April 1, 2019

Mr. Peter Bernard, Chair
ISO New England Inc. Planning Advisory Committee
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Holyoke, MA 01040
pbernard@iso-ne.com

Copy to: PACMatters@iso-ne.com

VIA Electronic Mail

RE: 2019 ISO New England Economic Study Request for Offshore Wind Impacts

Dear Mr. Bernard,

This letter requests that ISO New England Inc. ("ISO-NE") initiate an Economic Study in Accordance with Section 4.1(b) of Attachment K to Part II of the ISO-NE Tariff,[1] and the ISO's February 19, 2019 presentation and notice calling for 2019 Economic Study requests.[2]

As described in more detail below, Anbaric Development Partners, LLC ("Anbaric") is requesting that ISO-NE perform an Economic Study that reviews the impacts on (1) energy market prices, (2) air emissions, and (3) regional fuel security of three offshore wind power scenarios for a 2030 target year:

- 8,000 MW
- 10,000 MW
- 12,000 MW

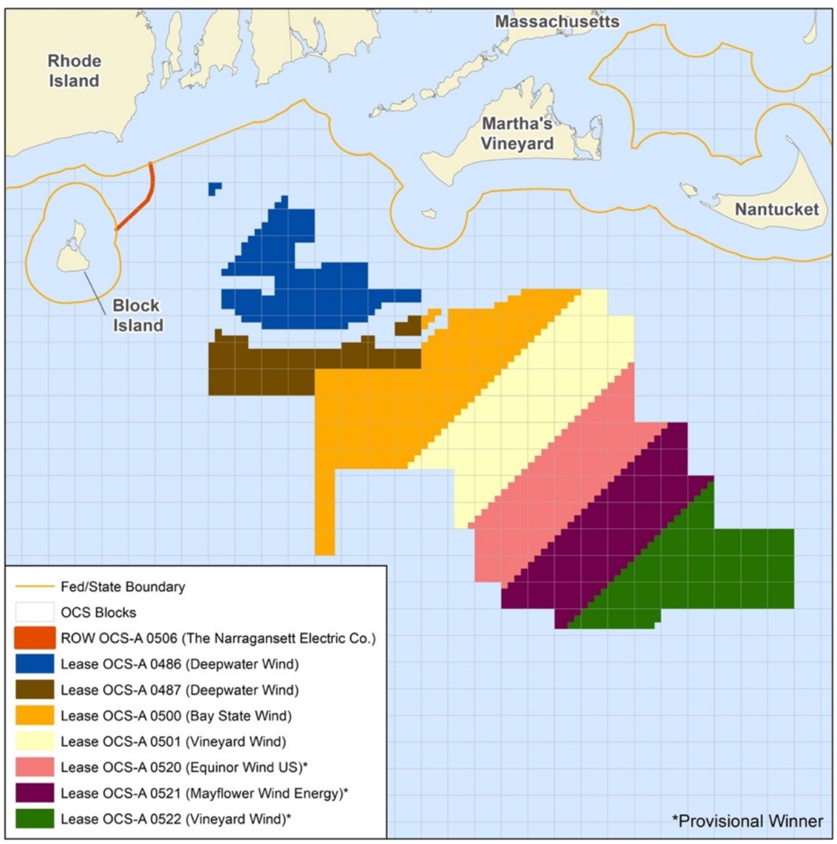
I. Background and Context

ISO-NE has previously conducted studies related to offshore wind impacts in the six-state New England region. Of particular note, on April 1, 2015, the Massachusetts Clean Energy Center ("MassCEC") requested an Economic Study looking at the impacts of 1,000 to 2,000 MW

[1] ISO New England Inc. Transmission, Markets, and Services ("Tariff"). Capitalized terms not otherwise defined have the meaning ascribed to them in the ISO-NE Tariff.
[2] https://www.iso-ne.com/static-assets/documents/2019/02/a4_2019_economic_study_request_process_rev1.pptx

of offshore wind interconnected by 2024.[3] More recently, in 2018 MassCEC requested an evaluation of the impact that 1,600 MW of offshore wind would have had on prices and fuel use during the 16-day 2017-2018 winter cold snap.

Since the 2015 MassCEC request, there have been significant changes in the power system topology and state policy targets regarding offshore wind. In 2016, Massachusetts legislated an initial offshore wind power target of 1,600 MWs. In 2016, the first offshore wind in the United States began operation off Block Island, RI. In 2018, Massachusetts procured first 800 MWs of offshore wind from the Bureau of Ocean Management ("BOEM")[4] lease areas in federal waters. Rhode Island followed with a procurement of 400 MW of offshore wind, and CT selected its first 300MWs in two procurements, both in 2018. In December of 2018, BOEM ran its second offshore wind area auction off the coast of New England. Four new areas were leased for a record $405 million.



