

Market Renewal Program: Introduction to Enhanced Real-time Unit Commitment (ERUC)

October 11, 2017

ERUC Stakeholder Engagement

Energy Workstream

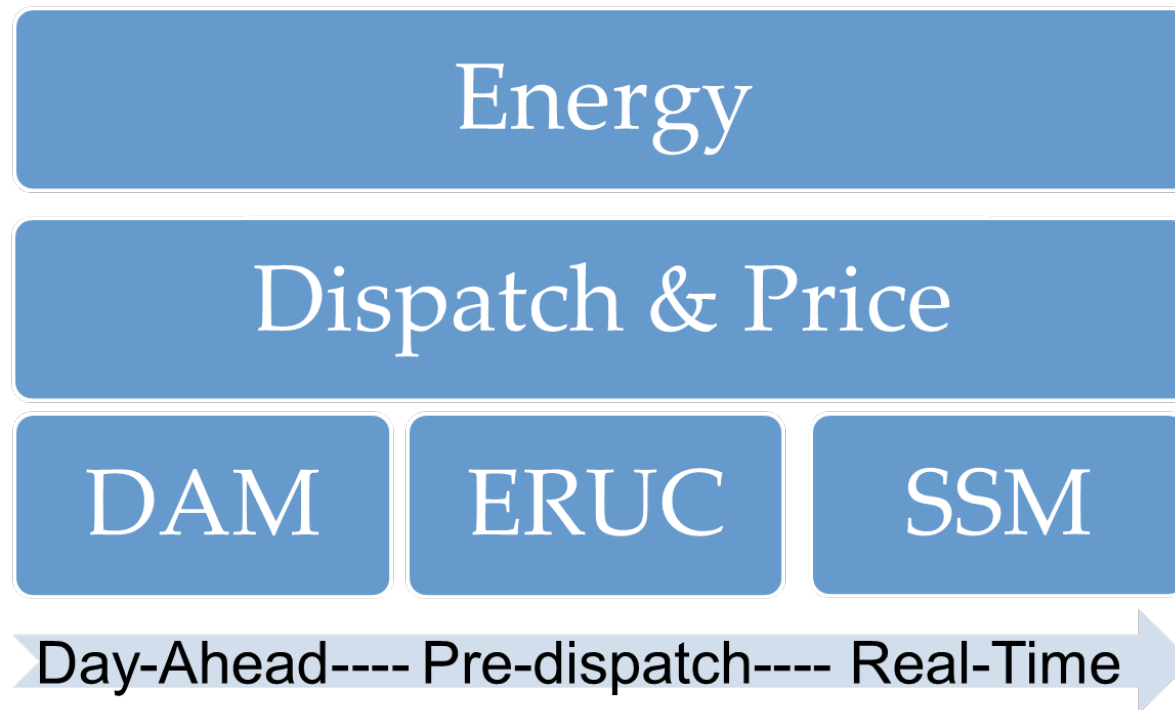
- The Energy workstream consists of three key projects:
 - Single Schedule Market
 - Day-ahead Market
 - Enhanced Real-time Unit Commitment
- Together they will improve the dispatch, commitment and pricing of resources in the energy market

ERUC Purpose

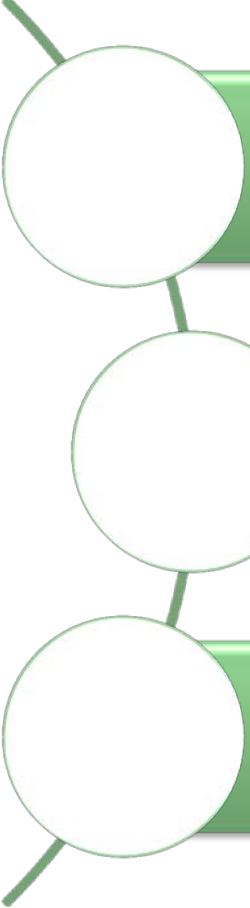
- ERUC will be a security constrained unit commitment, jointly optimizing energy and operating reserves in the pre-dispatch timeframe
- ERUC will consider all resource bids and offers to determine the optimal mix of resources to meet net load
- A non-quick start generator will be committed if it is the lowest cost resource

The Big Picture

Enhanced real-time unit commitment will operate in the pre-dispatch timeframe, after day-ahead / before real-time



