Union of Concerned Scientists

By E-mail: geo@maine.gov

Celina Cunningham
Deputy Director
Governor’s Energy Office
62 State House Station
Augusta, Maine 04333

May 30, 2024

Subject: Request for Information Regarding Maine Offshore Wind Renewable Energy and Economic Development Program

Dear Ms. Cunningham,

On behalf of the Union of Concerned Scientists (UCS), I write today in response to the April 24th Request for Information (RFI) regarding the design of the Maine Offshore Wind Renewable Energy and Economic Development Program. UCS is the nation’s leading science based non-profit organization with more than a half a million supporters nationally and more than 2,500 in Maine. UCS advances equitable science-based solutions to some of the world’s most pressing problems, including working to ensure that Maine and the rest of the country meets its climate and clean energy goals.

I. Maine GEO Request for Information

The RFI seeks input to inform the Maine Governor’s Energy Office (GEO) in its implementation of P.L. 2023, ch. 481 (An Act Regarding the Procurement of Energy from Offshore Wind Resources). Section 3408 of the statute directs the GEO to collaborate with the Maine Public Utilities Commission (PUC) in developing a Request for Proposals to develop and construct offshore wind projects.

a. P.L. 2023, ch. 481 mandates that reliability be prioritized

Section 3408 further directs the PUC to ensure that any selected projects:

> result in contracts that are cost-effective for electric ratepayers over the term of the contract, taking into consideration potential quantitative and qualitative economic, environmental and other benefits to ratepayers… in reviewing proposed contracts, the commission shall give priority to offshore wind power projects that…*[p]rovide ratepayer benefits, including, but not limited to,*

> *enhanced electric reliability, resource adequacy including contributing to reducing winter electricity price spikes and overall price impacts.*[1]

UCS has recently completed an analysis which demonstrates that offshore wind fleets with nameplate capacities of 1500 megawatts (MW), 4000 MW and 8000 MW can substantially contribute to the reliability of the New England power grid. Using the best available data from grid operator ISO New England (ISO-NE), the analysis shows how hypothetical offshore wind fleets of these sizes would have performed during winter seasons (December-February) from 2000 through 2022. The analysis shows the capability of offshore wind projects to supply large amounts of energy to the grid during periods of extreme cold, thereby significantly enhancing electric reliability and reducing the risk of energy shortfalls, which can lead to blackouts.

b. Comment on the timing and amount of nameplate capacity for Maine's solicitations for offshore wind energy (RFI Question 2.a.)

Our analysis shows that the two offshore wind projects currently under construction in New England, Vineyard Wind and Revolution Wind (approximate combined nameplate capacity of 1500 MW) will deliver important reliability benefits over the course of their operation. It also shows the high value of more offshore wind capacity for protection against energy shortfall risk. An additional 2500 MW of nameplate capacity is needed to achieve the reliability benefits of the 4000 MW scenario, and a further addition of 4000 MW (6500 MW of combined additional capacity) is required to achieve the reliability benefits of the 8000 MW scenario. UCS therefore recommends that GEO design a solicitation process reflecting the fact that larger amounts of offshore wind capacity will help ensure the greatest level of reliability benefits for Maine ratepayers.

c. Comment on the appropriate weighting of price-related costs and benefits and non-price factors (RFI Question 7)

We recommend that GEO and the PUC include the reliability benefits offshore wind can provide in reducing energy shortfall risk in their overall cost-benefit evaluation of the offshore wind bids. In addition to the direct benefit of enhanced reliability, offshore wind projects can help New England ratepayers avoid costly alternative solutions to supplement cold weather energy supplies, such as the Mystic Cost of Service Agreement and the Inventoried Energy Program.[2] Deploying offshore wind to meet Maine's energy needs could also eliminate the need to use expensive and highly polluting oil-fired power plants like the 822 MW Wyman Station in Yarmouth, which is Maine's largest power plant. The plant went online in 1978 and is used

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[1] Offshore Wind Energy Procurement, MRS Title 35-A, §3408(2)(F)(2023). Emphasis added.

[2] These programs, which are described in more detail in Section II.C, below, have to date cost ratepayers approximately $830 million to reduce energy shortfall risk for just three winter seasons (2022-2023, 2023-2024 and 2024-2025).

infrequently because of its high operating costs.[3] In addition, by delivering abundant local power during cold snaps, offshore wind can reduce the occurrence of price spikes in regional wholesale electricity markets by decreasing the amount of power generated with imported fossil fuels purchased at scarcity prices.

