IEc

Review of Daymark Ratepayer Impact Analysis for 3,600 Megawatts of Offshore Wind

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1. Introduction and Scope of Review

Massachusetts' fourth offshore wind solicitation closed on March 27, 2024, with the Commonwealth receiving bids from Avangrid Renewables, South Coast Wind Energy, and Vineyard Offshore. This represented the region's largest offshore wind solicitation to date, for a potential of up to 3600 MW of capacity. Policymakers and the public have expressed interest in understanding how the procurement of additional offshore wind capacity will affect electricity prices in coming years. To provide insights into these potential price impacts, Daymark Energy Advisors—working on behalf of Avangrid—performed a modeling analysis of electricity price impacts using contract terms from a recent New York-New Jersey procurement as a proxy for terms related to the Massachusetts procurement.[1] Daymark conducted this analysis for a 3600 MW incremental offshore wind capacity scenario, under three different power purchase agreement (PPA) price scenarios: $140 per megawatt hour (MWh), $160 per MWh, and $180 per MWh.[2]

The Environmental League of Massachusetts (ELM) contracted with Industrial Economics (IEc) for a technical review of the Daymark pricing analysis. This document presents the findings of IEc's review. The scope of this review is as follows:

- IEc identified the types of models used by Daymark and assessed the degree to which they are appropriate for assessment of electricity price impacts. IEc was not charged with conducting a detailed review of the specific modeling tools used by Daymark.
- IEc reviewed Daymark's specification of the baseline. This includes (1) the projected capacity and generation mix across electric generating technologies, (2) projected electricity demand, (3) the degree to which energy efficiency measures and electrification of New England's energy system (including transportation) are reflected in these demand projections, (4) natural gas price projections, and (5) projected development of transmission infrastructure within the New England ISO region.
- IEc reviewed Daymark's design of the offshore wind procurement scenario. Specifically, IEc identified the specific parameters and input data that Daymark modified in its suite of models to reflect this scenario and assessed whether these data/parameters are the appropriate elements to change in the models.
- IEc reviewed the results generated by the Daymark analysis for overall reasonableness and assessed their consistency with economic principles.

2. Summary of Daymark Analysis

The Daymark analysis assesses electricity price impacts based on a combination of its own internal modeling tools and data obtained from other sources. The primary elements of the Daymark analysis are as follows:

[1] Daymark is an energy advisory consultancy that provides integrated policy, planning, and strategic decision support services related to the North American electricity and natural gas industries. Daymark serves a mix of clients across North America, including utilities, infrastructure developers, energy suppliers, energy consumers, and regulators.

[2] The PPA price that was bid for the subject project was not disclosed to IEc for this review.

- **Specification of the baseline:** Focusing on the ISO New England region, Daymark developed baseline assumptions regarding both electricity supply and demand. On the supply side, Daymark projected both retirements of existing generating capacity and development of new capacity. Drawing on information published by ISO New England, Daymark assumes 3,629 MW of generation retirements through 2026 and no additional retirements thereafter. With respect to new capacity, Daymark's assumptions are largely based on existing projects, projects in development, and additional renewable capacity necessary to meet existing renewable portfolio standard (RPS) requirements. Based on these factors, Daymark projects 8,347 MW of offshore wind through 2034 (excluding the subject project), based on projects in development and Daymark assumptions regarding likely offshore wind development during the 2032-2034 period. Daymark also projects 1,000 MW of additional land-based wind (online in 2029 with no additional land-based wind thereafter), and 31,069 MW of utility-scale solar through 2051. Daymark's solar projections reflect steady growth in utility-scale solar through the early 2040s (9,663 MW as of 2043) and more rapid growth through 2051. To project electricity demand in the baseline, Daymark relies on projections from ISO New England's 2023 Capacity, Energy, Loads and Transmission Report (the CELT Report), which projects demand through 2032. After 2032, Daymark's projected load growth is approximately 2.5% per year.

