2050 Transmission Study: Offshore Wind Analysis

Transmission Planning

MARCH 21, 2025

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Section 1: Study Overview

The New England power system is experiencing an unprecedented shift in the ways electricity is produced and consumed. Five of the six New England states have committed to reducing their carbon dioxide emissions by at least 80% by 2050, prompting ongoing changes to the grid.[1] The expected shift toward mostly renewable, carbon-free power generation, coupled with increased electrification of heating and transportation, will radically transform supply and demand.

Among ISO New England's responsibilities as a Federal Energy Regulatory Commission (FERC)-authorized Regional Transmission Organization is ensuring the regional power system continues to operate reliably as system conditions change. Transmission planning seeks to make sure system reliability is maintained, which enhances the region's ability to support a robust, competitive wholesale power market by moving power from various internal and external sources to the region's load centers.

Peak demand for electricity is expected to increase significantly by 2050, and the resources that must meet this demand will likely be located in different geographical areas than the natural gas-fueled plants that meet the bulk of today's demand. This shift will change the region's transmission needs. The *2050 Transmission Study: Offshore Wind Analysis* continues the ISO's pioneering look at how New England's transmission system may be affected by changes to the power grid by investigating how hypothetical injections of offshore wind farms might reliably interconnect to the region.

1.1 Study Background & Objectives

In October 2020, the New England States Committee on Electricity (NESCOE) released the *New England States' Vision for a Clean, Affordable, and Reliable 21st Century Regional Electric Grid*. This vision statement recommended that ISO New England work with stakeholders to conduct a comprehensive long-term regional transmission study, eventually titled the *2050 Transmission Study* (referred to here as the "initial study"). Published in February 2024, the initial study identified high-likelihood concerns, roadmaps, and estimated costs to help inform stakeholders of the amount and type of transmission infrastructure necessary to provide reliable, cost-effective energy to the region throughout the clean energy transition.

Following the study's publication for stakeholder review, the ISO received a variety of stakeholder questions and feedback on results. To respond to that feedback, the ISO conducted additional analysis in pursuit of two goals:

1) **Offshore Wind Relocation:** Explore connecting some offshore wind further south in the region to reduce the overloads observed on the North-South interface in the initial study.
2) **High-Level Offshore Wind Interconnection Screening:** Examine possible Points of Interconnection (POIs) to provide high-level information about their potential viability for connecting future offshore wind farms.

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[1] The five states with the emissions reduction goals described here are Connecticut, Maine, Massachusetts, Rhode Island, and Vermont.

These objectives are the basis of this report, and later sections detail related assumptions, inputs and results.

1.2 Overview of Key Findings

This section details the study's key findings. It is important to note that these findings are based solely on N-1 DC thermal steady-state analysis, which helps provide high-level information about system constraints. Neither the initial study nor this subsequent offshore wind analysis includes the more detailed analyses of an interconnection study.

Connecting some of the initial study's hypothetical future offshore wind further south could reduce necessary upgrades.

- Relocating some offshore wind POIs from Maine to the Boston area may lead to significant transmission cost savings.
- The system will still need upgrades on the North-South and Maine-New Hampshire transmission interfaces.

Around 9,600 megawatts (MW) of additional offshore wind may be able to interconnect in New England without new transmission infrastructure.[2,3] Assuming they successfully complete a full interconnection study involving more detailed analysis:

- **Up to 38%** of the existing major coastal substations in New England studied may be electrically suitable for a 1,200 MW offshore wind interconnection **without constructing any new transmission infrastructure AND without upgrading any existing transmission infrastructure** to address thermal concerns.[4]
- **Up to 86%** of the existing major coastal substations in New England studied may be electrically suitable for a 1,200 MW offshore wind interconnection **without constructing any new transmission infrastructure; however, some of these require upgrades to existing infrastructure** to address thermal concerns.
- **A much smaller subset of** these substations may be able to accommodate a 2,000 MW wind farm **without any new transmission infrastructure**.

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[2] This analysis examined generic MW injections at POIs; while the study refers to these injections as offshore wind, the results of this analysis also apply to other types of resources that could connect to these POIs.

[3] The 9,600 MW value is limited by the amount of load seen in New England during light-load conditions and is not due to a thermal constraint on the transmission system. Loads lower than the 12,500 MW light-load studied would be expected to see more wind curtailment, although the extent of this is not quantified in the study.

[4] The more detailed analyses of an interconnection study would likely reduce the percentages mentioned here. References to "transmission infrastructure" throughout this document do not include the interconnection facilities required to connect projects to the existing power system.

- Depending on location, **approximately eight** 1,200 MW wind farms (9,600 MW total) may be able to operate simultaneously at full output without new transmission infrastructure or significant curtailment.[5]

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[5] These hypothetical wind farms would operate in addition to the existing and planned regional offshore wind farms as of August 2024 (Block Island, Vineyard Wind, and Revolution Wind).

Section 2: Offshore Wind Relocation

This section describes the inputs, assumptions, and detailed findings related to the possibility of interconnecting some offshore wind further south than was assumed in the initial study.

