Addendum - Assessment of Potential Alternatives for Project 2015A in Peabody, Massachusetts

Prepared by Strategen Consulting
Maria Roumpani
Eliasid Animas

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Summary

The Massachusetts Municipal Wholesale Electric Company (MMWEC) is proposing to build Project 2015A, a nominal 60 MW natural gas and oil peaking power plant in Peabody, Massachusetts. The purpose of the project is to respond to a need for additional electrical generating capacity in the Northeast Massachusetts zone of the ISO-NE system, especially during periods of peak demand. Nonetheless, a peaking plant is not the only technology capable of providing peak capacity to the region, cleaner alternatives include energy from renewables, energy storage technologies, and the market.

In June 2021, Strategen assessed the economics of energy storage as an alternative to Project 2015A. The report provided information about the ability of energy storage to provide peaker plants, including a short list of recent energy storage projects that have been deployed to replace fossil-fueled peakers. The analysis concluded that energy storage is not only a viable replacement option for the needed capacity, but that it is also preferable from an environmental perspective and results in significant benefits for consumers, including cost savings and environmental justice issues.[1]

The purpose of this addendum is to explore yet another avenue for the replacement of project 2015A. Specifically, this analysis focuses on the purchase of capacity from the market. We find that the participating municipal light plants could fulfill their capacity obligations by buying capacity from the market at a lower cost than participating in Project 2015A.

ISO-NE Capacity Obligations & Prices

Project 2015A Capacity Obligations

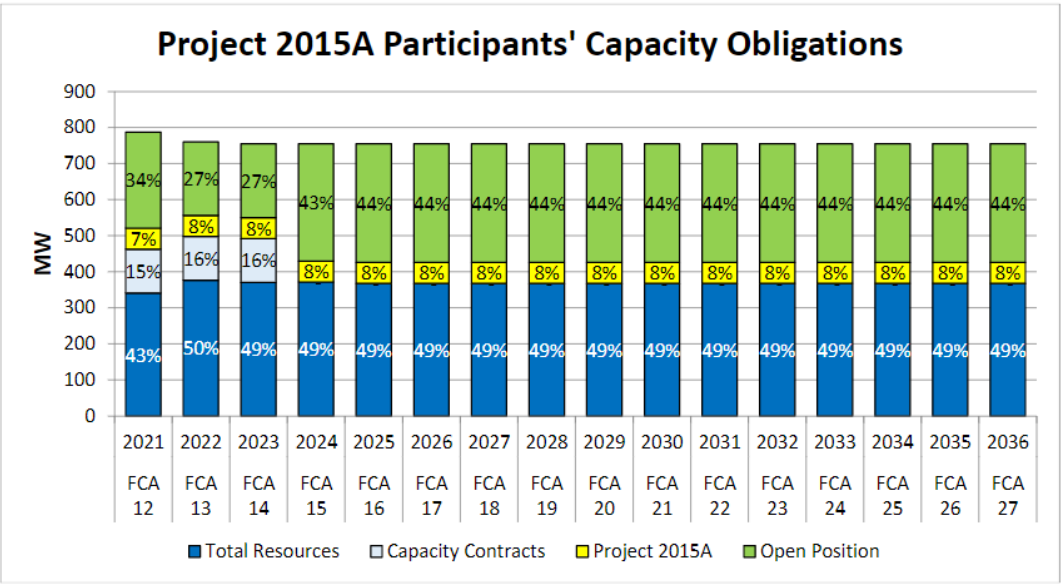
Project 2015A participants include 14 municipal light plants (MLPs), all of which, as load-serving entities are required to provide capacity to the Independent System Operator of New England (ISO-NE). The capacity provided should cover the MLP's peak load, plus a reserve margin. Project 2015A, a 60MW nominal capacity gas plant is projected to provide approximately 8% of the total Capacity Load Obligation of the Project Participants. Project 2015A has obtained a Qualified Capacity Value from ISO-NE's capacity qualification process totaling 57.97 MWs.[2] For the Capacity Periods after 2022, the Capacity Load Obligation of Project

[1] Strategen, 2021. Assessment of Potential Energy Storage Alternatives for Project 2015A in Peabody, Massachusetts

[2] DPU 21-29, Information Request DPU 1-7

2015A participants is expected to be 754.99MW. Thus, Project 2015A is expected to provide 7.68% of the participants' capacity load obligation as presented in the graph below.

