2017 Economic Study Request

Study to Explore Least-Cost, Emissions-Compliant System Topologies

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ISO-NE Planning Advisory Committee
April 19, 2017

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- Request Guidelines
- CLF's Request
- Value Proposition

Request Guidelines

"The ISO's stakeholders may request the ISO to initiate a Needs Assessment to examine situations where **potential regulated transmission solutions or market responses or investments could result in (i) a net reduction in total production cost to supply system load based on the factors specified in Attachment N of this OATT, (ii) reduced congestion, or (iii) the integration of new resources** and/or loads on an aggregate or regional basis (an 'Economic Study')."

Attachment K, Section 4.1(b) of the Tariff

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CLF's Request

Study to Explore Least-Cost, Emissions-Compliant System Topologies

As a continuation of its 2016 Economic Study analysis, ISO-NE **develop and price at least two new system topologies** (of generation and transmission) **for 2025 and 2030 that have total system CO_2 emissions at or below the average system emissions levels of Scenario 3** (the "RPS-plus scenario") of the 2016 Economic Study.

CLF's Request

Goal:

To determine whether there are viable system topologies other than those analyzed in Scenario 3 with similar **total system emissions (~ 20M tons in 2025; ~15M tons in 2030) but at a lower Total Annual Resource Cost** than has been projected for Scenario 3.

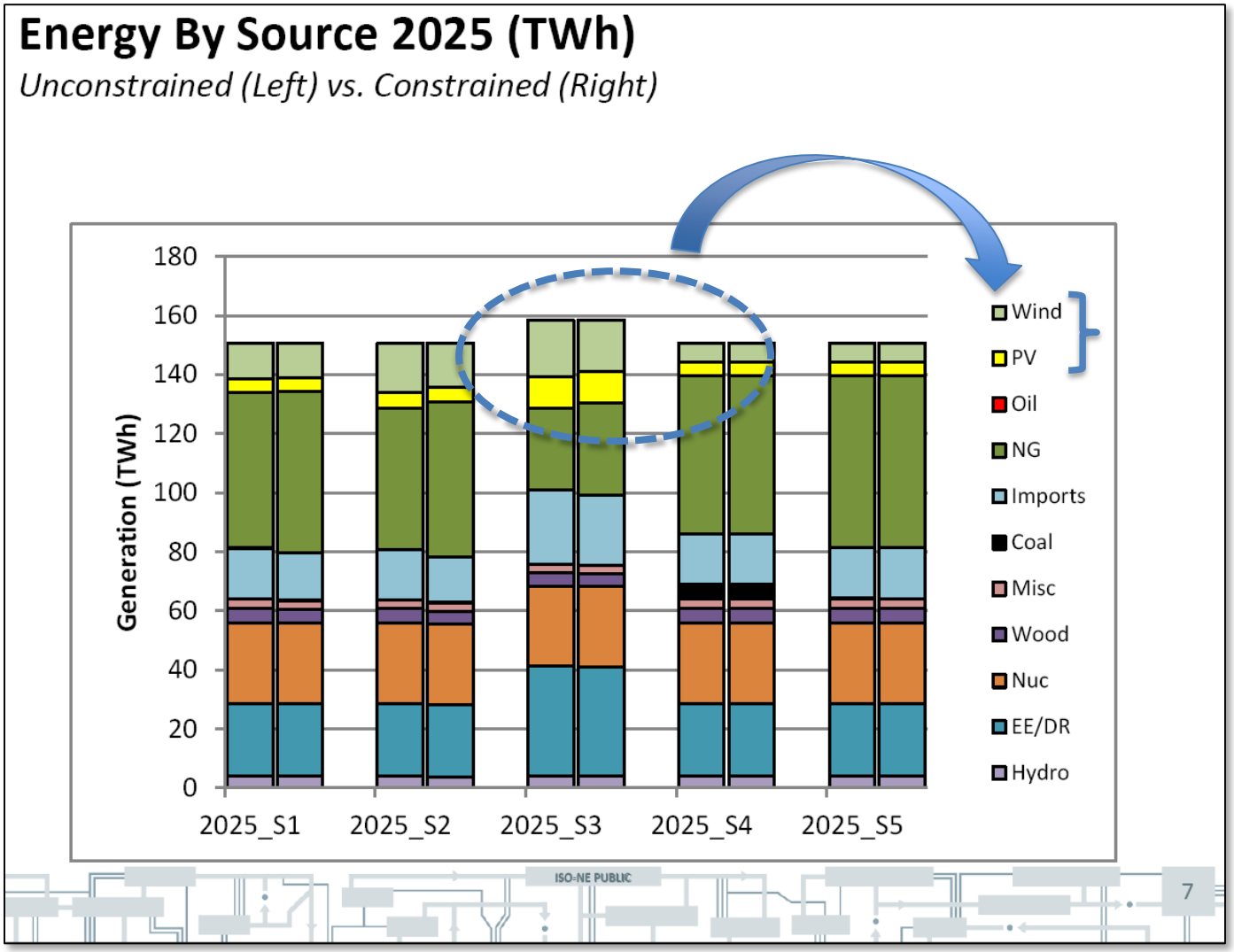
CLF's Request

Meets Section 4.1(b) requirements:

- Emissions compliant scenarios likely to lead to a "net reduction in total production cost to supply system load"
- Examine need for new regional TX to "reduce[] congestion" in emissions-compliant scenarios
- Examine situation involving "the integration of [substantial] new resources and/or loads on an aggregate or regional basis."

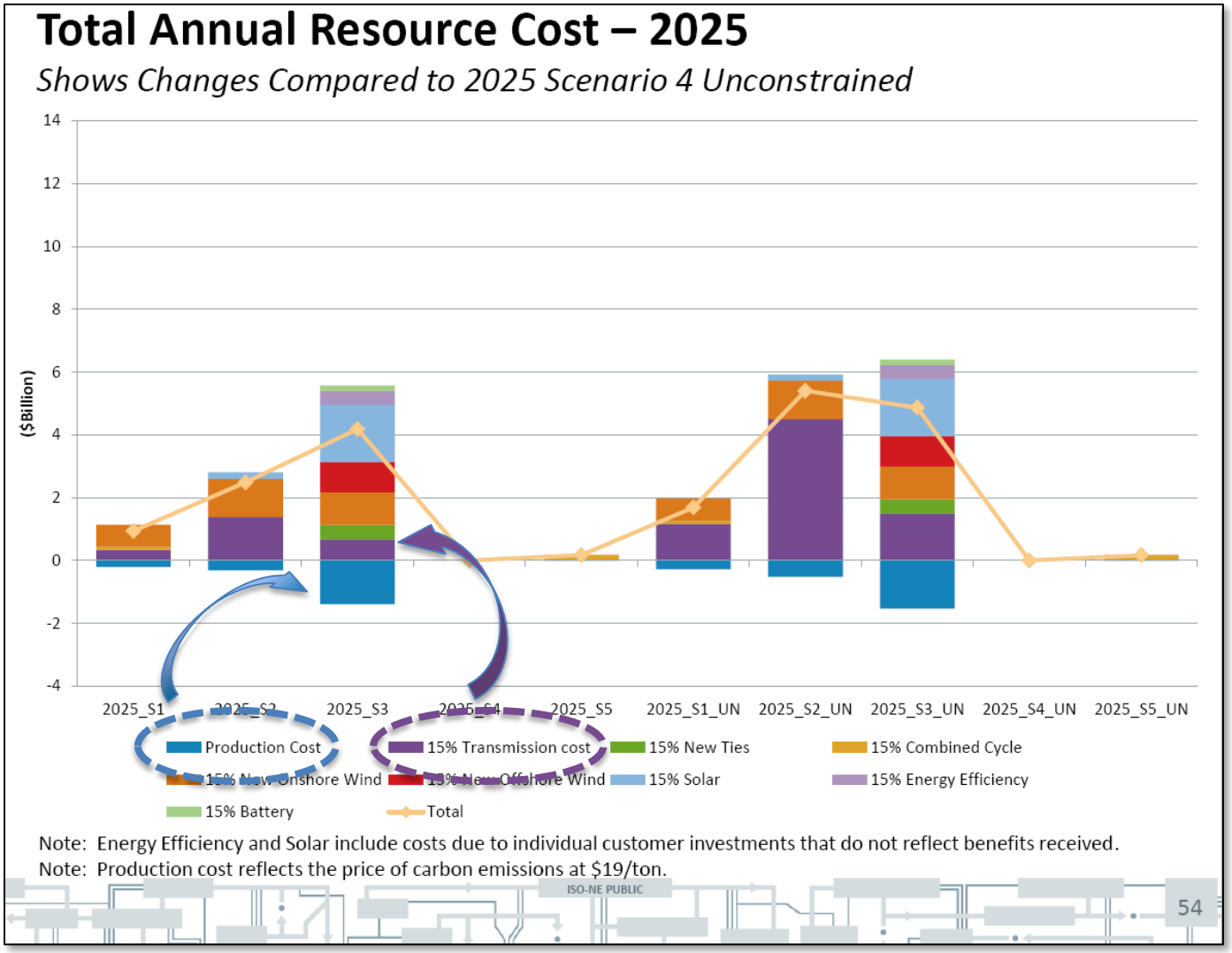
→ Draft 2016 Econ. Study Results, Scenario 3 ←