2.1 Study Inputs and Revised Assumptions

The initial study developed 13 “snapshots” based on a combination of winter and summer load forecasts and potential resource mixes for the years 2035, 2040, and 2050. The first portion of the offshore wind analysis examines the same snapshots.

Snapshot inputs are taken from the All Options Pathway in the Massachusetts-commissioned *Energy Pathways to Deep Decarbonization* report, published in December 2020. A summary of assumptions related to these snapshots can be found in section 1.1 of the initial study’s final report.

Results from the initial study included discussion of *high-likelihood concerns* (based on criteria related to potential thermal overloads in the future), and *roadmaps* (high-level plans designed to show generally how high-likelihood concerns could be alleviated). A subset of these high-likelihood concerns and roadmaps are also included in the offshore wind analysis results.

2.1.1 Location of Offshore Wind

A large share of the region’s future offshore wind production will likely come from the Gulf of Maine lease area. At the time of the initial study, the boundaries of this lease area were not precisely defined—so the ISO estimated which coastal substations might be the best candidates for interconnecting future Gulf of Maine offshore wind from a preliminary lease definition. The boundaries of the lease area were finalized in March 2024, and were located further south than the original estimation. Much of the lease area is now as close to Boston as it is to Maine, and in some cases closer. The new boundaries made it possible to analyze more southerly interconnection points.

One high-likelihood concern focused on the Maine-New Hampshire and North-South interfaces, which are the transmission interfaces that connect Maine and New Hampshire to northeastern Massachusetts. Given the thermal overloads observed on these interfaces in the initial study, and the actual location of most offshore wind lease areas further south than originally supposed, the analysis explores how interconnecting some Gulf of Maine offshore wind facilities to Massachusetts rather than to Maine could reduce thermal overloads.[6] Locating interconnections for this generation (not necessarily the wind farms themselves) closer to load centers would decrease the power flow on the overloaded lines identified in the initial study.

The offshore wind analysis moves certain points of interconnection from the initial study as follows:

- Relocates one original Gulf of Maine wind farm POI from Yarmouth, ME to Brighton, MA

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[6] This portion of the study included both N-1 and N-1-1 DC thermal steady-state analysis, which helps provide high-level information about system constraints, but not stability and voltage concerns, which sometimes limit this area of the system in the present-day.

- Relocates one original Gulf of Maine wind farm POI from Orrington, ME to Ward Hill, MA
- Relocates one original MA/RI Wind Energy Area wind farm POI from Brighton, MA to Millstone, CT

These relocations, illustrated in Figure 1, result in very little change to the mileage of offshore cables. All other hypothetical wind farms are interconnected at the same POIs as the initial study.

