

# Energy Security Improvements Impact Analysis

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Principal

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## Agenda

- Overview of Draft Impact Assessment Report
- Review of Report's Contents
- Review of Report's Findings
- Incremental Analyses since Feb MC

The first three agenda items include content that is generally unchanged from that presented at the February MC

# Draft Impact Assessment Report

## Overview of Energy Security Improvements (ESI) Impact Assessment

- Impact Assessment is intended to provide quantitative and qualitative information on the expected impacts of ESI proposal
  - Intended to assist stakeholders' evaluation of the proposal
  - Assessment includes analysis of impacts and illustration of the mechanisms through which ESI would improve market participant incentives and affect market outcomes
  - Analysis is limited to energy and ancillary service markets

# Draft Impact Assessment Report

## Overview of Energy Security Improvements (ESI) Impact Assessment

- Draft Impact Assessment Report summarizes and details our methods, data, results and findings
  - Results and findings largely cover analyses presented previously
    - Some new information related to market prices, emissions, and fuel
  - Results remain preliminary, although no modifications are anticipated at this time

# Review of Report's Contents

# Contents of Draft Report

## Introduction

- Assignment
  - Provide quantitative and qualitative assessment of likely ESI impacts
    - Changes to customer payments and production costs;
    - Changes to incentives to market participants to take steps to improve their ability to supply energy in real-time;
    - Changes to fuel system operational outcomes that have implications for system reliability;
    - Other expected energy market impacts.
  - Does not include analysis of FCM or FRM
- Overview of ESI
  - Describes, at a high level, the proposed day-ahead energy options (EIR, GCR, and RER) and the Forecast Energy Requirement (FER)

# Contents of Draft Report

## Approach to Impact Analysis

- Production Cost Model: Overview
  - The structure of the production cost model
- Day-Ahead and Real-Time Markets
  - The day-ahead and real-time market clearing
  - Modeling of ESI implementation, including DA energy option offers
  - Modeling of dynamic EIR requirement and FER payments
- Fuel Inventory Constraints
  - Natural gas pipeline and market assumptions
  - Fuel inventory storage and refueling model
- Market Settlement & Model Outputs
  - Describes the output metrics studied

# Contents of Draft Report

## Impact of Energy Security Improvements on the Energy Market

- Winter Cases
  - Description of results for Frequent, Extended, and Infrequent Central Cases
  - Focus on key changes, such as: payments, incentives for fuel inventory, production costs, impacts across technologies
- Non-Winter Cases
  - Description of results for Severe and Moderate Non-Winter Cases
  - Reliability analysis not conducted for Non-Winter Cases
- Scenario Analysis
  - Walkthrough of results for all 17 scenarios
  - Additional tables are provided in a Supplemental Appendix
- Conclusions Regarding ESI (see next section of slide deck)



# Contents of Draft Report

## Appendices

- Additional Production Cost Model Details
  - Mathematical model description
  - Opportunity cost adder methodology
  - Sloped demand curve bid calibration
- Resource Data and Assumptions
  - Electricity market supply and demand assumptions
  - Fuel and emissions prices
  - Additional detail on oil inventory, holding costs, and LNG assumptions
- Day-Ahead Energy Option Offers
  - Calculation of expected closeout costs and risk premium
- Supplemental Scenario Tables: Payments, LMP, Reliability, and Shortages

# Review of Report's Findings

# Draft Impact Assessment: Key Findings (1)

## Incentives for improved delivery of real-time energy supplies

- 1. ESI would create strong financial incentives for resources to maintain more secure energy supplies (e.g., higher levels of energy inventories) and generally improve their ability to deliver energy supplies in real-time**
  - Incentives created through two channels:
    - FER payments for helping to meet the Forecast Energy Requirement
    - New ESI ancillary service products compensate resources for capability to deliver energy supply in real-time even if not awarded a DA energy position
  - ESI requires that market participants that sell DA options and cannot deliver in RT pay back face higher costs if they cannot deliver energy in real-time, particularly during stressed system conditions
  - Incremental incentives can be substantial and are greatest during stressed market conditions, when the system is in greatest need
  - ESI's incentives would be strongest for those resources best able to improve reliability through cost-effective improvements in their ability to supply energy in real-time

## Draft Impact Assessment: Key Findings (2)

### Shifts in resource use and bid-in demand

**2. *By providing another market through which resources can be compensated for providing energy security, ESI would increase incentives to preserve existing energy inventories***

- Resources with inventoried energy would be compensated for maintaining reserve energy supplies via their sale of DA energy options ‘backed’ by this energy

**3. *Under ESI, day-ahead market would be more likely to clear energy supplies at (or above) forecasted load***

- Any remaining gap between cleared supplies and forecast load will tend to be smaller with ESI
- This outcome is a consequence of the auction clearing mechanism under ESI, which will implicitly assign a ‘cost’ to not meeting the FER

## Draft Impact Assessment: Key Findings (3)

### Changes in production costs and reliability outcomes

- 4. *Through these mechanisms, ESI can improve reliability outcomes by increasing incentives for improved deliverability of energy supplies in real-time***
- Assessment not designed to analyze system reliability or security
  - Assessment can quantify certain aspects of fuel system operations consistent with improved reliability
  - Assessment shows improvements in operational outcomes that are consistent with improved reliability from incremental inventory expected to be incented by ESI

## Draft Impact Assessment: Key Findings (4)

### Changes in production costs and reliability outcomes

- 5. ESI can improve efficiency and lower production costs under stressed market conditions when the increase in energy inventory reduces energy production from less efficiency and higher cost fuels**
- ESI can help avoid resource-level underinvestment in energy security under current market rules
  - Under stressed conditions, production costs reduced by \$19 and \$36 million, separate from the benefits of improvements in reliability