CLF's Request



2016 Economic Studies Executive Summary Supplement (Nov. 29, 2016)

CLF's Request



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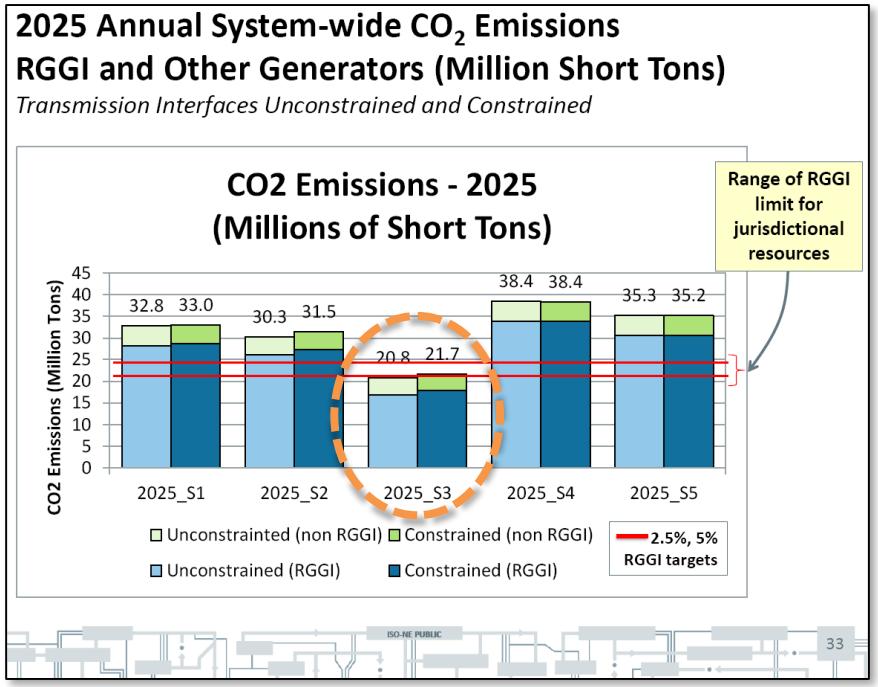

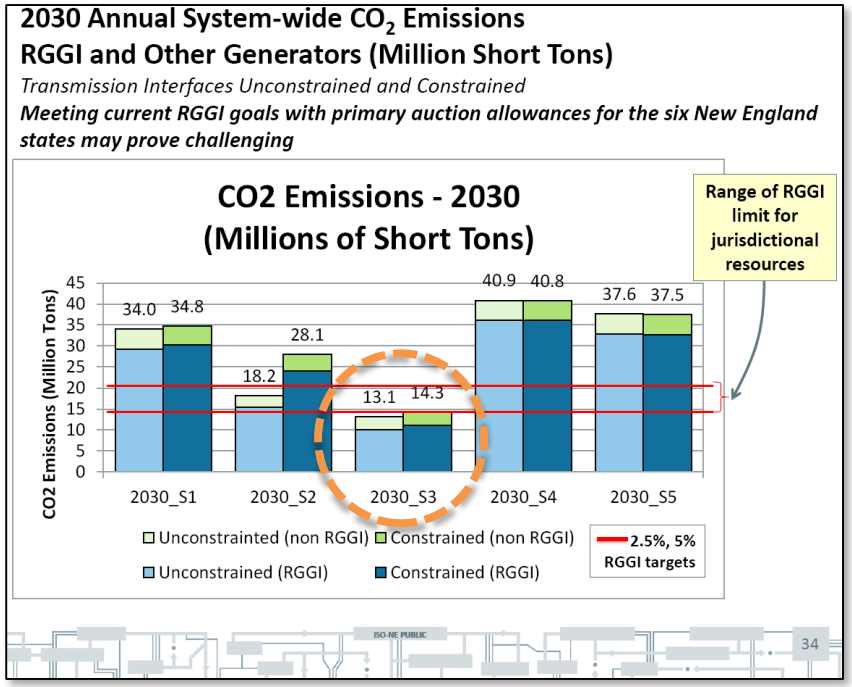

2016 Economic Studies Executive Summary Supplement (Nov. 29, 2016)

Shift in Focus → **Exploring and understanding future grid topologies that comply with existing state law** (RPS; RGGI; GWSA)

