COMMONWEALTH OF MASSACHUSETTS

DEPARTMENT OF PUBLIC UTILITIES

Petition of Massachusetts Wholesale Electric Company for Authorization and Approval to Issue Bonds, Notes and Other Evidences of Indebtedness in an Amount not to Exceed $170,000,000 Pursuant to St. 1975, c. 775, §§ 5(p), 9, 11, and 17	)	**D.P.U. 21-29**

INITIAL BRIEF
OF MASSACHUSETTS CLIMATE ACTION NETWORK, INC.

I. INTRODUCTION

The Massachusetts Climate Action Network, Inc. ("MCAN") submits this Initial Brief pursuant to the Department of Public Utilities' ("Department") schedule as set forth in the Hearing Officer's Memorandum dated July 20, 2021.[1]

On March 3, 2021, the Massachusetts Municipal Wholesale Electric Company ("MMWEC" or the "Company") filed a petition (the "Petition") with the Department seeking approval to issue revenue bonds, notes, or other evidences of indebtedness in an amount not to exceed $170,000,000 pursuant to St. 1975, c. 775, §§ 5(p), 9, 11, and 17 ("Financing Request"). These bonds would be issued to finance a 60 MW dual fuel gas-fired peaking electric generating unit ("Project") pursuant to Power Sale Agreements executed by each of fourteen MMWEC municipal light plant Project Participants ("Project Participants"). The Department docketed this matter as D.P.U. 21-29.

As set forth below, MCAN's review in this case was restricted by the Hearing

[1] On April 23, 2021, the Hearing Officer established the schedule for briefing with the submittal of the initial brief due May 13, 2021. As MMWEC requested, the schedule was amended following a two-month "pause" with submittal of the initial brief due on July 29, 2021.

Officer's decision to unfairly deny MCAN any meaningful right to intervene and participate as a party[2] and its failure to fully evaluate the Project at the evidentiary hearing held on April 26, 2021.[3] Nevertheless, it is evident from even a cursory evaluation of the available record that MMWEC failed, as part of its assessment of the Project, to (i) fully consider the Global Warming Solutions Act , St. 2008, c. 298, ("GWSA") and the recently enacted Act Creating a Next-Generation Roadmap for Massachusetts Climate Policy, Chapter 8 of the Acts of 2021 ("Roadmap") and account for the net zero emissions goal of the Commonwealth, (ii) adequately assess available alternatives to the Project, including options that would be available to meet capacity (assuming such a need was demonstrated); (iii) compare the costs of this Project to other possible alternative resource options; (iv) analyze the risk that the Project would be a stranded cost and contribute to climate change; and (v) evaluate the environmental justice implications. Accordingly, as set forth fully below, MMWEC did not meet its burden of proof to demonstrate that the Project is in the public interest as required by the applicable

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[2] On April 23, 2021, MCAN appealed the Hearing Officer's denial of MCAN's Petition to Intervene to the Department. The Department's determination is pending. MCAN reiterates its request to intervene as a full participant in this docket.

[3] Following MMWEC's update on July 15, 2021, in its letter dated July 19, 2021, MCAN reiterated its request to intervene and requested that the Department reopen the hearings to allow for a more detailed review of the Project and alternatives as well as a review of the environmental justice implications of the Project in Peabody. On July 20, 2021, the Hearing Officer denied MCAN's request indicating that MCAN's requested review of MMWEC's assumptions regarding, among other things, project economics, alternatives, and environmental justice "are outside the scope of this proceeding." Hearing Officer Memorandum at 2, fn. 1. As set forth herein, these topics are relevant to this financing, and the Hearing Officer erred in her decision to limit the scope and not reopen the hearings.

statutory framework.[4]

II. STANDARD OF REVIEW

In order for the Department to approve the issuance of bonds by MMWEC, the Department must determine that the proposed borrowing is *reasonably necessary* to accomplish some legitimate purpose in meeting MMWEC's service obligations, pursuant to St. 1975, c. 775, §§ 11, 17.[5] Fitchburg Gas & Electric Light Company v. Department of Public Utilities, 395 Mass. 836, 842 (1985) ("Fitchburg II"), citing Fitchburg Gas and Electric Light Company v. Department of Public Utilities, 394 Mass. 671, 678 ("Fitchburg I"). The courts have found that, for the purposes of St. 1975, c. 775, §§ 11 and 17, "reasonably necessary" means "reasonably necessary for the accomplishment of *some purpose having to do with the obligations of the company to the public and its*

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[4] MCAN's evaluation is constrained by the limited information presented in this case and its inability to participate as a full party. It does not waive any rights to address other issues or to further consider any of the issues briefed in the event this proceeding is appealed. Indeed, with an opportunity to fully participate as a party, as noted in its Petition to Intervene and in its Appeal of the Hearing Officer's Ruling, MCAN would have undertaken discovery, cross-examined witnesses, accessed the full unredacted record and sponsored a witness. With full participation, MCAN would have provided additional information in the proceeding (and in this brief) regarding significant issues not otherwise fully available for review. As set forth in MMWEC's update, the Project has been delayed until 2023, and so there is ample time for a full review and for specific consideration of non-fossil alternatives as requested herein.

[5] St. 1975, c. 775, §11, provides, in pertinent part: "[MMWEC] may issue refunding bonds for the purpose of paying of its bonds at maturity or upon acceleration or redemption, subject to the approval of the [D]epartment under this act."

St. 1975, c. 775, §17, provides, in pertinent part: "[MMWEC] shall issue only such amount of bonds as the [D]epartment may from time to time vote is reasonably necessary for the proposed purpose of such issue, and such approval shall be subject to such reasonable terms and conditions as the [D]epartment may determine to be in the public interest; provided, however, that where such bonds are payable at periods of not more than one year after the date of issue, approval of such issuance by the [D]epartment shall not be required."

ability to carry out those obligations with the greatest possible efficiency." Fitchburg II, citing Lowell Gas Light Company v. Department of Public Utilities, 319 Mass. 46, 52 (1946) ("Lowell Gas") (emphasis added). The Fitchburg I and II and Lowell Gas cases also established that the burden of proving that an issuance is reasonably necessary rests with the petitioner and that the Department's authority to review a proposed issuance "is not limited to a 'perfunctory review.'" Fitchburg I at 678; Fitchburg II at 842-43 (citations omitted).

Thus, pursuant to St. 1975, c. 775, § 17, the Department is required to undertake a thorough, i.e., not perfunctory, examination of the financing application to determine whether the financing is in the "public interest." Fitchburg II at 842 (1985). The Department must not only determine whether the amounts are reasonably necessary but must also decide whether the *purposes themselves are reasonably necessary*. Id. at 844. As set forth in Fitchburg II, the scope of this review is well-established, and includes an evaluation of the economics of the project, including the underlying costs because "individual issuances could not be determined to be reasonably necessary" and "would be meaningless" without accurate and reliable underlying information. Id. at 846. Moreover, the Court has also determined that the Department should evaluate the "risk involved", including, for example, the "degree of risk associated with increased costs and the potential for future abandonment", e.g., stranded costs. Id. In addition, under the applicable standard, the Department should fully examine MMWEC's explicit claims that the Project is consistent with the Commonwealth's decarbonization goals and is a necessary lowest cost capacity resource providing price stability for customers. Exh. MMWEC-3, at 4-6.

Given the precedent, a detailed review of MMWEC's Project is essential since there is no other opportunity for the Department to assess whether MMWEC's activities are in the public interest. MMWEC should not be allowed to avoid scrutiny because this is a "financing proceeding" or because it is "public entity"; to the contrary, this proceeding, *as the only available mechanism to review of MMWEC's activities*, is a fundamental component of the Department's responsibility to serve the public interest. As the Court stated in holding MMWEC subject to a detailed review pursuant to St. 1975, c. 775, § 17: "MMWEC is different from the investor-owned utilities in at least two relevant respects. The rates paid by municipal light department customers as a result of participation in an MMWEC project are not subject to departmental review. Thus, the department does not have any opportunity, as it would with [a public utility] to consider ameliorating the impact of any rate shock. Secondly, MMWEC has no stockholders, other than its ratepayers, to decide whether the risk of continued participation in a project is warranted and, if so, to bear a portion of the risk." Fitchburg II at 854-855.[6] The Court noted that the Legislature did not intend to apply a less demanding standard to MMWEC as compared to an investor-owned utility. Id. at 842-43.

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[6] Nor is the fact that the Department may have approved MMWEC's requests in the prior cases dispositive. Exh. MMWEC-1, Att. 8. The Court rejected a similar argument: "MMWEC's similar contention that, because it relied on prior [D]epartment approval in entering into contracts which created ownership obligations, issuance of the MMWEC bonds must be authorized as reasonably necessary. First of all, we do not consider the department's reasonable exercise of its authority under G.L. c. 164, § 14, or St. 1975, c. 775, § 17, to be subject to amendment through contract by those it is intended to govern. In addition, if ever we were inclined to apply principles of estoppel to public utilities, we should certainly not do so in a case such as this where application of those principles would tend to negate requirements of law intended to protect the public interest." Fitchburg II at 856-857.

Essentially, MMWEC's unique position as a non-public utility public entity compels a comprehensive review here. There is no other recourse for its customers. The Court was clear that these types of reviews are meant to serve as "a screening mechanism 'to shield the public from the effects of management's unchecked discretion in the limited realm of capital spending projects that are so large in relation to the company's internal funds as not to be sustainable without external financing.'" Id. at 858.

Indeed, MMWEC's proposal ignores what can only be characterized as an extraordinary climate emergency in 2021 and the overwhelming consensus that the detrimental impacts of climate change on the health and well-being of all residents of the Commonwealth, including the very communities that MMWEC purports to serve, need to be addressed now. MMWEC's petition to finance and construct a fossil fuel based generating facility (even assuming a need which may not exist) signifies a total failure of leadership and represents an extraordinary threat to the local community. The Department, as noted above, has the power to undertake a meaningful review of MMWEC's Project and has exercised its significant supervisory powers in similar cases in the past.[7]

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[7] The Department has recognized its long-standing authority to undertake a detailed review of MMWEC's financing requests and to examine specific project assumptions as part of its evaluation. See Petition of Canal Electric Company, Fitchburg Gas and Electric Light Company, Massachusetts Municipal Wholesale Electric Light Company and New England Power Company, D.P.U. 84-152, (1985) and the cases cited therein. In that case, the Department considered its role in reviewing MMWEC's financing requests under Chapter 775 of the Acts of 1975 and determined (as did the Court in Fitchburg II), that its deference to MMWEC as a public entity was not absolute. The Department evaluated the changed circumstances since the PSAs were signed, evaluated the underlying costs and risk of the generating project under review, and following a full consideration of the public interest concerns, rejected the financing as requested. Id. at 74-78. In this case, the recognized realities of climate change as set forth below are at least as significant as the factors

As is set forth below, MMWEC has failed to meet its burden to demonstrate that the Project is in the public interest as required by St. 1975, c. 775, § 17 and by the Court. The Company has failed to prove that the Project (1) is consistent with the GWSA and Roadmap Legislation; (2) compares favorably to the range of alternative options reasonably available to the Company and its customers, including net zero options; (3) is cost effective; (4) does not pose an inordinate risk to customers, and (5) serves the environmental justice community. Accordingly, the Department should deny the Company's request for financing.

III. ARGUMENT

A. Introduction

The Project, initially planned in 2015, is to be located in Peabody, Massachusetts at the location of the Peabody Municipal Light Plant ("PMLP") Water River Station. Exh. MMWEC-1, Att. 2.[8] MMWEC will use the parcel pursuant to a License and Use Agreement. Id.

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considered in D.P.U 85-152, and the Department should, consistent with its precedent, undertake a detailed assessment of MMWEC's proposal to fully consider zero-emission alternatives to the Project and environmental justice impacts. Significantly as well, as noted in D.P.U 85-152, the Department allowed full participation as intervenors by informed stakeholders and its decision adopted many of the intervenors' arguments and recognized the value of full stakeholder participation. The Department's failure here to conduct a wide-ranging review and allow meaningful intervention is inconsistent with its precedents and with its obligation to serve the public interest.

[8] The legal and regulatory landscape has evolved significantly since this Project's inception in 2015. In 2015, there were still unresolved questions with respect to DEP's authority (and responsibility) to set emission limits as required by the Global Warming Solutions Act (addressed in Kain v. Department of Environmental Protection, 474 Mass. 278 (2016) ("Kain"), which held that DEP was required to promulgate regulations) and whether the Act would "sunset" in 2020 as the New England Power Generators Association ("NEPGA") asserted (addressed in NEPGA v. Department of Public Utilities, 480 Mass. 398 (2018) where the Court noted the Act

As originally proposed, the Project would consist of a single-cycle combustion turbine generator primarily fired with natural gas, with ultra-low sulfur distillate ("ULSD") as the backup fuel. Id. The entire configuration would include the gas turbine, an SCR (or selective catalytic reduction) system with an ammonia (or Urea injection skid; an oxidation catalyst system; a 90-foot-tall exhaust stack; and other supporting ancillary equipment including USLD storage and an electric-powered natural gas compressor. Id.[9] In its supplemental submittal filing on July 23, 2021, MMWEC stated that it would not install a 200,000 gallon oil storage tank and use urea, and not ammonia, as a scrubbing agent. Supplemental IR DPU 2-1 (July 23, 2021). The facility is proposed to operate no more than 1,250 hours per year, with ULSD firing limited to 250 hours per year.[10] Exh. MMWEC-1, Att. 2.