- **Specification of the project scenario:** To specify the project scenario, Daymark estimated annual generation for the project from 2032 through 2051. Projected generation is approximately 9.7 million MWh in 2032 and 2033 and increases to approximately 14.5 million MWh in 2034 and remains at that level through 2051. Daymark also specified the trajectory of the contracted power price per year associated with the present value contract prices of $140/MWh, $160/MWh, and $180/MWh.

- **Conduct modeling analyses:** Based on the specification of the baseline and project scenarios, Daymark applied its *CapMarker* capacity model in conjunction with its PLEXOS-based Northeast Market Model of power market operations to forecast ISO New England wholesale energy market outcomes, including changes in the mix of generation across technologies and locational marginal prices (LMPs). Daymark also applied its *RECMarker* model to forecast renewable energy certificate (REC) prices.

- **Assessment of ratepayer impact based on model results:** Integrating the outputs from its modeling analyses, Daymark estimated the average ratepayer impact per month. Daymark's derivation of these estimates reflects (1) the costs of additional offshore wind generation at the predetermined PPA price; (2) the energy value and REC value of the additional offshore wind, based on the projected locational marginal prices and Daymark's REC price forecast; (3) the reduction in the electricity price for electricity still subject to locational marginal prices (as opposed to PPAs); and (4) the average monthly electricity consumption of different customer classes.

Based on this approach, Daymark's projections of the average residential monthly bill impacts for each of the three PPA pricing scenarios are summarized in Table 1 below. The values in the table represent the average monthly bill impact over the 20-year time horizon of the analysis. As indicated in the table, Daymark projects that the monthly bill impact per household would vary from a small cost savings (effectively no impact) under the $140/MWh scenario to a $2.27 monthly increase under the $180/MWh scenario.

Table 1. Daymark Estimate of Average Monthly Bill Impact per Residential Customer Over 20-Year Time Horizon, by PPA Pricing Scenario (2023$)

PPA Price	Average Monthly Electric Bill Impact per Household
$140/MWh	($0.01) per month
$160/MWh	$1.13 per month
$180/MWh	$2.27 per month

3. IEc Review

The findings of IEc's review are presented below in question-and-answer format.

Q: Is the suite of modeling tools used by Daymark appropriate for the assessment of ratepayer impacts?

A: The three types of models that Daymark applied for this analysis—a capacity expansion model, a dispatch model, and a REC price model—are appropriate for the analysis of ratepayer impacts. These types of models are regularly used in this type of analysis and each provides different results that are required for estimating ratepayer impacts.

Q: Did Daymark appropriately specify the baseline for the purposes of its analysis?

A: The baseline for any economic analysis should reflect the state of the world absent the policy or project under consideration. In the context of an offshore wind project that would be developed contemporaneously with several other initiatives to reduce the greenhouse gas footprint of New England's power system, the baseline could conceivably be specified in two ways. The first potential baseline would reflect only those projects and initiatives that are currently in place, under development, or planned. The second potential baseline would capture those projects reflected in the first baseline plus additional actions to meet formal commitments to reduce GHG emissions from the electric power (e.g., the requirement for power sector GHG emissions in Massachusetts to be at least 93% below 1990 emissions in 2050), even if the specific projects to fulfill those commitments have not yet been developed or approved.

Assessing impacts relative to the first baseline informs decision-makers of impacts incremental to specific initiatives that have already been identified and, at a minimum, planned. In contrast, assessing impacts relative to the second baseline informs decision-makers of the marginal impact of a project incremental to a full suite of other projects that would fulfill a stated policy commitment.

Whether the first or second baseline would be more appropriate would depend on what decisionmakers would hope to learn from an analysis. Regardless of the choice, it is important for the baseline in an analysis to be internally consistent. In other words, all projections and assumptions that constitute the baseline for an analysis should reflect the same baseline, with all projections reflecting either the first potential baseline described above or the second potential baseline.

