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MARKET RENEWAL PROGRAM EDUCATION FOR TECHNICAL PANEL

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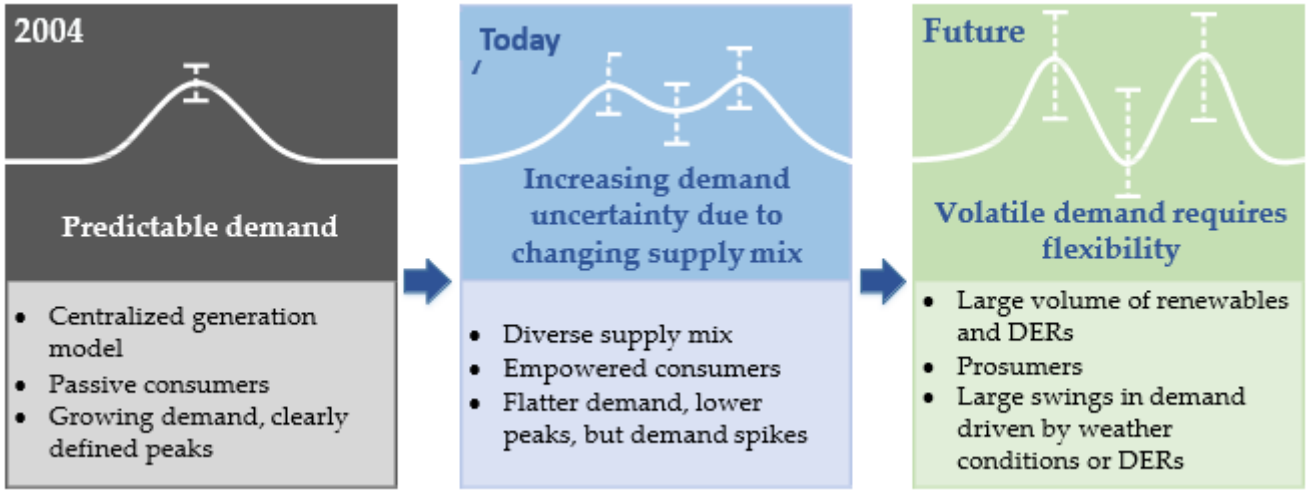
WHY IS THE IESO PURSUING MARKET RENEWAL?

Market Renewal Program Overview

- Launched in 2016
- Ambitious set of initiatives that amounts to a significant 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 and cost effectively

Electricity Sector Changes

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



Ontario's Electricity Market Today (before MRP)

Ontario's current market design is unique. While it has worked well to maintain reliability, it has not done so cost-effectively and is increasingly challenged to meet the needs of today and the future.

Inefficient design

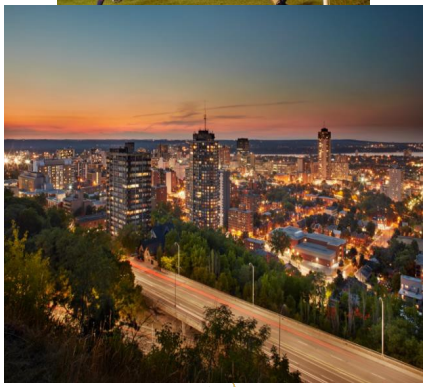
- Overly reliant on a real-time market based on a unique Ontario two schedule system

Administrative

- Out-of-market payments are necessary for reliability but costly to administer and have at times led to poor market participant behaviour

