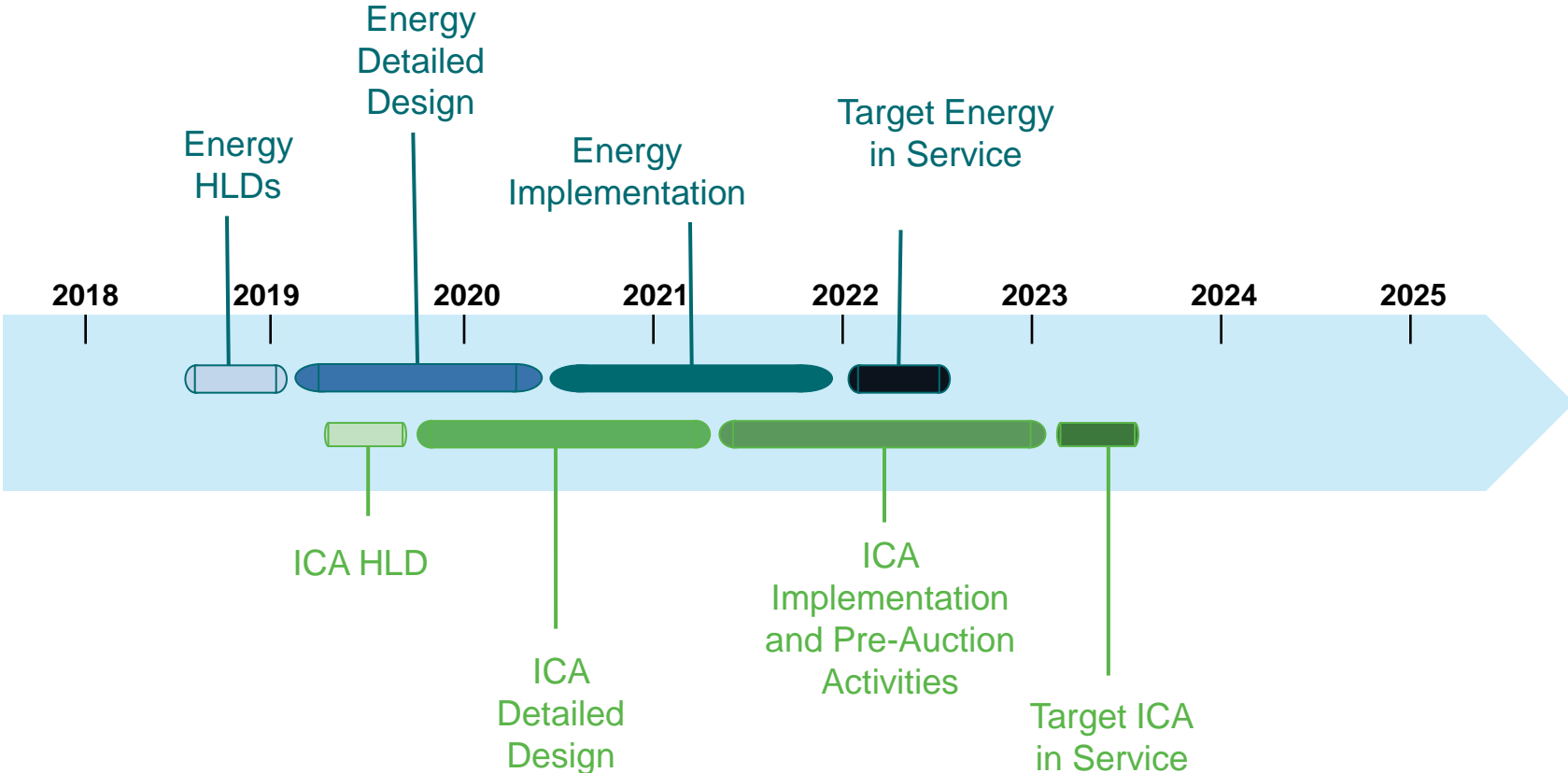
Market Renewal Principles

A more efficient, stable marketplace with competitive and transparent mechanisms that meet system and participant needs at lowest cost



Market renewal must meet Ontario's reliability needs and work within public policy parameters

Market Renewal Timeline



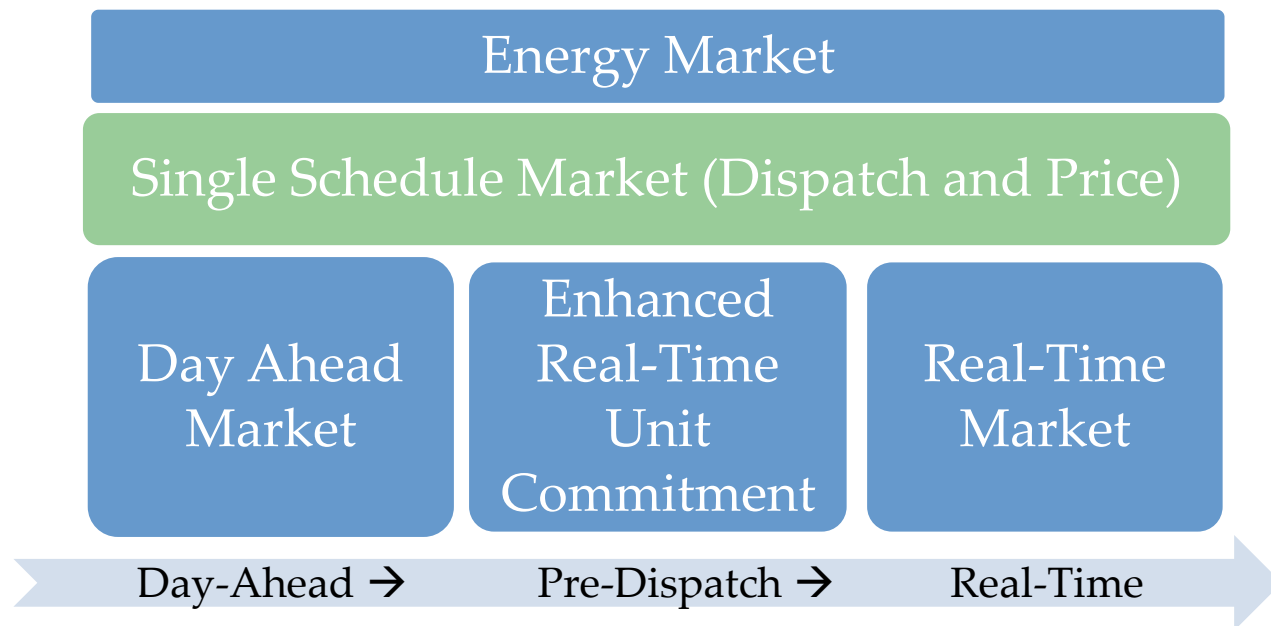
**This graphic is for illustrative purposes only and dates are subject to change*

Market Renewal and Contracts

- Market Renewal is focused on improving the efficiency of Ontario's electricity markets, consistent with contract provisions and fairness to all contract counterparties, the IESO is not targeting to extract value from contracts
- The IESO will continuously work with our contract counterparties to understand contract implications, and address these changes throughout the design of the MRP

Single Schedule Market - The Big Picture

- This initiative will replace Ontario's two schedule market with a single schedule market (SSM) that better aligns price with dispatch
- Improving the energy price signal in Ontario is a foundational change that is required to address existing challenges and prepare for the market of the future



Ontario's Current Market Design

Ontario's current market uses two different schedules (sets of calculations) to determine price and dispatch in Ontario

Schedule 1

- Determines a province-wide uniform price for energy (MCP)
- Ignores certain physical limitations of the system
- Used to settle the market financially

When there are differences between the two schedules, out-of-market CMSC* payments must be made to maintain reliability

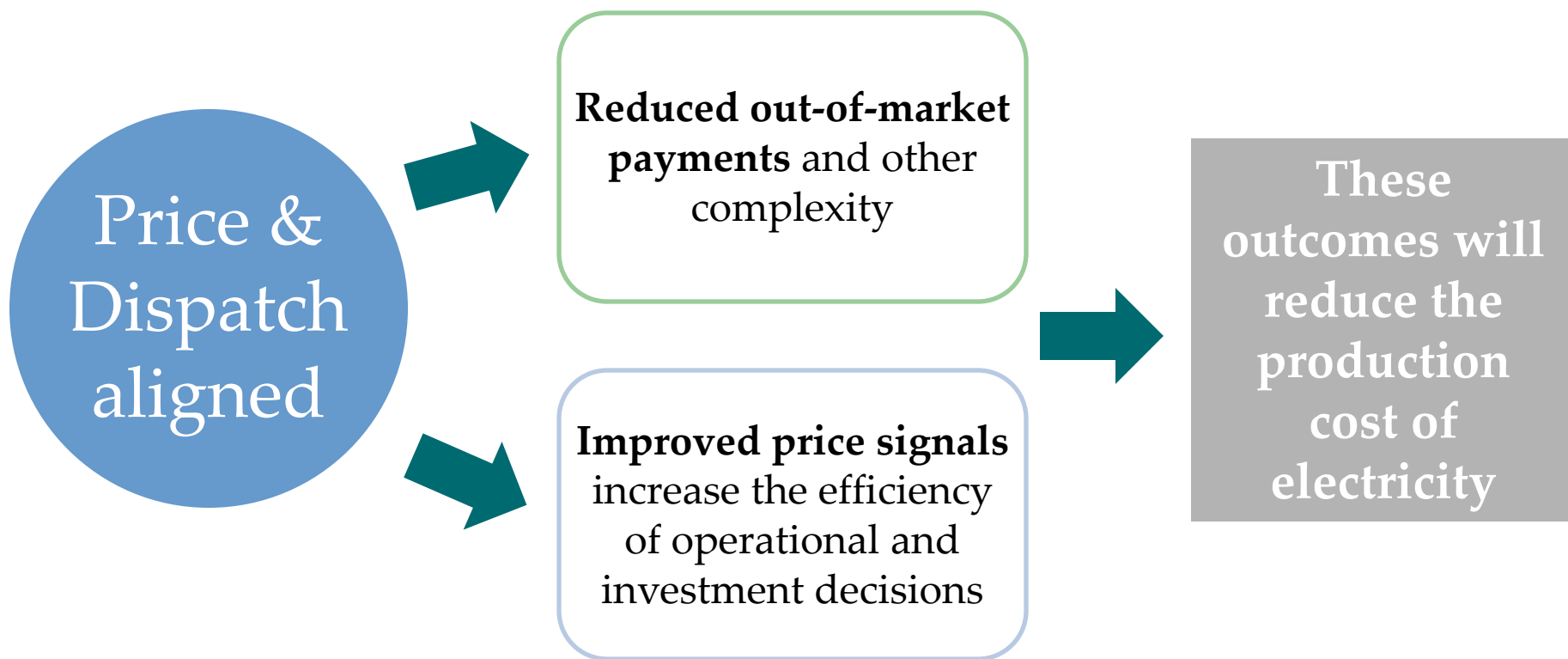
These payments have led to inefficient behaviour and costly outcomes for consumers