Our review of the Daymark baseline involved consideration of this guiding principle and comparison with other analyses from reputable sources.

Electricity generating capacity: The model outputs provided by Daymark did not include the amount or mix of generating capacity under the baseline or project scenarios.

Electricity generation: Daymark's projected baseline mix of electricity generation across technologies includes an appreciably lower share of renewables than projected by the Massachusetts Executive Office of Energy and Environmental Affairs (EEA) for the five decarbonization scenarios included in the Massachusetts Clean Energy and Climate Plan for 2050.[3] The Daymark baseline projections show renewables accounting for between 27% and 34% of generation between 2032 and 2051, whereas renewables make up between 55% and 86% of generation in the EEA projections.

The differences between Daymark's projections and those in the EEA analysis reflect the clean energy commitments captured in each set of projections. The clean energy commitments in Daymark's analysis include specific offshore wind projects proposed or under development, an additional 3600 MW of future offshore wind not yet proposed, and renewable investments necessary to meet existing Renewable Portfolio Standards. In contrast, the EEA analyses reflect the more significant commitments that Massachusetts and other New England states have made to reduce the GHG footprint of their energy systems, inclusive of renewable projects that have not yet been planned or proposed. Thus, Daymark's representation of future renewable generation is more consistent with the first potential baseline described above.

Electricity demand: Daymark's projections of electricity demand are fairly consistent with the EEA projections in the early 2030s but diverge thereafter. This reflects Daymark's assumption of steady growth in electricity demand at roughly 2.5% per year post-2032, in contrast to the EEA analyses, which show much more rapid demand increases due to electrification of the transport and buildings sectors, as well as demand related to electrolysis for hydrogen production. Thus, consistent with baseline generation, Daymark's representation of baseline electricity demand is more consistent with the first potential baseline described above rather than the second.

Natural gas price projections: Daymark relies on the Energy Information's (EIA's) *Short-Term Energy Outlook*, EIA's *Annual Energy Outlook 2023*, and OTC Global Holdings gas forward pricing data as the basis for its projections of natural gas prices. These are reputable sources that are appropriate for Daymark's analysis.

Transmission infrastructure development: Daymark's analysis reflects construction of the NECEC transmission project, which will connect the ISO New England region to 1,200 MW of capacity in Québec, and the Northern Maine Transmission project, which will connect 1,200 MW of renewable power in Maine to the ISO New England transmission system. For both projects, Daymark captures the locations of interconnection to the grid and the timing of completion. Daymark's representation of transmission infrastructure development reflects the best available information on these projects and is appropriate for use in the ratepayer impact analysis.

Overall, Daymark's specification of the baseline is appropriate for its assessment of ratepayer impacts. Although the Daymark baseline does not reflect the full suite of investments likely to be made in the

[3] See Massachusetts Executive Office for Energy and Environmental Affairs, "Massachusetts Workbook of Energy Modeling Results", August 2023.

power system in coming years, it is appropriate for assessing the ratepayer impacts of the proposed offshore wind project after accounting for projects that are already in development or proposed.

Q: Is Daymark's specification of the wind procurement scenario appropriate for the assessment of ratepayer impacts?

A: Daymark's specification of 14.5 million MWh of annual generation once the project is fully operational implies a capacity factor of approximately 46%, which is consistent with estimates in the literature for offshore wind.[4] Daymark introduced the project capacity and generation into its suite of models in the appropriate capacity zones.

Daymark's specification of the procurement scenario also includes calculating year-specific contract prices such that the present value per MWh over the full 2032-2051 period equals the illustrative PPA price (either $140/MWh, $160/MWh, or $180/MWh). The projection of contract prices used in the Daymark analysis, however, is inconsistent with this condition. The year-specific prices used by Daymark reflect uniform generation of 14.5 million MWh per year over the full 2032-2051 period, but projected generation in 2032 and 2033 is just 9.7 million MWh per year. This oversight has only a small effect on Daymark's projections of contract cost (e.g., less than 1% for the $180/MWh scenario) and ratepayer impacts, with the year-specific contract prices set slightly higher than necessary to achieve the target PPA price levels.