The cost of the Project will be passed onto the customers in the participating municipal light plants cities and towns. Project Participants have executed Power Sales Agreements ("PSAs") whereby each participant is obligated to purchase and pay for the

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did not sunset). Both Kain and NEPGA are discussed in detail below. In addition, since 2015, the Commonwealth and the federal government have recognized the need to restrict the fossil based emissions in the electric sector in response to what is now recognized as a climate emergency. Had MCAN been allowed to fully participate in this case, it would have presented information (directly and in cross-examination of the Company's witnesses) about the change in circumstances and the need to restrict the continued development of fossil facilities given the climate crisis, an aim reinforced in the new Roadmap Legislation.

[9] Natural gas will be provided to the Unit using a natural gas connection available on the Waters River Station site. The Unit will interconnect with the regional high voltage transmission system by connecting into the existing PMLP-owned and operated substation. Exh. MMWEC-1, Att. 2.

[10] MMWEC has not explained whether it would still planned to use oil back up and whether that may be available from other storage tanks on the site. Similarly, MMWEC has not explained whether and to what extent its planned changes would require a revisions of its air permit. See Supplemental IR DPU 2-6.

cost of Project.[11] Exh. MMWEC-1, at 28-29. Specifically, the take or pay obligations in the PSAs obligates each member participant to bear the costs of the Project "whether or not the capacity resource is 'undertaken, completed, operable or operating and notwithstanding the suspension, interruption, interference, reduction or curtailment of the output of the [facility]'". Id. at 29. Under the PSAs, Project Participant customers are responsible for the costs associated with this project and rates must be "set … at levels sufficient to enable Project Participants to meet their unconditional payment obligations under the Project PSAs." Id.[12]

MMWEC's witnesses promote the Project as a capacity resource in ISO-NE's forward capacity market ("FCM"), necessary to provide electric power during periods of peak demand. Exh. MMWEC-1, Att. 2; see also Exh. MMWEC-3, at 4-6. MMWEC claims that its investment in a gas burning peaking facility with oil back-up will "accommodate the growth of renewable and non-carbon emitting sources in the region". Exh. MMWEC-1, at 33. It also asserts that the Project is consistent with its obligations under the GWSA and the recently passed Roadmap mandating a reduction in carbon emissions. Exh. MMWEC-1, at 34; Exh. MMWEC-3, at 19-20. Although it admits (as it must) that the Project is a carbon emitting resource, it claims that its proposal is justified

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[11] Notwithstanding MMWEC's claim that the resource is essential, a significant number of MMWEC's members have not joined in support of the Project. Most recently, and during the pendency of this case, two of the 14 participants have notified MMWEC of their intent to withdraw from the Project as it is "no longer part" of their long-term plans. See filings of Holyoke Gas and Electric Department, and Chicopee Municipal Lighting Plant as submitted in this docket.

[12] In short, municipal light plant customers are responsible for Project costs and bear the regulatory and financial risks associated with the Project if approved by the Department. Customers are not protected from unnecessary costs or operational changes, e.g., stranded costs or emission restrictions that may result from future policies imposed by the Commonwealth to limit the use of fossil fuels.

because the Project has cost benefits to consumers, and it serves capacity, not energy needs. Exhs. MMWEC-3, at 5, 9-13, 18-19; MMWEC-1, at 33-37. Moreover, as further justification, MMWEC purports that the ISO-NE market structure, which routinely provides the resources for energy use in New England for MMWEC and other load serving entities, is inadequate. Exhs. MMWEC-3 at 10-14; MMWEC-1, at 24-25, 33-37.

MMWEC's claims that the Project is reasonably necessary for its purpose are without merit. The Project is wholly inconsistent with the Commonwealth's Legislation mandating net zero targets and designed to address climate change, and MMWEC has not provided credible evidence that this Project, as compared to alternatives, is least cost or presents an acceptable risk to customers. MMWEC has not sustained its burden to demonstrate, as it claims, that the Project is consistent with each participant's obligations to "provide its customers with electricity at the lowest possible cost and provide rate stability." Exh. MMWEC-1, at 20. Accordingly, for the reasons set forth below, the Department, pursuant to its authority as set forth in Fitchburg II, should determine that MMWEC has not met its burden to demonstrate that the Project is in the public interest.

B. MMWEC Has Not Demonstrated that the Project Is in the Public Interest.

This is not a business as usual financing. MMWEC seeks approval of a gas-fired, greenhouse gas emitting, generation facility in the midst of a climate emergency and at the same time the Massachusetts Legislature has enacted ground breaking legislation restricting such facilities. The landscape has completely changed since the Project was initially planned in 2015.

Nevertheless, as justification for its proposal, MMWEC cites to generalized ISO-NE market conditions, unsupported capacity deficiency claims, unquantified cost

benefits, and a nebulous and facially suspect theory that building a carbon emitting facility actually promotes renewable development. It fails to evaluate resource options, ignores real risks to its customers and discounts the environmental impacts and environmental justice implications of the Project on the residents of Peabody. MMWEC has simply not supported its claim that the Project is in the public interest.[13]

1. The Climate Crisis Is Real and the Legislature Has Restricted Construction of Fossil Generation such as the Project

Although the purported benefits of MMWEC's Project are abstract, the nature of the climate crisis is very real. The Legislature, since 2008, has promulgated legislation designed to protect the health and welfare of all citizens of the Commonwealth from the harmful impacts of climate change. The GWSA was explicitly passed to "address the grave threats that climate change poses to the health, economy and natural resources of the Commonwealth." NEPGA at 399 (citations omitted).[14] As the Court in NEPGA noted: "The act is designed to make Massachusetts a national, and even international,

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[13] As MCAN noted in its Petition to Intervene: MMWEC argues that in order for the Commonwealth to meet its non-carbon emission goals, MMWEC must build and the Commonwealth must approve, a carbon-emitting facility. MMWEC's argument is disturbingly absurd given the Commonwealth's legislative and regulatory commitments that now mandate municipal light plants to reduce carbon emissions in the near term and comply with a statewide zero emissions standard by 2050. The Company's presentation of the Project as least cost, reliable, and flexible, and therefore beneficial to the Company's customers is inconsistent with the Commonwealth's goals to reduce fossil emissions and should be rejected in this case. Exhs. MMWEC-1, at 33-36; MMWEC-3, 10-13.

[14] The GWSA "was developed against the backdrop of an emerging consensus shared by a majority of the scientific community that climate change is attributable to increased [greenhouse gas] emissions, as well as perceptions in the Commonwealth that national and international efforts to reduce those emissions are inadequate." NEPGA at 400 (quoting Kain at 281.). The GWSA "established a comprehensive framework to address the effects of climate change in the Commonwealth by reducing emissions to levels that scientific evidence had suggested were needed to avoid the most damaging impacts of climate change." Id. (quoting Kain at 281-82.)

leader in the efforts to reduce the greenhouse gas emissions that cause climate change." Id. It thus establishes significant, "ambitious," legally binding, short- and long-term restrictions on those emissions. G. L. c. 21N, §§ 3, 4. See Executive Order No. 569 (Sept. 16, 2016).

The GWSA is most applicable to the electric sector (and to MMWEC's proposal) and requires a review of whether the Project is consistent with the GWSA's fundamental purpose of "reducing greenhouse gas emissions, and combating climate change in Massachusetts." NEPGA at 405 (citations omitted).[15] The Court recognized the significant role of the electric sector's contributions to greenhouse gas emissions and the critical need to reduce emissions. As the Court stated: "The electric sector's transition away from fossil fuels is critical to reaching the sustainable future that the act envisions. Presently, the electric sector accounts for approximately twenty percent of Statewide greenhouse gas emissions. Given that the electric sector is one of the largest in-state greenhouse gas emission sources, it would make little to no sense for the Legislature to have excluded it from the critical emission reduction requirements set out in [c. 21,] § 3(d). There is also no express exclusion of the electric sector from § 3(d)." Id. (citations omitted).

Nor is the move toward electrification any justification to expand emissions from the electrical section. The expansion of the electrical sector will require more vigilance to control fossil emissions. In order to achieve its goal of reducing emissions by at least eighty percent by 2050, "`the Commonwealth must achieve a significant reduction in

[15] "The [GWSA] is one of the primary mechanisms for achieving reductions in emissions, and is the sole piece of legislation authorizing the establishment of legally binding limits on those emissions in the Commonwealth." Kain at 282 (citations omitted).

[greenhouse gas] emissions from transportation, the heating of buildings, and the electric sector. Because a significant percentage of vehicles and building systems must be electrified as a way to reduce [greenhouse gas] emissions,´ cutting emissions from the electric sector is a crucial initial step to achieving long-term progress in combating climate change." Id. at 405-06. (citations omitted). The Court was clear: "The act is designed to go well beyond business as usual in terms of reducing emissions: to upend, rather than to uphold, the status quo. The electric sector is no exception." Id. at 406.

The recently enacted Roadmap underscored the Legislature's ongoing commitment to address the impacts of climate change and to further restrict the continued development of fossil fuel facilities like the Project. The Roadmap regulated municipal light departments and directed municipal lighting plants (MMWEC's members) to establish and comply with a new greenhouse gas emission standard with sets minimum percentage of non-carbon emitting energy "sold [] to all retail end-user customers" with "energy sales achieving net-zero greenhouse gas emissions by 2050." See Roadmap, Section 33. Non-carbon is defined to include numerous generation technologies but does not include a new single-cycle gas-fired generation project. Id. Indeed, with respect to natural gas thermal generation, such as proposed in the instant case, the Legislature created a pilot program designed to demonstrate, among other things, *the feasibly of* ***replacing gas-fired thermal generation*** with "renewable thermal energy sources, systems, and technologies capable of substituting for fossil based natural gas." See Roadmap, Section 99 (emphasis added). Moreover, the Legislature reiterated its concerns about the public health impacts of "climate change, air pollution" and expressed

the need for an expanded review and environmental justice assessment of facilities like the Project. Roadmap, Sections 56 and 57.

In passing the GSWA and the Roadmap, the Legislature was well aware of ISO-NE, the FCM, RGGI, MMWEC, municipal light departments and other material components of the electric power sector markets. The Legislature imposed limitations on fossil generation and the electric sector understanding how energy markets function and appreciating that regulated utilities, generators, MMWEC, and ISO-NE operating in those markets would have to comply with additional restrictions in order to mitigate the impacts of climate change and associated health impact. The Legislature assumed that regulators, including the Office of Energy and Environmental Affairs, the Department of Environmental Protection, and the Department, would enforce the Legislature's mandate and intent, undertake a meaningful review of proposed projects, and promulgate necessary regulations. The Roadmap explicitly requires that the Department, as part of its specific responsibilities to, among other things, "prioritize [] reductions in greenhouse gas emissions to meet statewide greenhouse gas emission limits and sublimits pursuant to Chapter 21N." See Roadmap, Section 15. The Legislature clearly understood and expected that the purported vagaries of the market would not serve as an excuse, as MMWEC seems to suggest, for promoting a fossil emitting resource.

2. MMWEC's Proposal Is Inconsistent with the GWSA and Roadmap

As part of its assessment of whether MMWEC's proposal is in the public interest, the Department must determine whether the development of a new fossil fuel plant is consistent with the GWSA and the Roadmap. Notwithstanding MMWEC's claim to the contrary, MMWEC's filing does not address climate change or the requirements of the

GWSA and the Roadmap. In a few pages of Mr. Hibbard's testimony,[16] MMWEC provides no specific information about how the Project will comply with the revised emission limits required by Roadmap, particularly with its clear promotion of "non-fossil thermal generation" and with its concerns regarding the "environmental justice population." MMWEC's repetitive reliance on the purported deficiencies in the capacity market and the need for a "capacity resource" are insufficient to support any conclusion that this Project is consistent with the GWSA and the Roadmap.[17] As noted, we can assume that the Legislature was aware of the operation of that capacity market in enacting the GWSA and the Roadmap.

There is a compelling need for the Department to act in this case. As set forth in Section III.B.4 below, the emissions from the Project are significant and MMWEC's

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[16] While Mr. Hibbard recognizes the importance of the Commonwealth's pathway to net zero emissions, he incorrectly continues to insist that the Project, as a peaking resource that "will operate in limited hours of the year", is consistent with that goal. Exh. MMWEC-3, at 19-22. His argument that installing another carbon emitting generation unit that produces significant emissions will not add emissions because it will displace other even dirtier generation is not a rationale that regulators should accept in 2021 to address a "climate emergency". That rationale would support the construction of an entire fleet of new gas generation to displace less efficient existing gas generation with the net effect that significant fossil generation will continue. The solution, as noted here and as set forth in the Roadmap, is to replace fossil generation with non-fossil generating options as quickly as possible.