II. Offshore wind and energy shortfall risk

a. The risk of an energy shortfall in winter is real and growing

Over the past two decades, the fundamental dynamics of energy supply and demand have regularly put the New England power grid at risk during periods of extreme cold.[4] With every cold snap, demand for power has risen while the supply of fossil fuels to power plants has fallen, and on several occasions has come close to running out.[5] Gas supplies fall because they are diverted to meet heating needs, while oil supplies, which typically are only enough to last for two weeks, fall rapidly when stored inventory is consumed.[6]

With supply and demand moving in opposite directions during cold weather, grid operator ISO New England (ISO-NE) increasingly has warned about the danger of an *energy shortfall*, an event during which supply will simply not be enough to meet all of the demand on the system and cover reserve requirements. In one recent example, ISO-NE in February 2022 stated:

> Well-documented natural gas pipeline constraints, coupled with concerns about global supply chain issues related to deliveries of fuel oil and liquefied natural gas (LNG), placed New England's power system at heightened risk this winter…ISO's analysis indicated that a severe prolonged cold snap could necessitate the implementation of emergency actions if resources were unable to access to the fuel needed to operate.[7]

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[3] The location of the Wyman facility has been identified as a promising interconnection point for offshore wind development in the Gulf of Maine.

[4] ISO New England, "Efforts to address fuel security in New England," accessed May 24, 2024, www.iso-ne.com/about/what-we-do/in-depth/efforts-to-address-fuel-security-in-new-england; Federal Energy Regulatory Commission, "New England Winter Gas-Electric Forum," September 8, 2022 and June 20, 2023, www.ferc.gov/news-events/events/new-england-winter-gas-electric-forum-09082022, www.ferc.gov/news-events/events/2023-new-england-winter-gas-electric-forum-06202023.

[5] See, for example, "New England grid operated reliably through 2012/2013 winter despite resource performance challenges," ISO Newswire, March 27, 2013, https://isonewswire.com/2013/03/27/new-england-grid-operated-reliably-through-2012-2013-winter-despite-resource-performance-challenges. While average demand has broadly declined over the last two decades, reflecting increasing amounts of energy efficiency and distributed energy resources such as rooftop solar, daily demand levels continue to fluctuate significantly due to weather conditions, particularly extreme variations of temperature.

[6] The last coal-fired power plant in New England is scheduled to close by 2028. See Granite Shore Power, March 27, 2024, "Last Coal Plants in New England to Voluntarily Close, Transitioning to Renewable Energy Parks." www.graniteshorepower.com/press-release.

[7] ISO New England, "Operational Impacts of Extreme Weather Events: Energy Security Study Performed in Collaboration with EPRI," February 15, 2022, available at www.iso-ne.com/static-assets/documents/2022/02/a08_operational_impact_of_extreme_weather_events.pptx, at 10.

The risk of an energy shortfall is expected to grow over the next several decades as electrification of heating and transportation drives a significant increase in overall demand for power, particularly during the winter.[8] In response to this challenge, ISO-NE has collaborated with the Electric Power Research Institute (EPRI) to develop a detailed framework, known as the Probabilistic Energy Adequacy Tool or PEAT, to evaluate energy shortfall risk across various time horizons.[9] In an initial study evaluating risk in 2027 and 2032, ISO-NE found that "the region's energy shortfall risk is dynamic and will be a function of the evolution of the supply and demand profiles."[10] This means New England states have an opportunity to impact energy shortfall risk over this time horizon, including through procurements of supply-side resources such as offshore wind.

b. Energy shortfalls can directly impact electric customers

Energy shortfalls, if they occur, can directly impact electric customers. ISO-NE has well-established procedures that it follows when forecasts suggest that an energy shortfall may be imminent, and it may implement several measures to attempt to close a forecasted gap between supply and demand.[11] However, if these measures are not sufficient, ISO-NE must ultimately find a way to reduce demand, either through issuing a "Power Warning" to seek voluntary conservation by electric customers, or—if voluntary cutbacks are not enough—by implementing controlled rotating outages (i.e., blackouts) until the level of demand has been reduced to match the available supply.[12] ISO-NE Operating Procedure 4, Section VI. provides in part:

> A Power Warning is defined as a notification for public appeals when an immediate reduction in power usage is necessary to avert overload of the electrical system. Public appeals are made when

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[8] "CELT 2024: Heating electrification will drive higher energy use, winter peaks," ISO Newswire, May 9, 2024, https://isonewswire.com/2024/05/09/celt-2024-heating-electrification-will-drive-higher-energy-use-winter-peaks.

[9] See ISO New England, "Operational Impact of Extreme Weather Events: Final Report on the Probabilistic Energy Adequacy Tool (PEAT) Framework and 2027/2032 Study Results" ("PEAT Study") available at www.iso-ne.com/static-assets/documents/100006/operational_impact_of_exteme_weather_events_final_report.pdf.