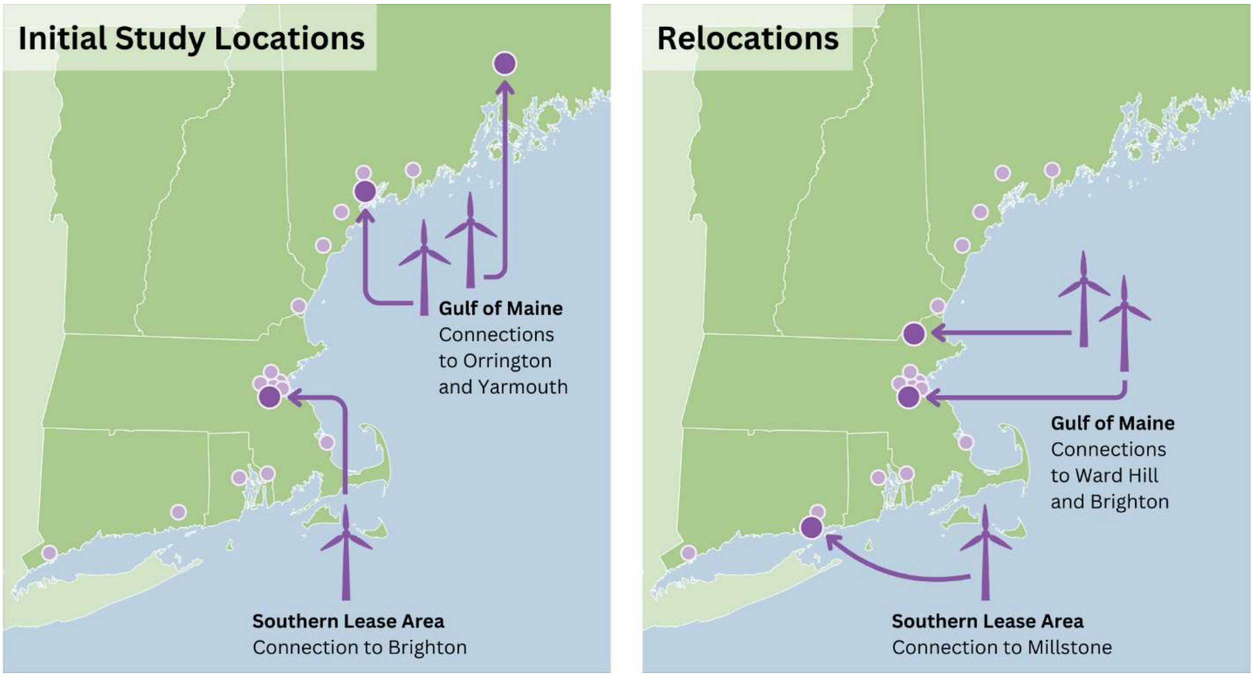

Figure 1: Offshore Wind POIs from Initial Study & Relocations

2.2 Detailed Findings

As with the initial 2050 Transmission Study, both N-1 and N-1-1 analysis were performed to examine thermal performance of the transmission system. Results detailed in Table 1 show a reduction in the flow of electrical power across the Maine-NH and North-South interfaces after the described offshore wind POI relocation. While the relocations have little impact on flows across these interfaces in summer, they have a significant impact on flows across the same interfaces in winter, since the study's inputs include the assumption that wind production is much higher in winter peak periods than in summer peak periods.

Table 1: Reduction in Electricity Flow Over ME-NH and North-South Interfaces by Season

	Summer Flows for Initial Study Locations (MW)[7]	Summer Flows Post-Relocation (MW)	Reduction in Flow of Electrical Power		Winter Flows for Initial Study Locations (MW)	Winter Flows Post-Relocation (MW)	Reduction in Flow of Electrical Power
Maine-NH	1,848	1,750	**-5%**	**Maine-NH**	6,090	3,988	**-35%**
North-South	5,187	5,098	**-2%**	**North-South**	5,714	3,778	**-34%**

2.2.1 Roadmap Revisions

If these reductions eventuate, thermal overloads will decrease, and some of the transmission upgrades and costs detailed in the initial study roadmaps may not be necessary. Four roadmaps were initially developed for the North-South/Boston interfaces:

- an **AC roadmap**, which focuses on an AC 345 kV framework
- a **Minimization of New Lines Roadmap**, which focuses on avoiding the construction of new lines where possible, and instead prioritizes rebuilding existing lines with higher-capacity conductors
- an **HVDC Roadmap**, which focuses on a point-to-point HVDC framework
- an **Offshore Grid Roadmap**, which makes use of offshore networks of up to three connected offshore wind plants per network.

These offshore wind relocation results provide a new, revised version of these roadmaps, reflecting a subset of upgrades from the initial study. The initial roadmaps were designed to serve both summer and winter peak loads for two different possible scenarios: one in which the 2050 winter peak reaches 57 GW, and one in which the 2050 winter peak load reaches 51 GW, comparing how transmission costs might vary if electrification of heating and transportation is less than expected, and/or efforts to reduce system load (such as demand response programs and other methods) help reduce peaks. The revised roadmaps analyze the same load conditions.[8]

Table 2 describes, at a high level, how the new roadmaps differ from the initial roadmaps. More detail is provided in an appendix to this report.

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[7] MW totals are the maximum observed for each season across the 13 snapshots.

[8] The two different sets of roadmaps (both initial and revised) also meet the lower, but differently distributed, summer peak loads.

Table 2: Roadmap Revisions for 51 GW and 57 GW 2050 Scenarios

	51 GW Scenario Changes	57 GW Scenario Changes[9]
AC Roadmap	**8% fewer** miles of overhead 115 kV line rebuilds and **70% fewer** miles of overhead 345 kV line rebuilds.	**5% fewer** miles of additional overhead 115 kV line rebuilds and **23% fewer** miles of additional 345 kV line rebuilds. No second Timber Swamp – Ward Hill line.
Minimization of New Lines Roadmap	**7% fewer** miles of overhead 115 kV line rebuilds and **51% fewer** miles of overhead 345 kV line rebuilds.	57 GW peak snapshot **can now be served**; it could not in the initial study. Rebuild an additional **565 miles** of overhead 115 kV lines and an additional **342 miles** of overhead 345 kV lines compared to the 51 GW path.
HVDC Roadmap	**2% fewer** miles of overhead 115 kV line rebuilds and **45% fewer** miles of overhead 345 kV line rebuilds.	**4% fewer** miles of additional overhead 115 kV line rebuilds and **29% fewer** miles of additional 345 kV line rebuilds. No new HVDC line from South Gorham to Tewksbury.
Offshore Grid Roadmap	No Timber Swamp – Ward Hill line. No reconfiguration of the 375 and 3038 345 kV lines. **3% fewer** miles of overhead 115 kV line rebuilds and **9% fewer** miles of overhead 345 kV line rebuilds.	No second Timber Swamp – Ward Hill line. **1% fewer** miles of additional overhead 115 kV line rebuilds and **1% fewer** miles of additional 345 kV line rebuilds.

In sum, the relocation of offshore wind POIs in this analysis reduces the necessary upgrades in **every North-South roadmap** from the initial study. Given these reductions, assumed costs also decrease. The associated reductions in estimated cost over the next several decades are shown in Figure 2. Detailed final costs can be found in an appendix to this report.