3 A copy of the 2015 MassCEC Economic Study request is posted on the ISO-NE website at: https://www.iso-ne.com/static-assets/documents/2015/04/offshore_wind_deployment_eco_study_request.pdf

4 BOEM is located within the United States Department of the Interior. More information regarding the BOEM New England lease areas can be found at: https://www.boem.gov/Massachusetts/

Over 2018 to the present, state policy targets have been expanding. In August of 2018, Massachusetts passed legislation directing the Department of Energy Resources to explore the procurements of 1,600 MW of additional offshore wind energy resources, for a total of 3,200 MW.[5] Several offshore wind related bills have been introduced in the Commonwealth that increase targeted procurement amounts, with the largest calling for 6,000 additional MWs of offshore wind,[6] which with the existing 3,200 MW would bring Massachusetts into line with the 9,000 MW of offshore wind now being targeted by New York State.[7] The state of Connecticut similarly has legislation pending that would procure between 1,000 to 2,000 MW of additional offshore wind. Taken together, current targets in New England amount to 3,900 MW, with up to a combined total of 11,900 MW a possibility.

While those numbers may seem large, approximately 12,000 MW of offshore wind would roughly equate to 6,000 MW of average energy output – certainly a material change, but less than a quarter of the region's power needs. While more wind procurements may be necessary and likely to help the states meet the region's renewable energy goals (along with solar PV, energy efficiency, and the use of batteries), 12,000 MW of nameplate offshore wind bounds the upper end of this requested economic study.

Given these significant changes, Anbaric is requesting this new Economic Study so that developers, consumer interest groups and advocates, policy makers and regulators all have access to updated data to reach informed decisions.

Further, along with significant forward movement in the area of offshore wind energy targets, fuel security concerns have arisen in New England and have steadily become more acute over the past 15 years since first being highlighted in 2004.[8] Facing the retirement of nuclear generation – the region has recently lost the Vermont Yankee nuclear station in Vermont, and Pilgrim in Massachusetts is entering its last weeks – and a significant reliance on

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[5] Massachusetts bill H.4857, enacted into law in August of 2018.

[6] HD2206 introduced by Representative David Rogers, as summarized by the Environmental League of Massachusetts, this bill: "requires the department of energy resources to consult with the appropriate state government agencies in Vermont, New Hampshire, Maine, Rhode Island, and Connecticut for the purpose of determining the feasibility of creating a multi-state offshore wind energy generation solicitation and procurement of up to 6,000 megawatts of aggregate nameplate capacity by December 31, 2035." https://www.environmentalleague.org/wp-content/uploads/2019/03/offshore-wind-fact-sheet.pdf

[7] New York Governor Cuomo set out the 9,000 MW in his state of the state address in January of 2019 along with other new renewable energy targets. In doing so, the Governor also called for the *development of a transmission system for offshore wind*, stating: "Transmission: Initiate a first of its kind effort to evaluate and facilitate the development of an offshore transmission grid that can benefit New York ratepayers by driving down offshore wind generation and integration costs."

[8] https://www.iso-ne.com/static-assets/documents/2017/09/iso-ne_management_response_cold_snap_report.pdf

a gas generation fleet that was overbuilt without the just-in-time fuel system to support it, ISO-NE completed a fuel security study in 2017, which was released in 2018.[9] The ISO-NE Fuel Security Assessment was closely followed by the announced retirement plans and retirement bids of Exelon's Mystic generating station in Everett, MA. In concert, Exelon announced that it had taken over ownership of the Everett LNG terminal and that it planned to keep that facility in service as long as necessary to fuel operation of the Mystic generation.[10]

As a result, ISO-NE entered into a cost-of-service ("COS")[11] agreement with Exelon to retain the Mystic generating station's units 8 and 9 – two, two-on-one combined cycle gas turbine generators that produce a combined 1,417 MW. The retirement of the oil-or-gas fueled Mystic 7 (575 MW) and oil-fueled Mystic Jet (9 MW) are moving forward.[12] For the first two years of the cost-of-service contract, the region will be responsible for the over $200M per year operating costs of the generation *and* the LNG terminal. After the first two years – a Tariff time limit on the duration of a fuel security-based COS agreement – if the Mystic station is still needed for reliability (and it has been already found by ISO-NE to be needed without transmission upgrades into the Boston Area), under the ISO-NE cost allocation rules, the NEMA zone will be left to pay the full costs of the COS agreement by itself.[13]