[10] PEAT Study at 232. The study demonstrated the potential of offshore wind to reduce energy shortfall risk in multiple future scenarios, including in stakeholder-requested sensitivity analyses exploring the retirement and replacement of some or all oil-fired generation. See PEAT Study at 216-217.

[11] ISO New England Operating Procedure No. 4 – Action During a Capacity Deficiency (OP-4), available at www.iso-ne.com/static-assets/documents/rules_proceds/operating/isone/op4/op4_rto_final.pdf; ISO New England Operating Procedure No. 21 (OP-21) – Operational Surveys, Energy Forecasting & Reporting and Actions During An Energy Emergency, available at www.iso-ne.com/static-assets/documents/rules_proceds/operating/isone/op21/op21_rto_final.pdf.

[12] OP-21 at 13; ISO New England Operating Procedure No. 7 – Action in an Emergency (OP-7), available at www.iso-ne.com/static-assets/documents/rules_proceds/operating/isone/op7/op7_rto_final.pdf, ISO New England Operating Procedure No. 7 – Action in an Emergency, Appendix A – Instructions for Implementation of Manual Load Shedding, available at www.iso-ne.com/static-assets/documents/rules_proceds/operating/isone/op7/op7a_rto_final.pdf.

> other efforts (e.g., emergency purchases, voluntary curtailment, contracted curtailment and voltage reduction) have been unsuccessful in bringing supply and demand back into balance.[13]

ISO-NE's Operating Procedure 21 provides, in part:

> If actions 1 - 7 above do not result in the necessary relief…the following actions may be taken…
>
> 8. Implement a New England State Governors appeal in accordance with OP-4: Request New England State Governors to reinforce appeals for voluntary load curtailment and the Power Warning Implementation.
>
> 9. Under extreme conditions, ISO shall seek reliability relief through load shedding actions available through implementation of OP-7.[14]

Each cold weather event in New England thus comes with the very real prospect that the governors of Maine, Connecticut, Massachusetts, New Hampshire, Rhode Island and Vermont could be forced to issue emergency appeals to the public for conservation, and—should those measures fail—the danger that many electric customers will be left not only in the dark, but in the cold.

c. Mechanisms to increase fossil fuel supplies to the region during cold weather are expensive for ratepayers and vulnerable to disruption by global events

To date, ISO-NE's solutions to address energy shortfall risk have involved substantial subsidies to existing oil and gas generators to incentivize them to import additional supplies of fuel during the winter. Electric ratepayers in New England are currently paying for two such programs: the Mystic Cost of Service Agreement (Mystic COSA), under which the owner of the Mystic Generating Station in Everett is reimbursed for fuel purchases, has cost roughly $755 million over the past two years.[15] The Inventoried Energy Program (IEP), which is in effect for the winters of 2023-2024 and 2024-2025, obligates ratepayers to provide incentive payments primarily for oil and gas generators to arrange for supplemental fuel supplies during the months of December through February. Payments under the first year of the program were roughly $80 million, but because the payment formula is tied to Dutch TTF gas price futures, ratepayers

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[13] OP-4 Section VI: Public Notifications.
[14] OP-21 at 14.
[15] The most recent estimate of the costs of the Mystic COSA is available at www.iso-ne.com/static-assets/documents/100011/mystic_cos_prelim_03_2024.pdf.

remain obligated to pay as much as $400 million under the program in its second year of operation.[16]

Although these extraordinary subsidies will soon expire, any alternative mechanisms to increase the supply of fossil fuels in New England will face the same constraints that have made the Mystic COSA and the IEP so expensive. Chief among these constraints is the fact that all fossil fuel supplies must be imported because the region has no supplies of its own. Additionally, both oil and gas are commodities which are traded in global markets, which makes prices highly volatile and supplies vulnerable to sudden disruption by events in other parts of the world.[17]

d. The characteristics of offshore wind make it an effective solution to mitigate energy shortfall risk

Adding offshore wind to the New England power system will improve the fundamental dynamics of energy supply and demand that have historically driven winter reliability risk in the region. Unlike fossil fuels, the supply of offshore wind energy *increases* during the winter, and multiple ISO-NE studies have shown that offshore wind projects can generally be expected to be operating at well above average output during extreme cold.[18] In other words, in any given winter season, if a cold spell occurs, offshore wind projects will typically deliver a substantial supply of power just when demand for power is rising. This well-timed supply will also be stably priced and under local control, and (unlike oil and LNG) it will automatically replenish itself for any subsequent cold snaps. These characteristics make offshore wind an ideal resource to mitigate the risk of energy shortfalls.