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[9] Note that 57 GW snapshot roadmaps are based on additional upgrades over and beyond those detailed in the 51 GW snapshot roadmaps.

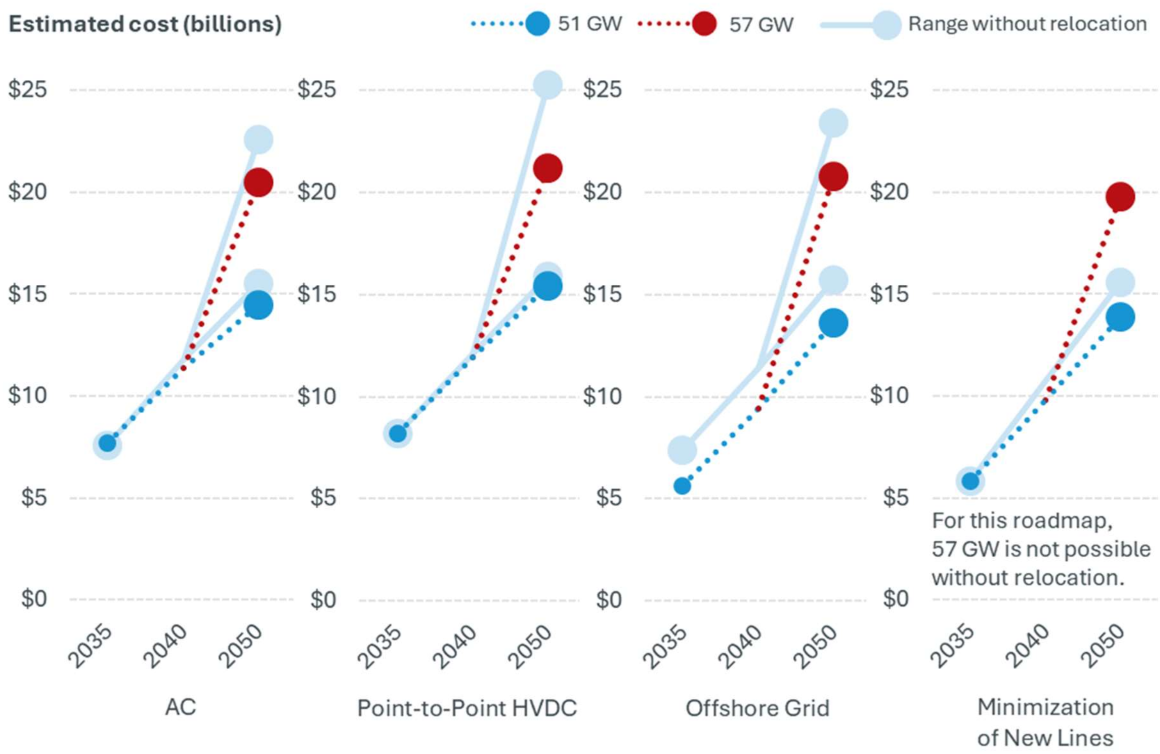

Figure 2: Reduction in Estimated Costs from Revised Roadmaps

Though POI relocations do reduce costs, upgrades are still necessary on the North-South interfaces to accommodate the combination of load growth from electrification and significant increase in generation build out in northern New England. However, these results indicate that the precise location of these northern New England generators, particularly large generators like offshore wind, can affect the scope of necessary upgrades and associated costs—and that optimizing the locations of these POIs can provide meaningful regional benefits.

Section 3: High-Level Offshore Wind Interconnection Screening

The initial study found that the specific location of generators affects the scale of transmission upgrades required for reliability, particularly in population-dense regions like Boston. Locating generators closer to large population hubs helps reduce strain on the transmission system, since the cumulative distance power must flow to reach consumers is greatly reduced.

Given this takeaway, multiple stakeholders, including NESCOE, requested further analysis on the viability of coastal substations/POIs for accommodating the expected growth in offshore wind generation over the next several decades.[10] The following sections explore this request.

This screening provides high-level information about potential locations to interconnect future offshore wind farms, and to approximate how much total offshore wind the existing system may be able to accommodate without upgrades to transmission lines or the construction of new transmission lines. It is important to note that the main goal of this screening is to compile a list of POIs that definitively **cannot** accommodate the interconnection of a large wind farm without major upgrades, providing essentially a "best case scenario" for each POI, which may help inform future developers when making decisions on submitting projects to ISO New England's Interconnection Request Queue.[11]

While this analysis refers to hypothetical MW injections as offshore wind, the results also hold true for any other resource type. The injections are generic MWs, and could just as easily be batteries or any other resource type.

This analysis should not be construed as prohibiting an interconnection request at one of the locations that requires significant upgrades, or at any other point on the New England transmission system. The generator interconnection procedures in Schedules 22 and 23 of the ISO-NE Open Access Transmission Tariff, and applicable Planning Procedures, govern the interconnection process, and this analysis does not modify them in any way.