Schedule 2

- Calculates "shadow" prices at each node
- Considers all relevant physical limitations of the system
- Prices used to dispatch resources

CMSC = Congestion Management Settlement Credit

Single Schedule Market



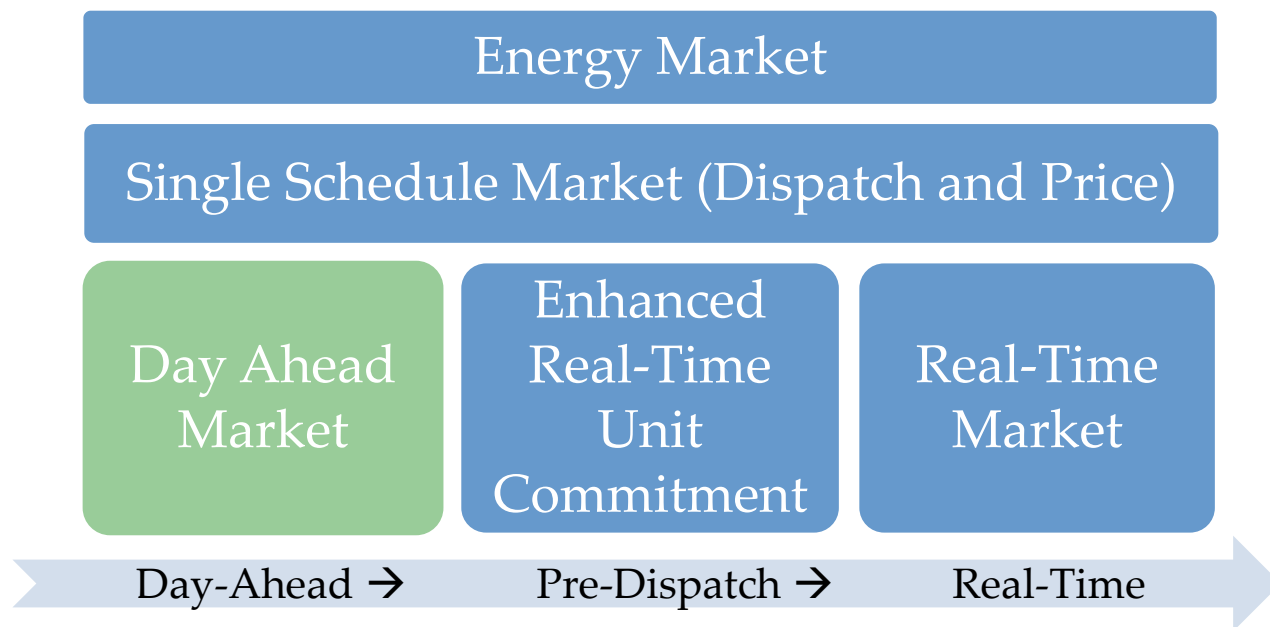
Enabled by Single Schedule Market

Single Schedule Market – Key Takeaways

- SSM will introduce locational prices for energy and operating reserve that will more accurately reflect the value of those services, enabling more efficient operational and investment decisions
- Unlocks other market changes including the day-ahead market
- Not seeking to extract value from contracted resources
- Allows resources that can provide the most value to the system to benefit from accurate locational prices

Day-Ahead Market: The Big Picture

- A day-ahead market will provide financially binding day-ahead schedules
- It is enabled by the single schedule market design and will operate prior to pre-dispatch and real-time



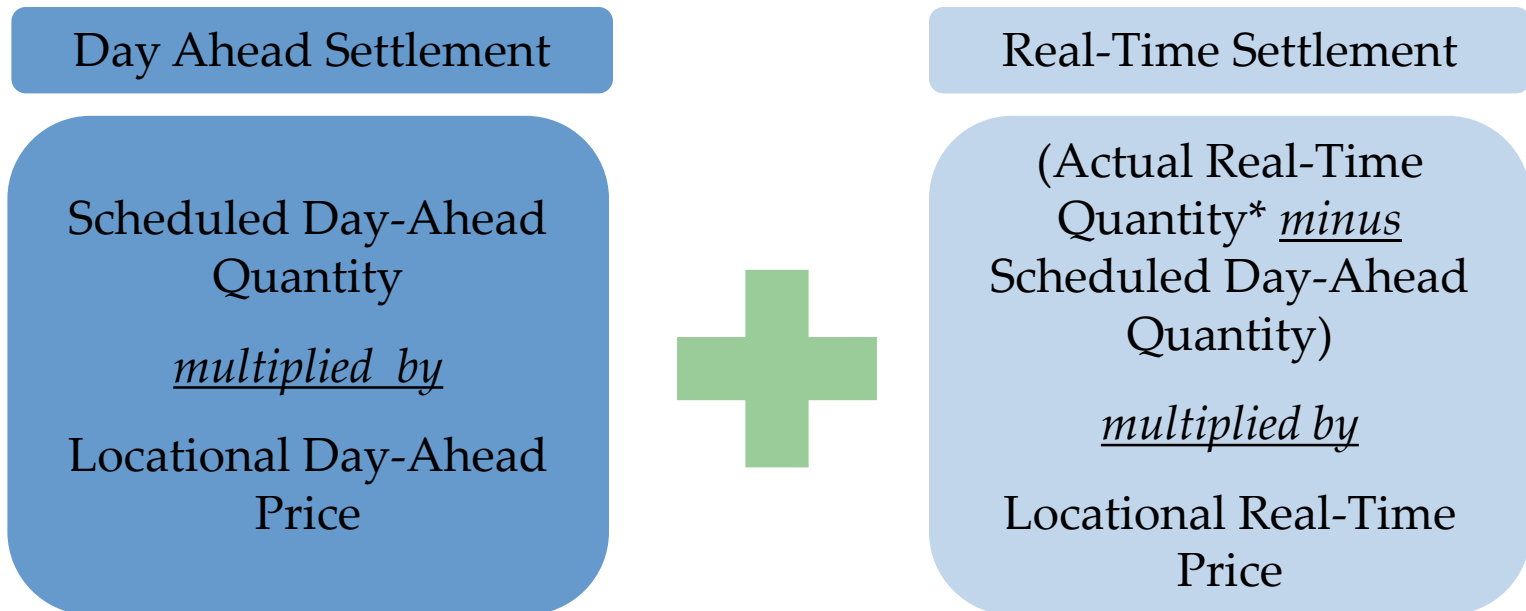
Why a Day Ahead Market?

Current Day-Ahead Commitment Process (DACP)	Day-Ahead Market (DAM)
<ul style="list-style-type: none">Participants submit day-ahead bids and offers primarily to declare availability in real-time.	<ul style="list-style-type: none">Participants submit day-ahead bids and offers to compete with other for a day-ahead price.
<ul style="list-style-type: none">Day-ahead bids and offers may be less efficient because they are not competing for a price	<ul style="list-style-type: none">Day-ahead bids and offers are more efficient because they are competitive
<ul style="list-style-type: none">Exports can participate but are not incentivized to do so	<ul style="list-style-type: none">Exports have incentive to participate in the DAM
<ul style="list-style-type: none">Resources are scheduled to meet Ontario demand, providing a rough approximation of tomorrow's operation	<ul style="list-style-type: none">Resources are scheduled to meet total Market demand, providing a better view of tomorrow's operation

A day-ahead price signal incentivizes more efficient participation from all resources

How it Works

- DAM produces hourly schedules and prices that are financially binding, introducing a 'two-settlement' system