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[16] See "About the Inventoried Energy Program," Ask ISO: ISO New England Participant Support, December 27, 2023, https://askiso.iso-ne.com/s/article/About-the-Inventoried-Energy-Program; ISO New England, "Inventoried Energy Program," accessed May 24, 2024, www.iso-ne.com/markets-operations/markets/inventoried-energy-program; "Gas Volatility Leads ISO-NE to Seek Update to Inventoried Energy Program: Changes Necessary to Attract LNG Because of High European and Asian Prices," Jon Lamson, RTO Insider, April 11, 2023, www.rtoinsider.com/31980-gas-volatility-iso-ne-update-inventoried-energy-program.

[17] The Russian invasion of Ukraine in 2022 disrupted global gas markets and caused a dramatic spike in the price of LNG purchased under the Mystic COSA. See Bruce Mohl, "Everett grid 'insurance' cost $536m over first 13 months," August 22, 2023, https://commonwealthbeacon.org/economy/everett-grid-insurance-cost-536m-over-first-13-months-2.

[18] DNV-GL, Analysis of Stochastic Dataset for ISO-NE, February 4, 2021, available at: www.iso-ne.com/static-assets/documents/2021/03/a9_dnv_gl_report_analysis_of_stochastic_dataset_for_iso_ne_rev1.pdf, at 23 (finding that offshore wind contributes even more energy during these periods than onshore wind: "[d]uring cold snaps…offshore generation exhibits a much higher frequency of events with generation above 80% capacity" coincident to the daily peak load). See also Figs. 2-7 and 2-9. ISO New England, High-Level Assessment of Potential Impacts of Offshore Wind Additions to the New England Power System During the 2017-2018 Cold Spell, Dec. 17, 2018, available at 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.

III. Analysis

To understand the impact of offshore wind on energy shortfall risk in more detail, we looked at the difference that various levels of offshore wind capacity would have made over the course of 22 past winter seasons (December through February 2000-2022). We first compared actual historical demand levels to shortfall risk thresholds established by ISO-NE, and then we looked at what net demand would have been after subtracting the energy supplied by offshore wind fleets with nameplate capacities of 1500 MW (roughly equivalent to combined capacity of the Vineyard Wind and Revolution Wind projects), 4000 MW and 8000 MW.[19] While the Governor's Energy Office in this instance is considering a potential procurement of up to 3000 MW, the available offshore wind resource is substantially greater, and many other New England states are simultaneously evaluating potential procurements on this scale. The analysis was therefore designed to capture the potential collective impact on the regional power system of multiple state procurement decisions.

a. Methodology

i. Daily energy demand risk thresholds

To measure the difference that offshore wind would have made during the winters evaluated, we used the same framework that ISO-NE uses to monitor in-season energy shortfall risk, the 21-Day Energy Assessment.[20] During each winter, ISO-NE populates this framework weekly with updated information about a range of risk factors affecting energy supply and energy demand. One critical risk factor, "Peak Forecasted Daily Energy Demand," is measured against a gauge graphic that indicates increasing levels of risk corresponding to thresholds of 350,000 megawatt-hours (MWh), 400,000 MWh and 450,000 MWh.[21] Although it is only one of several risk factors, and daily energy demand does not by itself predict whether an energy shortfall will occur, ISO-NE nevertheless considers it an important indication that the risk is elevated,

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[19] Net demand is a commonly used metric to model electric power systems with high levels of renewable resources. *See* Denholm, Paul, Ilya Chernyakhovskiy, and Lauren Streitmatter. 2024. "Maintaining Grid Reliability – Lessons from Renewable Integration Studies. April 2024. National Renewable Energy Laboratory. Department of Energy. Available at www.nrel.gov/docs/fy24osti/89166.pdf. "Early studies of variability introduced several important concepts in power system planning and operation with increased use of renewable energy. One is the concept of net load, or load minus the contribution of renewables. Net load represents the energy that must be served by the balance of the system fleet." (at p. 7)

[20] See ISO New England, 21-Day Energy Assessment Forecast and Report" ("21-Day Energy Assessment") available at www.iso-ne.com/isoexpress/web/reports/operations/-/tree/21-Day-Energy-Assessment-Forecast-and-Report-Results. See also "ISO-NE rolls out enhancements to report on 21-day energy supply forecast," ISO Newswire, December 19, 2022, https://isonewswire.com/2022/12/19/iso-ne-rolls-out-enhancements-to-report-on-21-day-energy-supply-forecast.