3.1 Revised Assumptions and Study Inputs

The initial study was largely a load-serving study aimed at determining whether the large peak loads expected from 2035 onwards could be served reliably. As such, it modeled offshore wind at less-than-full output, because peak load levels often occur at times of lower wind output. However, since the goal of this screening is to explore whether certain POIs can accommodate offshore wind farms without significant curtailment or transmission upgrades, offshore wind farms in this additional analysis are modeled at their maximum possible production levels. This analysis also expands the geographical scope beyond that of the initial study, exploring new possible locations near the region's lease areas for offshore wind interconnections.

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[10] Although analysis explores constraints for offshore wind, inputs for analysis are generic MW injections, which could also represent other resources such as HVDC imports, solar, batteries, etc.

[11] The interconnection process determines the actual upgrades required to interconnection a project.

Instead of the 13 snapshots for 2035/2040/2050 used in the initial study, this analysis explores six 2033 snapshots: three loads under two different transfer scenarios. The load levels are shown in Table 3. The West-East transfer scenario models system conditions when generation minus load is higher in the West than the East, while the East-West transfer scenario models system conditions when generation minus load is higher in the East than the West. The most-limiting snapshot for a particular POI sets the MW limit for the amount of generation that may be able to connect for that POI in this study.

Load and generation forecast data for 2033 is less uncertain than projections for 2050. Examining a closer point in time also provides a useful intermediate point to help the region envision how to progress from the system of today to a system more similar to that of the initial study's 2050 endpoint.

Table 3: POI Screening Snapshots for Additional Analysis

Snapshot Name[12]	Net Load
2033/2034 Winter Evening Peak	31,296 MW
2033 Summer Evening Peak	29,710 MW
2033 Light Load	12,500 MW

The analysis examines 50 regional POIs located within 20 miles of the coastline near the two major regional offshore wind areas (Gulf of Maine Wind Energy Area and Massachusetts and Rhode Island Wind Energy Area), illustrated in Figure 3. Details on each of these POIs including latitude, longitude and distance from offshore wind areas can be found in an appendix to this report.

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[12] Each peak snapshot is modeled twice; once with an East – West stress, and once with a West – East stress

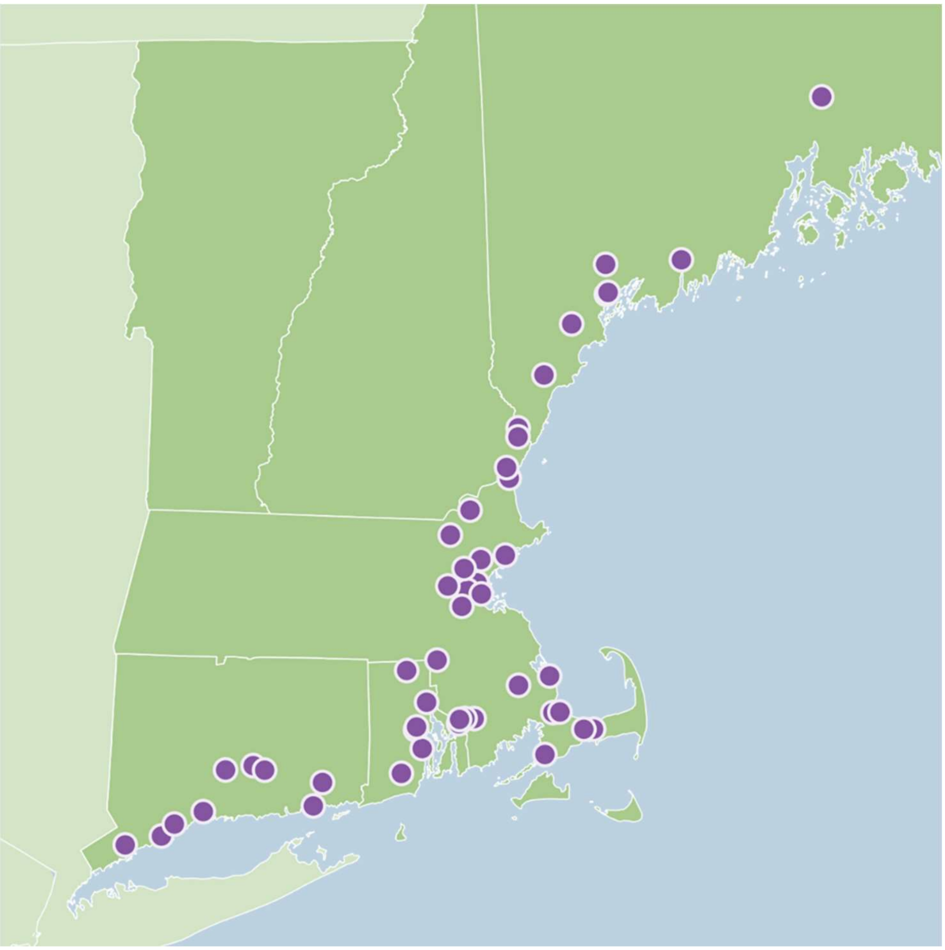

Figure 3: Points of Interconnection Analyzed in Offshore Wind Screening

This screening includes only N-1 DC thermal steady-state analysis, which helps provide high-level information about system constraints that might limit the viability of a POI for new generation. However, a thorough interconnection study like those conducted by the ISO for the Interconnection Request Queue would also include other analyses, such as AC thermal, voltage, stability, short circuit, extreme contingency and electromagnetic transient analysis, which are beyond the scope of this study. Non-electrical factors like siting, land availability and physical access to POIs are also beyond the scope of this study.