## Draft Impact Assessment: Key Findings (5)

### Consumer Financial Outcomes

- 6. *ESI would be expected to increase aggregate payments by load (to suppliers) during periods when stressed market conditions are uncommon or infrequent – for example:***
  - Payments increase \$35 million over the 3-month winter (Infrequent Case)
  - Payments increase \$89 million over the 9-month non-winter (Moderate Case)
- 7. *Under stressed market conditions, total payments by load (to suppliers) could increase or decrease***
  - Impact depends on multiple factors – for example:
    - Nature of the stressed conditions (e.g., frequency and duration of stressed conditions)
    - Amount of incremental energy inventory incented by ESI, as this inventory can lower market prices, particularly during stressed market conditions

## Draft Impact Assessment: Key Findings (6)

### Supplier Financial Outcomes

- 8. *Net revenues to suppliers tend to run opposite to payments by load (i.e. net revenues increase when payments by load increase)***
  
  - 9. *Magnitude of change in net revenues varies across resource type, but generally direction of impact the same across resource types***
- Estimated changes in payments (and generator net revenues) reflect only changes in energy and ancillary services market outcomes
    - Does not account for potential changes in FCM or FRM revenues



# Incremental Analyses since Feb MC

# Incremental Analyses

## Includes new Tables and Figures

- Changes to exposition to clarify descriptions, explanations and findings
- New Tables and Figures
  - Figure 6. Illustration of Distribution of DA Energy Option Closeout Costs
  - Table 18. Cleared DA Energy and Ancillary Service Products, Winter Central Case
  - Table 24. Change in Fuel Consumption by Fuel Type, Winter Central Case
  - Table 36. ESI Payment Impacts Relative to Total Customer Payments in ISO-NE Markets
  - Table 58. Total Fuel Consumption by Fuel Type, Winter Central Case
  - Table 59. Massachusetts Annual CO<sub>2</sub> Emissions

# Appendices: New Tables and Figures

# New Tables and Figures

## DA Energy and DA Energy Option Supply

### Cleared DA Energy and Ancillary Service Products, Winter Central Case, ESI (MWh)

Case	Day-Ahead Energy	DA Energy Options				
		Total	EIR	GCR10	GCR30	RER
Frequent Case	32,215,469	7,749,058	6,604	3,456,000	1,728,000	2,558,454
Extended Case	31,943,398	7,791,810	25,172	3,456,000	1,728,000	2,582,638
Infrequent Case	31,634,655	7,859,245	83,245	3,456,000	1,728,000	2,592,000

# New Tables and Figures

## Fuel consumption

### Total Fuel Consumption by Fuel Type, Winter Central Case

Case		Total		
		Natural Gas (MMBTU)	Oil (BBL)	Coal (MMBTU)
Frequent Case	CMR	48,779,867	8,435,575	11,973,792
	ESI	46,726,510	8,738,681	11,973,792
Extended Case	CMR	70,954,852	3,925,122	8,030,226
	ESI	70,924,801	3,856,651	8,030,226
Infrequent Case	CMR	83,546,079	1,318,809	6,849,625
	ESI	83,546,079	1,314,057	6,849,625

### Change in Fuel Consumption by Fuel Type, Winter Central Case

Case	Total					
	Natural Gas (MMBTU)		Oil (BBL)		Coal (MMBTU)	
Frequent Case	(2,053,357)	-4.21%	303,106	3.59%	-	0.00%
Extended Case	(30,051)	-0.04%	(68,471)	-1.74%	-	0.00%
Infrequent Case	-	0.00%	(4,752)	-0.36%	-	0.00%

# New Tables and Figures

## Consumer Financial Outcomes

### ESI Payment Impacts Relative to Total Customer Payments in ISO-NE Markets

	Non-Winter Case	Severe			Moderate		
	Winter Case	Frequent	Extended	Infrequent	Frequent	Extended	Infrequent
Incremental Payments from ESI		\$257	\$56	\$160	\$221	\$20	\$123
Percent of Total		2.1%	0.5%	1.3%	1.8%	0.2%	1.0%
Total Payments (2018)		\$12,240	\$12,240	\$12,240	\$12,240	\$12,240	\$12,240

# New Tables and Figures

## Emissions

### Massachusetts Annual CO<sub>2</sub> Emissions

Non-Winter Case Winter Case		Frequent	Severe Extended	Infrequent	Frequent	Moderate Extended	Infrequent
<b>MA Limit 2025 <sup>[1]</sup></b>		<b>7,380,000</b>	<b>7,380,000</b>	<b>7,380,000</b>	<b>7,380,000</b>	<b>7,380,000</b>	<b>7,380,000</b>
<b>Central Cases</b>							
MA CO <sub>2</sub> Emissions (metric tons)	CMR	8,824,865	8,037,318	7,691,581	8,623,248	7,835,701	7,489,964
	ESI	8,748,793	7,976,487	7,681,679	8,547,176	7,774,871	7,480,062
	Change	(76,072)	(60,831)	(9,902)	(76,072)	(60,831)	(9,902)
<b>\$5 MA CO<sub>2</sub> Adder</b>							
MA CO <sub>2</sub> Emissions (metric tons)	CMR	8,515,251	7,731,520	7,385,709	8,289,895	7,506,164	7,160,353
	ESI	8,432,947	7,673,953	7,375,569	8,207,592	7,448,598	7,150,213
	Change	(82,304)	(57,567)	(10,140)	(82,304)	(57,567)	(10,140)

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