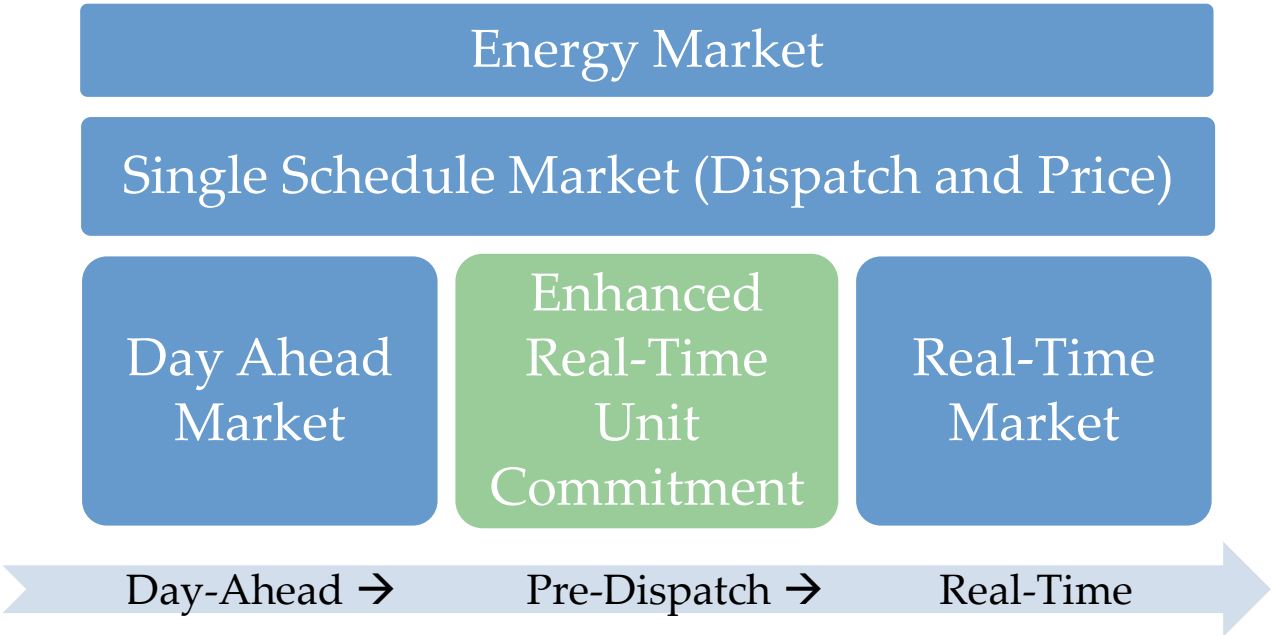
- Real-time settlement only used for balancing deviations from day-ahead schedules

Day-Ahead Market – Key Takeaways

- Financially binding DAM will improve participation in day-ahead scheduling, helping to ensure reliability while efficiently scheduling resources
- Expect increased commitment of NQS resources to occur in day-ahead timeframe, increasing financial and operational certainty for these suppliers
- Improved alignment with gas nomination window can help to manage supplier risk
- *Note: These topics are discussed in greater detail in the key concepts section of the presentation*

ERUC: The Big Picture

The initiative will replace the existing pre-dispatch and real-time generation cost guarantee (RT-GCG) program



Summary of Issues with Current Real-time Unit Commitment Process

Incomplete Picture

Not all costs are considered in optimization process

Lack of Competition

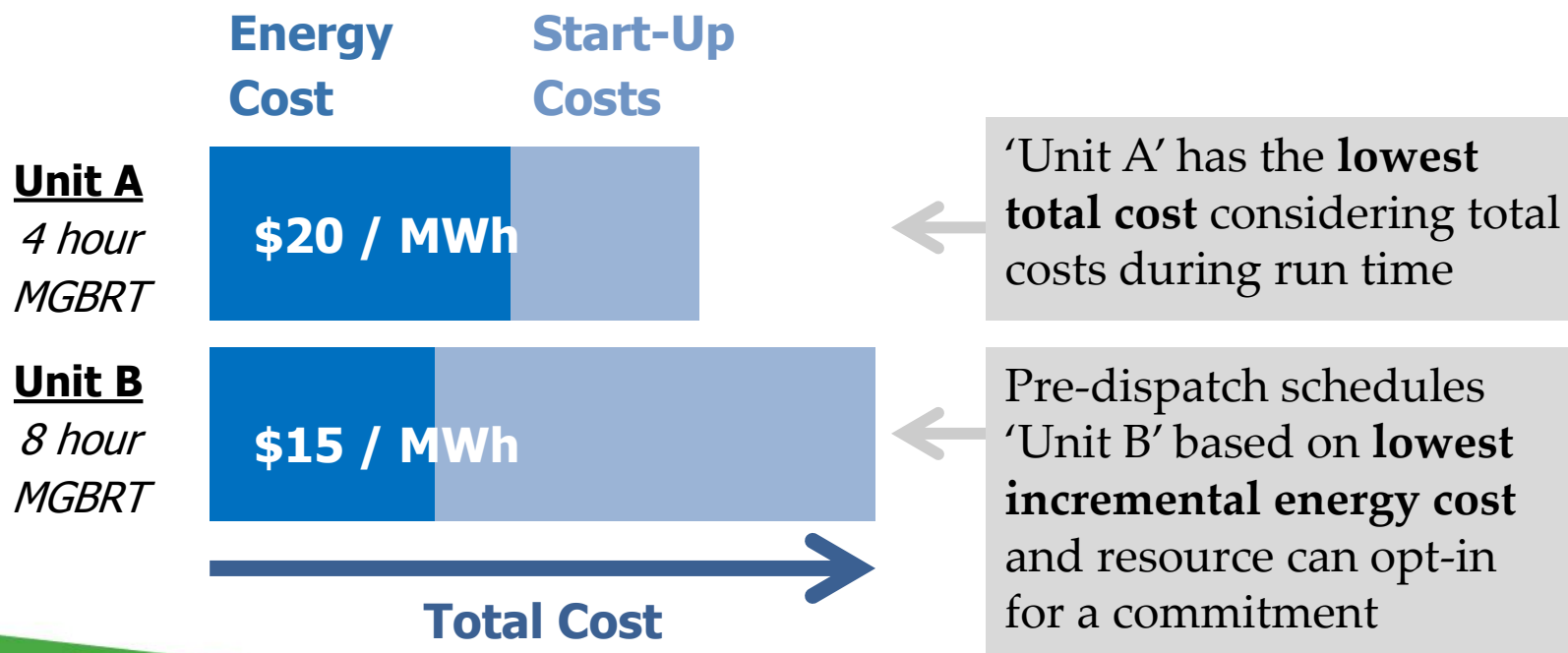
After-the-fact cost submission means no competition between generators on those costs

Limited look-ahead

Optimizes commitments based on a single hour

Inefficient Commitment Example

Today's Pre-Dispatch (PD) optimization can cause inefficient commitments by scheduling non-quick (NQS) start resources without considering all unit costs and operating restrictions over multiple hours

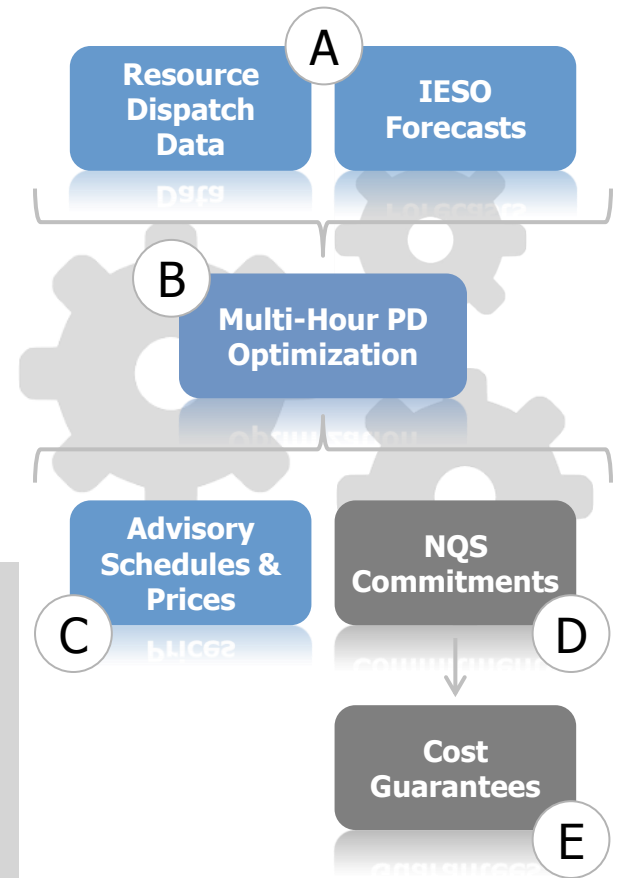


ERUC Re-Design of Pre-Dispatch

ERUC will redesign the PD engine to:

- A. Consider all resource dispatch data and the latest forecasts
- B. Optimize PD scheduling over a “look-ahead period”(LAP) hourly
- C. Provide advisory schedules & prices for all participating resources
- D. Send **operational commitment** for eligible lowest cost NQS resources
- E. Provide **cost guarantee** payments for eligible committed NQS resources to promote reliability

NQS Resources



Enhanced Real-Time Commitment – Key Takeaways

- ERUC project is replacing today's pre-dispatch process and the RT-GCG program
- Improved pre-dispatch process will help to ensure resources will be scheduled when they are among the lowest cost options
- Financial guarantee will remain to ensure NQS resources do not operate at a loss and IESO can maintain reliability
- Increased alignment with day-ahead scheduling
- *Note: These topics are discussed in greater detail in the key concepts section of the presentation*