Value Proposition

Build on learning from 2016 Econ. Study:

2025: S2->S6 Δ = ~ 0.1% MW

2025 and 2030 Scenario Resource Additions Summary

Scenario	PV (MW)	EE (MW)	On-Shore Wind (MW)	Off-Shore Wind (MW)	New NG Units (MW)	HQ and NB External Ties (MW)	Battery (MW)
2	505 (2025) 2,804 (2030)	0 (2025) 895 (2030)	3,306 (2025) 12,973 (2030)	0 (2025) 1,219 (2030)	0 (2025) 0 (2030)	0 (2025) 0 (2030)	0 (2025) 0 (2030)
6	1,458 (2025) 6,832 (2030)	0 (2025) 895 (2030)	1,077 (2025) 5,798 (2030)	1,270 (2025) 5,370 (2030)	0 (2025) 0 (2030)	0 (2025) 0 (2030)	0 (2025) 0 (2030)

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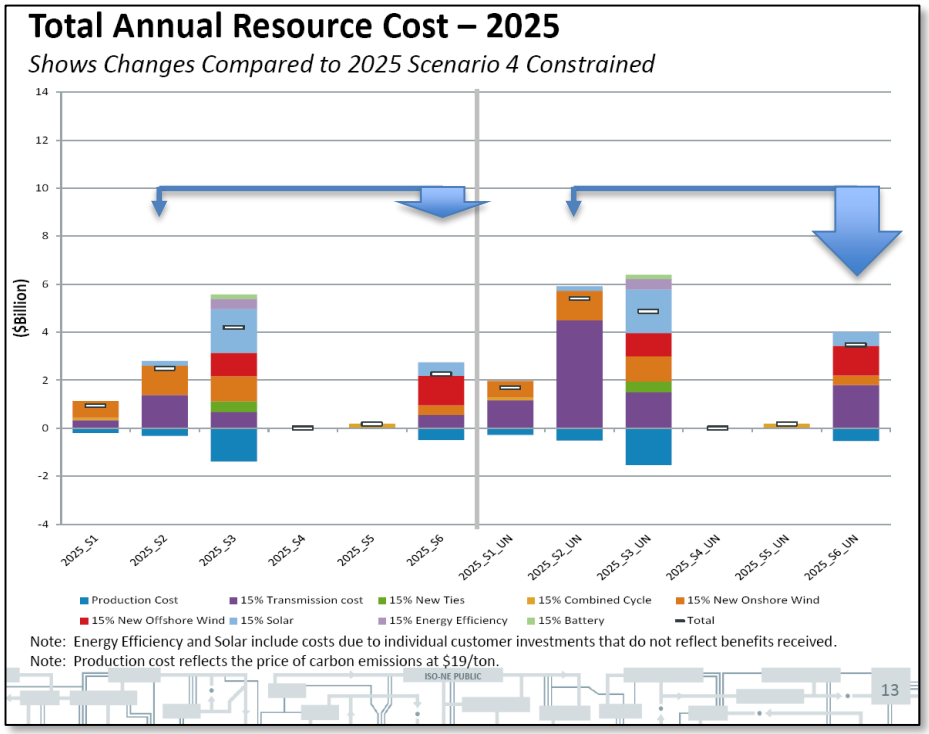
2025: S2_UN->S6_UN Δ = ~ $2B



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Results are meaningfully sensitive to changes in topology