[17] MMWEC's criticism of the capacity market is unavailing. The market provides a robust opportunity for the development of renewable resources to replace fossil fuel based generation, including energy storage projects. Since 2015, approximately 20 MW of grid-scale battery-storage projects have come online in ISO NE, more than 600 MW are planned, and that number will keep growing, under state mandates like Massachusetts' statutory goal of 1,000 MWh of energy storage by the end of 2025. Energy Storage Initiative (https://www.mass.gov/energy-storage-initiative). As of February 2021, nearly 3,000 MW of grid-scale stand-alone energy-storage projects were requesting interconnection. Resource Mix (https://www.iso-ne.com/about/key-stats/resource-mix/). Even assuming a need for an additional peaker, the market provides a clear mechanism MMWEC to develop a non-fossil alternative.

proposal seemingly ignores that the Legislature just reset the emission goals in the Commonwealth to *net zero greenhouse gas emissions* in 2050. Roadmap, Section 8. In order to meet that goal, there is no time to waste and the first year (this year) is critical in order to achieve the long term goal.[18] Indeed, if MMWEC's rationale is accepted, virtually every generator/developer, citing the capacity market as justification, would be able to develop and construct a peaking fossil generating unit. This scenario would create an absurd result: a long-term 2050 statewide emissions goal without any mechanism to reach it. See Flemings v. Contributory Retirement Appeal Bd., 431 Mass. 374, 375-376 (2000) ("If a sensible construction is available, we shall not construe a statute to make a nullity of pertinent provisions or to produce absurd results").

Simply stated, MMWEC has not met its burden of proof to show that its Project is consistent with the GWSA and the Roadmap. Emphatically, given the recognized climate emergency, the Legislature does not condone the building of a new thermal fossil generating facility or authorize the approval of such by any regulated entity of the Commonwealth.

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[18] The Court recognized that in order to meet the long-term goal established for 2050, the first year (in that case 2020) "is the most important". NEPGA at 411 (citations omitted). Similarly, this year, 2021 is critical. The Roadmap filled in some of the next steps of the GWSA in significant ways: it reduced the overall goal in 2050 from 80 percent below the 1990 levels to an emissions level that achieves net zero greenhouse gas emissions in 2050 (with a level no higher than 85% below the 1990 levels) (See Roadmap, Section 8). In addition, it establishes interim levels of at least 50 percent below the 1990 level for 2030 and 75 percent below the 1990 level for 2040. Roadmap, Section 10 (revising G. L. c. 21N, *inter alia*, by adding Section 4(h)). The level for 2020 is set at between 10 percent and 25 percent below 1990 emissions." Id. (revising G.L. c. 21N, *inter alia*, by adding Section 4(a).)).

3. MMWEC Has Failed to Evaluate the Project as Compared to Alternatives and Demonstrate that the Project Is Lowest Possible Cost

Although it claims in its filing that the Project would provide the "lowest possible cost"[19] to its customers, MWWEC only considered a single-cycle gas-fired facility in its assessment of the Project. To the extent it considered alternatives, MMWEC limited its assessment to other geographic locations (six properties) in the region and ultimately determined that the proposed location was best. Exh. MMWEC-1, Att. 2. ENF Certificate dated October 7, 2016 at 3-4 ("ENF Certificate").[20] MMWEC failed to consider both market-based alternatives and the viability of energy storage peaking facilities in the near and long term. Accordingly, MMWEC has not demonstrated the Project is lowest possible cost and failed to undertake the detailed analysis as set forth in Fitchburg II.

a. MMWEC Failed to Evaluate Market-Based Alternatives

MMWEC states that MLPs have the "obligation to secure through ownership, bilateral contracts and market purchases sufficient energy, capacity and ancillary services to meet electrical capacity and energy load obligations associated with the use of electricity in the MLP cities and towns and to do so at the lowest possible cost to consumers, with price stability." Exh. MMWEC-3, at 7. In satisfying its capacity obligation, MMWEC cites to its responsibility to obtain sufficient supply "through a diverse mix of power plant operations, bilateral contracts with power plant owners inside

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[19] See Exhs. MMWEC-1, at 15-16, 20; MMWEC-3, at 5, 8, 14.

[20] The ENF Certificate does not consider any of the elements now required by the Roadmap as part of a MEPA review including environmental justice implications. The fact that the Project would impact an environmental justice community as set forth in Section Section III.D. 5 imposes an additional obligation on MMWEC to meaningfully evaluate this Project.

and outside of New England and through energy market purchases in the ISO-NE wholesale market." Id. at 8. Although MMWEC concedes that bilateral contracts and/or market purchases of energy and capacity may be available as an alternative to ownership of the Project, it fails to present any specific options and/or comparison of the Project with these existing market based alternatives. Id. at 7. No other options were reviewed or presented as any alternative to the Project and thus there is no basis to assess whether the Project as compared to these other alternatives would represent lowest possible cost or would address MMWEC's stated rationale for the Project (i.e,. needed to address "uncertainty" and "price volatility"). Id. at 14. Accordingly, without any comparison and specific information regarding other options in the market, there is no basis to conclude that the Project has the lowest possible costs or is in the public interest. On this basis alone, MMWEC has failed to support its conclusion that this Project is economically "in the public interest."

b. MMWEC Failed to Evaluate Energy Storage Peaking Capability

Similarly, MMWEC's testimony does not seriously address non-thermal peaking options. Exh. MMWEC-3, at 22-23. Although it concedes that non-thermal storage options "could obviate the need to maintain thermal capacity", it deems, without support, such non-thermal options "a significant risk to the regional energy system." Exh. MMWEC-3, at 22, fn. 34. MMWEC misstates the risk—the risk here is from climate change and the harmful impacts of climate change on public health. MMWEC has an obligation to seriously evaluate these alternative energy storage technologies and its failure in this case is inconsistent with its obligations as a public entity.

MCAN could find no support in MMWEC's testimony for the notion that the Commonwealth, as policy, prefers a fossil generation facility over a non-carbon alternative or that a non-thermal alternative is a threat to the existing energy system.[21] The cited references in Mr. Hibbard's testimony[22] relate to **existing** gas-fired generation and do not consider the deployment of **new** fossil options as proposed as a solution to address climate change. Nevertheless, the Roadmap, as discussed, is clear on this point with its unambiguously stated mandates moving away from fossil thermal generation.

MMWEC has not met its burden of proof to demonstrate that the Project is a better alternative (i.e., least cost or less risk) as compared to non-thermal battery storage alternatives. It simply assumed, without any foundation or record support (and notwithstanding ISO-NE's successful experiences to the contrary), that such resources were not viable alternatives. Indeed, as is set forth below, the latest information shows that battery storage is a viable option effectively deployed in the ISO-NE region, as well as in other markets, and is a cost-effective alternative to thermal peaking facilities assuming such a need exists. MMWEC had an obligation to undertake a review of battery storage as a resource option and, in the absence of any such review, failed to meet its burden, as required by the Court in Fitchburg II, to demonstrate that its financing request is in the public interest.

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[21] As set forth below, both ISO-NE and the Commonwealth have encouraged development and active participation of non-thermal resources in FCM markets. MMWEC's characterization of these resources as a threat should be rejected by the Department and should not be accepted as any basis to approve MMWEC's petition.

[22] Exh. MMWEC-3, fn. 34.

c. Energy Storage Is a Viable Alternative to the Project

As set forth above, MMWEC has a responsibility to undertake a serious and comprehensive review of the Peaker Project as compared to other alternatives, including battery storage alternatives, a part of its Petition and its failure to do so warrants rejection of its request.

The viability and cost effectiveness of energy storage has been recognized as a resource option to replace gas-fired peakers. Recent analyses by Sandia National Laboratories supported the use of energy storage facilities to replace peaker plants and recognized that "The cost of utilizing a state-of-the-art ESS, with the additional benefit of zero emissions, is extremely competitive compared to running a fossil fuel peaker plant. Aside from the cost advantage, batteries have a much faster response time—they can virtually ramp up and down instantly by following signals from the grid operator. Gas peakers can barely match the flexibility and responsiveness time of batteries." Sandia National Laboratories, Issue Brief, Energy Storage to Replace Peaker Plants, Will McNamara ("McNamara"), November 2020, at 4 (https://www.sandia.gov/ess-ssl/download/4887/).

As an example of what MMWEC should have undertaken, MCAN recently collaborated with Strategen Consulting to undertake a comparative analysis of battery energy storage alternatives to the Project ("Strategen Report" or "Report"). The Strategen Report, based upon publically available source material and utilizing ISO-NE market information, provided detailed support for the conclusion that energy storage is a cost effective and reliable alternative to the Project. The information contained in the Report was readily available to MMWEC, and MMWEC should have presented (and

been required to present) such an analysis of other available (and lowest possible cost options) to the Department in this case. The Report reviews energy storage in ISO-NE markets, provides an economic comparison of the Project vs. energy storage, evaluates comparative emissions (energy storage does not generate local emissions), evaluates overall system reliability and considers environmental justice implications.

Had MMWEC undertaken such an analysis, it would have determined, as stated in the Report, that energy storage is a viable option in ISO-NE to provide energy and capacity, is cost effective (at lower cost), with no detrimental environment impacts or harmful environmental justice implications. Had MCAN been allowed to intervene it would have sponsored the Strategen Report in order to provide a complete record for the Department's consideration.[23] The Strategen Report is attached hereto as an example of what MMWEC should have undertaken in this case.

The Report highlights the acceptance of energy storage as a peaking resource in ISO-NE and undermines MMWEC's unsupported assertion that energy storage as a capacity and energy resource is a risk. The publically available ISO-NE data referenced in Strategen Report underscores that:

(i) Energy storage is already a significant component of the ISO-NE's resource mix. More than 630 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 a 175 MW/350 MWh battery in Gorham, Maine. Strategen Report at 4.

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[23] Of course, the Department can still rule in favor of MCAN's Petition to Intervene on appeal, and reopen the hearings to allow for full consideration of the information presented herein. In any case, on the record here, MMWEC has not sustained its burden of proof.

(ii) Based upon ISO-NE data, net battery storage costs are significantly lower than the cost of new combustion turbines. The Report cites to widely available information with respect to the preparation of FCA 16, and Concentric Energy Advisors' ("CEA") independent analysis on behalf of ISO-NE of the Cost of New Entry ("CONE"), Net CONE and Offer Review Trigger Price ("ORTP") values.[24] Notably, the CEA ORTP costs indicated that the net costs of battery storage are significantly lower than the cost of a new combustion turbine. This means that based upon market conditions in upcoming FCM auctions, storage is expected to have a significantly lower net cost than other capacity resources, including simple cycle gas units as is proposed here. The ORTP values, updated to reflect further input by the Massachusetts Attorney General and NEPOOL[25], are presented below as submitted to the Federal Energy Regulatory Commission in an ISO-NE Compliance Filing[26]:

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[24] Joint Filing of ISO New England Inc. and New England Power Pool Regarding Offer Review Trigger Prices, Attachment I-1b December 2020 CONE and ORTP Report (December 2020) (https://www.iso-ne.com/static-assets/documents/2021/04/offer_review_trigger_prices_filing.pdf). The CONE and Net CONE values are, respectively, estimates of the total and net costs of developing the most economically efficient type of new capacity resource in New England. The Offer Review Trigger Price (ORTP) values are estimates of the entry costs for all resource types that would reasonably be expected to participate in the FCM and are used to screen offers from new resources that may require further review per ISO New England's (ISO-NE) buyer-side market power mitigation provisions. Strategen Report at 7.

[25] Revenue for Energy Storage Participating in ISO-NE Energy and Reserves Markets, Alternative ORTP EAS Offset Estimates Massachusetts Attorney General's Office | B.W.Griffiths | Updated 11-3-2020]; https://www.newengland-rto.com/static-assets/documents/2020/11/a4_b_xii_ma_ago_memo_re_alternative_eas_energy_storage.pdf). Strategen Report at 7.

[26] Docket No. ER21-1637-000, Order Accepting In Part And Rejecting In Part Proposed Tariff Revisions And Directing Compliance, Issued June 7, 2021 (https://www.iso-ne.com/static-assets/documents/2021/06/er21-1637-000_ortp_jumpball_order_6-7-2021.pdf). Strategen Report at 8.