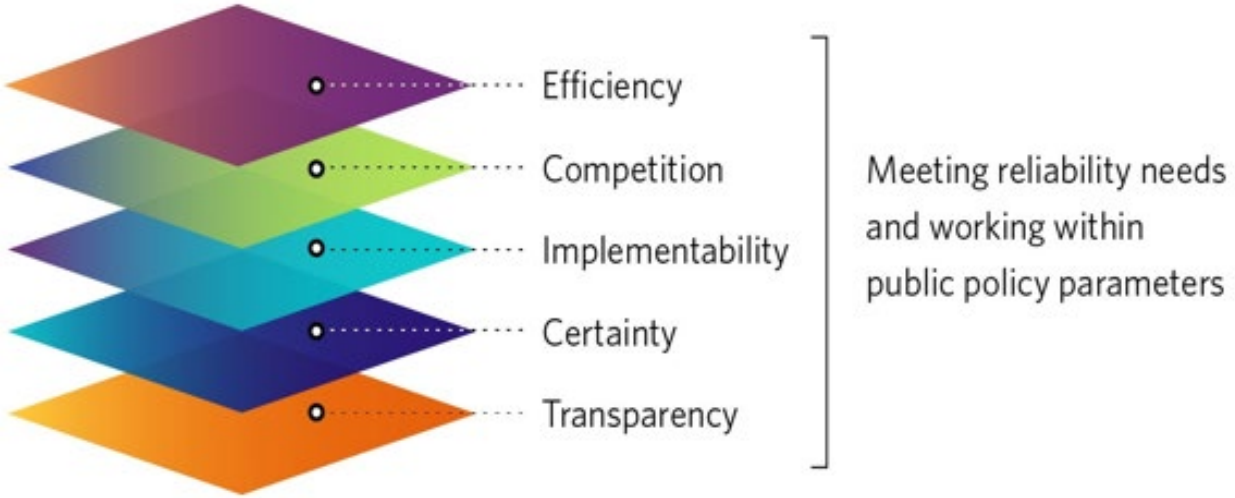
Market Renewal Program

- Improved price signals
- Focus on system needs
- Greater reliance on competition
- Better use of existing assets
- Net benefits of $800M



MRP Guiding Principles

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



WHAT HAS BEEN DONE TO DATE ON MRP?

Engagement Process

Stakeholder engagement has been critical to the success of the Market Renewal Program.

Some of those forums include:

- Market Renewal Working Group
- Non-Emitting Resources Subcommittee
- Stakeholder Advisory Committee
- Governance and Decision-Making Advisory Group

Engagement Process (continued)

- MRP Education and Awareness
- MRP Update Meetings
- High-level design and detailed design engagements, technical sessions, and responses to feedback

Key Energy Market Structures

Market Renewal will bring Ontario's market design in line with best practices. It will enhance key market structures that are foundational to commit and dispatch electricity resources.

TYPE OF ENERGY	OUTCOME
Day-Ahead Energy Market (DAM)	• Commits energy resources the day before operation • Stabilizes real-time markets • Reduces operational risks for the IESO and market participants
Enhanced Real-Time Unit Commitment (ERUC)	• Ensures optimal mix of resources are committed to deliver reliability at lowest cost • Occurs 3-24 hours before operation
Single Schedule Market (SSM)	• Ensures energy pricing transparently reflects global and local system constraints on a real-time basis 5-15 minutes before operation to reduce costs • Enables the implementation of DAM and ERUC

Energy Stream: Improve Asset Utilization

The Single Schedule Market initiative is the enabling change needed to achieve further efficiencies in scheduling and optimizing energy and ancillary services.

Day-Ahead Market
Providing the opportunity for production and consumption decisions to be made with certainty day-ahead is beneficial to all market participants and the IESO

Enhanced Real-Time Unit Commitment
Optimizing unit commitment over a longer timeframe based on a competitive platform, while ensuring commitment costs are transparent will enable improved utilization of assets in real-time

Energy Stream – Phasing Timeline

The phasing timeline includes 3 initiatives of high-level design, 14 design sections, and the implementation phase.

High-level Design: Initiative 1	Design Section	Implementation Phase
Singled Schedule Market	Overview	Market Rules and Manuals
	Authorization and Participation	Process Models and Business Requirements
	Prudential Security	Process Models and Business Requirements
	Facility Registration	Contract Amendments
	Revenue Meter Registration	Contract Amendments