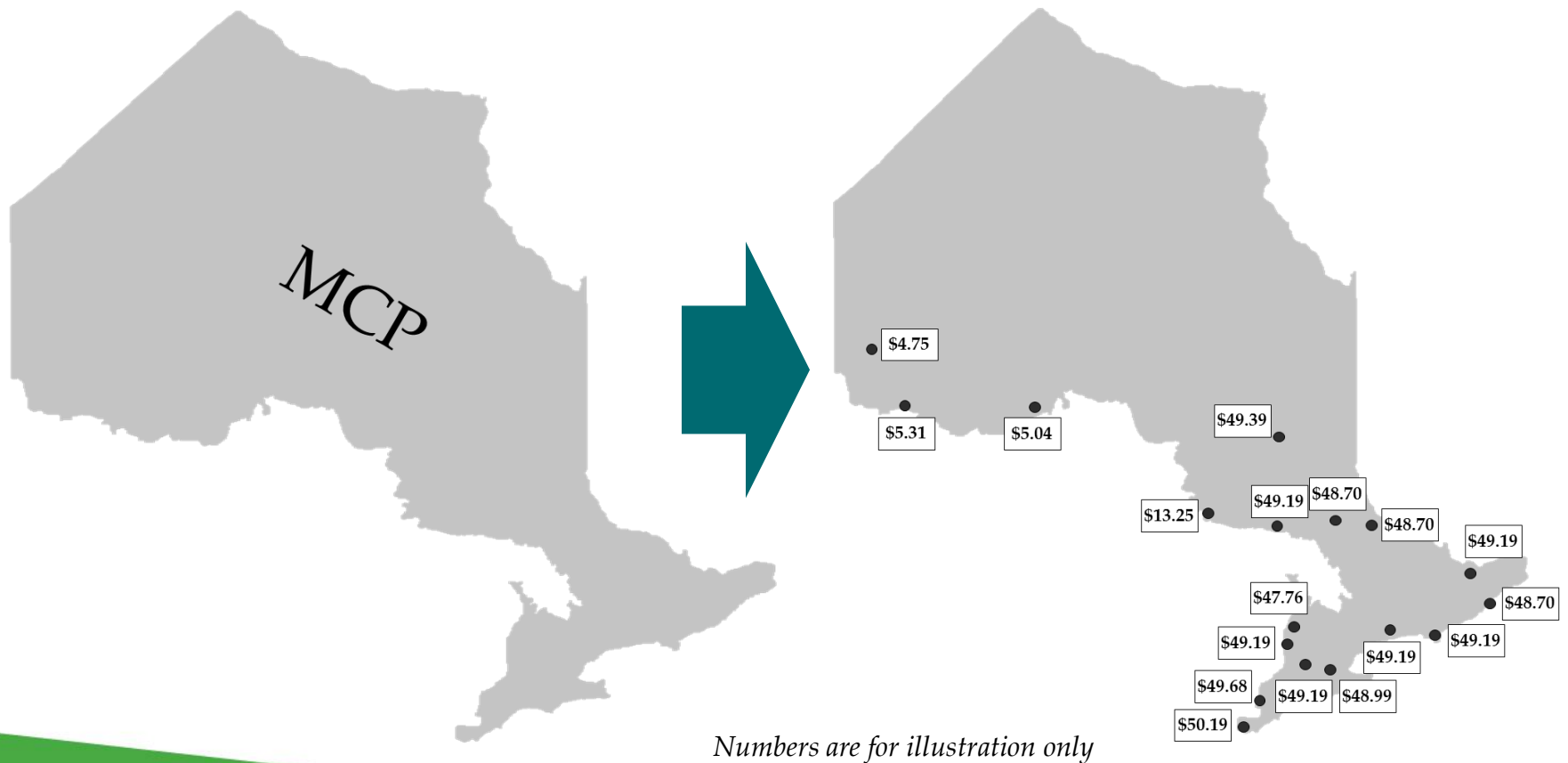
KEY DESIGN CONCEPTS

Context

- Locational Marginal Pricing (LMP) is a foundational feature of Market Renewal
- Locational prices will:
 - ✓ Align price with dispatch
 - ✓ Significantly reduce out-of-market payments
 - ✓ Unlock broader market renewal benefits
 - ✓ Reduce the cost of energy for Ontario consumers

Design Concept 1 – Locational Pricing Design for Suppliers

Generators will move from MCP to nodal pricing:



Numbers are for illustration only

Design Concept 1 – Locational Pricing

Pricing Summary

Participant	Customer Class	Current settlement price:	SSM settlement price:
IESO-Settled Loads	Dispatchable Loads	Uniform Market Clearing Price (MCP)	Nodal
	Non-dispatchable Loads (including LDCs)	HOEP	Zonal with Nodal option
LDC-Settled Loads	Large Customers (>250,000KWh)	HOEP	TBD by OEB
	Small Customers (<250,000 KWh)	RPP	
Suppliers	N/A	Uniform Market Clearing Price (MCP)	Nodal

Context

- Prices impacted by market power do not reflect marginal costs and result in inefficient outcomes that drive up costs to consumers
- Market power can be exercised through:

Economic Withholding

To offer a portion of or all available capacity at a higher than competitive price

Physical Withholding

To not offer a portion or all available capacity into the market

Design Concept 2 – Market Power Mitigation

Application

- Market power mitigation (MPM) will be triggered where the IESO determines competition to be restricted
- MPM will apply to energy, operating reserve and certain operational parameters
- MPM will be applied through conduct and impact tests:
 - **Conduct test:** defines the boundaries within which participants will not be mitigated. The test will be based on reference levels which will provide proxies of competitive offers
 - **Impact test:** defines how much of an impact that offers in excess of the conduct threshold can have on market prices before mitigation is applied

Design Concept 2 – Market Power Mitigation

Summary for Suppliers

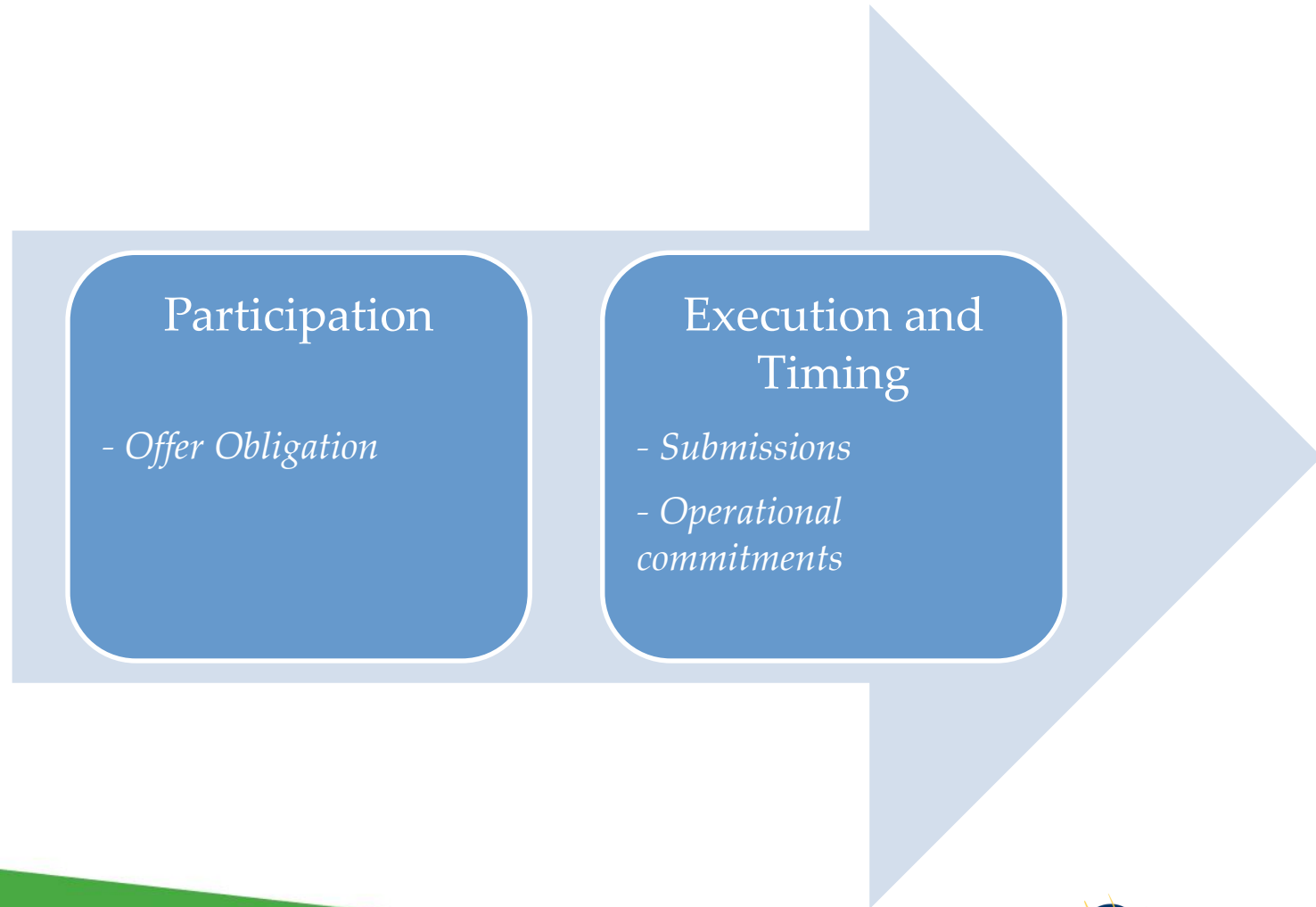
	Economic Withholding	Physical Withholding
Tests	<p><i>Conduct and impact tests</i></p> <p><i>Conduct test: Are offers/operational parameters beyond competitive thresholds?</i></p> <p><i>Impact test: Will settlement costs be beyond set threshold?</i></p>	<p><i>Conduct and impact tests</i></p> <p><i>Conduct test: Did resource not offer all available capacity?</i></p> <p><i>Impact test: Were settlement costs beyond set threshold?</i></p>
Timing	<i>Before DAM, PD and RT schedules are produced</i>	<i>After energy delivery</i>
Test standard	<i>Both conduct and impact tests failed</i>	
IESO Response to Failed Tests	<i>Offers adjusted to reference levels before scheduling</i>	<i>Settlement Adjustment</i>

NQS Considerations

- Start-up offers, speed-no-load offers and non-price parameters (e.g., MLP, MGBRT) will also be tested
- Uplift impact test will be applied after the fact to see if uplift payments were impacted
- Resources that fail the conduct and uplift impact tests will be mitigated