3.2 Single POI Analysis

The first high-level screening is a single POI analysis, which examines each POI in isolation to explore whether an offshore wind farm could connect to that station without upgrades or new transmission lines, and to identify any system constraints related to this single POI that would cause significant curtailment of offshore wind output. The steps for analysis are:

1. Identify existing 115 kV and 345 kV substations within approximately 20 miles of the New England coastline and consider them as potential POIs.

2. Assemble relevant data on these POIs from System Impact Studies (SISs) and other sources.[13]
3. Adjust the six snapshots to stress any relevant interfaces for each POI based on its location.
4. Add an injection of 1,200 MW at the relevant POI, designed to represent a single offshore wind generator. Note that no modeling parameters used for this were specific to offshore wind, so this could represent a 1,200 MW injection from any resource type.
5. Increase the size of the wind generator progressively while simultaneously reducing non-nuclear, non-offshore wind generation to maintain balance between generation and load on the system until a thermal constraint appears.
6. Record total MW reached for each POI in the most limiting snapshot.
    - If this total is less than 2,400 MW (representing two 1,200 MW offshore wind farms), progressively apply possible upgrades (line rebuilds with higher-capacity conductors, transformer additions, or any of the roadmap solutions listed in the initial study) until a 1,200 MW wind farm can be interconnected, then again until a 2,000 MW wind farm can be interconnected, and then again until 2,400 MW (two 1,200 MW wind farms) can be interconnected. If at any point these upgrades are not enough to enable the amounts of wind mentioned above, this would indicate that new transmission construction would be required; the analysis for the POI was stopped if this point was reached. If the POI could handle 2,400 MW, the analysis did not examine any amounts beyond this level.

This multi-step approach presents a **best-case scenario** for each POI and helps estimate costs related to improving the viability of that POI. The results are considered best-case since the viability of each POI could only *decrease* when subjected to a full interconnection study with more detailed analysis, along with other non-electrical factors such as permitting and siting.

3.3 Single POI Detailed Findings

Single POI results show that *when viewed in isolation*, 31 of the 50 POIs examined are currently unsuitable for offshore wind connection without transmission upgrades. The remaining 19 *could* be viable candidates for offshore wind interconnection without transmission upgrades. The number of feasible offshore wind POIs, examined individually and not simultaneously, and the MW level they could potentially support without upgrades, are shown in Table 4.[14]

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[13] System Impact Studies are part of the ISO's Interconnection Request study process and include technical specifications for New England's substations.

[14] These results are taken from the study's N-1 DC thermal analysis, which helps provide high-level information about system constraints, but does not include the more detailed analysis of an interconnection study.

Table 4: Summary of Single POI Results

	POIs that can support 1,200 MW without upgrades	POIs that can support 2,000 MW without upgrades[15]	POIs that can support two 1,200 MW wind farms without upgrades[16]
Maine	4	1	1
New Hampshire	0	0	0
Boston	4	0	0
Southeast Massachusetts	6	1	0
Rhode Island	0	0	0
Connecticut	5	1	0
Total	**19**	**3**	**1**

Figure 4 shows the number of POIs for several cost categories of necessary upgrades between zero and $1 billion for injections of 1,200 MW, 2,000 MW and 2,400 MW.