With that backdrop, the MassCEC's more recent 2018 study request began to explore what is a key aspect of this request: the impact of significant offshore wind on the much-discussed fuel security needs of the New England region. The MassCEC request asked ISO-NE to look at the impact the first Massachusetts offshore wind procurement of 1,600 MW would have had during the 16-day cold snap of Winter 2017-2018 assuming a 70% capacity factor based on data samples.[14] The results over that short time period with that modest amount of wind were

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[9] https://www.iso-ne.com/static-assets/documents/2018/01/20180117_operational_fuel-security_analysis.pdf ("ISO-NE Fuel Security Assessment")

[10] http://www.exeloncorp.com/newsroom/exelon-generation-completes-acquisition-of-everett-lng-facility

[11] Cost-of-service agreements for generators are often also referred to as "reliability must run" or "RMR" agreements.

[12] To prevent "toggling" between the higher-of out-of-market revenue contracts and market prices, the remaining Mystic Units 8 and 9 are *required* to retire under the terms of the ISO-NE Tariff once all reliability issues have been addressed.

[13] ISO-NE is currently performing an updated Needs Assessment that is expected to be released in draft form in May 2019. That updated Needs Assessment will evaluate the power system with the full retirement of the Mystic generating station.

[14] As ISO-NE described in its December 2018 report at page 2 "MassCEC provided the ISO with offshore wind production estimates for three offshore project scenarios of varying nameplate sizes: 400 MW, 800 MW, and 1600 MW. These estimates are based on wind speeds that were recorded for three offshore sites (Sites A, B, and C) during the cold spell period spanning from December 24, 2017 through January 8, 2018 (16 days). …

significant. ISO-NE found that 1,600 MW of offshore wind would have avoided 219,200 tons of CO_2 emissions, avoided the use of 160,200 barrels of oil, and avoided $80 to $85 million in production costs.[15] As ISO-NE has noted, the economic impacts of cold snap events to the electric markets are significant, stating that: "Winter 2018 energy costs were $2.60 billion; **an 89% (or $1.23 billion) increase relative to Winter 2017 costs**. Higher energy costs were driven by a historic 15-day Cold Snap period from December 26, 2017 through January 9, 2018, when frigid temperatures led to soaring natural gas prices and elevated LMPs."[16] More fundamentally, ISO-NE's actions in supporting contracts amounting to hundreds of millions of dollars to keep needed generation in-service until needed transmission and/or alternative generation are in place indicate that the dependability and reliability of the electricity supply that is essential for the health and safety of the people of New England is at risk.

II. Study Assumptions and Requested Scenarios

This Economic Study request is based on the following assumptions.

a. Year of Study: 2030

b. System Loads: The latest 10-year planning horizon forecast numbers for 2029, modified by NREL or other relevant data projections for load the growth impact of electrification (e.g. to the transportation and heating sectors) by 2030.[17]

c. Inclusion of Photovoltaic and Energy Efficiency: The latest 10-year planning horizon forecast for 2029.

	400 MW Project (Site A)	800 MW Project (Sites A + B)	1600 MW Project (SitesA+B+C)
MassCEC Production Data (MWh)	106,865	215,569	435,257
Average Capacity Factor Over 16-day Cold Spell Period (% of nameplate capacity)	70%	70%	71%

Figure 1
Estimated Offshore Wind Production for MassCEC 1600 MW Project Scenario Based on Wind Speeds Recorded from December 24, 2017 through January 8, 2018 (MW)"

[15] https://www.iso-ne.com/static-assets/documents/2018/12/2018_iso-ne_offshore_wind_assessment_mass_cec_production_estimates_12_17_2018_public.pdf

[16] https://www.iso-ne.com/static-assets/documents/2018/05/2018-winter-quarterly-markets-report.pdf at page 5. Emphasis added.