Current Real-Time Unit Commitment



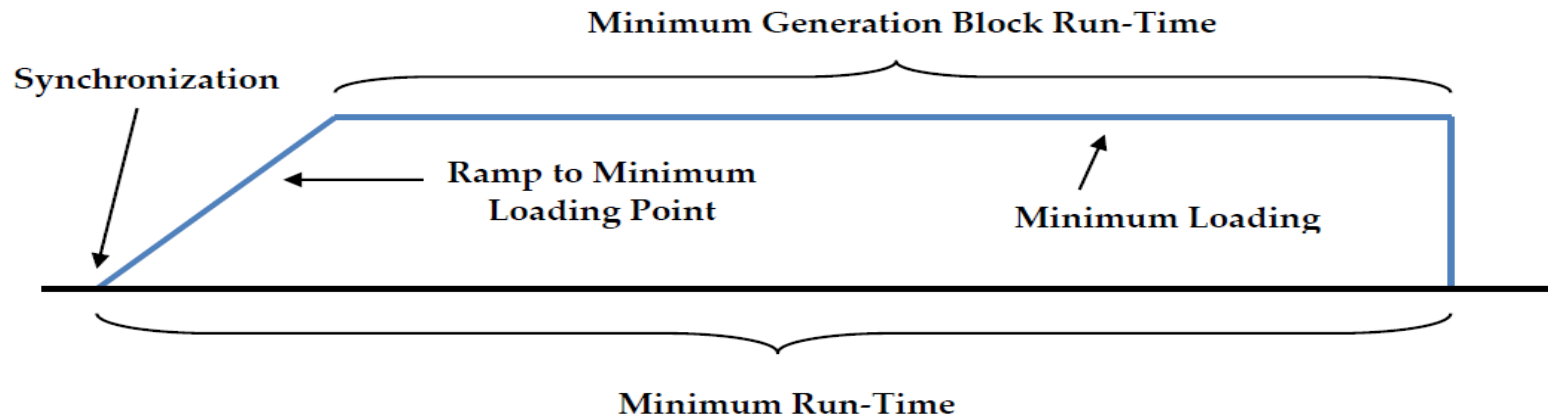
Real-time program is intended to maintain system reliability by providing eligible generators with a commitment and a cost guarantee

Generators with long start-up times must make decisions and prepare to start-up well in advance of real-time

The program ensures that generators will come online even if there is a risk that the real-time price will not cover their costs

Characteristics of Long Start Units

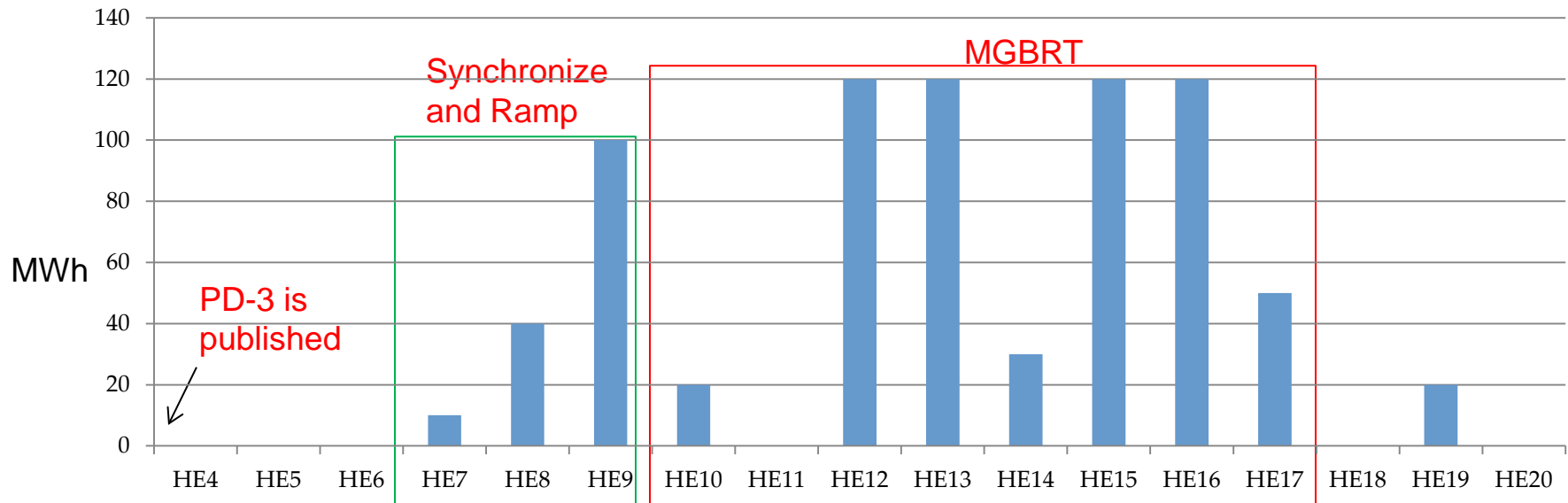
- Generators must operate at their minimum loading point (MLP) for their minimum generation block run-time (MGBRT) for technical reasons