Q: Is Daymark's calculation of ratepayer impacts based on its modeling results conceptually correct and accurate?

Daymark's calculations of ratepayer impacts based on its modeling results are conceptually correct. They appropriately account for the costs of the project, the energy value and REC value of the project, and the reduction in price for load that remains subject to LMPs. Using this information, Daymark calculates the net rate impact per MWh of electricity sales. To estimate the impact on monthly electric bills, Daymark applies this impact to an assumed household electricity use of 0.5 MWh, which Daymark states is based on representative customer profiles. For simplicity of communication, Daymark kept those values constant through the study time horizon.

To derive the most accurate estimates of household bill impacts, however, Daymark could have developed estimates of average electricity use per household that were consistent with its overall load forecast. Specifically, these values could have reflected the trend toward electrification in the building and transportation sectors, as represented in the CELT load forecast that Daymark used as the basis for projecting load to 2032. Without accounting for these factors, Daymark likely underestimates household electricity bill impacts. The extent to which these impacts are underestimated would scale linearly with the assumed average electricity use per household. For example, if household electricity use in a given year were 0.6 MWh per month instead of 0.5 MWh as assumed by Daymark, the bill impact to households would be 20 percent higher than projected by Daymark.

[4] For example, see National Renewable Energy Laboratory, 2021 Cost of Wind Energy Review and Massachusetts Department of Energy Resources, Offshore Wind Study, May 2019.

Q: Are the Daymark results reasonable and consistent with economic principles?

Overall, the Daymark results (summarized above in Table 1) are reasonable based on our review. Although the results of any modeling analysis are uncertain, the magnitude of ratepayer impacts estimated by Daymark is reasonable based on the information provided. We note that the small ratepayer savings under the $140/MWh PPA scenario may be somewhat counterintuitive, but this outcome is possible with REC prices in the range estimated by Daymark and the change in LMPs estimated by Daymark's suite of power sector models. However, rather than demonstrating that the $140/MWh PPA price will definitively result in a ratepayer cost savings, Daymark's projection of a small ratepayer savings under this scenario demonstrates that the cost saving/offsetting elements of the proposed project (i.e., REC value and reduction in LMPs for electricity purchased by load serving entities on the wholesale market) can offset the increased cost of generation.

4. Conclusion

We find that the Daymark analysis applies modeling tools and methods that are consistent with standard practice for electricity sector pricing impact analyses and that their estimates of ratepayer impacts are reasonable for the illustrative PPA price scenarios examined by Daymark. Because the actual PPA bid price for the proposed project was not shared with IEc for the purposes of this review, we cannot comment on the transferability of Daymark's results to the proposed project.

Our review identified two minor limitations of Daymark's analysis: (1) their approach for calculating year-specific contract prices and (2) their assumption of a fixed value of 0.5 MWh per household for monthly electricity consumption. Both of these items are described above. The first leads to a slight overestimation of yearly contract prices and overestimation of ratepayer costs. In contrast, to the extent that building and transportation electrification lead to increased household demand for electricity over time, the second leads to underestimation of ratepayer impacts. In our view, these limitations are unlikely to affect the order of magnitude of the ratepayer impacts associated with the proposed offshore wind project.

Finally, we note that Daymark's estimates represent impacts relative to a baseline reflective of clean energy projects and initiatives that are currently in place, under development, or planned. Although Massachusetts and other New England states have made formal commitments to reduce the power sector's GHG emissions, Daymark's baseline does not include clean energy initiatives to fulfill these commitments, beyond those already in place, under development, or planned. We take no view on which baseline is more appropriate for this analysis, as both perspectives may provide useful insights to decisionmakers.