Table 1. Offer Review Trigger Prices for the Forward Capacity Auction[27]

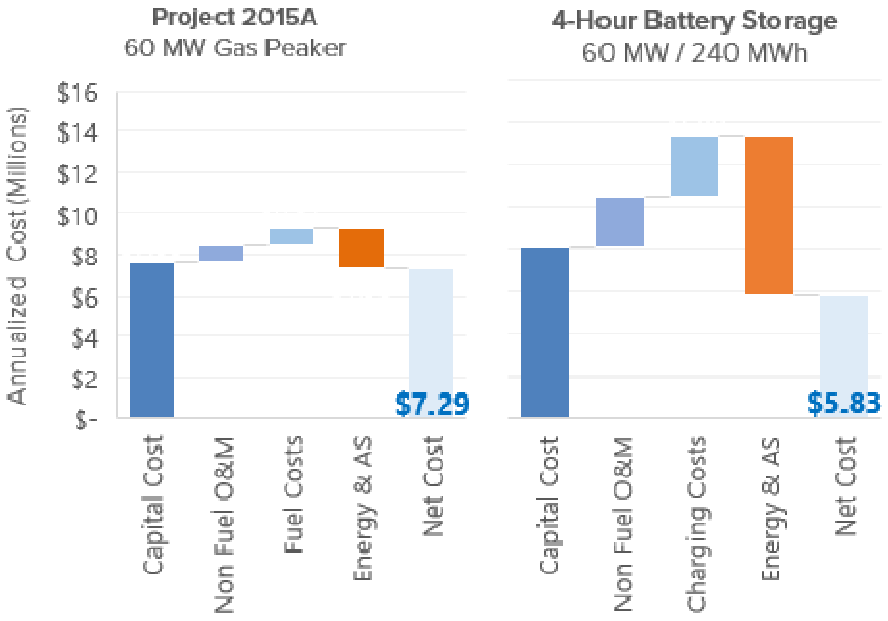
Generating Capacity Resources	
Technology Type	**Offer Review Trigger Price ($/kW-month)**
Simple Cycle Combustion Turbine	$5.355
Combined Cycle Gas Turbine	$9.811
On-Shore Wind	$0.000
Energy Storage Device – Lithium Ion Battery	$2.601
Photovoltaic Solar	$1.381

These market-based assessments evaluating the relative pricing of resources by ISO-NE, used to evaluate relative costs of generation resources, are clearly at odds with MMWEC's stated conclusions here that the market does not support energy storage and that the Project is least cost.

(iii) Standalone batteries storage facilities are projected to result in significant cost savings compared to the Project. Strategen's economic comparison of the Project vs. battery energy storage, based upon ISO-NE data and information provided by MMWEC, confirms that battery storage provides the lowest possible cost to MMWEC's customers. The analysis utilizes MMWEC's assumptions with respect to the Project and compares the Project to an energy storage facility. As summarized in the chart below, a detailed review of capital, fuel, and operations and maintenance costs, as well as for the expected energy and ancillary services revenue, concludes that the net cost of batteries is projected to be significantly lower than the Project. Strategen Report at 10.

[27] Docket No. ER21-1637-001; ISO New England Inc., Compliance Filing to Conform Tariff to Commission Acceptance of Offer Review Trigger Prices for FCA 16, June 22,2021 (https://www.iso-ne.com/static-assets/documents/2021/06/ortp_compliance_filing.pdf). Strategen Report at 8.

Annualized cost comparison: Project 2015A vs Standalone Storage (Figure 2)



In its analysis, Strategen considered MMWEC's operating and costs assumptions, National Renewable Laboratory ("NREL") estimates of cost to install a standalone battery storage facility, a 2-hour facility vs. a 4-hour facility, and the specific operating cost and revenues associated with a standalone battery storage facility in the NE-ISO markets. Strategen Report at 6-11. The specific assumptions are set forth below.

Project Assumptions

With respect to the Project, the Strategen Report uses MMWEC's data and assumes (i) an upper limit of 1,250 hours of full-load operation per twelve-month rolling period at maximum firing rate, of which a maximum of 250 hours per twelve-month rolling period will be on ULSD [28]; (ii) costs of $76.6 million with an additional ten

[28] MassDEP, Draft Air Quality Air Approval, August 2020 (https://www.mass.gov/doc/proposed-non-major-comprehensive-plan-approval-municipal-wholesale-electric-co-peabody/download?_ga=2.46829860.2015550143.1606524447-1582993833.1603467498)

percent ($7.7 million) as a contingency for COVID-19-related issues,[29] indicating capital costs of $1,243/kW.[30] Strategen Report at 8.

Battery Storage Assumptions

With respect to energy storage costs, the Report cites to NREL estimates that the cost to install a standalone battery storage facility designed to provide peaking power in the 2021 timeframe could be as low as $744/kW for a 2-hour battery and $1,250/kW for a 4-hour battery (in $2019) and uses NREL's moderate capital cost projections for a 2-hour battery ($763/kW) and a 4-hour battery ($1,318/kW) (2019 dollars inflation-adjusted). Strategen Report at 9. Cost projections are based on the National Renewable Energy Laboratory's (NREL) Annual Technology Baseline (ATB) 2021.[31] Historical data from peaker operations in the Northeast Massachusetts and Boston Zone (NEMA), where the capacity need has been identified, do not support the need for a duration beyond 4-hours. Strategen Report at 9. Specifically, the 2019 and 2020 operations of Medway, Framingham, and M Street Jet, three peaking resources in NEMA, could be covered by a battery with the same power capacity as the Project and a duration of four hours.[32] Id.

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[29] Exh. MMWEC-1, Attachment 3.

[30] The capital cost estimate used in the analysis excludes the cost of upgrading the local substation ($400,000) that might be needed regardless of the selected generating technology. The cost also excludes the COVID contingency, and the capitalized costs.

[31] https://data.openei.org/files/4129/2021-ATB-Data_Master.xlsm.

[32] Based on historical data from the S&P Market Intelligence Platform for the hourly generation of the Medway (https://platform.marketintelligence.spglobal.com/web/client?auth=inherit#powerplant/powerplantprofile?id=4683), Framingham (https://platform.marketintelligence.spglobal.com/web/client?auth=inherit#powerplant/powerplantprofile?id=3195) , and M Street Jet (https://platform.marketintelligence.spglobal.com/web/client?auth=inherit#powerplant/powerplantprofile?id=4510) units in 2019 and 2020.

ISO NE does not require batteries to have a longer duration to participate in the ancillary services or capacity markets.[33]

ISO-NE Market Assumptions

The Report compares an assumed standalone battery with a power rating of 60 MW and evaluates the value streams from the energy, reserve, and regulation markets as well as the operations costs, which will drive the net cost of the facility.[34] Using 2019 historical energy and regulation data from ISO-NE for the project location[35], and reserve price data as outlined in the CEA ORTP model, the Strategen Report estimates annual revenues for the gas plant and the battery storage assets. To estimate the storage revenue, Strategen developed an optimal dispatch model that maximizes the expected revenue across the ISO-NE markets, including the Forward Reserve Market ("FRM").[36] Strategen Report at 9. For the Project, the revenue is estimated based on the energy

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[33] The ORTP calculation in the Joint Filing of ISO New England Inc. and New England Power Pool Regarding Offer Review Trigger Prices, Attachment I-1b December 2020 CONE and ORTP Report (December 2020) (https://www.iso-ne.com/static-assets/documents/2021/04/offer_review_trigger_prices_filing.pdf) assumes participation of a two hour battery in energy, regulation, reserve, and capacity markets without restrictions.

[34] While capital costs are a useful metric to represent the cost of energy technologies, they are non-specific for the ISO-NE market nor the Boston region. The net costs, on the other hand, are closer to the actual bidding price of these energy assets because they are estimated using data on specific markets and regions. Strategen Report at 9.

[35] CEA ORTP model: https://www.iso-ne.com/static-assets/documents/2020/11/a4_a_i_cone_ortp_dispatch_models.zip

[36] See Figure 2 of the Strategen Report referenced above. The model follows CEA's assumption that the battery can provide up to 11% of its capacity for regulation. The model optimizes only for the Real Time market; further revenues could be available if the Day Ahead market was also included in the optimization. Strategen Report at 10.

generation during the highest-priced hours of the year up to the projected capacity factor and reserve provision through the FRM for the rest of the year. Id.

Strategen's cost comparisons demonstrate the clear cost advantage of energy storage vs. MMWEC's peaker operating in the ISO-NE markets. Battery storage has a lower annualized cost than the gas-fired peaker—$2.0 million annualized cost for a 2-hour battery, and as shown in Figure 2, and $5.8 million annualized cost for a 4-hour battery as compared to $7.3 million annualized cost for the Project. The cost comparison takes into account relevant revenue (energy and ancillary services) and expenses. Id. at 10.

MCAN offers this analysis as an example of the comprehensive review that MMWEC should have undertaken as part of any analysis of alternatives in support of its request to finance the Project and as a demonstration of what MCAN would have presented had it been allowed to participate as an intervenor in the case. At this stage, and given MCAN's limited participant status, the Strategen Report is not offered for its truth of the matters asserted therein but rather as a specific example of MMWEC's failure to present a meaningful review of non-fossil alternatives as required by Fitchburg II. Given the GWSA, the Roadmap and the climate emergency recognized by the Legislature (as noted by the Court), MMWEC should have evaluated and presented for the Department's review a thorough analysis of its Project versus a battery energy storage system.

In short, since MMWEC first evaluated the Project, there has been an unprecedented shift in technological advances, as well as regulatory and political mandates that require that MMWEC reexamine and update its analysis of the Project.

With its failure to undertake any comparative analysis as discussed above, MMWEC has failed to demonstrate how the Project is least cost or cost effective as compared to other alternatives. MMWEC's reliance on generic concerns with respect to the capacity market are not sufficient to support its choice of the Project as proposed. MMWEC failure to undertake any specific comparison, particularly given the mandates as discussed in Section III.B.1 is fatal and its request should be rejected.

4. MMWEC Failed to Assess the Risks Associated with the Project

MMWEC ignored that the Project poses a number of significant risks, including the risk that the unit will become uneconomic, i.e. a stranded asset, and the risk posed by the Project's significant contribution to climate change. With respect to a stranded asset, in the same way that gas-fired generation has replaced coal generation and renewable alternatives are now competitive with gas-fired generation, this Project is unlikely to be economic as a power supply option as compared to battery storage or renewable alternatives as discussed above.[37] A gas-fired peaker will not be able to compete with increased development and operation of renewables, including energy storage facilities at zero marginal cost electricity. The cost associated with the Project are simply not

[37] As Sandia National Laboratories stated: "Just as natural gas replaced coal due to its economic viability, more recently we have seen a similar shifting of resource considerations due to the economic viability of solar and wind when compared to natural gas, which has become increasingly evident in the last three years or so. The transition is part of a broader transformation as the [energy and utilities] sector moves away from its historic reliance on centralized fossil fuels and toward a mixture of renewables (e.g, wind and solar), distributed energy resources (e.g., microgrids, [energy storage systems]), and demand side efforts (e.g., energy efficiency and demand response programs), which used together can strategically reduce consumption. [] There are many data sets that can be used to support the conclusion that it is now more economical to build new renewables generation sources than to run existing coal or to build new natural gas plans in specific regions of the US." McNamara, at 3.

sustainable given market trends over the near term and given the analysis set forth in Section 2 above. It is unreasonable and even outrageous to expect a polluting capacity resource, slated to be constructed in an environmental justice community and within a mile or less of 7 other environmental justice communities, to still be operating in the decades to come given the Commonwealth's focus on net zero and clean energy investments.[38]

With respect to climate change, MMWEC's peaker will dramatically contribute to the emission of greenhouse gases including carbon dioxide, SO_2, and NO_X and thus exacerbate the climate emergency and risk of climate change. Specifically, the Project is expected to emit .6 tons of SO_2, 6.3 tons of NO_X and 8.3 tons of CO_2 per year.[39] Moreover, the Project will increase emissions of particulate matter alone in excess of 12 tons per year and may exceed "the PM25 significant emissions rate threshold of 10 tons per year." See ENF Certificate, Attachment DEP Letter dated September 27, 2016, at 2. Accordingly to DEP, it is unclear whether this level of emissions would subject the Project to the federal Prevention of Significant Deterioration (PSD) regulations and permitting process. Id. In short, the impacts from particulate matter as well as other pollutants are significant.

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[38] The public hearing testimony echoed these concerns with respect to stranded costs. See Tr.-1 at 13-14, 33-34, 37.

[39] MassDEP, Draft Air Quality Approval, August 2020, at 6. (https://www.mass.gov/doc/proposed-non-major-comprehensive-plan-approval-municipal-wholesale-electric-co-peabody/download?_ga=2.46829860.2015550143.1606524447-1582993833.1603467498)

In contrast, battery storage resource will have *zero* local emissions. In short, the fossil emissions risk and harmful implications for climate change are well documented in Section III.B.1 above and are beyond dispute. Accordingly, MMWEC has failed to demonstrate that the Project poses an acceptable risk to its customers.