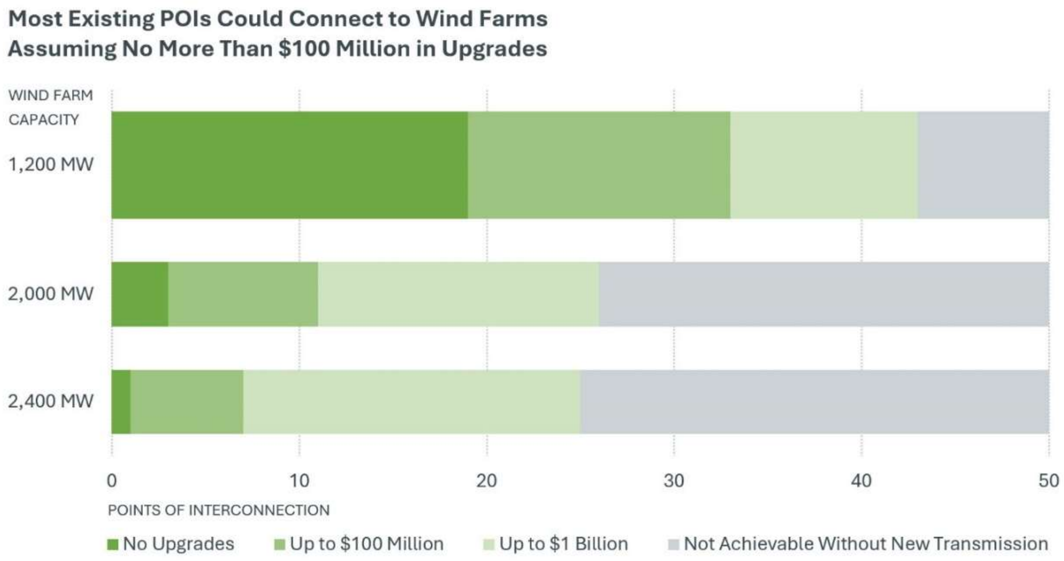

Figure 4: Breakdown of Costs by MW Category for Single POI Results

3.4 Multiple POI Analysis

The second high-level screening is a multiple POI analysis, which is designed to examine how numerous injections of offshore wind, all operating at full output simultaneously and interconnected at different coastal POIs, might affect the wider regional transmission system.

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[15] The POIs that can support 2,000 MW without upgrades is a subset of the POIs that can support 1,200 MW without upgrades.

[16] The POIs that can support two 1,200 MW wind farms without upgrades is a subset of the POIs that can support 1,200 MW without upgrades, and the POIs that can support 2,000 MW without upgrades.

Results show what system constraints related to these POIs would cause significant curtailment of offshore wind output.

Since the multiple POI analysis models many potential offshore wind farms operating simultaneously, it may provide a better estimate of the *total* amount of future offshore wind that can be interconnected without constructing new transmission than the single POI analysis.

It is important to note that while this analysis captures the "big picture" of regional offshore wind possibilities, other combinations of POI MW injections not examined in this analysis may also be possible. Interconnection studies identify the actual upgrades required to interconnect projects and take into account resources in the interconnection queue along with POIs specified in related Interconnection Requests. Strong coordination within the region is essential to ensure that offshore wind is built in an organized and efficient manner.

The steps for multiple POI analysis are as follows:

- Identify POIs from the single POI analysis that could accommodate 1,200 MW or more of injections for $100 million or less in upgrades.
- Test different combinations of these POIs over the six snapshots by adding discrete injections of 1,200 MW per wind farm, and up to 2,400 MW per POI.
- Increase the MW progressively in 1,200 MW increments while simultaneously reducing non-nuclear, non-offshore wind generation to maintain balance between generation and load until a thermal constraint appears.
- Add potential upgrades (line rebuilds with higher-capacity conductors, transformer additions, or any of the roadmap solutions listed in the initial study) to interconnect offshore wind farms of 1,200 MW each until the construction of a new transmission element not listed in the initial 2050 Transmission study becomes necessary to resolve thermal overloads in at least one of the snapshots studied.

Multiple POI analysis first examines combinations of POIs in smaller subregions and then combines those subregions to provide a progressively higher-level view of how regional POIs interrelate. A high-level representation of the steps of analyses, from small subregions and combined larger regions, are shown in Figure 5.