Timing

- Real-time unit commitment happens after the day-ahead commitment process (DACP) runs and before real-time; referred to as the “pre-dispatch” timeframe
- However, units are not “committed” by pre-dispatch schedules
- Generators receive hourly pre-dispatch schedules, giving an indication when they are likely economic in real-time
 - If the eligibility criteria are met, the participant will “invoke” a start and begin to bring its unit online

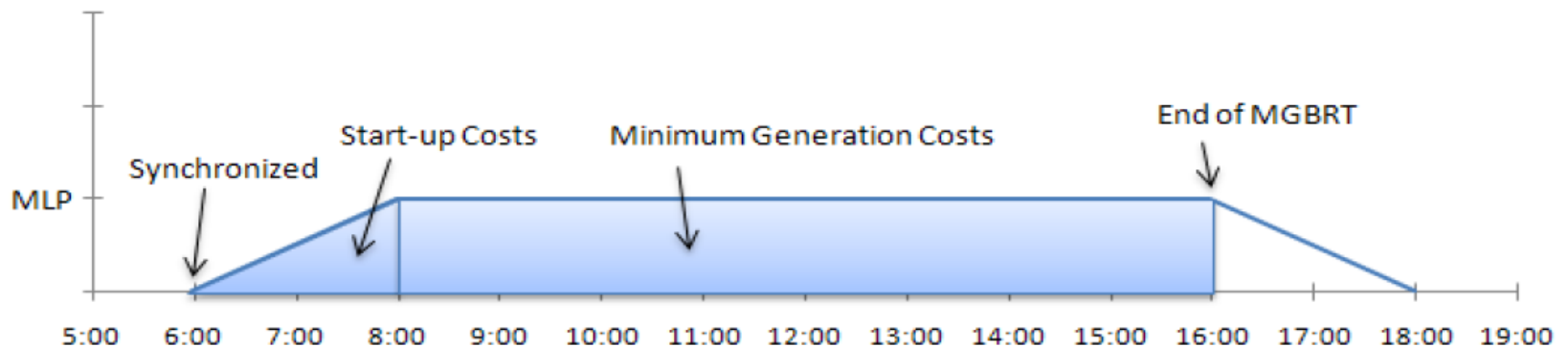
Example: Eligibility for RT-GCG



- In order to be eligible, the generator must be scheduled at their MLP or greater for at least half of their MGBRT in a pre-dispatch schedule
- The generator receives a commitment for all MGBRT hours at MLP

RT-GCG Guarantee Payment

- Guaranteed costs are:
 - A. Pre-approved start-up costs; and
 - B. Minimum generation costs based on energy offer
- Guarantee payment are made if the guaranteed cost is greater than market revenues earned up to MLP during the period from synchronization to end of MGBRT



How has the design evolved?

2003

- Original design created during a time of tight supply: generators were eligible if scheduled for as little as 1 MW, and the guarantee was based on costs submitted after the fact

2009

- Changes made to more efficiently commit: linked guarantee payment to offer prices and tightened the eligibility requirements (MLP for $\frac{1}{2}$ MGBRT)