[21] 21-Day Energy Assessment at 3.

compared to normal conditions, when values are above these thresholds.[22] In both the ISO-NE gauge graphic and in the single-season charts presented below (Figures 1 and 2), these risk levels are shown as areas of yellow, orange and red.

ii. Historical demand

Using historical load data from ISO-NE for the period from 2000-2022, we aggregated hourly values to calculate daily energy demand for each day of each winter season in the period.[23] We then compared those levels to the risk thresholds in the 21-Day Energy Assessment to determine when this risk factor was elevated (shown by the black line in Figures 1 and 2).

iii. Historical demand net of hypothetical offshore wind fleets

Next, using historical offshore wind power estimates from ISO-NE for the same time periods, we aggregated hourly values to calculate how much energy would have been supplied over the course of each day by hypothetical offshore wind fleets with nameplate capacities of 1500 MW, 4000 MW and 8000 MW.[24] Subtracting these hypothetical daily deliveries of offshore wind energy from the historical energy demand, we determined what the daily energy demand level would have been, *net* of this offshore wind supply, and again compared these levels to ISO-NE's risk thresholds (with the net demand for the three offshore wind levels shown by the dashed light blue, light blue and dark blue lines, respectively, in Figures 1 and 2).

iv. Multi-year risk profiles

Finally, we tallied the total number of days with elevated risk (i.e., daily energy demand above 350,000 MWh) in each winter based on historical demand and arranged those values chronologically to provide a view of risk levels across all 22 years (shown by the clustered black columns in Figure 3 below). We also tallied the total number of days that would have had elevated risk in each of the three hypothetical offshore wind scenarios and presented those values chronologically to allow a comparable long-term view of risk (shown by the clustered blue columns in Figure 3).

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[22] Our analysis was limited to the impact of offshore wind on net demand compared to these thresholds. It did not evaluate other energy shortfall risk factors included in the assessment, the primary purpose of which is to alert ISO-NE to the potential for an "Energy Emergency," a narrowly defined type of energy shortfall that implies specific power system conditions based on the relationship between demand and available generation on an hourly basis.

[23] 2023 ISO New England Variable Energy Resource (VER) Data Series (2000-2022) Revision 0 ("VER Data Series"), ISONE_grossload_metdata_spliced_23yr_EPT, accessed April 2024, www.iso-ne.com/static-assets/documents/2023/05/2023_isone_ver_dataset_2000_2022_rev0.zip.

[24] VER Data Series, 2023_ISONE_Wind_ofsw_Aggregated_Power_Data_2000-2022_NetPwrTS, accessed April 2024, www.iso-ne.com/static-assets/documents/2023/05/2023_isone_ver_dataset_2000_2022_rev0.zip.

b. Results

i. Individual winter seasons

Examination of individual winter seasons highlights the important contributions that offshore wind can make during extreme winter weather. The examples below show the difference that offshore wind would have made during two winter seasons when energy shortfall risk was particularly high.

Winter 2013-2014

The winter of 2013-2014 was exceptionally cold, and the region experienced multiple extended cold snaps which caused daily energy demand to rise above the “higher” (orange) 400,000 MWh risk threshold on 13 days, including two roughly week-long periods when this higher risk was nearly constant (Figure 1). During these extended periods of deep cold and exceptionally high demand, the region’s oil-fired power plants burned a significant amount of their oil inventory, and tight gas markets drove spikes in wholesale electricity prices.[25] If Vineyard Wind and Revolution Wind had been operating during this period, the analysis shows that the estimated output of their combined (1500 MW) nameplate capacity would have been sufficient to offset the increased demand on almost all of those 13 days, effectively moving the region out of the “higher” (orange) risk zone on all but three days. If 8000 MW of offshore wind had been online, the region would have experienced *only one day* with “elevated” (yellow) risk during the entire season:

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[25] “Oil Inventory was Key in Maintaining Power System Reliability Through Colder-Than-Normal weather During Winter 2013/2014,” ISO Newswire, April 4, 2014, https://isonewswire.com/2014/04/04/oil-inventory-was-key-in-maintaining-power-system-reliability-through-colder-than-normal-weather-during-winter-2013-2014.