5. MMWEC Failed to Consider Environmental Justice Implications of the Project

This Project, proposed to be located in an area already served by existing fossil-emitting facilities, will disproportionately impact the surrounding community and result in permanent environmental impacts in Peabody.[40] As set forth above, the impacts from particulate matter as well as other pollutants in the area are significant. Moreover, the Project is within three miles of more than four elementary schools, half mile of one high school, two and one half miles from another high school, and two miles from a middle school, which raises serious environmental justice concerns. Tr. 1 at 67-68. The construction of another fossil fuel resource in the area will disproportionately impact the already disadvantaged residents of Peabody.

The Roadmap specifically requires that Environmental Justice populations be given a voice and allowed meaningful participation in the decision making process relating to the approval of infrastructure and energy projects such as in the instant case. Roadmap, Sections 6, 56-57, 60, 62. The Legislature recognized the potentially detrimental impact of continuing to locate energy facilities in designated environmental

[40] Massachusetts 2020 Environmental Justice Populations (https://mass-eoeea.maps.arcgis.com/apps/MapSeries/index.html?appid=535e4419dc0545be980545a0eeaf9b53)

justice communities such as those in Peabody. Id. The Roadmap mandates that environmental and public health consequences of any proposed facility such as the Project be evaluated and requires heightened scrutiny by regulators as part of any review.[41] Given its location in a community with an environmental justice population, as part of its obligation to demonstrate that the Project is in the public interest, MMWEC has a responsibility to assess the health and environmental impacts of the Project on the Peabody community. Notwithstanding these requirements, MMWEC has failed to address the environmental health and environmental justice implications of the Project.

IV. CONCLUSION

The record demonstrates that MMWEC failed to consider the requirements of the GWSA and Roadmap, evaluate alternative options, confirm that the Project is lowest possible cost, assess project risks and weigh the environmental justice implications of the Project. Accordingly, MMWEC has not established, as required by St. 1975, c. 775, §17, that the proposed Project is in the public interest and represents the best option, at least-cost, given other possible alternatives and associated risks. Therefore, the Department should deny the Company's Petition.

Wherefore, MCAN respectfully requests that the Department reject the Company's Petition for approval of the financing of the Project.

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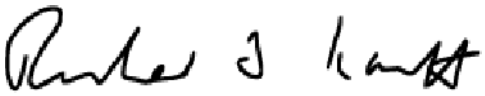
[41] The Roadmap amends the Massachusetts Environmental Policy Act to require additional information as part of the EIR process in order to evaluate potential damage to the air quality or to the environment in environmental justice communities and empowers the Secretary of Energy and Environmental Affairs to "direct" "consideration of "environmental justice principles in making any policy, determination or taking any other action related to project review…" Roadmap at Section 55-57, 62K.

MASS CLIMATE ACTION NETWORK, INC.

By its attorneys,



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Date: July 29, 2021

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ATTACHMENT

Assessment of Potential Energy Storage Alternatives for Project 2015A in Peabody, Massachusetts

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For Massachusetts Climate Action Network & Clean Energy Group.
July 2021

Background

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.

Initially, fourteen municipal utilities agreed to purchase a portion of the facility to fulfill their capacity requirements. However, in April 2021, two of the municipal utilities filed with the Department of Public Utility to withdraw from the contract. Subsequently, the MMWEC board of directors authorized a minimum 30-day pause in the project during a special meeting held in early May. According to the Company's statement, the pause is meant "to address the concerns brought to the MMWEC Board, while also considering available options to fulfill its participants' required capacity obligations under the Independent System Operator's New England (ISO NE) rules." MMWEC later decided to extend the pause of the Project.[1]

Project 2015A was initially chosen after a request for proposals (RFP) issued by MMWEC in 2016, calling specifically for a capacity resource fueled by natural gas and ultra-low sulfur oil as a secondary fuel. Technologies considered before the issuance of the RFP included combined-cycle and simple-cycle combustion turbine technologies. While the awarded peaker proposal outperformed the operational requirements and presented a low cost at the time, new capacity technologies like storage have become viable and increasingly cost-competitive.

Recent examples from leading utilities show how clean energy portfolios can meet capacity needs at a lower cost than gas: the Rocky Mountain Institute identified 11 recent procurements by utilities serving >6 million customers that illustrate how all-source procurements can harness competition to lead to lower-cost outcomes for customers while maintaining reliability. Crucially, in these leading examples, only ~10% of procured capacity came from gas plants, while ~90% of new capacity procured was from clean energy resources (wind, solar, storage, efficiency, and demand response). All-source RFPs are now the preferred approach to procure capacity resources.[2]

[1] Update of the Massachusetts Municipal Wholesale Electric Company, DPU 21-29, submitted on June 14, 2021

[2] L. Shwisberg, M. Dyson, G. Glazer, C. Linvill, M. Anderson, How to Build Clean Energy Portfolios A Practical Guide to Next-Generation Procurement Practices, March 2021

In addition to this, the state's Next-Generation Roadmap Bill was signed into law this year. The bill requires municipal utilities to get to net zero emissions by 2050 and mandates the deployment of additional wind and solar in the state, creating further need for flexible technologies to integrate them into the grid. The bill also aims to ensure increased outreach to environmental justice populations and requires more engagement from state agencies as they carry out their duties.

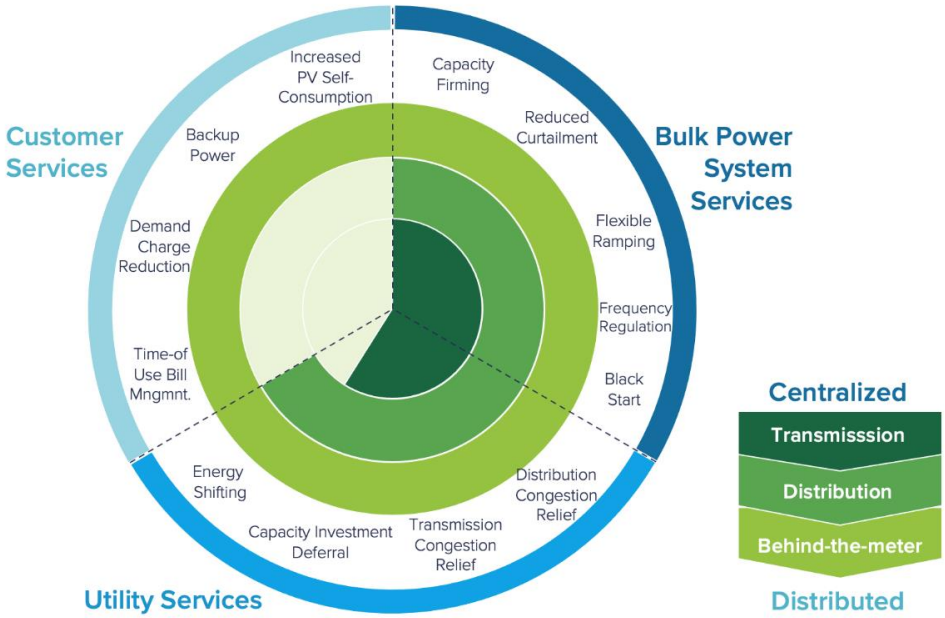
Recognizing that much has changed in policy and technology since the project was first proposed several years ago, the 30-day pause was meant to provide an opportunity for re-assessment and investigating whether the capacity need can be met by a resource that is not fossil fuel-fired. To this end, the Clean Energy Group (CEG) together with the Massachusetts Climate Action Network (MCAN) explored energy storage as an alternative option to fulfill the participant's capacity obligations.

In this briefing, Strategen provides information about the feasibility of using storage or other solutions to meet the capacity needs of MMWEC in place of the proposed Project 2015A. Specifically, this report provides information about the ability of storage to replace peaker plants, including a short list of recent energy storage projects that have been deployed to replace fossil-fueled peakers. This report then investigates the economics of replacing the proposed peaker with energy storage. The investigation examines Project 2015A and energy storage in terms of capacity provision, affordability, and emissions. The report concludes that energy storage is not only a viable replacement option, but that it also results in emissions and cost savings.

Recent Energy Storage Project Examples

Key services that utility-scale battery storage provides to the grid include energy time shifting, ancillary services, and variable generation integration, resource adequacy, transmission & distribution congestion relief, and investment deferral. On top of their environmental advantages, as technology costs continue to fall, portfolios including renewables, energy storage and distributed energy resources (DER) are becoming significantly more cost-effective than fossil fuel technologies.

Figure 1. Energy storage value streams across the grid (adapted from Rocky Mountain Institute)[3]



The number of replacement portfolios that include energy storage, and specifically batteries, is continuously increasing as both regulators and utilities realize the technology's key role in transitioning to a clean grid. Globally, there is now a significant number of commercial, large-scale battery storage projects that are online, under construction or are contracted to be built in order to provide capacity during hours of peak demand. Below are just a few examples of some of these recent projects:

Oxnard, CA – Standalone storage

In 2019, Southern California Edison selected a 195 MW portfolio of batteries to supply local capacity needs around the coastal city of Oxnard, instead of the 262 MW natural gas peaker plant it had chosen previously. The portfolio includes a 100 MW / 400MWh battery in addition to smaller energy storage units ranging from 10 to 40 MW each. The 20-year resource adequacy contract leaves the batteries free to monetize on energy and ancillary benefits as a participant in the CAISO market when not called upon to fulfill its capacity

[3] Garrett, Mandel, Morris, and Touati. The Economics of Battery Energy Storage: How multi-use, customer-sited batteries deliver the most services and value to customers and the grid. Rocky Mountain Institute, September 2015.

obligation. This further improves the project economics relative to a system that only operates during peak events.[4]

The grid operator, CAISO, initially determined that energy storage could fulfill the reliability needs, but at nearly three times the price. That analysis, however, relied on outdated storage pricing data that exaggerated the technology's costs and stakeholders pushed for an evaluation of gas plant alternatives before regulators signed off on the gas project. Within months, the commissioners signaled their intent to reject the gas plant and directed SCE to launch a new solicitation to see exactly how competitive storage and other resources had become.

On June 29, 2021, one of the largest energy storage facilities in the United States was unveiled to the public: the Saticoy Energy Storage Site consisting of a 100MW battery storage system in Oxnard, California. The battery system went in between summer 2020 and December 2021 and is estimated to have cost less than half of what the gas plant would have, leaving ratepayers significantly better off while alleviating the environmental burden of an already impacted community. The battery site demonstrates how to locate large amounts of power within populated areas with no noise or pollution.

APS all-source solicitation, AZ – Standalone storage

Arizona Public Service (APS) issued an "all-source" request for proposals (RFP) in 2018, seeking 400 to 800 MW of capacity to meet peak energy needs, meaning that the capacity should be delivered between 3:00 p.m. and 9:00 p.m. when APS electricity demand is highest. As a result, APS bought 150 MW of stand-alone batteries with four-hour durations by 2021. The energy storage projects competed and won against new gas-fired peakers; however, the RFP was controversial because it designated that at least half the capacity come from gas-powered facilities. APS selected a 463 MW gas plant PPA that was competitive with storage by being an existing plant, not a new project. The existing peaker was contracted to deliver power only during the summer and only for seven years. APS has expressed its intention to build additional energy storage after the peaker contract expires and it gets more comfortable with the new storage technologies.[5]

ISO-NE, Capacity auction - Standalone storage

This year, Plus Power won two bids in the latest ISO-NE forward capacity auction. The two battery projects competed against fossil fuel plants and were contracted for seven years to deliver power during times of peak demand, starting in 2024. This was achieved without federal tax credits as they do not apply to standalone batteries. The 150 MW / 300 MWh battery in Massachusetts and the 175 MW / 350 MWh battery in Maine are the first standalone batteries to win competitive capacity auctions after the market was first opened to batteries by ISO-NE's implementation of FERC Order 841.[6]

Oakland, CA – Standalone and distributed storage

In 2019, Oakland's CCA, East Bay Community Energy, approved battery capacity contracts to incrementally replace a 40-year-old, 165 MW jet fuel-fired peaker plant. The first portion will be replaced with a 36.25 MW standalone battery and more will be added as the retirement of peaker units frees up space for development.[7] These utility-scale batteries will be complemented by a virtual power plant (VPP), leveraging residential solar and battery systems installed and managed by Sunrun. The VPP will deliver more than 2

[4] GTM, 2019. *Southern California Edison Picks 195MW Battery Portfolio in Place of Puente Gas Plant.* News article.

[5] Utility Dive, 2019. *APS to install 850 MW of storage, 100 MW of solar in major clean energy buy.* News article.

[6] GTM, 2021. *Plus Power Breaks Open Market for Massive Batteries in New England.* News article.

[7] S&P Global, 2020. *Vistra to increase Oakland battery storage project to 36.25 MW.* News article.