2017

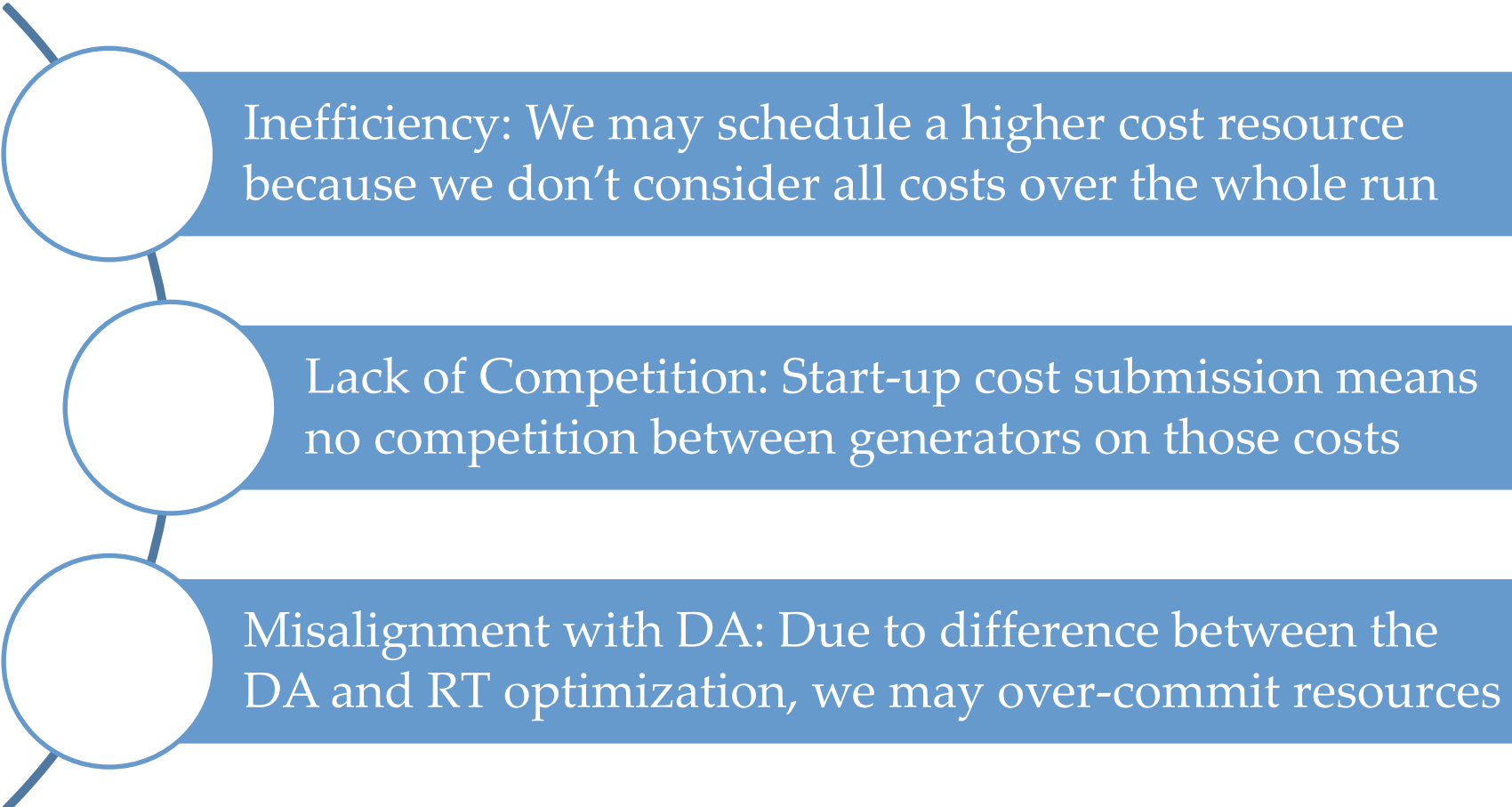
- Replaced after-the-fact start-up cost submission with a pre-approved cost recovery framework

Market Surveillance Panel

In its monitoring reports, the MSP has commented on numerous occasions that there is a need for an optimized program using three-part offers.

Monitoring Report on the
IESO-Administered
Electricity
Markets

Summary of Issues with Current Program



Inefficiency: We may schedule a higher cost resource because we don't consider all costs over the whole run