Figure 1: Project 2015A Participants' Capacity Obligations[3]



Capacity Market in ISO-NE

Capacity prices in Massachusetts are set in the ISO-NE Forward Capacity Market (FCM), a long-term market that ensures resource adequacy, both zonally and for the ISO-NE system as a whole. The market is designed to promote economic investment in capacity resources when and where they are needed. Capacity assets that may participate in the FCM include new and existing resources, comprised of generating resources, imports, demand response resources, and energy efficiency resources.

To purchase sufficient capacity to satisfy the region's future resource adequacy needs and allow enough time to construct new capacity resources, Forward Capacity Auctions (FCAs) are held each year approximately three years in advance of the 12-month Capacity Commitment Period during which time the resources that clear in an FCA must meet their assumed obligation. Resources compete in the auctions to obtain a commitment to supply capacity in exchange for a market-priced capacity payment. Those that clear the auction receive a monthly capacity payment in that future year in exchange for their commitment to provide power or curtail demand when called upon by the ISO. The payments are in addition to the revenues those resources are eligible to receive in the ISO-NE energy and ancillary services and other markets.

New England's most recent annual capacity auction (FCA-15) for power system resources concluded in February 2021 with sufficient resources to meet peak demand in the 2024-2025 period. Clearing prices ranged from $2.48/kW-month in Northern New England to $3.98/kW-month in Southeast New England. FCA-15 indicates the first year that almost 600 MW of battery storage cleared the NE market including two new standalone projects: a 150 MW/300 MWh system near a cranberry bog south of Boston, Massachusetts and

[3] DPU 21-29, Joint Direct Testimony of Ronald C. Decurzio and Glenn R. Trueira, Attachment 6

a 175 MW/350 MWh battery in Gorham, Maine. The auction also included a significant increase in load management resources, including almost 170MW of new demand resources.