Design Concept 3 - Day-Ahead Market Participation

Context



Participation

Participation

- *Offer Obligation*

- ✓ The DAM in itself will not have a participation obligation as financially binding schedules will incentivize greater and more efficient participation from all resources
- ✓ Expect majority of NQS commitments in day-ahead timeframe

Execution and Timing

Execution and Timing

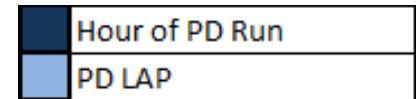
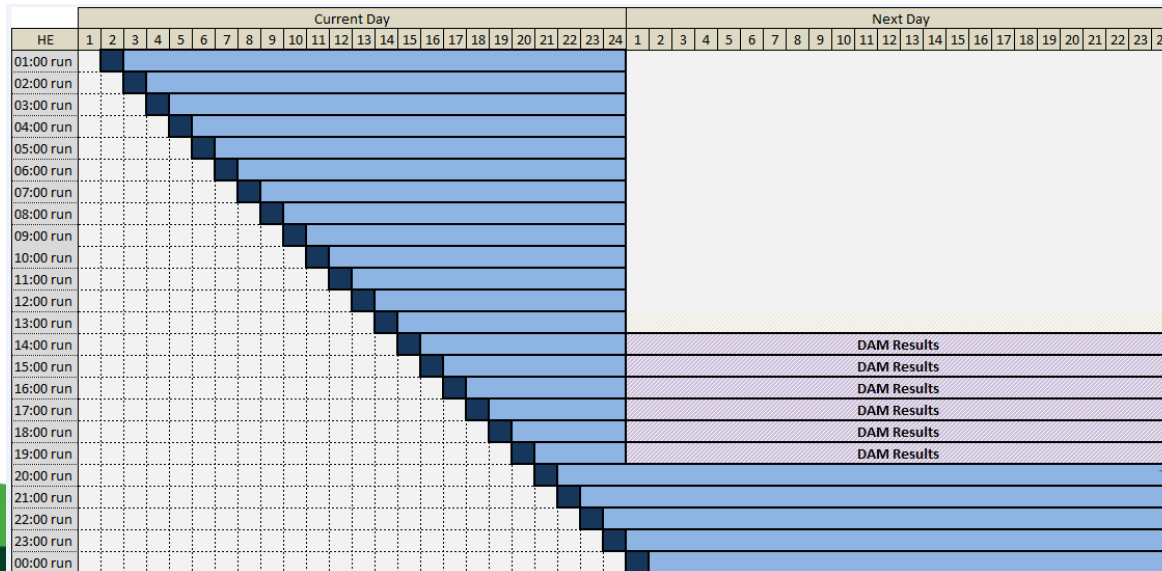
- *Submissions*
- *Operational commitments*

- ✓ DAM will execute between 10:00 EPT and 13:30 EPT to align with gas nominations
- ✓ Operational constraints associated with DAM financially binding schedules for NQS will be respected in PD and RT

Design Concept 4 – Pre-Dispatch Process

Pre-Dispatch Optimization

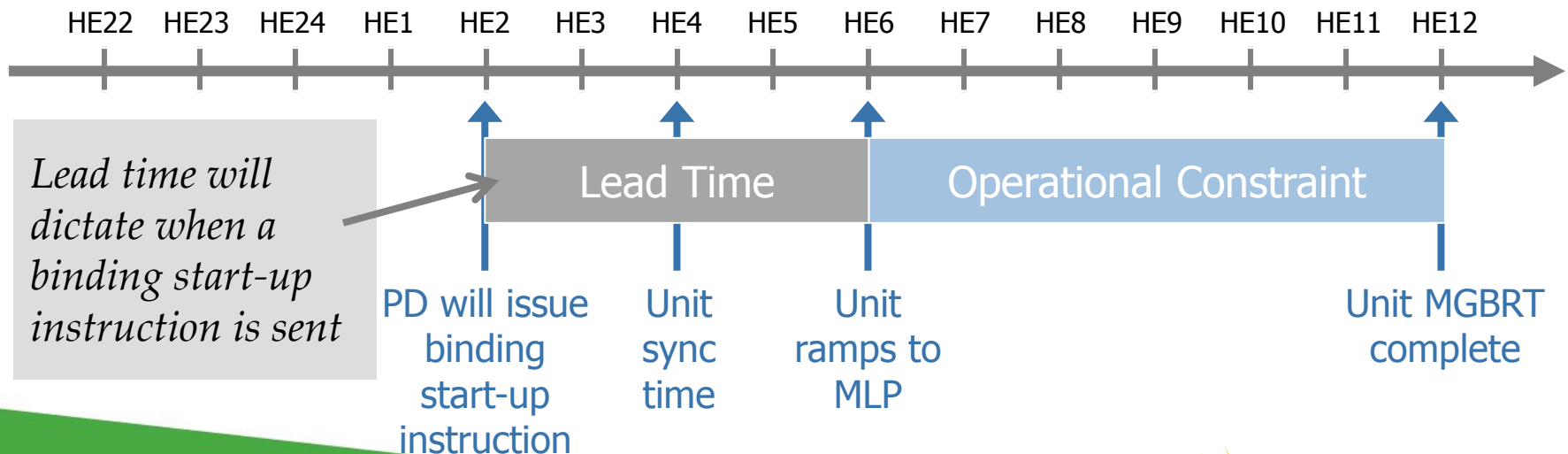
- Optimization will consider a **broader data set**:
 - Hourly dispatch data (e.g., regular or *3-part offers* as applicable)
 - Daily generator data (e.g., MLP, MGBRT, *lead time curve data*)
- Look-ahead period (LAP) will be **extended and more comprehensive**:
 - Hourly PD runs will evaluate all resource and forecast data for the LAP
 - Optimized LAP will be between 4 to 27 hours depending on run start time



PD run at 20:00 will have the longest LAP and extend into next day

Pre-Dispatch Schedules

- For **all** resources, improved PD advisory schedules will be provided hourly and better indicate expected RT economic quantities
- For **NQS** resources, PD schedules will automatically:
 - Reflect operational constraints
 - Be advisory until PD determines that the resource must be committed based on “**lead time**” data submissions



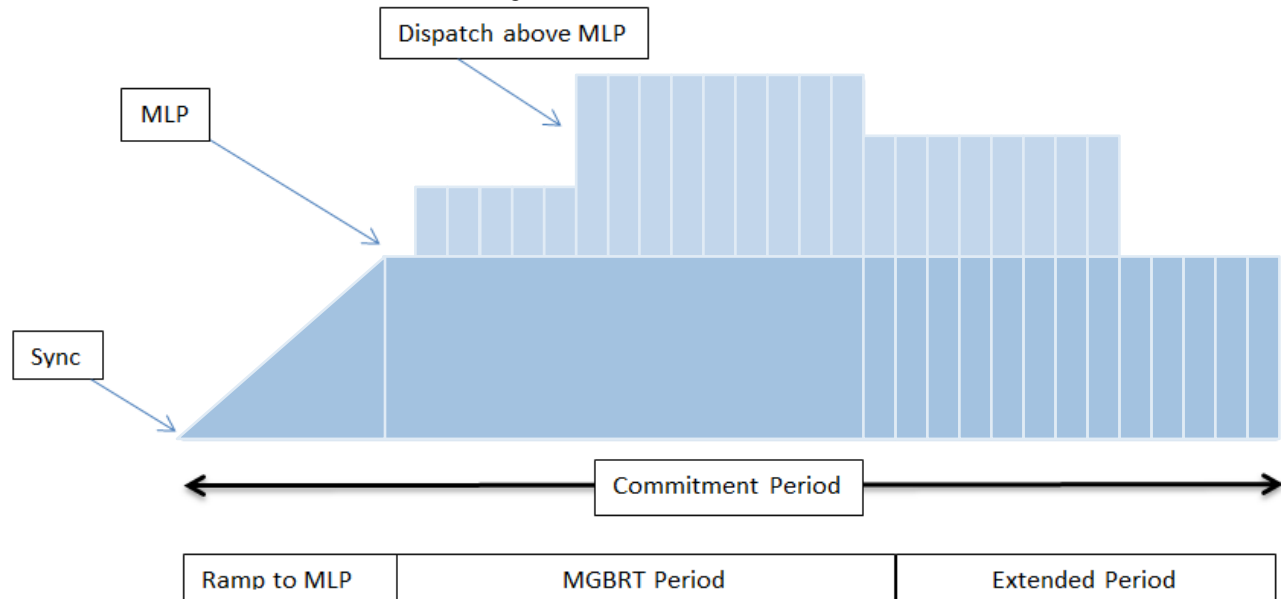
Design Concept 4 – Pre-Dispatch Process

NQS Resource Commitment

The PD optimization will create and update NQS commitments by:

1. **Issuing a notification with sync information** – i.e., replacing participant calling the control room to “invoke” commitment program
2. **Applying an operational constraint for MLP over MGBRT** – i.e., replacing manual control room operator constraint application
3. **Extending commitment as needed hourly** if the resource is still economic after MGBRT

PD will indicate when to begin to ramp down & de-sync by no longer providing extensions, and resource will be dispatched below MLP