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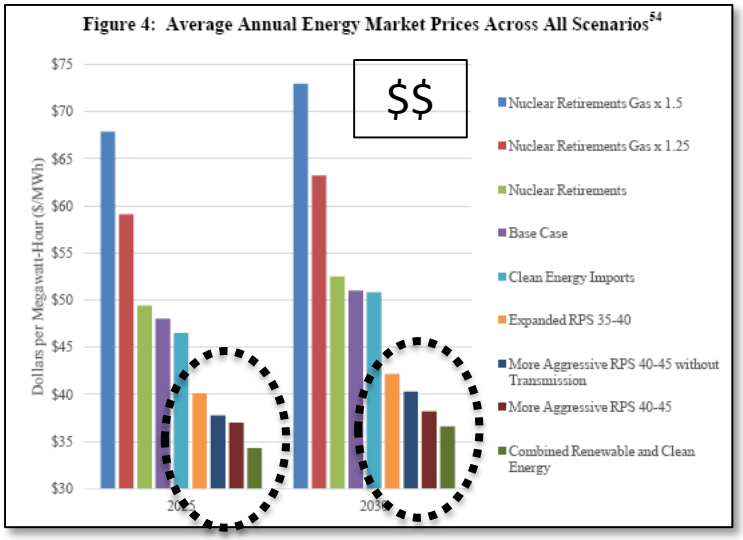
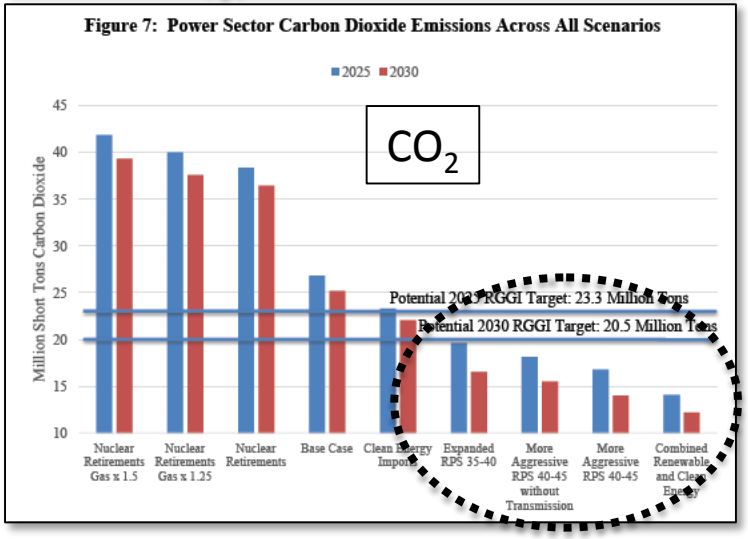
Value Proposition

Broaden range of compliant topologies; different cost impacts

Table F: Overview of Scenario Assumption Details

Scenario	2025	2030
1: Expanded RPS 35%-40% ("Expanded")	+ 2,750 MW On-Shore Wind (+2,400 MW HVDC) + 600 MW Solar PV +1,500 MW Off-Shore Wind	+3,575 MW On-Shore Wind (+2,400 MW HVDC) +1,000 MW Solar PV +2,000 MW Off-Shore Wind
2: More Aggressive RPS 40%-45% ("Aggressive")	+4,250 MW On-Shore Wind (+3,600 MW HVDC) +1,000 MW Solar PV +2,000 MW Off-Shore Wind	+5,500 MW On-Shore Wind (+3,600 MW HVDC) +1,250 MW Solar PV +2,500 MW Off-Shore Wind
3: Clean Energy Imports ("Imports")	+7,800 GWh Clean Energy (+1,000 MW HVDC) (90% Capacity Factor)	+7,800 GWh Clean Energy (+1,000 MW HVDC) (90% Capacity Factor)
4: Combined Renewable and Clean Energy ("Combined")	+4,250 MW On-Shore Wind (+3,600 MW HVDC) +1,000 MW Solar PV +2,000 MW Off-Shore Wind +7,800 GWh Clean Energy (+1,000 MW HVDC)	+5,500 MW On-Shore Wind (+3,600 MW HVDC) +1,250 MW Solar PV +2,500 MW Off-Shore Wind +7,800 GWh Clean Energy (+1,000 MW HVDC)
5: Nuclear Retirements ("No Nuclear")	Retire remaining nuclear resources by 2025; Nuclear resources replaced by gas-fired resources	Retire remaining nuclear resources by 2025; Nuclear resources replaced by gas-fired resources
6: Expanded RPS Without Transmission ("No Transmission")	+4,250 MW On-Shore Wind ~~(+3,600 MW HVDC)~~ +1,000 MW Solar PV +2,000 MW Off-Shore Wind	+5,500 MW On-Shore Wind ~~(+3,600 MW HVDC)~~ +1,250 MW Solar PV +2,500 MW Off-Shore Wind





NESCOE, *Renewable and Clean Energy Scenario Analysis and Mechanisms 2.0 Study, Phase I: Scenario Analysis* (Winter 2017)

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Value Proposition

- Little/no value in modeling non-compliant systems
  - No different than reliability . . .
- Lots of value in exploring various emissions-compliant topologies
  - Directly impacts costs, operability, TX . . .
- A wealth of information for ISO-NE to work with
  - 2016 Econ. Study, Scenario 3
  - NESCOE 2017 Scenario Analysis
  - Others (e.g., 2014 U.S. Pathways to Deep Decarbonization)

➢ **Direct impact on/contribution to IMAPP effort**

- Expand range of compliant mixes for market to deliver
- Address many issues raised in Apr. 7, 2017 NESCOE Memo