[17] https://www.nrel.gov/analysis/electrification-futures.html

d. System Topology

i. Transmission System. The transmission system should include all Regional System Plan projects within the 10-year planning horizon as in-service as well as Asset Condition upgrades known at the time of the Economic Study.

ii. Units Available for Dispatch.
Base case: Current generator fleet with:
A. 1600 MW of wind into MA, and 700 MW interconnected into RI for the RI and CT procurements.
B. Mystic Generating Station retired
C. Millstone nuclear generating station retired
D. Remaining oil units in CT and ME retired

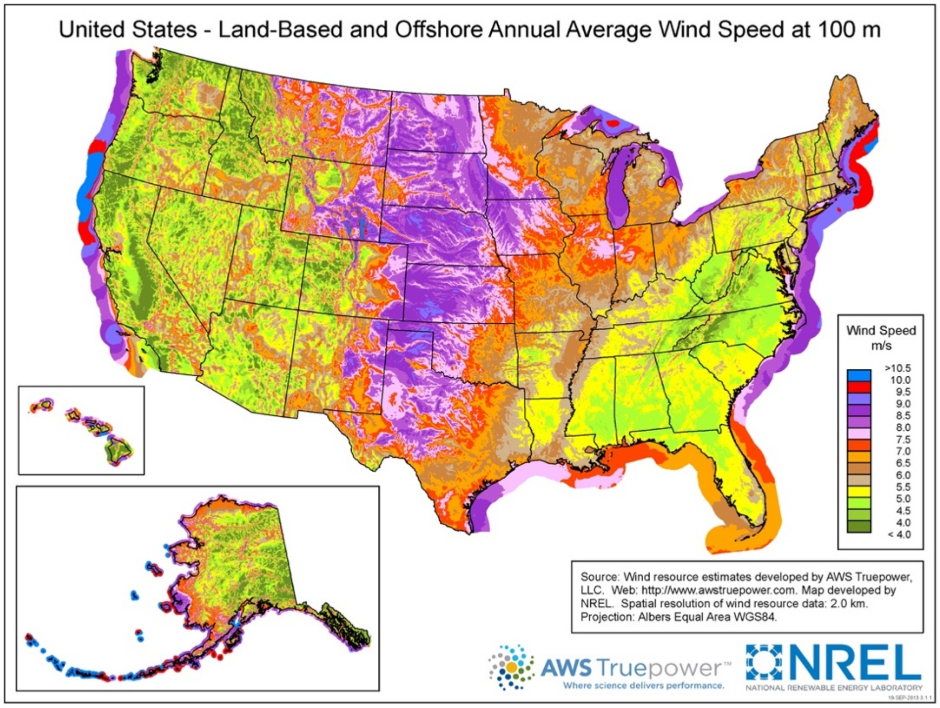
iii. Economic Study Offshore Wind Additions:
Same as base case with:
Three levels of total nameplate, offshore wind resources serving New England regional load (i.e., this does not include the current 9,000 MW target to serve New York electric loads):