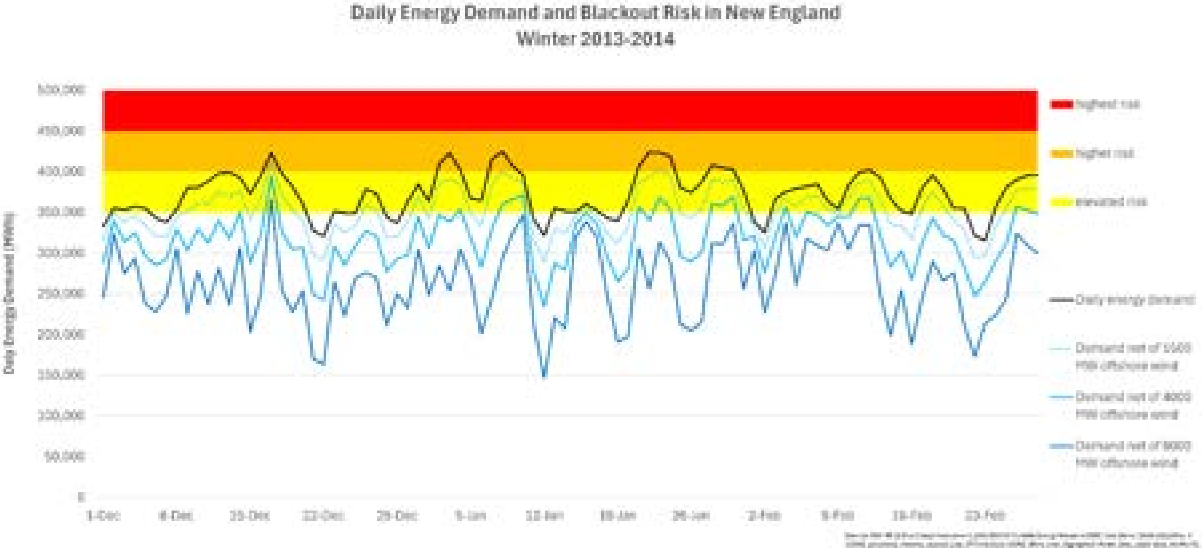

Fig. 1 Daily energy demand and blackout risk, winter 2013-2014

Winter 2017-2018

During the winter of 2017-2018, the region experienced a long-duration cold snap that lasted over two weeks. Between December 28 and January 7, daily energy demand was above the "higher" (orange) 400,000 MWh threshold on eight days (Figure 2). Gas prices spiked, leading to exceptionally high prices in the energy market.[26] Oil-fired power plants burned through their inventories until they reached dangerously low levels, and many had trouble replenishing their supplies because the persistent high demand for fuel oil across the region had caused delivery-truck drivers to reach their legally mandated limits on driving hours.[27] Finally, on January 5, Governor Baker of Massachusetts issued an emergency order to lift this limit, stating:

> This emergency exemption is issued as a result of below average cold temperatures that have caused an increased demand for fuel throughout the Commonwealth. These cold temperatures are forecast to continue for a period of time….The following is ordered: An emergency exists that requires relief from regulations adopted in Massachusetts and Federal Statutes and Regulations pertaining to hours of service of motor carriers and drivers of commercial motor vehicles, while transporting and delivering…any necessary fuels to electric generating facilities.[28]

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[26] See "Winter 2017/2018 recap: Historic cold snap reinforces findings in Operational Fuel-Security Analysis," ISO Newswire, April 25, 2018, https://isonewswire.com/2018/04/25/winter-2017-2018-recap-historic-cold-snap-reinforces-findings-in-operational-fuel-security-analysis.

[27] Ibid.

[28] Office of the Governor. Commonwealth of Massachusetts. Declaration of Emergency Notice (Title 49 CFR § 390.23). Federal Motor Carrier Safety Administration. January 5, 2018. www.fmcsa.dot.gov/emergency/commonwealth-massachusetts-doe-notice-title-49-cfr-%C2%A7-39023-jan-5-2018.

Again, our analysis shows that offshore wind would have significantly reduced the stress on the power system during the extreme cold.[29] A 1500 MW fleet would have kept the region out of the “higher” (orange) risk zone on all but two days of that period, while a 4000 MW fleet would have eliminated any days in the “higher” (orange) risk zone, and an 8000 MW fleet would have altogether eliminated demand-driven risk (that is, kept demand out of even the “elevated”/ yellow risk zone):