MWh of batteries on more than 500 low-income housing units, providing additional grid reliability capacity to East Bay Community Energy and resiliency capabilities to low and moderate income (LMI) communities. Both the standalone battery and the VPP carry 10-year contract periods starting in 2022.[8]

ISO-NE, Capacity auction - Distributed storage

Also in 2019, Sunrun won a 20-megawatt bid in the forward capacity auction for ISO New England. That auction ensures that enough capacity will be available in the grid three years in advance. Sunrun offered coordinated solar-plus-storage aggregations that competed in an open auction alongside conventional capacity resources such as gas plants. Becoming eligible to bid into the market took extensive procedural work, but now provides a precedent for the model to spread in New England. Sunrun's network of small solar-plus-storage installations will give backup power to around 5,000 customer homes and provide capacity for reliability across the region. The company is promising to deliver the necessary contracted power to the grid while using the revenues from the capacity market to reduce production costs for customers.[9]

While this report is focused on standalone, utility-scale batteries as a replacement option for gas peaker plants, aggregated and coordinated DER like Sunrun's VPP can be leveraged to design more diverse capacity portfolios. The cost and additional benefits of such portfolios are not calculated in this analysis but could be assessed going forward while considering their potential value for local communities and the grid.

[8] S&P Global, 2019. *Sunrun selected to replace part of Oakland plant with home solar, storage*. News article.

[9] Energy Storage News, 2019. *'Breakthrough moment': Sunrun's home solar-plus-storage to provide 20MW capacity in New England*. News Article.

Energy Storage Participation in ISO-NE Markets

Energy, Regulation, and Reserve Market

In the ISO-NE, a continued storage facility (CSF), like a battery, can participate simultaneously in energy, reserves, and regulations markets. Specifically, under phase 1 of the Energy Storage Device (ESD) project, ISO New England allowed participants with grid-sized CSFs to offer the full range of their asset's capability in the regulation market while continuing to operate as a dispatchable energy market resource. CSFs are registered as three asset types:

- An Alternative Technology Regulation Resource (ATRR)
- A non-regulation capable generator asset
- A dispatchable-asset-related demand (DARD) asset

These three asset types, combined, represent the single physical asset. This arrangement allows the asset to perform in the various markets.

In terms of current deployment, about 20 MW of grid-scale battery-storage projects have come online in ISO NE since 2015; more than 600 MW are planned, and that number will keep growing, under state mandates like Massachusetts' statutory goal of 1,000 MWh of energy storage by the end of 2025.[10] As of February 2021, nearly 3,000 MW of grid-scale stand-alone energy-storage projects were requesting interconnection.[11]

Forward Capacity Market

Separate from the energy market, ISO-NE also holds annual Forward Capacity Auctions (FCAs). The Forward Capacity Market (FCM) is 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, 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 2024-2025. Clearing prices ranged from $2.48/kW-month in Northern New England to $3.98/kW-month in Southeast New England. More than 630 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 a 175 MW/350 MWh battery in Gorham, Maine.

[10] MA government website. Energy Storage Initiative. Emerging Technology Division. Accessed June 2021.

[11] ISO NE, 2021. Resource Mix. Key Grid and Market Stats. Accessed June 2021.

Economic Comparison: Peaker vs. Standalone Energy Storage

Peaking power units are resources that supply electricity only during times of peak demand. Technically, these units are flexible and capable of fast ramping. However, these units have low utilizations because their high-marginal costs limit their dispatch and operation. Thus, peaking units provide little additional value in terms of energy or other grid services during the year beyond peak capacity. Battery storage units, on the other hand, are set up for high utilization across the year due to their low marginal costs. For this analysis, we first compare the cost of the two technologies and then examine the different value streams for each technology to understand their net cost.

Cost of New Entry in ISO-NE

In addition to the Strategen analysis, it is worth presenting some cost comparison results from ISO-NE. Specifically, the ISO-NE estimates the cost of developing new resources that could enter the FCM, known as the Cost of New Entry (CONE). At a high level, the CONE and Net CONE values are, respectively, estimates of the total and net costs of developing the most economically efficient type of new capacity resource in New England. The Offer Review Trigger Price (ORTP) values are estimates of the entry costs for all resource types that would reasonably be expected to participate in the FCM and are used to screen offers from new resources that may require further review per ISO New England's (ISO-NE) buyer-side market power mitigation provisions. ISO-NE evaluates technology types that are likely to participate in the FCM to identify which technology types require an ORTP to be calculated. ORTP is then calculated by estimating the gross entry costs and expected net market revenues based on assumptions about the technology's operating characteristics, its energy and ancillary service market participation, and other factors. ORTPs are based on market conditions expected to prevail in the upcoming auction rather than longer-term market conditions. The ORTP values reflect the low end of the competitive range of the offer price that commercial technologies can plausibly submit to the auction. Still, the values offer insights as to how the resources compare to each other in terms of net cost.

In preparation of FCA 16, ISO-NE engaged Concentric Energy Advisors (CEA) to conduct an independent analysis of the CONE/Net CONE and ORTP values.[12] Notably, the CEA ORTP costs indicated that the net costs of battery storage are significantly lower than the cost of a new combustion turbine. This means that although the installed costs may be higher for a battery storage resource relative to a combustion turbine, the ability of storage to capture additional revenue streams more than offsets the upfront cost, making storage a more cost-effective resource over the life of the asset.

Still, the CEA methodology for the storage ORTP was criticized by the Massachusetts Attorney General's Office, finding that the energy and ancillary services revenue estimates for energy storage were unreasonably low, meaning that ORTP prices for storage could be even lower in the state.[13] The New England Power Pool (NEPOOL) Participants Committee also agreed that optimally dispatching the resource could result in higher expected revenue and that CEA materially underestimated the amount of energy and ancillary services revenues a competent battery operator could expect to receive.

[12] Joint Filing of ISO New England Inc. and New England Power Pool Regarding Offer Review Trigger Prices, Attachment I-1b December 2020 CONE and ORTP Report (December 2020)

[13] Revenue for Energy Storage Participating in ISO-NE Energy and Reserves Markets, Alternative ORTP EAS Offset Estimates Massachusetts Attorney General's Office | B.W.Griffiths | Updated 11-3-2020

In its Order, the Federal Energy Regulatory Commission finds that both ISO-NE's and NEPOOL's proposed ORTPs for battery resources are just and reasonable, but that in this instance NEPOOL's estimate is preferable as it better reflects how a reasonable battery operator would operate the battery.[14]

Thus, based on market conditions expected to prevail in the upcoming auction, storage is expected to have a significantly lower net cost than other capacity resources, including simple cycle gas units. The revised ORTP values are presented below.

Table 1. Offer Review Trigger Prices for the Forward Capacity Auction[15]

Generating Capacity Resources	
Technology Type	**Offer Review Trigger Price ($/kW-month)**
Simple Cycle Combustion Turbine	$5.355
Combined Cycle Gas Turbine	$9.811
On-Shore Wind	$0.000
Energy Storage Device – Lithium Ion Battery	$2.601
Photovoltaic Solar	$1.381

Economic Analysis: Project 2015a vs Standalone Storage

As a peaking unit, Project 2015A is forecasted to run very infrequently. Specifically, MMWEC states an upper limit of 1,250 hours of full-load operation per twelve-month rolling period at maximum firing rate, of which a maximum of 250 hours per twelve-month rolling period will be on ULSD.[16] The project is estimated to run an average of only 2.72% of the time, equivalent to approximately 239 hours per year and accounting for only 0.535% of Project Participant energy needs.

In contrast, an energy storage system, can efficiently provide value to the grid during many hours of the year, not simply during peak load hours. For the purposes of this analysis, we model a standalone battery with a power rating of 60 MW and project the value streams from the energy, reserve, and regulation markets. Cost projections are based on the National Renewable Energy Laboratory's (NREL) Annual Technology Baseline (ATB) 2021.

MMWEC is projecting costs of $76.6 million with an additional ten percent ($7.7 million) as a contingency for COVID-19-related issues,[17] indicating capital costs of $1,243/kW.[18][19] Based on the available data, it is unclear whether this cost includes the emission control technology costs, which would make Project 2015A an even more expensive option.

[14] Docket No. ER21-1637-000, Order Accepting In Part And Rejecting In Part Proposed Tariff Revisions And Directing Compliance, Issued June 7, 2021

[15] Docket No. ER21-1637-001; ISO New England Inc., Compliance Filing to Conform Tariff to Commission Acceptance of Offer Review Trigger Prices for FCA 16, June 22,2021

[16] MassDEP, Draft Air Quality Air Approval, August 2020

[17] Joint Direct Testimony of Ronald C. Decurzio and Glenn R. Trueira, Attachment 3.

[18] The capital cost estimate used in the analysis excludes the cost of upgrading the local substation ($400,000) that might be needed regardless of the selected generating technology. The cost also excludes the COVID contingency, and the capitalized costs.

[19] NREL ATB 2021 estimates capital expenses of $919/kW for a new Combustion Turbine in 2021 (in $2019), without including the cost of the emission control technologies.

NREL estimates that the cost to install a standalone battery storage facility designed to provide peaking power in the 2021 timeframe could be as low as $744/kW for a 2-hour battery and $1,250/kW for a 4-hour battery (in $2019). However, for this analysis, we are using NREL's moderate cost projection for a 2-hour battery ($763/kW) and a 4-hour battery ($1,318/kW). The projections were in 2019 dollars and were inflation-adjusted for the purposes of the analysis.

As already described, utility-scale batteries with a duration of two hours cleared FCA 15. Still, in this brief, we examine both 2hr and 4hr batteries to better understand how the economics of the proposed peaker compare to its alternatives. Historical data from peaker operations in the Northeast Massachusetts and Boston Zone (NEMA), where the capacity need has been identified, do not support the need for a longer duration. Specifically, the 2019 and 2020 operations of Medway, Framingham, and M Street Jet, three peaking resources in NEMA, could be covered by a battery with the same power capacity as the plant and a duration of four hours.[20] ISO NE does not require batteries to have a longer duration to participate in the ancillary services or capacity markets.[21]

Table 2. Cost comparison for peaking resource options

Technology	Estimated Delivery Year	Est. Initial Capital Cost (2021$/kW)	Est. Annualized Cost (2021$ Millions)[22]
Project 2015A Combustion turbine *With NOx and CO controls	2022	1,243	7.3
2-hour BESS – Moderate cost	2022	791	2.0
4-hour BESS – Moderate cost	2022	1,329	5.8

Importantly, these capital costs represent the total cost of a project before market revenues and operations costs, which will drive the net cost of the facility. While capital costs are a useful metric to represent the cost of energy technologies, they are non-specific for the ISO-NE market nor the Boston region. The net costs, on the other hand, are closer to the actual bidding price of these energy assets because they are estimated using data on specific markets and regions.

Based on 2019 historical energy and regulation data from ISO-NE for the project location, and reserve price data as outlined in the CEA ORTP model, [23] Strategen estimates annual revenues for the gas plant and the storage assets. To estimate the storage revenue, Strategen developed an optimal dispatch model that maximizes the expected revenue across the three markets including the Forward Reserve Market (FRM): those are depicted below as Energy and Ancillary Services (AS) Revenue.[24] For Project 2015A, the revenue is estimated based on the energy generation during the highest-priced hours of the year up to the projected

[20] Based on historical data from the S&P Market Intelligence Platform for the hourly generation of the Medway, Framingham, and M Street Jet units in 2019 and 2020

[21] The ORTP calculation in the Joint Filing of ISO New England Inc. and New England Power Pool Regarding Offer Review Trigger Prices, Attachment I-1b December 2020 CONE and ORTP Report (December 2020) assumes participation of a two hour battery in energy, regulation, reserve, and capacity markets without restrictions.

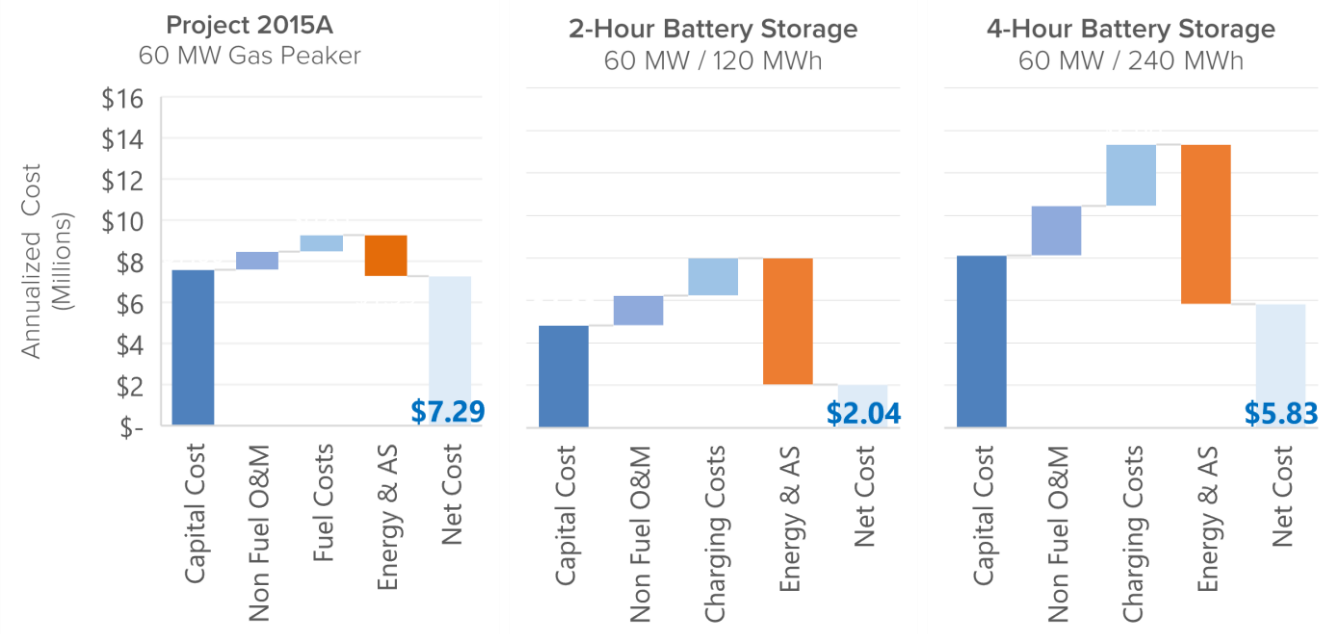
[22] Capital costs annualized based on lifetime of 20 years and weighted average cost of capital of 8%. Energy & ancillary services prices based on 2019 historical data. Technology, operation and maintenance, and fuel costs based on NREL ATB projections. Locational marginal prices, ancillary services prices, fuel, and operations costs assumed to escalate with the inflation rate. Charging costs for the battery are not inflated, as we assume zero marginal cost energy to be increasingly available.