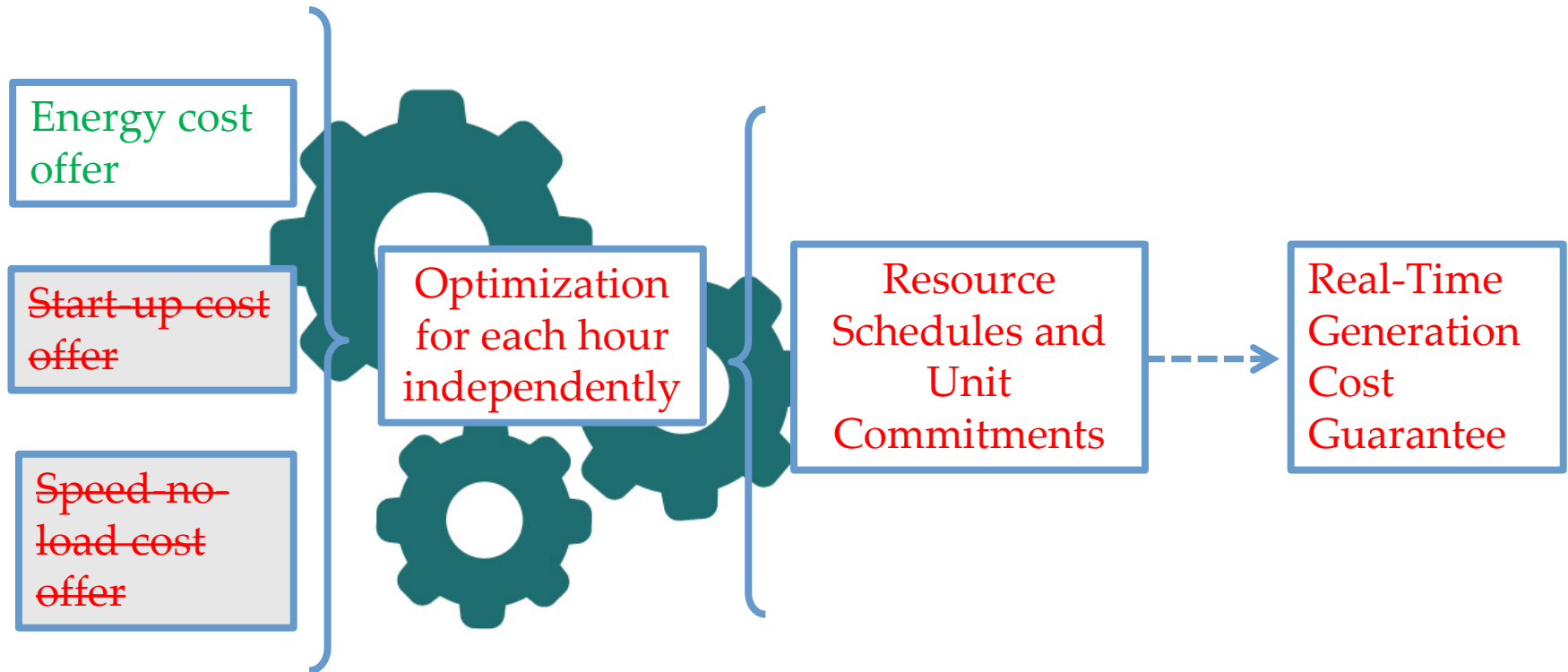
Lack of Competition: Start-up cost submission means no competition between generators on those costs

Misalignment with DA: Due to difference between the DA and RT optimization, we may over-commit resources

Unit Commitment with a DAM

- Even with a DAM, improvement of the current RT unit commitment is required because there are changes in demand and supply between timeframes
 - Energy supply, Ontario demand, exports
 - Operating reserve requirements
 - Ramp requirements
- Often a combination of factors can result in a commitment