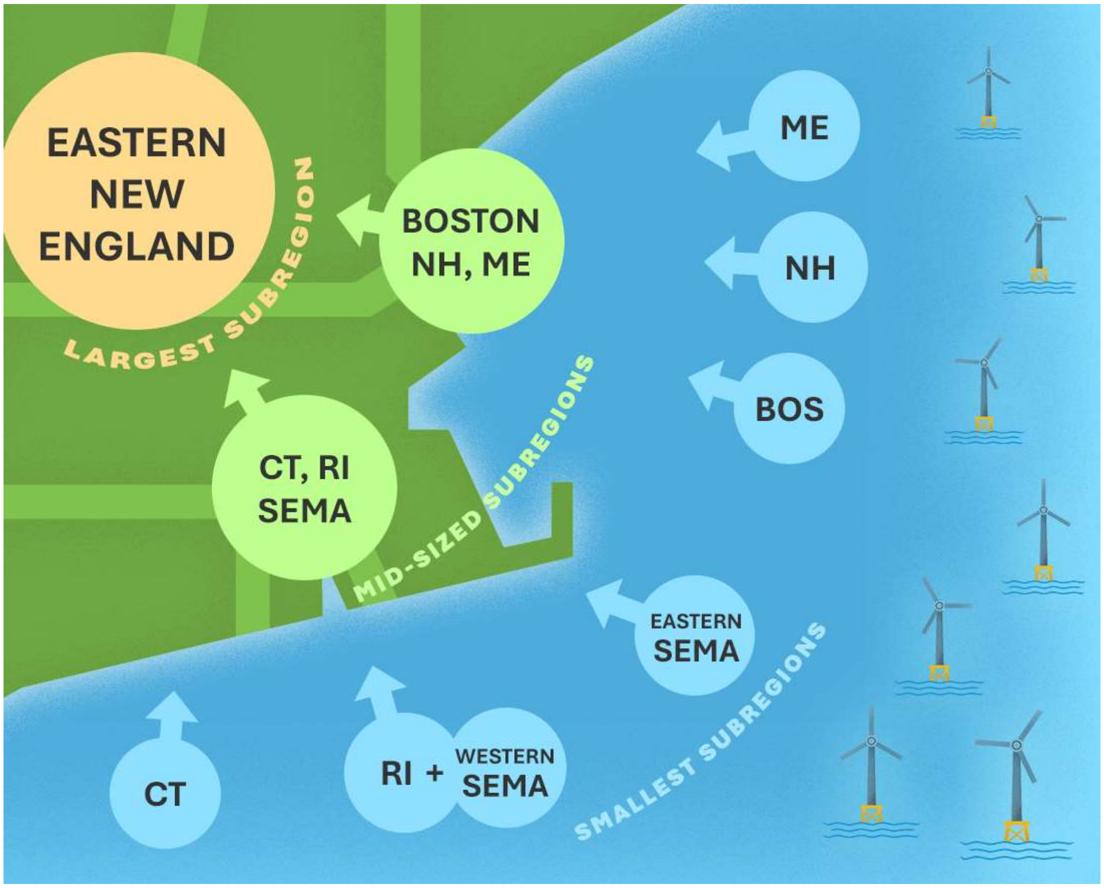

Figure 5: Progression of Steps in Multiple POI Analysis[17]

3.5 Multiple POI Detailed Findings

Multiple POI results, illustrated in Table 5, show how much offshore wind may be able to operate simultaneously across various sub-regions of New England. Combining several subregions to look at all eastern New England shows that up to **eight 1,200 MW** wind farms (9,600 MW total) could potentially interconnect without transmission upgrades and without significant curtailment.[18] High level results are shown in Table 5.[19]

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[17] The largest subregion comprises all Eastern New England (i.e., all smaller subregions combined, excluding Connecticut). Because minimum load conditions for the most limiting snapshot restrict additional offshore wind in the *entire* region to an upper limit of 9,600 MW, and 9,600 MW of wind is possible in Eastern New England without the addition of Connecticut, the results for Eastern New England and all New England are the same.

[18] See previous footnote.

[19] These results are taken from the study's N-1 DC thermal analysis, which helps provide high-level information about system constraints, but does not include the more detailed analysis of an interconnection study.

Table 5: Summary of Multiple POI Results

Smallest Subregions	Number of 1,200 MW wind farms possible without any upgrades	Total injection of offshore wind possible without any upgrades
Connecticut	2	2,400 MW
Rhode Island + Western SEMA	1	1,200 MW
Eastern SEMA	2	2,400 MW
Boston	3	3,600 MW
Maine + New Hampshire	3	3,600 MW
Mid-sized subregions		
Connecticut + Rhode Island + Western SEMA + Eastern SEMA	4	4,800 MW
Boston + Maine + New Hampshire	5	6,000 MW
Largest subregion		
Eastern New England[20]	8	9,600 MW

The most limiting scenario for the largest subregion studied is the 2033 12,500 MW light load condition, since this 9,600 MW of new offshore wind, combined with the roughly 1,500 MW of existing offshore wind and nuclear, would push New England into challenging operational conditions. More offshore wind above 9,600 MW may be possible but would require more curtailment during time periods when wind output is high, and demand is low. In this situation, curtailment is not due to specific transmission constraints within New England, but rather due to low load levels within New England and uncertainty regarding the potential to export wind into neighboring areas. Even in today's system, 12,500 MW is considered an average (rather than extreme) light load situation. Given expected growth in behind-the-meter photovoltaics, which reduce net load, system loads below 12,500 MW may be much more commonplace by 2033 than they are today. Essentially, more and more curtailment of this hypothetical offshore wind may become necessary in future years.

Exports to neighboring areas could reduce curtailment, but there is no guarantee that neighboring areas would be able to accept surplus offshore wind generation from New England, especially if they have large amounts of renewable generation and experience similar weather conditions. As a result, exports were not considered in this analysis.

If generator owners are willing to accept significant curtailment, or pair wind farms with substantial energy storage, more than 9,600 MW may be able to reliably connect without major upgrades. For

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[20] Rhode Island + Western SEMA + Eastern SEMA + Boston + Maine + New Hampshire

curtailment related to specific transmission constraints, the use of dynamic line ratings (DLRs) may also help decrease curtailment of offshore wind. Since many hours of the year with high wind output will likely coincide with less extreme temperatures than those in a peak load scenario, higher line ratings may allow for better utilization of wind output. However, significant additional analysis is required to quantify the effects of energy storage and dynamic line ratings on potential offshore wind curtailment.

Section 4: Conclusion

The 2050 Transmission Study is an unprecedented look at the future of New England's transmission system. The additional analysis performed to address stakeholder feedback detailed in this report builds on that innovative work by delving deeper into offshore wind, which is expected to play a crucial role in New England's clean energy transition.

Though full interconnection studies are required, high-level results suggest that significant amounts of offshore wind may be able to connect to the region without upgrades. However, achieving these totals will depend on careful planning and coordination between states and stakeholders. Significant cost savings can be realized if plans for offshore wind in New England take a holistic, regional view, rather than an incremental, "wind farm-by-wind farm" approach. Studies like this one help the region form a more comprehensive picture of what may be possible as the clean energy transition accelerates.