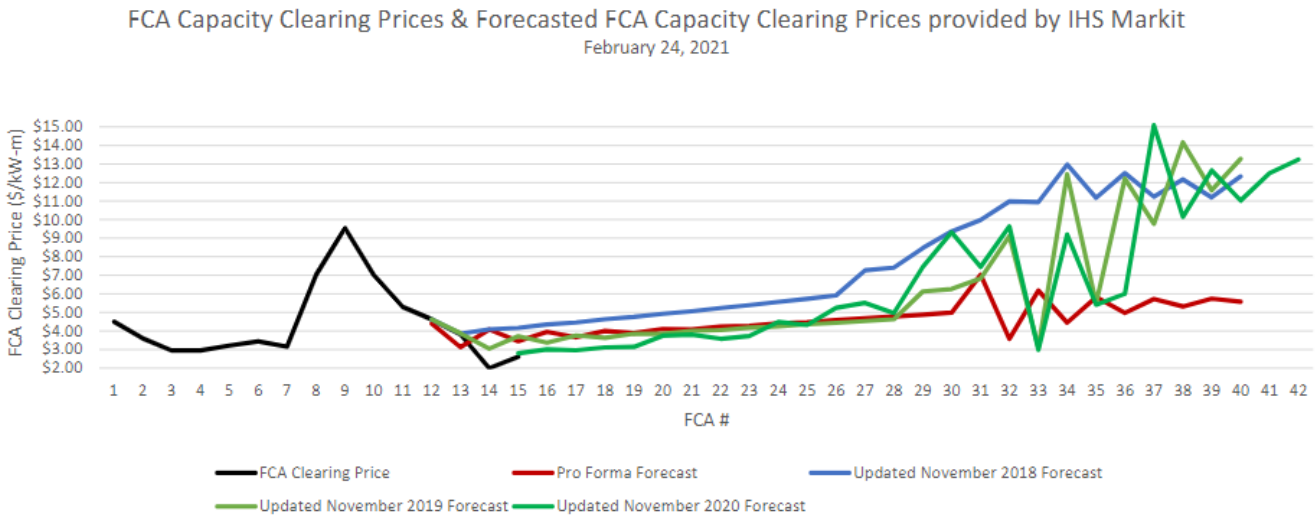
Analysis

In the original report, we compared Project 2015A with the alternative of installing energy storage and found that storage could outperform Project 2015A on a net cost basis, while also delivering environmental benefits. In this addendum, we explore the option of buying capacity from the market instead of participating in the 2015A project. For this, we compare the cost of constructing the gas unit versus the option of buying capacity from the market during the next ten years.

Developing price forecasts for future FCAs is a difficult exercise that includes several caveats. Market clearing prices are determined by changes in supply and demand. Supply changes include additions of battery storage, solar, wind, and natural gas-fired power plants, as well as retirements of older thermal generation plants and while clear trends exist for such changes, predicting unit additions and retirements on annual basis cannot be accurate. Policy changes or changes in participation rules can also significantly affect clearing prices.

However, MWECC has already provided a forecast (updated in November 2020) conducted by IHS Markit. We use this forecast to inform our analysis.

Figure 2: FCA Clearing Prices - IHS Markit Forecast[4]



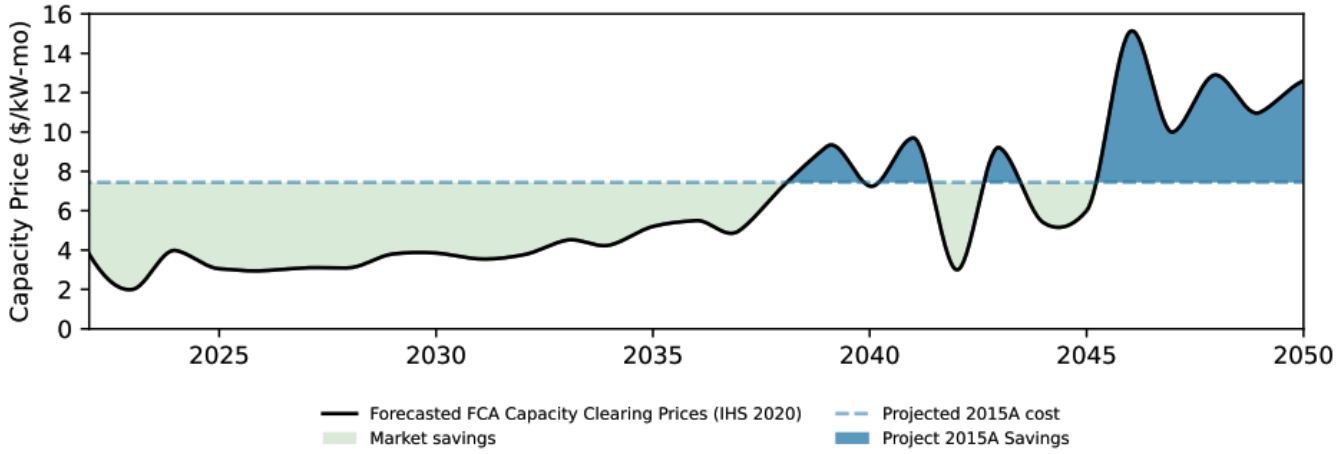
In this analysis, we compare the cost of $84.3 million[5] for constructing Project 2015A to the cost of buying from the market. Based on a useful life of 30 years, and a discount rate of 4.5%, we estimate the annualized payment for Project 2015A is approximately $5.175 million per year.