Current Real Time Unit Commitment



Misalignment with Day-Ahead

Day-ahead Commitment Process

Three-part offers

24 hour optimization

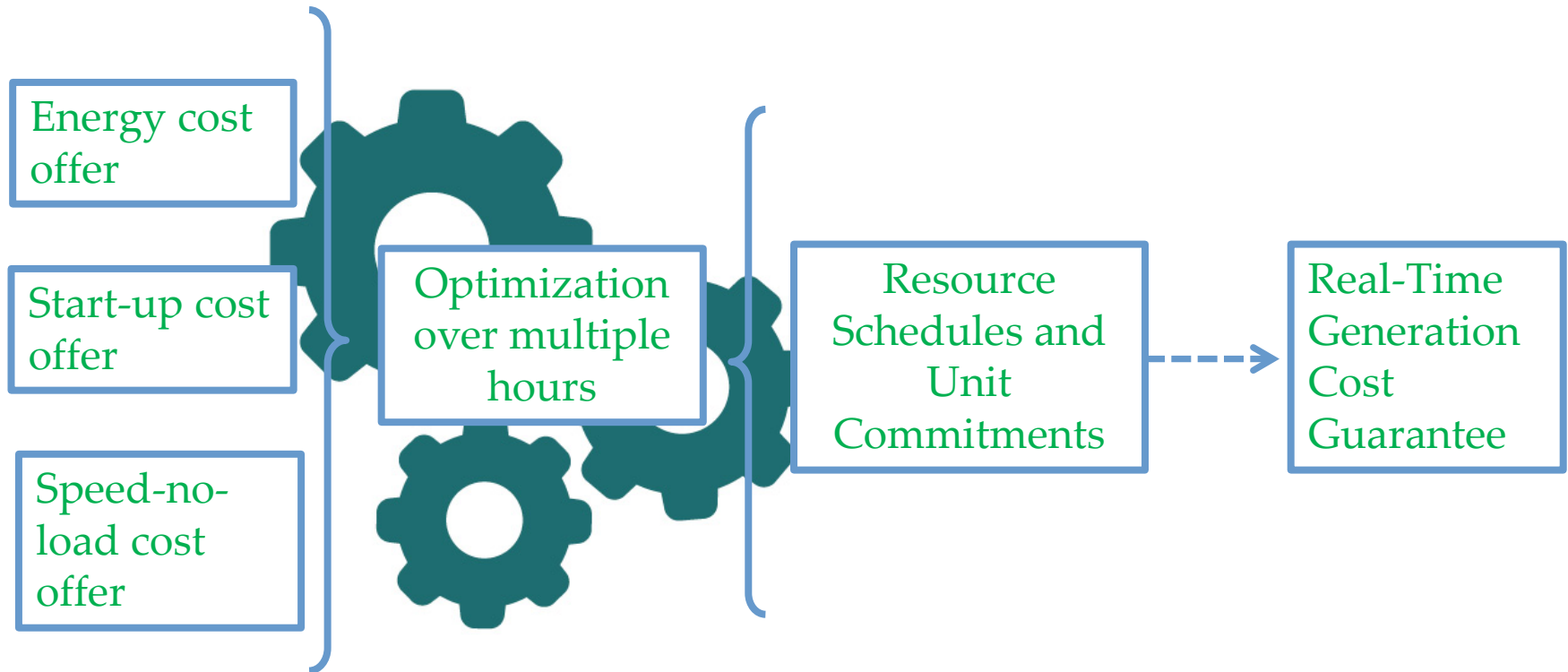
Real-time Commitment Process

Energy only offers

Optimize each hour independently

- Different optimization is utilized in real-time as compared to day-ahead
- Even with identical supply/demand conditions, a different solution may be produced

Enhanced Real Time Unit Commitment



Benefits of Enhanced RT Unit Commitment

1

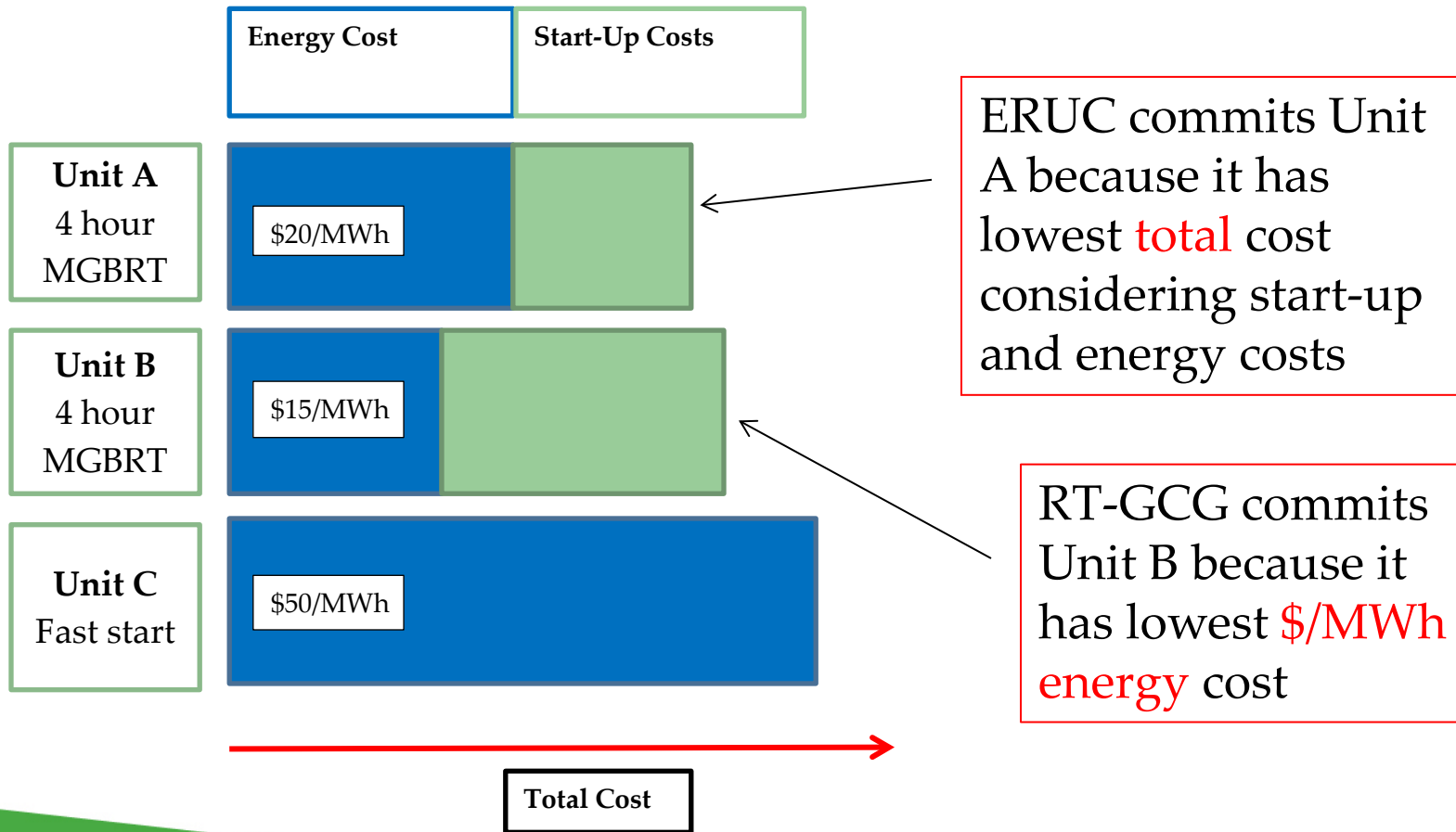
- Resources will be efficiently committed by considering all costs