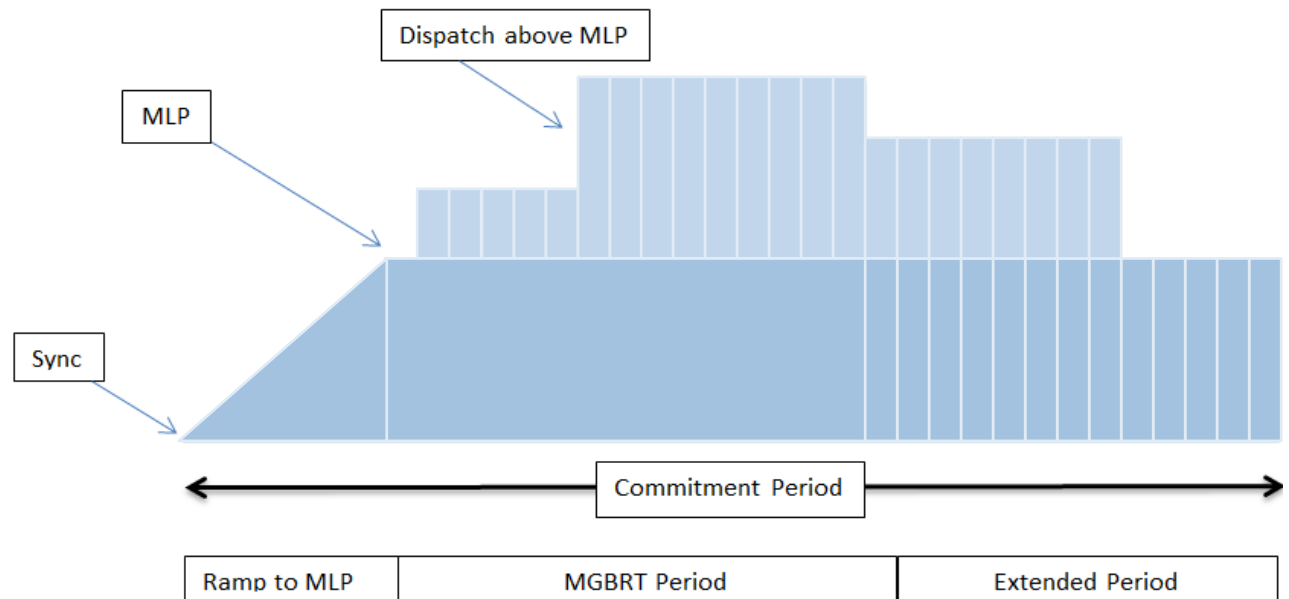


Design Concept 4 – Pre-Dispatch Process

NQS Resource Cost Guarantee

The pre-dispatch cost guarantee calculation will consider all energy market and operating reserve market revenues over the commitment period for the total delivered quantity, net of cost incurred

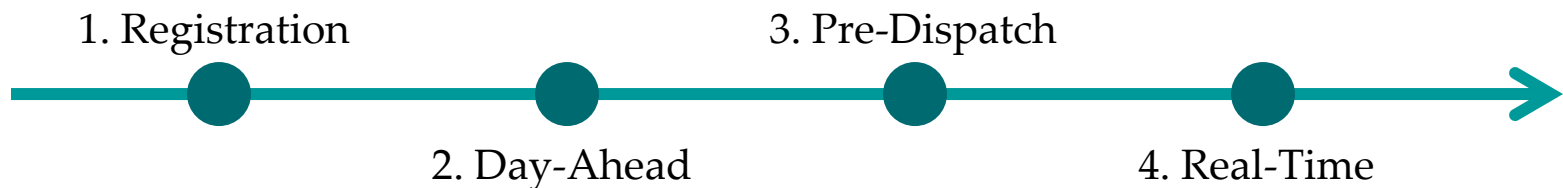
All Commitment Period hours will be eligible for payments to recover as-offered 3-part energy and OR costs net of all market revenues



SECTION B: OPERATIONAL WALK THROUGH

Introduction

- The section will compare the most relevant new design features to the current design
- This will be illustrated chronologically through four stages:

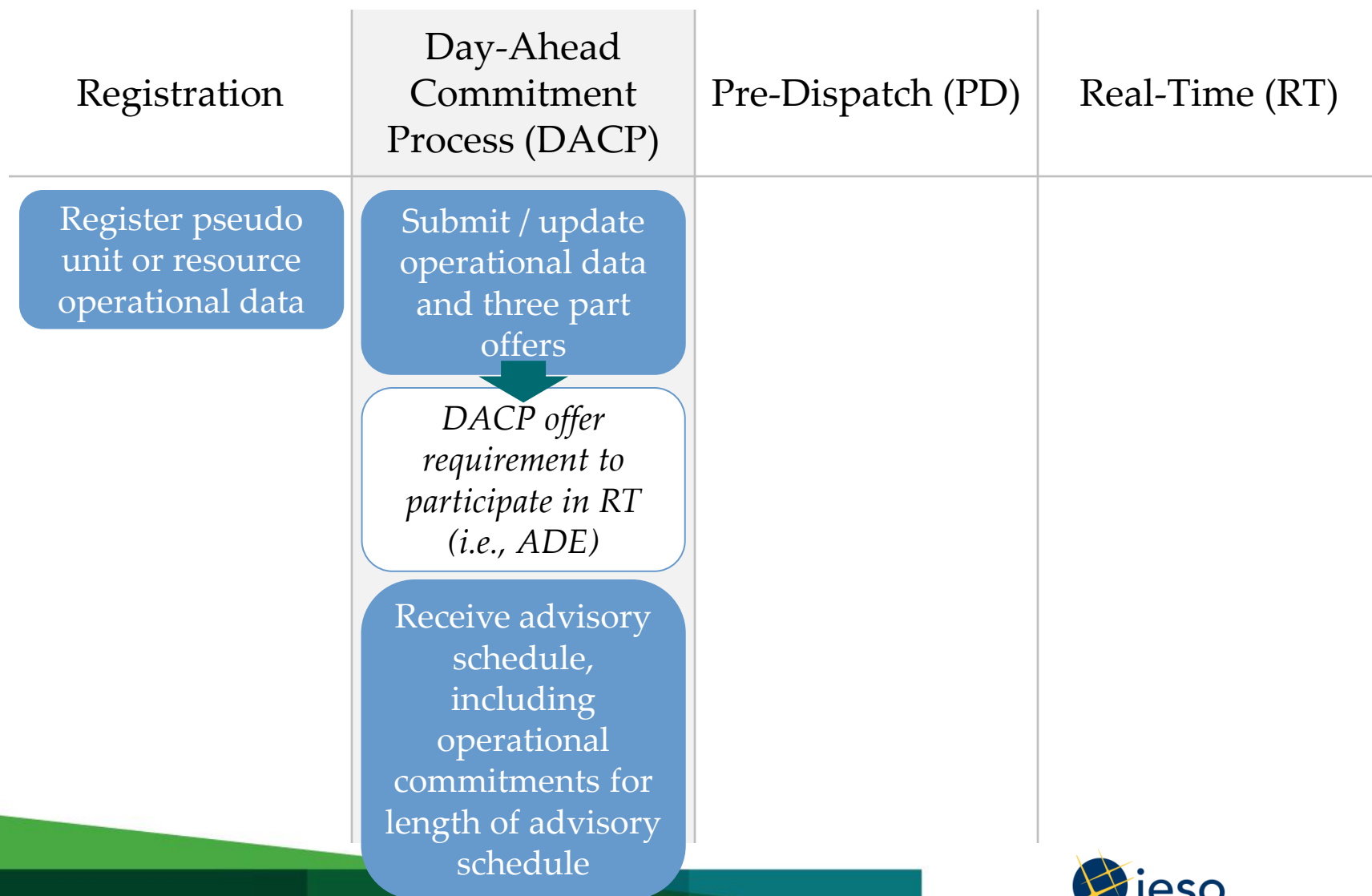


- The section will start with a recap of the current design before then moving on to describe the new design