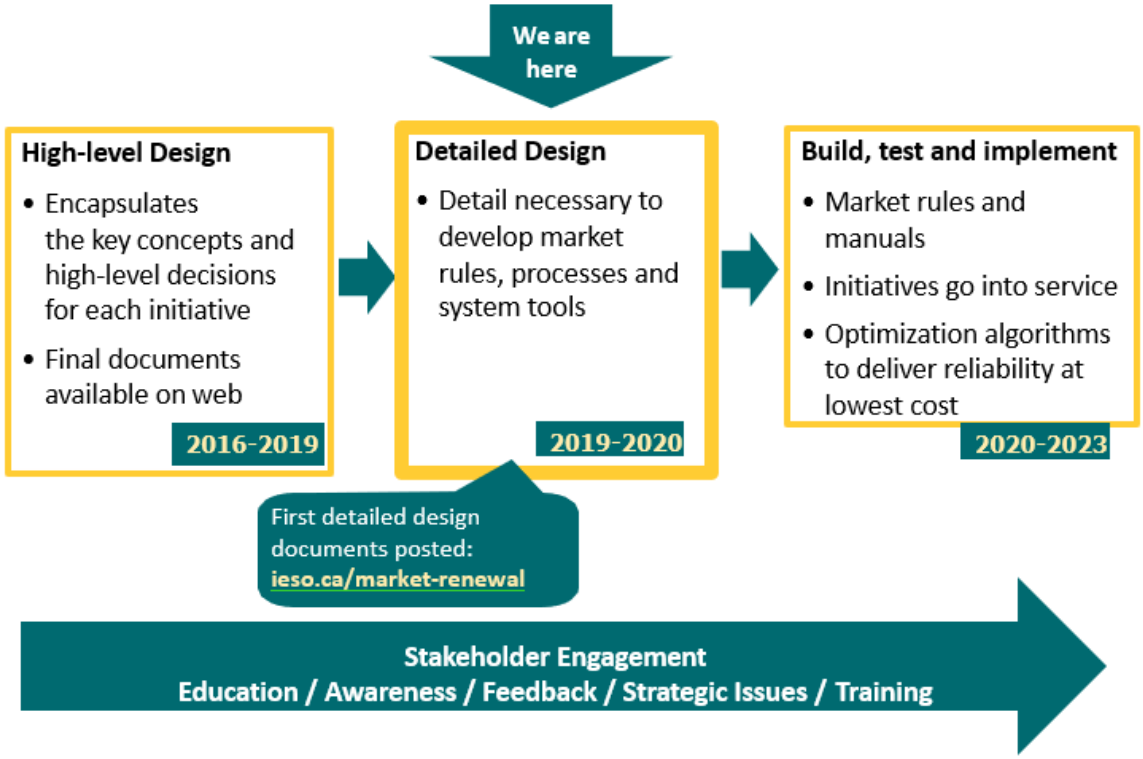
Energy Stream – Phasing Timeline (continued)

High-level Design: Initiative 2	Design Section	Implementation Phase
Day-Ahead Market	Offers, Bids and Data Inputs	Solution Development
	Grid and Market Operations	Solution Development
	3 Calculation Engines:	
	1. Day Ahead	Test Planning and Execution
	2. Pre-Dispatch	Test Planning and Execution
	3. Real-time	Test Planning and Execution

Energy Stream – Phasing Timeline (continued)

High-level Design: Initiative 3	Design Section	Implementation Phase
Enhanced Real-Time Unit Commitment	Market Power Mitigation	Market Participant Readiness
	Publishing and Reporting	Market Participant Readiness
	Market Settlements	IESO Readiness
	Market Billing and Funds Administration	IESO Readiness

Program Design Process



A CLOSER LOOK AT THE QUANTITATIVE BENEFITS OF MRP…

MRP Energy Stream Business Case

Through consultation with stakeholders, a business case was developed and identified the following benefits of the MRP Energy Stream:

- Enhanced reliability by aligning price and dispatch
- Operational certainty for IESO and market participants
- Address instances and causes of gaming
- Broader market benefits – incent good investments
- Enable future market – new technologies and participation

MRP Energy Stream Business Case (continued)

- Significant market efficiencies:
  - More efficient use of interties
  - Better commitment of resources
  - Greater competition between resources
- Positive financial benefits and customer savings

Benefits Assessment

The following benefits are real and have been qualitatively assessed as they are influenced by many factors, including behavioural change over time, and hard to accurately predict:

Improved Operational, Certainty and Reliability

- The Day-Ahead Market will provide reduced risk and greater certainty in day-to-day system operations

Broader Market Benefits

- Locational prices will provide improved signals to encourage new investment to where it can best meet needs and provide the most value

Benefits Assessment (continued)

The following benefits are real and have been qualitatively assessed as they are influenced by many factors, including behavioural change over time, and hard to accurately predict:

Reduced Gaming

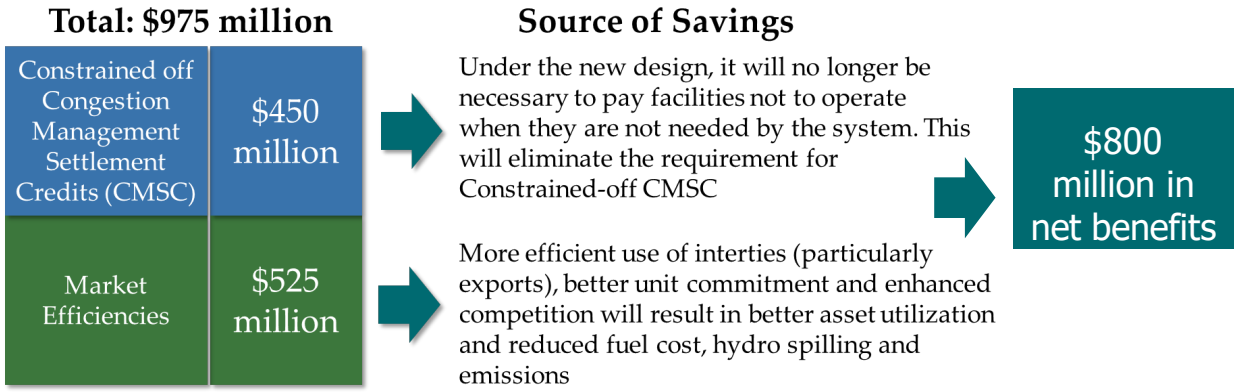
- Eliminating most out-of-market programs will reduce opportunities for gaming (which has historically resulted in claw backs of over $360M)

Enabling Future Markets

- Transparent prices and greater certainty will provide a platform to meet future needs and adapt to changes in a more effective manner

Quantitative Benefits

A number of key benefits were assessed on a quantitative basis where they could be calculated to a high degree of certainty:



Quantitative Benefits (continued)

The analysis used conservative assumptions and focused on the first 10 years of operation; but in reality, the benefits are expected to last well beyond this timeframe.

WHAT'S NEXT FOR THE DESIGN PHASE OF MRP?

Key Milestones: MRP Energy Stream

WHAT DOES THIS MEAN FOR TECHNICAL PANEL?

Testing and Assessment of Capacity Charge

Date	Design Document Topics
November 28, 2019	• Overview • Authorization and Participation • Prudential Security • Facility Registration • Revenue Meter Registration • Market Billing and Funds Administration
March 26, 2020	• Market Power Mitigation • Publishing and Reporting Market Information
May 5, 2020	• Grid and Market Operations Integration • Offers, Bids and Data Inputs • Market Settlements
July 27, 2020	• Day-Ahead Market Calculation Engine • Pre-Dispatch Calculation Engine • Real-Time Calculation Engine

Proposed Technical Panel Schedule

- TP will begin reviewing MRP rule packages starting approximately January 2021 until about February 2022
- TP meeting frequency is estimated to be Monthly
- Additional details will be provided at future TP education sessions

Outlook: Technical Panel Education Sessions

Quarter 1 of 2020

- Today – MRP Introductory Update, Benefits, Expectations

Quarter 2 of 2020

- View of detailed designs and sense for the set of market rule amendments linked to the design

Quarter 3 of 2020

- More granularity on the design elements, market rule amendments and TP scheduling

Outlook: Technical Panel Education Sessions (continued)

- Early look at an MRP schedule for rules review by the TP in 2021

Quarter 4 of 2020

- MRP rules schedule for TP review in 2021

QUESTIONS?

WE LOOK FORWARD TO PROVIDING FUTURE UPDATES