[4] DPU 21-29, Joint Direct Testimony of Ronald C. Decurzio and Glenn R. Trueira, Attachment 5

[5] DPU 21-29, Joint Direct Testimony of Ronald C. Decurzio and Glenn R. Trueira, Attachment 3

On the other hand, fulfilling a 57.97MW capacity need from the FCA would require a payment of approximately $1.4million in 2023 and $3.5 million in 2037, resulting in significant savings for the participating MLPs. In 15 years, expected savings for the MLP amount to over $29 million which approximately cover the termination costs for Project 2015A. Continued operations of Project 2015A post-2036 and up to 2050 would result in savings of approximately $23.5 million, as forecasted capacity prices increase in the last decade. The graph below shows that relying on the market results in savings during (approximately) the first 15 years, while there might be some additional costs in later years. It is important to recognize that projected capacity prices in those later years are highly uncertain. However, in reality, those high capacity prices might never materialize. MLPs will be paying for an expensive capacity resource having traded off significant short term costs for (highly uncertain) long term gains.

Figure 3: FCA cost versus Project 2015A cost



Project 2015A although assigned a 30-year useful life, will not be able to operate in 2050 and beyond without conversion or other costs to reduce its environmental impact. Thus, our finding that MLPs could purchase capacity from the market at a lower cost can be further emphasized if we assume a shorter and more realistic useful life for Project 2015A. Furthermore, withdrawing from Project 2015A could protect MLPs from budget overruns increasing their potential cost savings.

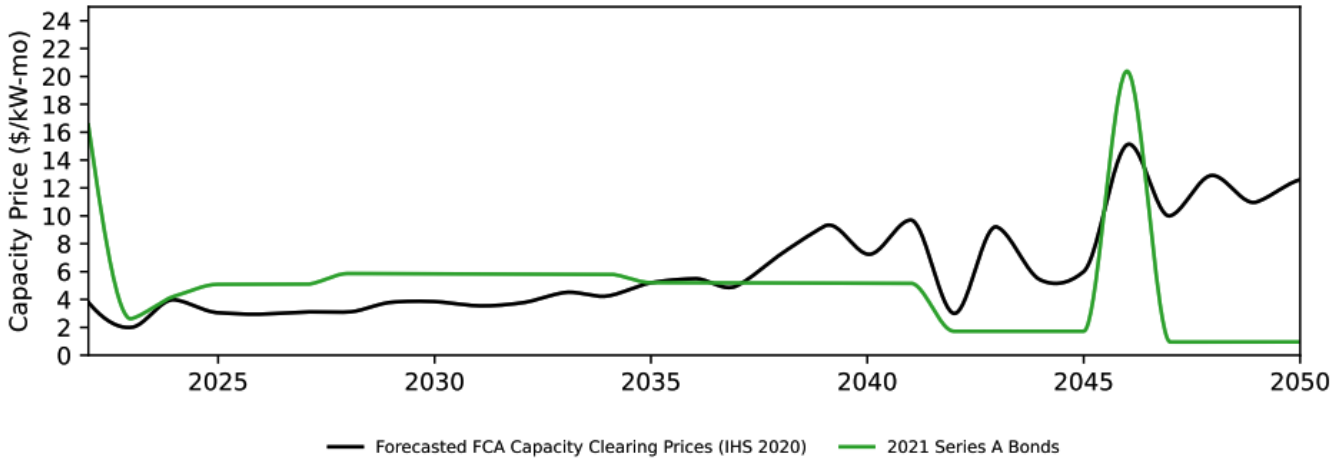
2021A Bonds

Project 2015A could be financed through the issuance of the Series 2021A Bonds.[6] Morgan Stanley & Co. LLC will act as the Underwriter for the Series 2021A Bonds. The Underwriter has agreed to purchase the Series 2021A Bonds from MMWEC at a purchase price of $73,218,857.73 which is the principal amount of the Series 2021A Bonds, less an Underwriter's discount of $285,642.42, plus an original issue premium of $12,654,500.15. This means that MMWEC will be receiving approximately $73 million. Additional funds of $10 million from Peabody Municipal Light Plant's (PMPL) capital contribution will be used to pay the costs of acquisition and construction. Even under the assumption that no additional funds will be needed, the issued bonds come at a total net present value cost of approximately $60 million plus the use of PMLP's $10 million, contribution, which again exceeds the cost of buying from the market (even under the most Project 2015A-

[6] Project 2015A Bonding

favorable scenario of high-capacity prices, no budget overruns, and no incremental capital expenses for a 30-year life, despite the state's 2050 commitment). The graph below shows the cost of buying from the market versus the payments MMWEC will have to make including principal amounts and interest (and PMPL's capital contribution in 2022).