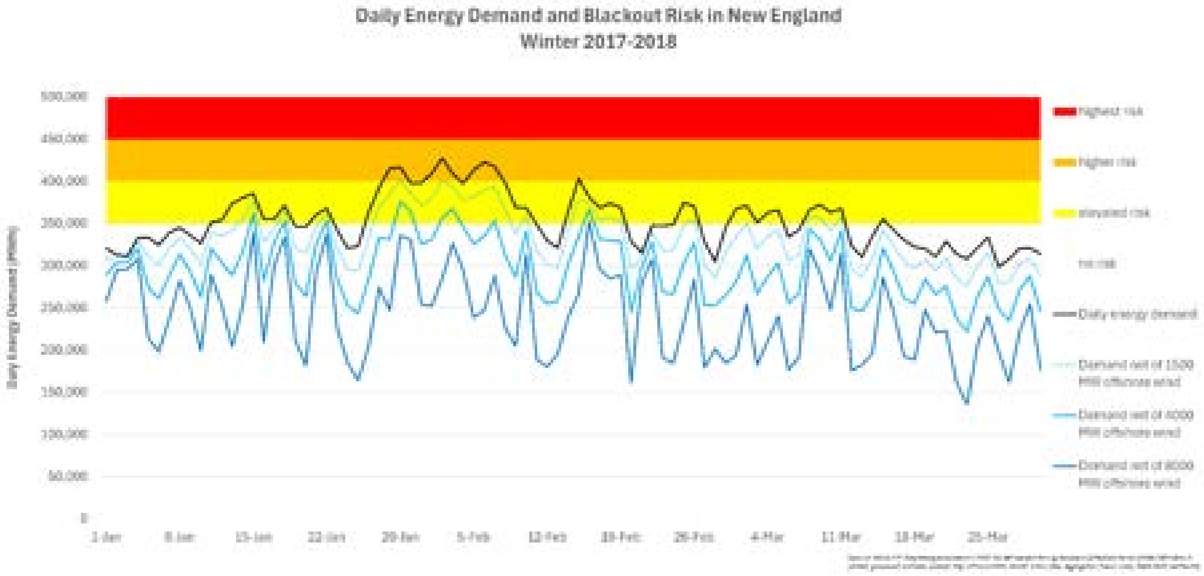

Fig. 2 Daily energy demand and blackout risk, winter 2017-2018

ii. Multi-year risk profiles

The multi-year risk profiles for historical demand and the three offshore wind scenarios demonstrate the dramatic difference that offshore wind can make in reducing the risk of winter blackouts throughout the decades that they will be operating. These results show that over the 22 past winter seasons we studied, daily energy demand put the region at an “elevated” risk for an

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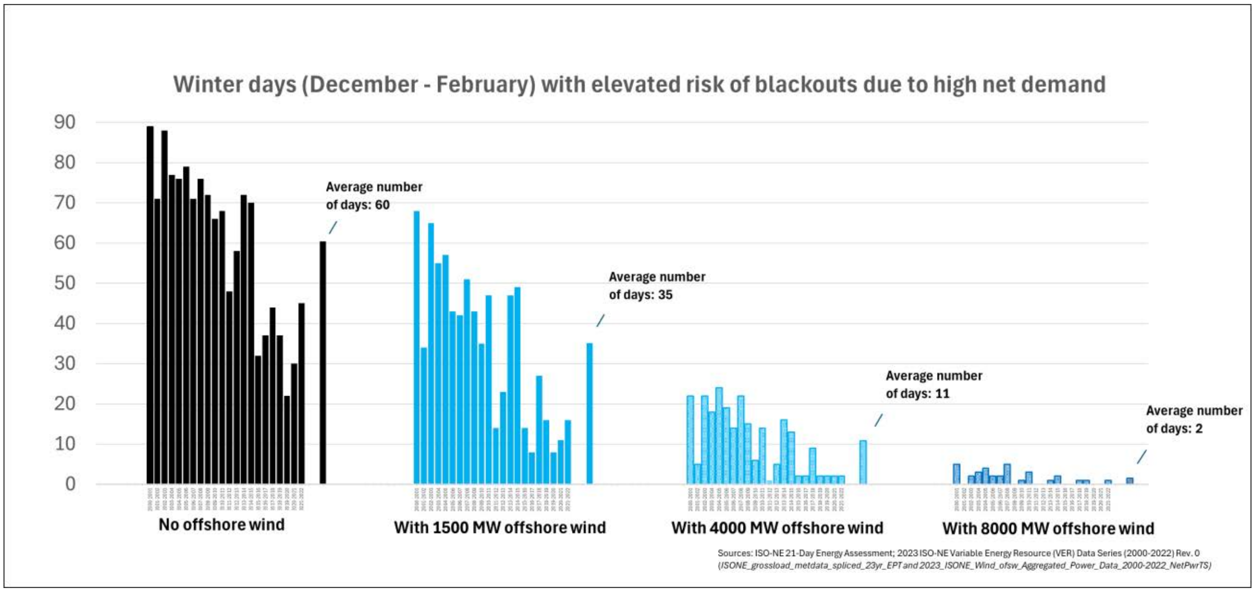
[29] These results are consistent with ISO-NE’s high-level assessment of the impacts of offshore wind during this period, which found that if 1600 MW of offshore wind had been available during the cold spell, consumers would have saved $80-85 million in avoided fuel costs, which would have translated into an $11-13 per MWh reduction in average wholesale electricity prices (locational marginal prices, or LMP). “ISO High Level Assessment,” supra note 17.