2

- Optimization will evaluate the overall efficiency of the commitment across the whole run

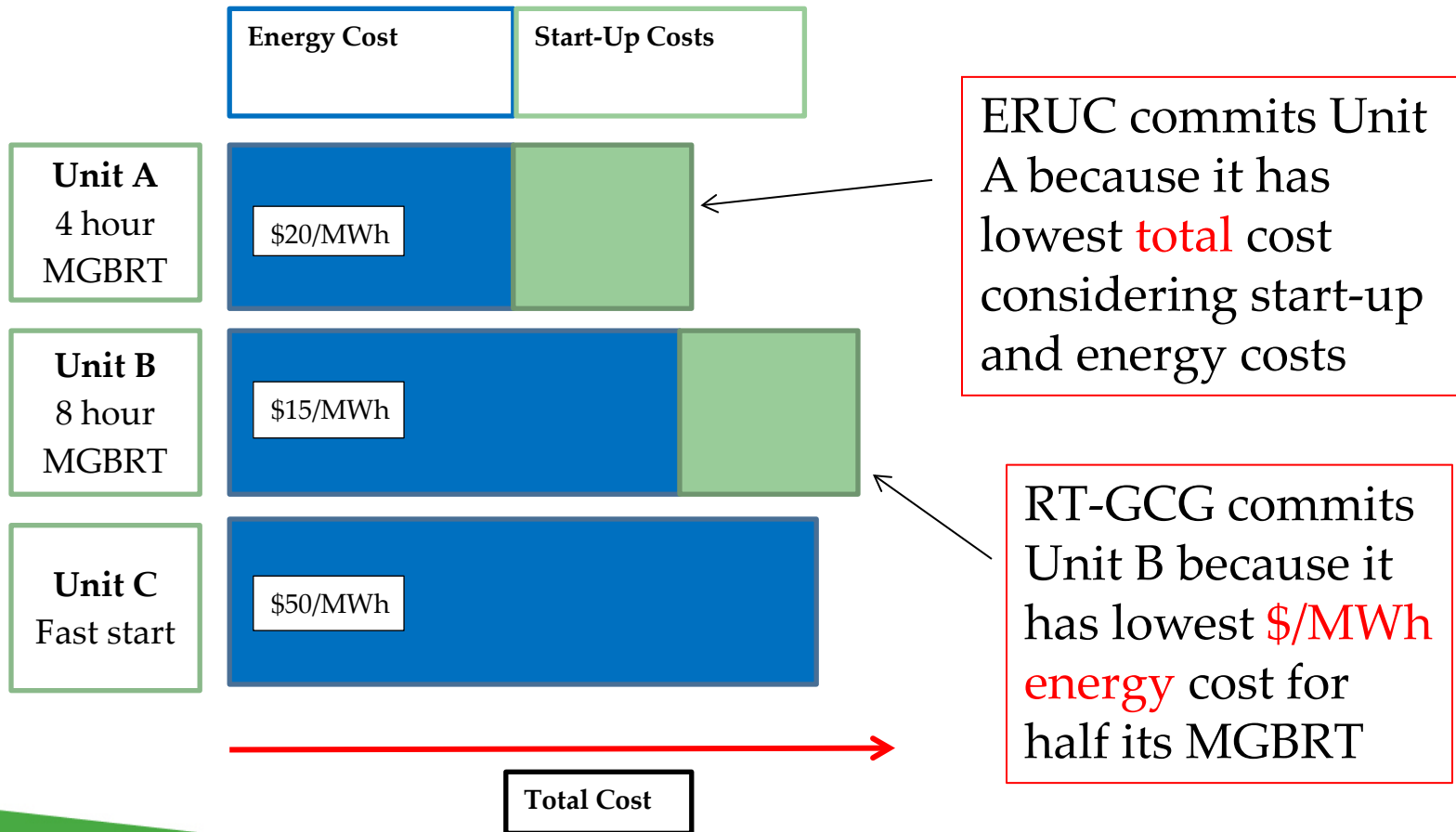
ERUC Optimization Example 1

Scenario: The grid needs to address a 3 hour shortfall.