Figure 4: FCA cost versus Bond Payments



Operating Revenues and Costs

Our analysis does not include energy costs, primarily because Project 2015 is projected to be a capacity resource. According to MMWEC, Project 2015A is a capacity resource, not an energy resource, as it is expected to run approximately just 239 hours per year, or 2.72% of the time.[7] Thus, the comparison focuses on the capital cost of constructing Project 2015A. However, on a net cost basis, we would also need to account for revenue from the participation of Project 2015A in markets other than capacity, as well as the additional costs of operating the unit. ISO-NE engaged Concentric Energy Advisors (CEA) to conduct an independent analysis of the cost of new entry values for different technologies, which can be used to provide estimates of those parameters.[8,9] The CEA analysis finds that a simple cycle unit could have additional revenues from market participation as well as significant operating costs. Additional revenues and operating costs are projected to be approximately the same and as such do not have an impact on the findings of this report.[10]

[7] Project 2015A Frequently Asked Questions, Slide 21

[8] Concentric Energy Advisors, Mott MacDonald, ISO-NE Net CONE and ORTP Analysis, September 2020

[9] The CEA analysis uses a number of slightly different parameters: for example, different projected capacity factors for a simple cycle unit. Still, the projections can be used as rough estimates of additional revenues and costs. Project 2015A with a lower projected capacity factor is expected to result in even lower revenues (and consequently higher net costs).

[10] Table 35: Summary of Revenue Offsets for Candidate Reference Units (2025$/kW-mo) projects pay for performance revenues of $0.843/kW-mo, scarcity revenues of $1.082/kW-mo, Energy & Ancillary Services (E&AS) revenues of $2.548/kW-mo for units with a capacity factor of 4-5%, and ISO-NE Energy Security Improvements Revenues of $0.447/kW-mo. Scaling down the EA&S from the CEA model (https://www.iso-ne.com/static-assets/documents/2020/11/a4_a_i_cone_ortp_dispatch_models.zip) to Project 2015A's projected capacity factor results in $1.60/kW-mo E&AS revenue and total revenue of $3.98/kW-mo (all values expressed in in 2025$). Table 18: Total Fixed O&M Components projects fixed costs of $47.95/kW-yr ($4/kW-mo). Thus, project revenues and operating costs are projected to be approximately the same and as such do not change the findings of this report.

MMWEC has provided a graph similar to Figure 3 with a significantly lower cost associated with the construction and operation of Project 2015A.[11] The MMWEC graph includes potential revenues but fails to explain whether operating costs are also included. No information is provided about the cost estimate. Furthermore, it is unclear whether the time value of money is included in the analysis.[12]

Our analysis does not include environmental benefits, as when capacity or energy is bought from the market, the replacement resource for Project 2015A cannot be clearly defined. However, with a net zero target for 2050, we can conclude that the energy mix in the market will have a decreasing emissions rate and as such has the potential of environmental benefits compared to the proposed gas unit.

Capacity Price Sensitivity

As previously stated, forecasting capacity prices for the next 30 years is very challenging, however, it is a crucial input in the comparison of Project 2015A versus the alternative of fulfilling capacity obligations through the capacity market. For this reason, we provide an additional data point to inform our findings.

ISO-NE developed the 2021 Avoided Energy Supply Component (AESC) Study (AESC 2021). The study was sponsored by a group representing all of the major electric and gas utilities in New England as well as efficiency program administrators, energy offices, regulators, and advocates. AESC 2021 contains cost streams of marginal energy supply components that can be avoided in future years due to reductions in the use of electricity, natural gas, and other fuels as a result of program-based energy efficiency or other demand-side measures across all six New England states.[13] To determine the values of energy efficiency and other demand-side measures, avoided costs, including capacity costs, are calculated and provided for each New England state in four hypothetical futures (counterfactuals) in which the New England program administrators do not install any new demand-side measures in 2021 or later years.