energy shortfall, on average, on 60 days during the months of December through February.[30] If a 1500 MW offshore wind fleet had been operating during these winters, the output from those projects would have offset demand to effectively reduce the average number of days with elevated risk to 35 (a 42% reduction). A 4000 MW fleet would have reduced the average number of days with risk to 11 (an 82% reduction), and an 8000 MW fleet would have reduced the average number of days when this risk factor was elevated to just two per season:



Sources: ISO-NE 21-Day Energy Assessment; 2023 ISO-NE Variable Energy Resource (VER) Data Series (2000-2022) Rev. 0 (*ISONE_grossload_metdata_spliced_23yr_EPT and 2023_ISONE_Wind_ofsw_Aggregated_Power_Data_2000-2022_NetPwrTS*)

Fig. 3 Number of winter days with elevated risk (2000-2022).

IV. Conclusion

The results of this analysis demonstrate that offshore wind can offer substantial protection for consumers in winter, when the risk of a blackout is highest. Because offshore wind energy typically increases during cold snaps, it can offset higher demand on the system during these periods and reduce the risk of an energy shortfall. Specifically, the results show that if a 1500 MW offshore wind fleet had been operating during the period studied (2000-2022), it would effectively have lowered the average number of winter days with demand-driven energy shortfall risk from 60 to 35, a 42% reduction. A 4000 MW fleet would have reduced the average number of winter days with elevated risk to 11 (an 82% reduction), and an 8000 MW fleet would have nearly eliminated winter days when this energy shortfall risk factor was elevated.

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[30] The results for the 2000-2022 period also show, in each scenario, a broad downward trend in the number of winter days with risk. This reflects an overall decline in demand on the bulk power system during the last two decades, largely due to energy efficiency measures and increasing levels of rooftop solar resources. However, ISO-NE expects this trend to reverse in the coming years. "CELT 2024: Heating electrification," supra note 7. ("ISO New England projects a dramatic increase in both overall electricity use and winter peak demand over the next 10 years.")

This analysis shows that the Vineyard Wind and Revolution Wind projects (with a combined capacity of roughly 1500 MW) will significantly lower demand-driven energy shortfall risk during each winter of their long-term contracts. Likewise, future procurements of offshore wind on this scale can be expected to provide critical support for winter reliability over 20- to 30-year contracts. An additional 2500 MW of nameplate capacity is needed to achieve the reliability benefits of the 4000 MW scenario, and a further addition of 4000 MW (6500 MW of combined additional capacity) is required to achieve the reliability benefits of the 8000 MW scenario.

UCS therefore recommends that GEO design a solicitation process reflecting the fact that larger amounts of offshore wind capacity will help ensure the greatest level of protection against energy shortfall risk for Maine ratepayers. UCS also recommends that this critical reliability benefit be included in the overall cost-benefit evaluation of offshore wind bids, as well as the avoided cost to ratepayers of alternative solutions to supplement cold-weather energy supplies.

Respectfully submitted,

/s/ Susan Muller

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Appendix A

Methodology

Data sources:

1. Energy Shortfall Risk thresholds are drawn from the ISO-NE 21-Day Energy Assessment Forecast (Peak Forecasted Daily Energy Demand: less than 350,000 MWh, 350,000 MWh, 400,000 MWh, 450,000 MWh)

2. Demand and offshore wind data are from the ISO-NE Variable Energy Resource (VER) time series

Step 1: Calculate the daily energy demand for each day of each winter season (December-February).

Using "ISONE_grossload_metdata_spliced_23yr_EPT," sum the values for ISONE_grs_ld in "Hour_Ending 1" through "Hour_Ending 24" for each day of the season.

These values provide the data for Column B.

Step 2: For the same time periods, calculate ISO-NE's best available estimate of the amount of energy that would have been delivered by hypothetical offshore wind fleets with nameplate capacities of 1500 MW, 4000 MW and 8000 MW.

Using "2023_ISONE_Wind_ofsw_Aggregated_Power_Data_2000-2022_NetPwrTS," sum the values for "HE1" through "HE24" for each day of the season.

These values provide the data for Column C.

Multiply the value in Column C by 1500 MW, 4000 MW and 8000 MW for each day of the season.

These values provide the data for Columns D, E and F.

Step 3: Calculate the daily energy demand net of energy from offshore wind.

Subtract the values in Columns D, E and F from the daily energy demand (B) for each day of the season.

These values provide the data for Columns I, J and K.

Step 4: Compare the daily energy demand without offshore wind and with offshore wind fleets of 1500 MW, 4000 MW and 8000 MW to the energy shortfall risk thresholds in ISO-NE's 21-Day Energy Assessment Forecast for each day of the season.

For each season, plot the data from Columns B, I, J and K as line graphs and the energy shortfall thresholds as stacked areas.