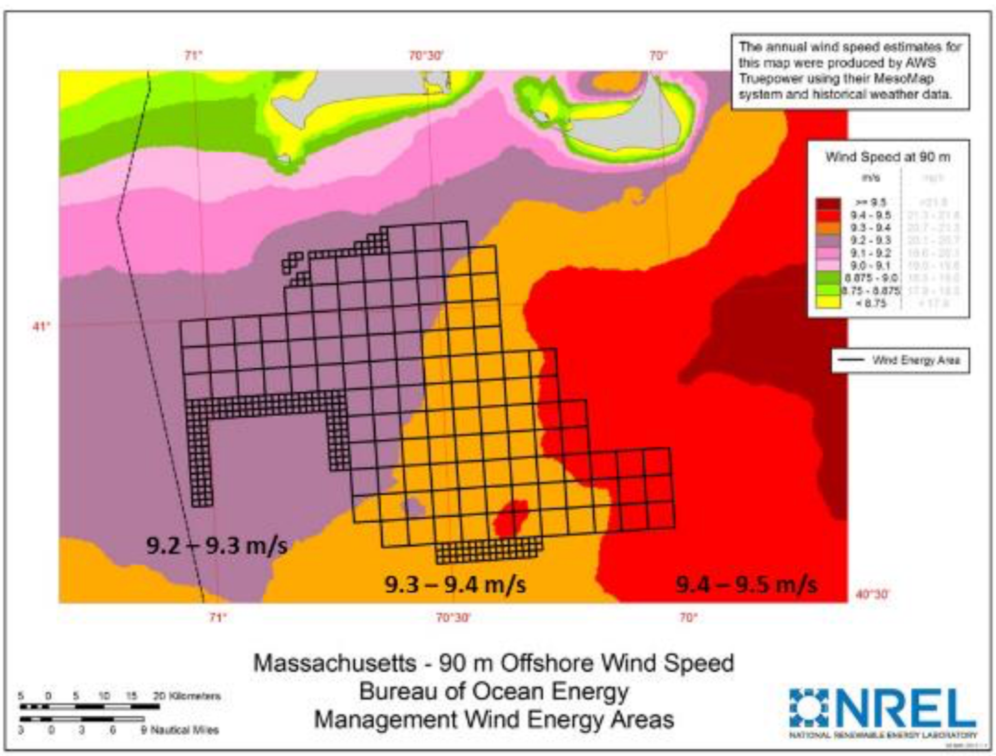
- 8,000 MW
- 10,000 MW
- 12,000 MW

iv. Interconnection Points:
Dispersed around Massachusetts, Rhode Island and Connecticut coastal substations in all scenarios

v. Capacity factors:
a. As background, capacity factors for offshore wind are greater than onshore wind. This is due to higher hub height (the average offshore wind hub height was approximately 128 meters[18] in 2017) and windier conditions. The New England BOEM lease areas are some of the consistently highest speed winds in the United States, as shown in the following NREL map depicting wind speeds at 100m, and more granularly over the New England BOEM lease areas at 90m:

[18] While hub heights vary, offshore wind heights are much taller than onshore wind. In 2017, the average hub height for offshore wind was 128m.
http://windmonitor.iee.fraunhofer.de/windmonitor_en/3_Onshore/2_technik/4_anlagengroesse/


United States - Land-Based and Offshore Annual Average Wind Speed at 100 m
Wind Speed m/s
>10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
< 4.0
Source: Wind resource estimates developed by AWS Truepower, LLC. Web: http://www.awstruepower.com. Map developed by NREL. Spatial resolution of wind resource data: 2.0 km. Projection: Albers Equal Area WGS84.
AWS Truepower™
Where science delivers performance.
NREL
NATIONAL RENEWABLE ENERGY LABORATORY


The annual wind speed estimates for this map were produced by AWS Truepower using their MesoMap system and historical weather data.
Wind Speed at 90 m
m/s
>= 9.5
9.4 - 9.5
9.3 - 9.4
9.2 - 9.3
9.1 - 9.2
9.0 - 9.1
8.875 - 9.0
8.75 - 8.875
< 8.75
Wind Energy Area
71°
70°30'
70°
41°
40°30'
9.2 – 9.3 m/s
9.3 – 9.4 m/s
9.4 – 9.5 m/s
Massachusetts - 90 m Offshore Wind Speed
Bureau of Ocean Energy
Management Wind Energy Areas
5 0 5 10 15 20 Kilometers
3 0 3 6 9 Nautical Miles
NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Anbaric requests that the following average offshore wind capacity factors be utilized:

December through February: 60%
Cold Snap Period: 70%[19]
June through August: 40%
All other periods: 50%

e. Winter Load Shape. As determined to be representative of fuel security concerns, the study should use the winter of 2014/2015.[20]

III. Requested Economic Study Results

For the baseline and three offshore wind scenarios, Anbaric requests the following Economic Study analysis results:

A. Impact on Energy Market Prices

B. Impact on Air Emissions
- Sulfur dioxide
- Nitrogen oxide
- Carbon dioxide

C. Impact on Fuel Security Needs

For this analysis, Anbaric requests that the ISO utilize the fuel security reliability spreadsheet tool as reviewed and refined with stakeholders over 2018 in support of the interim fuel security procedures. The inputs for the fuel security reliability should be revised with the various assumptions described above in this Economic Study request, for example, the offshore wind capacity factors specified above. Results should be displayed in the standard fuel security review format, e.g., number of hours of 10-minute reserve shortages in the base case and in each wind scenario, etc.

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[19] This is consistent with the MassCEC measurements, noted above.
[20] *See* Appendix I to ISO New England Panning Procedure No. 10. https://www.iso-ne.com/static-assets/documents/2019/02/pp-10-r22-02012019.pdf "The New England electric loads used in the model are based on the loads and temperatures experienced during the winter of 2014/15. All winter hourly loads are then scaled using the ratio of the forecast 90/10 peak demand (net of Energy Efficiency) for the applicable future Capacity Commitment Period year to the observed peak in the historical benchmark year (2014/15)."

If you have any questions regarding this Economic Study request, please feel free to contact me. I look forward to discussing the request with you and the Planning Advisory Committee.

Sincerely,

Theodore J. Paradise
Sr. Vice President, Transmission Strategy & Counsel
Anbaric Development Partners, LLC
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