[23] CEA ORTP model: https://www.iso-ne.com/static-assets/documents/2020/11/a4_a_i_cone_ortp_dispatch_models.zip

[24] The model follows CEA's assumption that the battery can provide up to 11% of its capacity for regulation. The model optimizes only for the Real time market; further revenues could be available if the Day Ahead market was also included in the optimization.

capacity factor and reserve provision through the FRM for the rest of the year. If the FRM were to sunset, project economics would remain significantly more favorable for energy storage compared to Project 2015A. The analysis results are presented below:

Figure 2. Annualized cost comparison: Project 2015A vs Standalone Storage



Our analysis shows that replacing the proposed peaker with energy storage is not only preferable from an environmental perspective but also results in significant cost savings for consumers. The analysis did not consider any tax incentive that could result from pairing the resource with renewable generation; eligibility for such a credit would result in increased savings.

MMWEC has already committed $9 million to the project.[25] However, this sunk cost is significantly lower than the 14 million of savings over the first 20 years of installing a four hour battery storage compared to Project 2015A.

MMWEC indicates that a longer duration resource might be needed.[26] Although this is not required for participation in the Forward Capacity or Forward Reserve Market and is not justified by the historical operations of other peaking units in the NEMA zone in 2019 and 2020, our analysis still indicates that under NREL's most aggressive cost projections a 385 MWh battery would result in the same net cost as the proposed peaker under the $85 million budget.

In addition to the economic savings, replacing the peaker with a battery will also eliminate the exposure of the municipal utilities and their customers to the increased volatility of fuel prices, effectively providing enhanced price stability for the customers of municipal utilities. Project 2015A is projected to generate energy very infrequently. Still, when energy generation will be needed, ratepayers will be exposed to the volatility of natural gas and oil prices. On the other hand, energy storage smooths peaks and reduces price differentials. As renewable penetration increases driven by declining costs and the state's clean energy

[25] Project 2015A Frequently Asked Questions

[26] MMWEC suggests that a 385 MWh battery would be needed in place of the proposed peaker, Project 2015A, Public Information Session, June 22, 2021

policy, zero marginal cost electricity will become increasingly available and storage resources will be able to charge at zero cost while reducing curtailment. This zero-cost energy will be shifted to peaking hours, reducing costs to ratepayers.

Emissions

The emission impacts of peakers can be, in part, quantified through the emission of local pollutants (SO_2 and NO_X), which cause incidences of respiratory illness, cancer, disease, premature mortality, as well as other damage near the source of emissions. Project 2015A emissions might be reduced due to the proposed control technologies, but will still exist as the project is designed to be fueled by natural gas and fuel oil. Specifically, the project is expected to have an SO_2 emissions rate of approximately 0.168 lbs/MWh and a NO_X emissions rate of 0.016 lbs/MWh.[27] In 2013, the US Environmental Protection Agency published a Technical Support Document (U.S. EPA 2013) describing an approach for estimating the average avoided human health impacts and monetized benefits related to emissions of $PM_{2.5}$ precursors including NO_X and SO_2 from 17 sectors.[28] According to EPA's analysis and based on the proposed peaker's projected NO_X and SO_2 emissions, Project 2015A could cost the state of Massachusetts an estimated $300,000 associated with local emissions over the first ten years (as shown in Table 3).

In addition to the local emissions, peakers also contribute to global emissions, specifically carbon dioxide. Global pollutants cause damage by concentrating in the atmosphere and have an impact on climate changes worldwide, regardless of where the source of emission is located. These climate changes signify societal impacts related to changes in net agricultural productivity, property damages from increased flood risks, human health, energy system costs, and other aspects of the economy. Based on the Social Cost of Carbon (SCC) suggested by the Environmental Protection Agency,[29] CO_2 emissions from the proposed gas peaker plant could cost society up to $459,000 just in its first year of operations, and $4.9 Million within the next decade.[30] Although the SCC value is not reflected within market prices, the RGGI value can be used as a proxy for quantifying the market value of reducing CO_2 emissions.

In its recent public information session on June 22, 2021, MMWEC claimed that Project 2015A reduces the generating fleet's emissions. This is incorrect. The peaking unit will emit local and global pollutants which will be adding to the fleet's emissions. The emission rate might be lower than some of the existing resources, but it is still positive and higher than alternative options. In fact, the emission rate of Project 2015A is higher than the 2019 marginal CO_2 and NO_X emissions rates for the marginal units in ISO NE.[31] The projected damage, as quantified in Table 3, is not insignificant.

[27] Strategen's calculations based on information from the MassDEP, Draft Air Quality Air Approval, August 2020

[28] U.S Environmental Protection Agency, Estimating the Benefit per Ton of Reducing PM 2.5 Precursors from 17 Sectors.

[29] U.S Environmental Protection Agency, The Social Cost of Carbon

[30] Project 2015A could potentially emit 50,780 tons of $C0_2$ annually. As reported in MMWEC Draft Plan Approval presented to the Massachusetts Department of Environmental Protection.

[31] ISO NE, 2019 ISO New England Electric Generator Air Emissions Report, March 2021

Table 3. Project 2015A emission costs

Pollutant	Potential Emissions (Tons/year)	First Year Economic Impact ($)	First Decade Economic Impact ($)
CO_2 (RGGI)	7,500	59,250	818,625
CO_2 (SCC)	7,500	458,748	4,884,027[32]
NO_x	1.1	17,338	181,847
SO_2	0.1	11,196	117,207

Installing batteries in place of the proposed gas peaker plant could bring economic benefits associated with the reduction of local and global pollutants. Estimating the reduction of emissions accurately is difficult as it depends on the emissions intensity of the generator whose output is used to charge the storage asset. As the grid transitions to higher renewable penetration levels, the emission intensity of the charging energy will keep declining. Still, even if the storage is not paired with a renewable resource and were to start operating today, it would result in reduced CO_2 and NO_X emissions. According to our dispatch model, the storage asset charges during off-peak hours, when the marginal CO_2 and NO_X emissions rates for the marginal units in ISO NE are lower than the project's rates, indicating potential emissions savings.[33] The absence of local emissions combined with the technology's modularity also increases siting flexibility, resulting in additional benefits.

In the effort to incentivize better utilization of clean energy technologies to supply power when electricity demand is at its peak, Massachusetts formulated the Clean Peak Standard (CPS). CPS, called for in legislation passed in 2018, creates credits for clean energy delivered during time windows identified as peak hours for a given season. Utilities in the state must obtain clean peak credits equal to a percentage of total electricity delivered in the year, starting at 1.5 percent in 2020 and growing annually. The goal is to create a price signal to shift clean power to the hours it's most valuable for the grid. CPS creates an opportunity for energy storage technologies such as batteries, which store electricity for use when desired. Energy storage systems can participate as standalone or co-located with storage units. However, per the Statute, municipal lighting plants (MLP) are exempt from the Clean Peak Energy Standard, which means that MLPs do not have a compliance obligation, and resources in MLP territories are ineligible to participate. Consequently, the analysis does not quantify any benefits from CPS eligibility.[34]

[32] Assuming a 7% escalation rate.

[33] ISO NE, 2019 ISO New England Electric Generator Air Emissions Report, March 2021

[34] M.G.L. c. 25A, § 17 (d) states that "this section shall not apply to municipal lighting plants."

Additional Considerations

Project Siting

Project 2015A, or the Peabody peaker project, is intended to be built on 0.6 acres of available land (yellow perimeter) within the 4-acre Water Rivers Station owned by PMLP (orange perimeter). The property already hosts a 115 kV substation[35], a 50-year-old 20 MW turbine and a 30-year-old 48 MW turbine, and three above-ground fuel-oil tanks with a 115,000-gallon capacity each.

Figure 3. Peabody development site at Water Rivers Station

The site's location and existing infrastructure make it suitable to host a new energy generation asset and, while it is too small for renewable energy generation, it could fit modular and energy-dense assets like batteries. In fact, storage can be rapidly and safely installed in small areas without the emission burden of gas peakers. Providers offering some of the most energy-dense utility-scale batteries can deploy about 83 MW of four-hour duration batteries in an acre. Tesla claims to be able to install a 250 MW, 1,000 MWh battery on a three-acre footprint in less than three months: four times faster than a traditional fossil fuel power plant of that size.[36] In a recently proposed project in California, Vistra Corp announced they could install a 600 MW, 4-hour battery on 22 acres. Using these examples, a 60 MW battery could be installed in a footprint ranging from 0.36 to 1.1 acres for a 2-hour battery duration or 0.72 to 2.2 acres for a 4-hour duration battery.

Depending on the battery provider and technology, the current project site may or may not be large enough to fit the battery system. While there are opportunities to optimize the use of space in the Water Rivers Station at Peabody,[37] battery storage systems are composed of modules that can be easily accommodated within the site or in distributed locations. In planning for project 2015A, MMWEC identified multiple alternative sites where available space, favorable zoning, and existing electric infrastructure would facilitate the installation of a new energy generator near the City of Boston, the load center. These locations, all in Massachusetts, include a 0.5-acre site in Fall River, a 0.4-acre site in Plymouth, and a second 3.5-acre site in Plymouth. While these sites are located near residential properties and thus were deemed less preferable

[35] Project 2015A contemplates an expense of $400,000 to replace circuit switches at PMLP substation.

[36] Tesla, 2019. Introducing Megapack: Utility-Scale Energy Storage. Press Release.

[37] Existing gas peakers in the site, with 30 and 50-years in service, are close and past the typical age of retirement for simple-cycle gas power plants. Retiring these plants and the associated fuel-oil reserve-tanks could free up two acres of land for the development of clean energy assets at Peabody.

for the gas peaker project, energy storage lacks the negative environmental externalities that would otherwise affect residents.

In addition to the utility-scale storage examined in this report, and as part of its planning going forward, MMWEC may wish to evaluate a VPP aggregating residential battery systems across the footprint of its member utilities. Considering that this would not be the first project of its kind in the state and that regulatory and technical barriers have already been overcome,[38] this option would reduce the space requirements at Peabody or any central location and could realize additional benefits from distributed capacity. Such benefits include building resiliency for customers from backup power, the relief of load pockets by reducing constraints at transmission and distribution lines, potential bill reductions for participating customers, and the advancement of the state's clean energy goals.

Environmental Justice

Project 2015A will be situated in an environmental justice community.[39] The Commonwealth's Next Generation Roadmap for the first time defines Environmental Justice populations in state statute. The definition is based on criteria of race, income, and language isolation. The roadmap law further amends the Massachusetts Environmental Policy Act (MEPA) to address environmental justice by introducing definitions for environmental benefits, environmental burden, environmental justice principles, and neighborhoods, and by providing new tools, protections, and public input for these communities. Specifically, it creates a new advisory council to work with state agencies to guarantee meaningful public participation in the decision-making process and remedy the legacy of how the state approves infrastructure and energy projects in environmental justice neighborhoods. Furthermore, following enactment of the Roadmap Law, an Environmental Impact report shall now contain additional information evaluating the environmental and public health impacts of the project, describing measures being utilized to minimize those, outlining unavoidable adverse short-term and long-term environmental and public health consequences, and investigating reasonable alternatives to the proposed project. The environmental impact report shall be required for any project that is likely to cause damage to the environment and/or to air quality and is located within a certain distance from an environmental justice population, assessing any existing unfair or inequitable environmental burden and related public health consequences impacting the environmental justice population from any prior or current private, industrial, commercial, state, or municipal operation or project that has damaged the environment. In the case of an existing unfair or inequitable environmental burden or related health consequence the report shall identify any:

(i) environmental and public health impact from the proposed project that would likely result in disproportionately adverse effect on such populations; and

(ii) potential impact or consequence from the proposed project that would increase or reduce the effects of climate change on the environmental justice population.