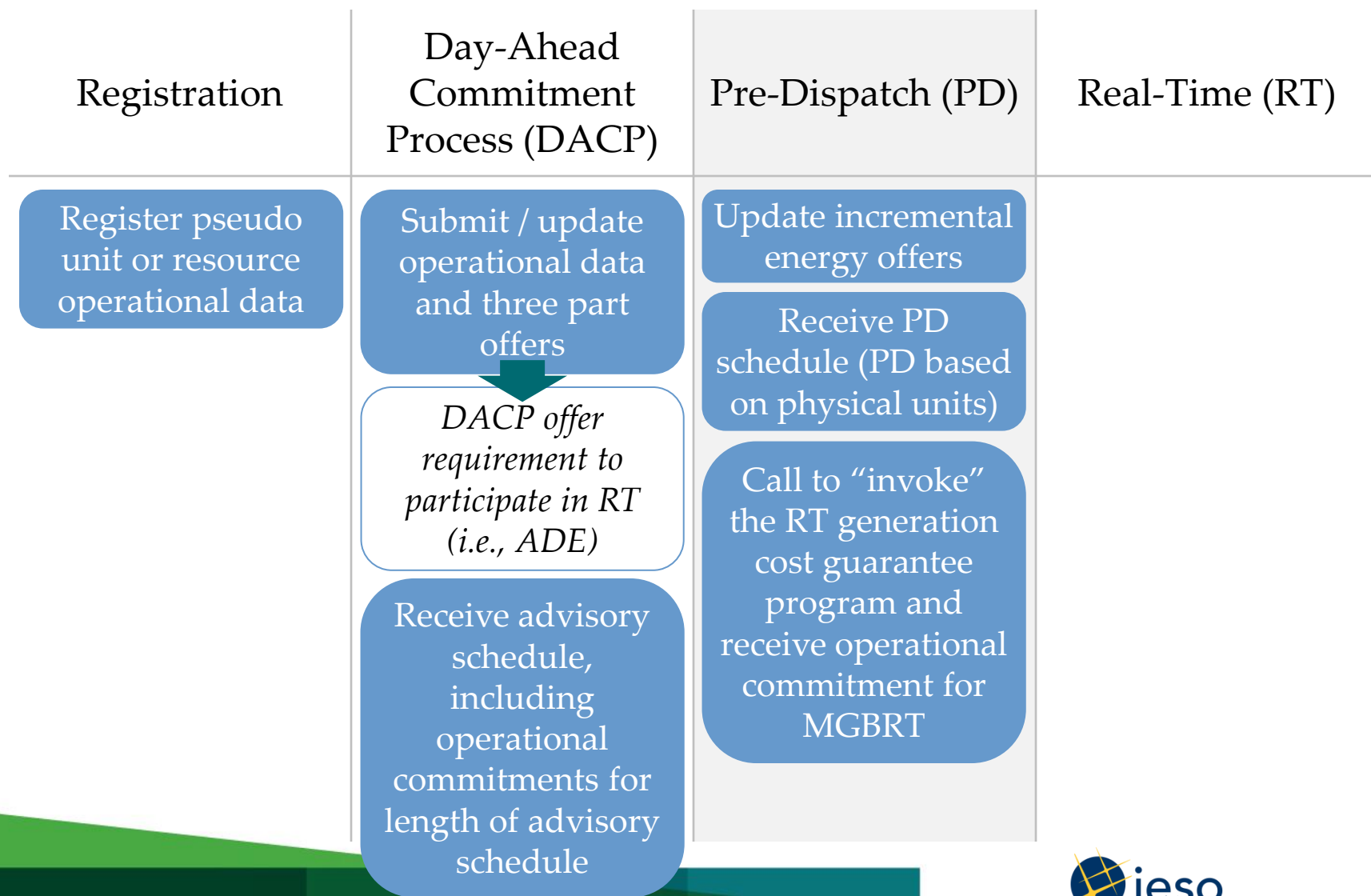
1. Registration – Current Design

Registration	Day-Ahead Commitment Process (DACP)	Pre-Dispatch (PD)	Real-Time (RT)
Register pseudo unit or resource operational data			

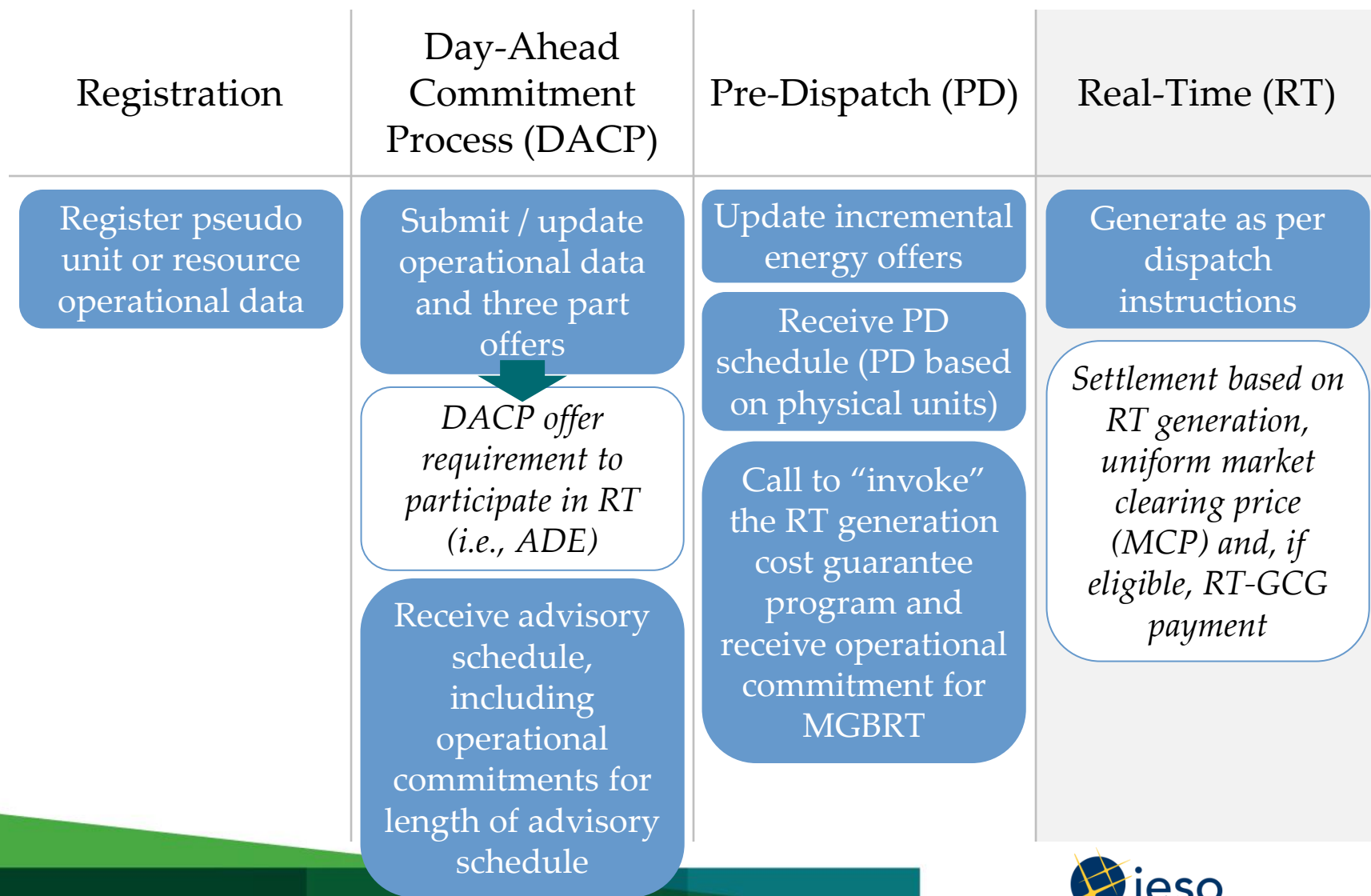
2. Day-Ahead – Current Design



3. Pre-Dispatch – Current Design



4. Real-Time – Current Design



1. Registration – Market Renewal Design

Registration	Day-Ahead Market (DAM)	Pre-Dispatch (PD)	Real-Time (RT)
<p>Register pseudo unit or resource operational data, including lead time</p> <p>Operational data subject to additional validation for market power mitigation (MPM)</p>			

2. Day-Ahead – Market Renewal Design

Registration	Day-Ahead Market (DAM)	Pre-Dispatch (PD)	Real-Time (RT)
<p>Register pseudo unit or resource operational data, including lead time</p> <p>Operational data subject to additional validation for market power mitigation (MPM)</p>	<p><i>No DAM offer requirement to participate in RT</i></p> <p>To participate in DAM: submit / update op. data, inc. lead time & 3 part offers</p> <p>MPM checks</p> <p>Receive financially binding schedule, including MGBRT op. commitments</p> <p><i>DAM settlement based on financially binding schedule and nodal price</i></p>		

3. Pre-Dispatch – Market Renewal Design

Registration	Day-Ahead Market (DAM)	Pre-Dispatch (PD)	Real-Time (RT)
<p>Register pseudo unit or resource operational data, including lead time</p> <p>Operational data subject to additional validation for market power mitigation (MPM)</p>	<p><i>No DAM offer requirement to participate in RT</i></p> <p>To participate in DAM: submit / update op. data, inc. lead time & 3 part offers</p> <p>MPM checks</p> <p>Receive financially binding schedule, including MGBRT op. commitments</p> <p><i>DAM settlement based on financially binding schedule and nodal price</i></p>	<p>Submit/update op. data inc. lead time and three part offers</p> <p>MPM checks</p> <p><i>DAM operational commitments up to MLP over MGBRT will be passed through to PD</i></p> <p>Receive PD schedule, including operational commitments (PD based on pseudo-units)</p>	

4. Real-Time – Market Renewal Design

Registration	Day-Ahead Market (DAM)	Pre-Dispatch (PD)	Real-Time (RT)
<p>Register pseudo unit or resource operational data, including lead time</p> <p>Operational data subject to additional validation for market power mitigation (MPM)</p>	<p><i>No DAM offer requirement to participate in RT</i></p> <p>To participate in DAM: submit / update op. data, inc. lead time & 3 part offers</p> <p>MPM checks</p> <p>Receive financially binding schedule, including MGBRT op. commitments</p> <p><i>DAM settlement based on financially binding schedule and nodal price</i></p>	<p>Submit/update op. data inc. lead time and three part offers</p> <p>MPM checks</p> <p><i>DAM operational commitments up to MLP over MGBRT will be passed through to PD</i></p> <p>Receive PD schedule, including operational commitments (PD based on pseudo-units)</p>	<p>Generate as per dispatch instructions</p> <p><i>RT settlement based on real-time generation, nodal price and, if eligible, cost guarantee</i></p>

SECTION C: SETTLEMENT SCENARIOS

Introduction

- This section will provide a series of simplified examples to illustrate the high-level settlement process for dispatchable generators
- Three scenarios will be presented:
 1. Real-Time energy production **equal to** Day-Ahead schedule
 2. Real-Time energy production **greater than** Day-Ahead schedule
 3. Real-Time energy production **less than** Day-Ahead schedule

Settlement for Suppliers

Day-Ahead

Scheduled Day-Ahead Quantity

multiplied by

Locational Day-Ahead Price

Suppliers are **paid for DA**
scheduled injections

Real-Time (balancing)

(Actual Real-Time Quantity* *minus* Scheduled Day-Ahead Quantity)

multiplied by

Locational Real-Time Price

Suppliers are **paid for**
incremental RT injections
but **pay for undelivered DA**
scheduled injections



*Scheduled Real-Time Quantity for Operating Reserve

Scenario 1:

REAL-TIME PRODUCTION AND DAY-AHEAD SCHEDULE EQUAL

S1: RT and DAM injection equal

Offers	Locational Day-Ahead	Locational Real-Time
<div style="background-color: #4F81BD; color: white; border-radius: 15px; padding: 10px; margin-bottom: 10px;">100 MW at \$20</div> <div style="background-color: #4F81BD; color: white; border-radius: 15px; padding: 10px;">80 MW at \$40</div>		

The supplier makes two offers, one offer to show that it is willing to inject 100 MW as long as the price is greater than or equal to \$20, and another to indicate it will inject an additional 80 MW if the price is greater than or equal to \$40

S1: RT and DAM injection equal

Offers	Locational Day-Ahead	Locational Real-Time
<div>100 MW at \$20</div> <div>80 MW at \$40</div>	<div>Market clears at \$100</div> <div>Supplier scheduled at 180 MW</div>	
Energy settlement	180 MW x \$100 = \$18,000	

The locational day-ahead market clears at \$100 and the supplier receives a financially binding schedule for 180 MW...