These hypothetical futures are not forecasts. Each of them represents a future that lacks some amount of anticipated demand-side measures. Furthermore, as is true for all scenarios, actual prices in the future will be different than the long-term prices calculated in the AESC study since true prices will be subject to short-term variations in energy markets that are not known at this point in time.

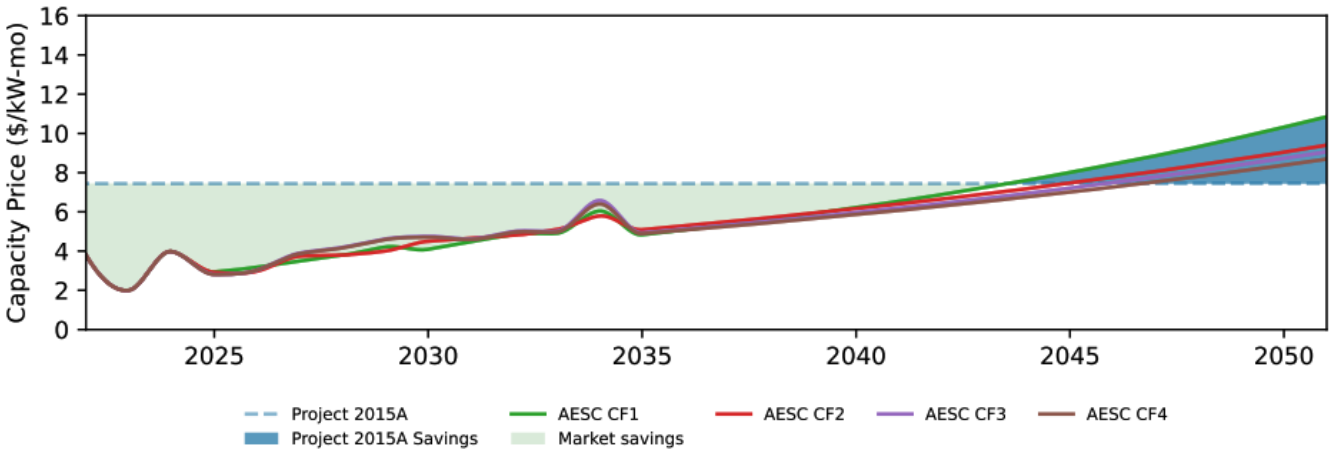
Based on capacity prices of counterfactual #1, which represents a future in which program administrators install no new energy efficiency, building electrification, or active demand management (demand response and energy storage) resources in 2021 or later years (and as such is the counterfactual with the highest capacity prices), MLPs would significantly benefit from withdrawing from Project 2015A. Specifically, capacity prices under counterfactual #1 result in potential savings approximately equal to the project's termination fees within the next 20 years. Savings are very similar under all counterfactuals.

[11] Project 2015A Frequently Asked Questions, Slide 17

[12] For example, the projected $84 million cost financed through 30-years 4-5% bonds (DPU 21-29, Information Request DPU 1-13) with equal annual principal amounts would result in undiscounted costs of over $140 million (an estimate close to the cost outlined by MMWEC in the graph). This estimate does not include any operating and maintenance, incremental capital, or other costs, and as such cannot be used to inform a cost comparison when revenues are included.

[13] Avoided Energy Supply Components in New England: 2021 Report

Figure 5: Project 2015A cost versus AAESC counterfactuals



Since those futures do not account for portions of the expected demand-side resources, actual capacity prices could be lower. Consequently, savings from buying from the market (versus constructing 2015A) could be even higher.

Conclusion

In a June 2021 report, Assessment of Potential Energy Storage Alternatives for Project 2015A in Peabody, Massachusetts, Project 2015A was compared against the alternative of energy storage and was found to be more expensive and environmentally harmful. In this addendum, we compare the cost of constructing the unit with buying capacity from the market. We find that participating MLPs stand to benefit from significant cost savings if they withdrew from the Project and purchased capacity from the market.