These MEPA amendments highlight the significance of environmental justice issues, especially in areas that are already suffering disproportionate pollution burdens. According to the Massachusetts Climate Action Network (MCAN), the proposed peaker plant is to be built less than half a mile away from two environmental justice communities and less than a mile away from seven local schools, a hospital, and several day-care centers. Besides the proposed peaker, the city of Peabody has several other sources of environmental pollution, including two natural gas peaker generators, three locations of toxic release, 15 air pollution

[38] See replacement use case in ISO-NE using distributed energy storage. Section on "Recent Energy Storage Project Examples", Page 3.

[39] Massachusetts 2020 Environmental Justice Populations

sources, and 85 sources of hazardous waste. The cumulative impact of these emissions contributed to Peabody, and neighboring communities, being some of the hardest hit by the COVID-19 pandemic in the State.[40]

The construction of another fossil fuel resource in the area will disproportionately affect the already disadvantaged communities. On the other hand, as renewable penetration increases, driven by declining costs and the state's clean energy policy, the alternative of energy storage is not only more economic, but also enables the use of more renewable energy positively impacting these communities.

Reliability

Even though it is an energy-limited resource, energy storage can meaningfully contribute to system reliability. The North American Electric Reliability Corporation has recently conducted analyses that underscore challenges presented with the acceleration of coal-fired generation retirements and the increased reliance on natural gas. The rapid shift to inverter-based resources (IBRs) that are variable energy resources due to their fuel source (e.g., wind, solar) creates potential challenges related to availability that may require additional resources to maintain the bulk power system's reliability. NERC notes that batteries could complement IBRs by providing some of the essential reliability services that are important to maintain reliability. Additionally, batteries provide elements of grid support, including flexible ramping support, fast frequency response, addressing the uncertainty of resource availability, and shifting energy to address new peaking conditions.[41]

NREL research has shown significant potential for energy storage to replace peaking capacity, and that this potential grows as a function of solar photovoltaic deployment. Specifically, the analysis demonstrated roughly 28 GW of practical potential for 4-hour storage providing peaking capacity, assuming current grid conditions and demand patterns.[42]

In a recent public information session, MMWEC questioned whether lower grid reliability lies ahead. They pointed to three issues: the at-home need for medical devices, the California rolling brownouts, and the recent Texas power crisis, indicating that renewables and storage would increase the risk for the Commonwealth. These are all misleading arguments.

First, distributed energy systems that include energy storage (and that could be part of a VPP setting as described above) would address the concern for the medically vulnerable population. Battery storage, especially when paired with solar PV (solar plus storage), increases grid resilience and helps mitigate this risk by providing reliable residential backup power in the event of an outage, allowing medically vulnerable residents to shelter-in-place or safely wait for evacuation in their own home. Second, resilient power can also help critical facilities, such as schools, hospitals, and nursing homes, provide community services through an outage or brownout.[43]

[40] In an analysis of 3,080 counties in the United States, researchers at the Harvard University T.H. Chan School of Public Health found that higher levels of the tiny, dangerous particles in air known as PM 2.5 were associated with higher death rates from COVID-19.
Wu, X., Nethery, R. C., Sabath, M. B., Braun, D. and Dominici, F., 2020. Air pollution and COVID-19 mortality in the United States.

[41] NERC, Energy Storage Impacts of Electrochemical Utility-Scale Battery Energy Storage Systems on the Bulk Power System, February 2021

[42] P. Denholm et al., The potential for battery energy storage to provide peaking capacity in the United States, Renewable Energy

[43] M. Mango, A. Shapiro, Home Health Care in the Dark: Why Climate, Wildfires and Other Risks Call for New Resilient Energy Storage Solutions to Protect Medically Vulnerable Households from Power Outages, Published By: Clean Energy Group, Meridian Institute, 06/04/2019

Finally, renewable energy and storage are simply not to blame for the California rolling brownouts and the Texas power crisis. MMWEC's mention of the two crises are misleading and shift blame away from what appear to be the root causes: the climate change induced extreme weather conditions, and the existing market conditions and practices.

In its final root cause analysis, the California Independent System Operator identified three major factors leading to the rotating outages: (i) the extreme heatwave across the western United States resulting in demand for electricity exceeding existing electricity resource adequacy (RA) and planning targets, (ii) the resource planning targets not keeping pace to ensure sufficient resources that can be relied upon to meet demand, and (iii) some practices in the day-ahead energy market exacerbating the supply challenges under highly stressed conditions.[44] In June 2021, California regulators adopted a decision to acquire 11.5 GW of electricity resources to support the state's grid after the Diablo Canyon nuclear plant and several natural gas plants are retired. Resources will mainly include zero-emitting generation, generation paired with storage, long-duration storage, demand response resources, and no incremental fossil fuel generation.[45]

The winter storm that roared into Texas on the weekend of February 14, 2021, precipitated a grid event of unprecedented severity, with power to millions of Texas electricity customers interrupted. The event was a critical combination of high demand and low supply. Freezing temperatures caused natural gas production and delivery to plummet, and ill-prepared power plants to go offline. At the same time, demand for both electricity and natural gas was soaring as Texans tried to heat their homes. With an islanded grid, the state could not import power from neighboring grids and a massive electricity generation failure occurred.[46] Although, the failures occurred across all types of generation, renewables included, the most significant energy gap resulted from natural gas and coal facilities.[47] For these reasons, statements blaming clean energy sources for the failures, or indicating that more gas power plants would have helped, are misleading.

Conversion to Hydrogen CT

One alternate energy solution under consideration by MMWEC is the use of combusted hydrogen in the turbine to replace the proposed fossil-fueled solution. MMWEC in its recent information session on June 22, 2021, stated that the project's existing turbine generator technology *likely* can operate with a fuel mix consisting of up to 25% hydrogen, while they are "in discussions with turbine manufacturer for developing the ability to increase the fuel mix to 100% green hydrogen", and that "development to green hydrogen fuel is a longer-term post-construction alternative". According to this statement, the proposed technology cannot operate with more than 25% hydrogen, and increasing this percentage would require additional investment. Still, even with a technology that can operate at 100% hydrogen, securing **green** hydrogen will pose additional technical and economic considerations, as further explained in this section. Based on the above, significant additional investment, far exceeding the costs of the alternative, would be required to make Project 2015 non-carbon emitting and in compliance with the Roadmap Law.

Hydrogen is a versatile energy option that has been used in small volumes for industrial processes for many years. However, the magnitude and scale of hydrogen that would be required to power a hydrogen turbine

[44] Final Root Cause Analysis, Mid-August 2020 Extreme Heat Wave, California Independent System Operator, California Public Utilities Commission, California Energy Commission, January 13, 2021

[45] California Public Utilities Commission, Decision Requiring Procurement To Address Mid-Term Reliability (2023-2026)

[46] E. Crooks, Wood Mackenzie, The Texas energy crisis: its causes and consequences, February 19, 2021

[47] C. Domonoski, National Public Radio, No, The Blackouts In Texas Weren't Caused By Renewables. Here's What Really Happened, February 18, 2021

would require significant commitment and upfront investment by MMWEC and its members. Furthermore, there still exist unresolved technical challenges around local pollutants, such as NOx, produced as a byproduct of hydrogen combustion. Combined, these challenges mean that a hydrogen turbine does not fit the needs of MMWEC, its members, or its community. This section lays out some of the key hurdles that would be required to implement a hydrogen turbine.

- Hydrogen supply: Hydrogen as an energy resource can come from a variety of sources – and not all of those are clean. In fact, most of the hydrogen in use today is "grey" hydrogen, which means it is produced from fossil fuel feedstocks. Thus, although the hydrogen itself may be a carbon-free energy storage medium, the production of the hydrogen can be extremely carbon-intensive. According to the International Energy Agency, clean or "green" hydrogen production accounts for only 0.1% of global production to date, with only $365 million invested in 94 megawatts (MW) of capacity.[48]

Table 4. Comparison of hydrogen production processes[49]

Hydrogen Production Methodology	Carbon Impact ($kg\ CO_2$ / $kg\ H_2$)	Share of Hydrogen Produced Globally
Gray (Natural gas steam methane reformation)	8 - 12	71 %
Brown (Coal gasification and SMR)	18 - 20	23 %
Blue (Natural gas SMR plus carbon capture)	0.6 – 3.5	5 %
Green (Electrolysis from renewable energy)	0	1 %

Even presuming that hydrogen is produced using non-emitting mechanisms, such as electrolyzers, significant infrastructure will likely be needed to meet the hydrogen production and volumes needed for a power generation plant.

- Hydrogen Combustion Emissions: While converting hydrogen to electricity using fuel cells is a clean and highly efficient process, many researchers and advocates have pointed to the fact that using hydrogen in combustion turbines leads to increased levels of NOx emissions.[50, 51] Furthermore, the US Department of Energy has noted that although technologies are being developed to attempt to control those higher NOx levels, they remain unproven.[52] As stated before, this kind of pollutant stays close to the emitting source, making them especially dangerous for local communities. Overall, If MMWEC were to propose retrofits on project 2015A to run on hydrogen in the near future (10-20 years) there are unresolved questions around cost-effectiveness and safety that the utility will need to address to

[48] International Energy Agency, 2019, The Future of Hydrogen.

[49] Green Hydrogen Coalition, 2020. Green Hydrogen Guidebook.

[50] The Union of Concerned Scientists (UCS), for example, noted that "when hydrogen is combusted (as opposed to used in a fuel cell), it can generate significant NOx emissions, commensurate with that of natural gas combustion—or worse". Accessible at: https://blog.ucsusa.org/julie-mcnamara/whats-the-role-of-hydrogen-in-the-clean-energy-transition/

[51] Two European studies have found that burning hydrogen-enriched natural gas in an industrial setting can lead to NOx emissions up to six times that of methane. Accessible at: https://doi.org/10.1016/j.ijhydene.2017.05.107.

[52] US Department of Energy, 2020. *Hydrogen Program Plan*

provide its ratepayers with the promised rate-stability and demanded emission reductions from the power generation site.

- **Hydrogen infrastructure:** As a volatile substance, hydrogen requires significant transport and storage assets to ensure safe handling, storage, and use. First, "green" hydrogen production will require the use of electrolyzers or biowaste that can be gasified for hydrogen production. Today, there are fewer than 100 MW of electrolyzers in operation globally, with one of the largest in operation being 20 MW.

  Second, hydrogen transport today is primarily via truck or rail. However, at the volumes contemplated for this project, hydrogen would likely require a dedicated hydrogen pipeline or to be produced onsite, carrying additional infrastructure investments. Today, standard rules and regulations for hydrogen pipelines are unclear, as all hydrogen pipelines in operation are operated by private, unregulated companies. Third, hydrogen has a low density at ambient temperature meaning that it rapidly expands into large volumes, and it requires advanced storage methods like compression or cryogenic tanks. Although larger volumes of gas can be stored in geological formations more cost-effectively, these are locational-constrained opportunities and the demand at Peabody is far from sufficient to entail this kind of gas storage infrastructure.

  Finally, hydrogen combustion will require the retrofit or redesign of the proposed turbine. While many turbines in the market are designed to burn and run on a blend of hydrogen and natural gas,[53] it is unlikely that the peaker project proposed in 2016 can use 100% hydrogen fuel without significant changes in its design. Combined, requirements for production, transport, storage, and energy generation represent significant capital outlays. Investing in hydrogen combustion should not be undertaken lightly.

In conclusion, even if hydrogen is promising for future large-scale applications, it unfortunately cannot be part of the solution to meet the capacity need under consideration. The high cost of a still nascent technology, the economic and technical risks it entails, and the question around environmental externalities cannot compete against an already proven and commercially ready technology like batteries which at this scale can cost-effectively address the need. Building a gas unit with the promise of later converting it to green hydrogen when a better alternative is readily available is not recommended.

Recommendation

Given the advancements in the state of battery storage, it appears warranted to revisit the viability of this option in lieu of the proposed alternative. MMWEC could conduct an all-source RFP solicitation that clearly defines system needs and would be open to a variety of resources including (but not limited to), energy storage, solar plus storage including aggregated distributed resources, and demand response. This would allow for broad market participation to determine the most cost-effective mix of resources able to fulfill MMWEC's peak capacity and reliability needs, resulting in cost and emissions savings for the Commonwealth of Massachusetts. Our analysis shows that energy storage would result in benefits in cost, global and local emissions, noise levels, and environmental justice issues.

[53] GE's 9F.03 gas turbines can run on 50% hydrogen. MHPS has been developing gas turbines capable of using up to a 30% hydrogen and 70% natural gas fuel mixture.