S1: RT and DAM injection equal

Offers	Locational Day-Ahead	Locational Real-Time
<div>100 MW at \$20</div> <div>80 MW at \$40</div>	<div>Market clears at \$100</div> <div>Supplier scheduled at 180 MW</div>	<div>Market clears at \$50</div> <div>Supplier injects 180 MW</div>
Energy settlement	$180 \text{ MW} \times \$100 = \$18,000$	$(180 \text{ MW} - 180 \text{ MW}) \times \$50 = \$0$

The supplier's real-time injection is the same as its day-ahead schedule so no balancing settlement applies...

S1: RT and DAM injection equal

Offers	Locational Day-Ahead	Locational Real-Time
<div>100 MW at \$20</div> <div>80 MW at \$40</div>	<div>Market clears at \$100</div> <div>Supplier scheduled at 180 MW</div>	<div>Market clears at \$50</div> <div>Supplier injects 180 MW</div>
Energy settlement	$180 \text{ MW} \times \$100 = \$18,000$	$+ (180 \text{ MW} - 180 \text{ MW}) \times \$50 = \$0$

The supplier is paid \$18,000 for injecting 180 MW

Locational day ahead settlement = (Day-Ahead Quantity x Day-Ahead Price), Locational Real-Time settlement = (Real-Time Quantity - Day-Ahead Quantity) x Real-Time Price

S1: RT and DAM injection equal – Summary

- In this scenario, the supplier placed two offers in the DAM which were both accepted at the locational market clearing price
- The participant's real-time injection matched its day-ahead schedule, and as a result, the supplier was not exposed to the fall in real-time prices
- Overall, this scenario demonstrates how participants can increase financial certainty when they offer into DAM their expected real-time capability

Scenario 2:

REAL-TIME PRODUCTION GREATER THAN DAY-AHEAD SCHEDULE

S2: RT injection greater than DAM

Offers	Locational Day-Ahead	Locational Real-Time
<div>100 MW at \$20</div> <div>80 MW at \$40</div>		

The supplier makes two offers, one offer to show that it is willing to inject 100 MW as long as the price is greater than or equal to \$20, and another to indicate it will inject an additional 80 MW if the price is greater than or equal to \$40

S2: RT injection greater than DAM

Offers	Locational Day-Ahead	Locational Real-Time
<p>100 MW at \$20</p> <p>80 MW at \$40</p>	<p>Market clears at \$25</p> <p>Supplier scheduled at 100 MW</p>	
<p>Energy settlement</p>	<p>$100 \text{ MW} \times \\$25 = \\$2,500$</p>	

The locational day-ahead market clears at \$25 and the supplier receives a financially binding schedule for 100 MW...

Locational day ahead settlement = (Day-Ahead Quantity x Day-Ahead Price)

S2: RT injection greater than DAM

Offers	Locational Day-Ahead	Locational Real-Time
<div>100 MW at \$20</div> <div>80 MW at \$40</div>	<div>Market clears at \$25</div> <div>Supplier scheduled at 100 MW</div>	<div>Market clears at \$100</div> <div>Supplier injects 180 MW</div>
Energy settlement	$100 \text{ MW} \times \$25 = \$2,500$	$(180 \text{ MW} - 100 \text{ MW}) \times \$100 = \$8,000$

The locational real-time market clears at a higher price than the locational day-ahead market and the participant injects an additional 80 MW...

S2: RT injection greater than DAM

Offers	Locational Day-Ahead	Locational Real-Time
<div>100 MW at \$20</div> <div>80 MW at \$40</div>	<div>Market clears at \$25</div> <div>Supplier scheduled at 100 MW</div>	<div>Market clears at \$100</div> <div>Supplier injects 180 MW</div>
Energy settlement	$100 \text{ MW} \times \$25 = \$2,500$	$+ (180 \text{ MW} - 100 \text{ MW}) \times \$100 = \$8,000$

The supplier is paid \$10,500 for injecting 180 MW

Locational day ahead settlement = (Day-Ahead Quantity x Day-Ahead Price), Locational Real-Time settlement = (Real-Time Quantity - Day-Ahead Quantity) x Real-Time Price

S2: RT injection greater than DAM – Summary

- In this scenario, the supplier placed two offers in the DAM, of which only one was accepted given the locational day-ahead market clearing price
- In real-time, the participant increased injection from the DAM schedule due to higher prices in real-time
- Overall, the scenario illustrates how the supplier had certainty day-ahead on the price of its first 100 MW of supply and had the flexibility to capture higher real-time prices for the remaining 80 MW

Scenario 3:

REAL-TIME PRODUCTION LESS THAN DAY-AHEAD SCHEDULE

S3: RT injection less than DAM

Offers	Locational Day-Ahead	Locational Real-Time
<div>100 MW at \$20</div> <div>80 MW at \$40</div>		

The supplier makes two offers, one offer to show that it is willing to inject 100 MW as long as the price is greater than or equal to \$20, and another to indicate it will inject an additional 80 MW if the price is greater than or equal to \$40

S3: RT injection less than DAM

Offers	Locational Day-Ahead	Locational Real-Time
<div>100 MW at \$20</div> <div>80 MW at \$40</div>	<div>Market clears at \$100</div> <div>Supplier scheduled at 180 MW</div>	
Energy settlement	180 MW x \$100 = \$18,000	

The locational day-ahead market clears at \$100 and the supplier receives a financially binding schedule for 180 MW...

S3: RT injection less than DAM

Offers	Locational Day-Ahead	Locational Real-Time
<div>100 MW at \$20</div> <div>80 MW at \$40</div>	<div>Market clears at \$100</div> <div>Supplier scheduled at 180 MW</div>	<div>Market clears at \$25</div> <div>Supplier injects 100 MW</div>
Energy settlement	$180 \text{ MW} \times \$100 = \$18,000$	$(100 \text{ MW} - 180 \text{ MW}) \times \$25 = -\$2000$

The locational real-time market price clears lower than the locational day-ahead price and the supplier injects 80 MW less than its financially binding day-ahead schedule...

S3: RT injection less than DAM

Offers	Locational Day-Ahead	Locational Real-Time
<div>100 MW at \$20</div> <div>80 MW at \$40</div>	<div>Market clears at \$100</div> <div>Supplier scheduled at 180 MW</div>	<div>Market clears at \$25</div> <div>Supplier injects 100 MW</div>
Energy settlement	$180 \text{ MW} \times \$100 = \$18,000$	$+ (100 \text{ MW} - 180 \text{ MW}) \times \$25 = -\$2,000$

The supplier pays \$2,000 to buy back 80 MW of its day-ahead schedule and gets a net payment \$16,000 for injecting 100 MW

Locational day ahead settlement = (Day-Ahead Quantity x Day-Ahead Price), Locational Real-Time settlement = (Real-Time Quantity - Day-Ahead Quantity) x Real-Time Price

S3: RT injection less than DAM – Summary

- In this scenario, the supplier placed two offers, which were both accepted given the locational day-ahead market clearing price
- The locational clearing price then dropped in the real-time market and the market participant reduced their injection and bought back the difference
- This scenario illustrates how a participant gains financial certainty through the locational DAM by offering in their expected real-time capability. In this case, the supplier profited from offering into the locational DAM even though the locational real-time market required less supply

WRAP-UP

Summary

- Market Renewal will help to more efficiently deliver a reliable supply of energy to Ontarians
- Existing contracts and regulation will help to ease the transition to a new market design for suppliers
- Best practice and stakeholder feedback are being leveraged to develop a market design that works for Ontario suppliers
 - E.g., A financially binding DAM will provide increased certainty for suppliers and better alignment with the gas nomination window
- The single schedule market will provide a more accurate locational signal for the value of energy and OR in Ontario allowing the resources that are best able to meet system needs to benefit
- DAM and ERUC will help to ensure that resources will be scheduled when they are the lowest cost option to meet system needs

How To Get Involved

- Review and provide feedback on HLDs
 - SSM HLD is available at: <http://www.ieso.ca/Sector-Participants/Market-Renewal/Single-Schedule-Market-High-Level-Design>
 - ERUC and DAM HLDs will be published before year end
- Participate in detailed design engagement
 - See engagement plan for further details: <http://www.ieso.ca/-/media/Files/IESO/Document-Library/engage/mrp/mrp-energy-dd-engagement-plan.pdf?la=en>
- Engage with appropriate industry associations to follow MRP progress
- Subscribe to IESO Bulletin to receive periodic updates on MRP

Further Reading

- For further information on the design, stakeholders are invited to review materials online at:
 - Single Schedule Market: <http://www.ieso.ca/Sector-Participants/Market-Renewal/Market-Renewal-Single-Schedule-Market>
 - Day-Ahead Market: <http://www.ieso.ca/Sector-Participants/Market-Renewal/Market-Renewal-Day-Ahead-Market>
 - Enhanced Real-Time Commitment: <http://www.ieso.ca/Sector-Participants/Market-Renewal/Market-Renewal-Enhanced-Real-Time-Unit-Commitment>