ERUC Optimization Example 2

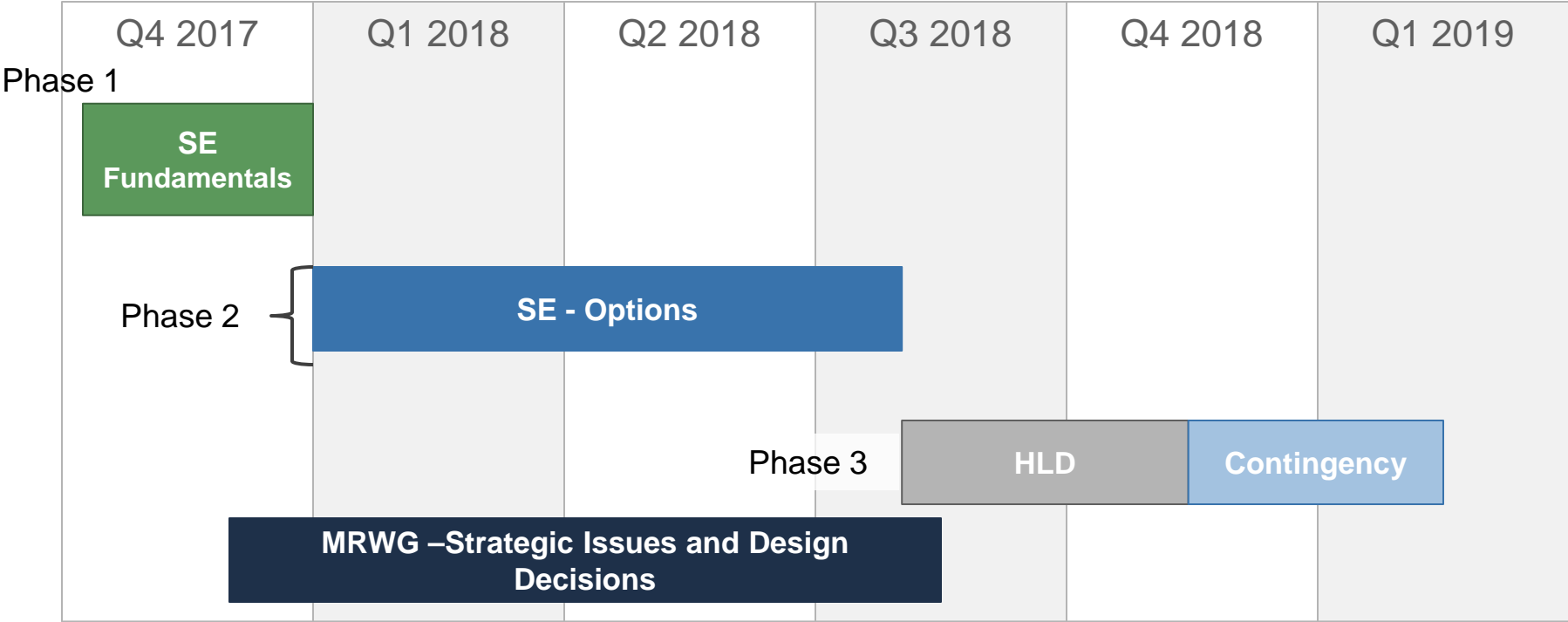
Scenario: The grid needs to address a 3 hour shortfall.



Introducing Proposed ERUC Design Elements

Module	Module Name	#	Design Element
A	Engine Parameters	1	Functional Passes
		2	Look Ahead Period
		3	Timing and Frequency of Run
		4	Time Step
B	Participation and Input Data	5	Intertie Transactions
		6	Must Offer Requirements
		7	Eligibility Requirements
		8	Market Participant Data
C	Market Power Mitigation	9	Commitment Cost and Non-Price Bids/Offers
		10	Bid/Offer Changes
D	Output of Engine	11	Binding Start-up Instruction and Operational Schedule
E	Settlements	12	Calculation of Make Whole Payment
		13	Failure Charge

ERUC Timelines



ERUC - HLD Schedule

- Three phases of High Level Design to continue through approximately Q4 2018
- Near-term schedule (Phase 1):

Date	Forum	Topic
Wednesday, October 11 (afternoon)	ERUC	Introduction
Tuesday, October 31 (all day)	ERUC	Fundamentals mtg. 1
Wednesday, November 29 (afternoon)	ERUC	Fundamentals mtg. 2