Comment on DPU 21-29
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Date: 26 April 2021
Title: Lithium ion battery energy storage as alternative to gas or oil fired peaker

Thank you for the opportunity to share my comments on Special Project 2015A. In the past I have worked as a researcher on emerging energy storage technologies, and have no current or anticipated future conflicts of interest. I am a resident of Wakefield, MA, which has signed the MMWEC Power Sales Agreement for Special Project 2015A, a 60 MW natural gas and oil powered peaker plant and compressor station. This letter details the benefits of evaluating lithium ion battery storage systems (Li ion BESS) as a substitute for the proposed gas fired peaker plant.

According to MMWEC DPU 21-29 Information Request DPU 1-1 dated April 12, 2021 [1], the 60MW Pratt and Whitney FT4000 CTG capacity resource was "chosen after evaluation of proposals submitted in response to MMWEC's Request for Proposals (issued in accordance with St. 1975, c. 775, §1-19) BB-160909, dated 9/9/2016." The document indicates that one criterion was "natural gas as the primary fuel and ultra-low sulfur oil as a secondary fuel," suggesting that proposals for energy storage options were not requested. There is no indication in the 2021 document that energy storage proposals were requested at a later date.

This would be understandable at the onset of special Project 2015A, but today, in 2021, utility scale Li ion BESS are widely used as substitutes for peaker plants. They can be integrated into existing power generation infrastructures to provide peak shaving, which is more economical than adding capacity. A sample profile is shown in figure 1 [2].

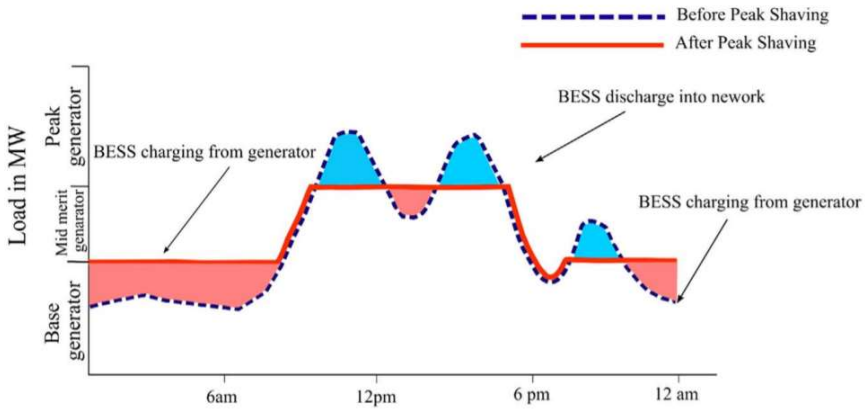

Figure 1: A sample profile for peak shaving of a generator integrated battery storage system (BESS) [2].

In addition to peak shaving, BESS can be used for load leveling, power quality / frequency regulation and voltage support to improve quality and efficiency, energy arbitrage to optimize economics, and scheduled or on demand load reduction which can help reduce energy waste (which, nationwide is approximately 70% [4]).

<u>Installation and Operating Costs</u>
According to permitting dFMF No. 609784 Air Quality Plan Proposal, "MMWEC-1 will be limited to 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. The Permittee intends to

startup and operate MMWEC-1 using natural gas, unless natural gas is unavailable, in which case ULSD will be used. Maximum projected emissions from the Project reflect a conservative scenario of 200 startup/shutdown cycles on natural gas and 50 startup/shutdown cycles on ULSD." [3]

The maximum likely operation time can be calculated from these parameters:
1250 h / 200 cycles natural gas = 6.25 h /cycle natural gas
250 h / 50 cycles ULSD = 5 h / cycle ULSD

Max gas fired peaker capacity = 60 MW, max gross output * 6.25 h, max duration = 375 MWh

Sizing of Li ion BESS = 375 MWh / (0.95 efficiency * 0.8 depth of discharge * 4 h) = 123 MW

BESS costs were detailed for 2018 and 2025, respectively, in a recent DOE report. Cost estimates include capital, balance of plant, power conversion systems, engineering and procurement [5]:

$282/kW (2018) * 123,000 kW = $35 M

$232/kW (2025) * 123,000 kW = $29 M

The costs were equivalent on the basis of kWh. Comparing these estimates to the budget for Special Project 2015A, initial cost alone seems to be ample justification to request Li ion BESS proposals.

Operating costs further differentiate lithium ion BESS. According to the same DOE report, in 2018 O&M expenses for Li ion BESS were less than 10% that of combustion turbines, at $3/kWh versus $38/kWh, respectively. The projected difference for 2025 is even greater [5]. If one takes into account likely penalties for carbon generation as well as hidden costs to health and the environment, the cost benefits of BESS are clear.

Footprint

In a recent WMGLD meeting, footprint was cited as a disincentive to pursuit of Li ion BESS. According to information provided by one BESS manufacturer, LMES [6], the footprint for 500 kW modules totaling 123 MW would be as follows:

123,000 kW * 4 h / 3 – 4 kW h / ft2 *1/ 43560 ft2/acre= 2.8 – 3.8 acres

Currently, 0.6 acres of a four acre site is allotted for Special Project 2015 A. Of course, proposals would be needed to determine the actual land requirement for this amount of energy storage, but it is clear that the peaker site at Waters River is too small.

Safety Concerns

There have been a number of high profile accidents traced to thermal runaway in lithium ion batteries, and even Li ion BESS, such as an explosion at a 2MWh UAPS facility in Arizona. It is prudent to distance energy storage, as well as energy generation, from residential areas as much as possible. For example, the 300 MW/1,200 MWh Moss Landing Energy Storage Facility, located south of San Francisco, started up in December 2020. It is located away from residential areas, in a commercial district adjacent to a waterfront and a nature preserve. As a resident of a town investing in Special Project 2015A, I hope for the evaluation of alternate sites as well as the evaluation of Li ion BESS as a substitute for the gas fired peaker.

I am grateful to WMGL and MMWEC for providing reliable power and superb service but understand that we must act locally to combat the global climate crisis. The recent Energy Storage Initiative will require 1,000 MWh of energy storage in MA by December 31, 2025. Senate Bill 9 - *An Act Creating a Next Generation Roadmap for Massachusetts Climate Policy*, requires 50% reduction emissions by 2030 (which coincides with new federal goals) and net zero emissions by 2050. To meet these aggressive targets, opportunities for clean energy and energy storage will need to be pursued, and I would like WMGL and MMWEC to be proactive.

References:


1. MMWEC, DPU 21-29, Information Request DPU 1-1, Date of Response: April 12, 2021, Witness Responsible: Ronald C. DeCurzio
2. M. Uddin et al. Renewable and Sustainable Energy Reviews 82 (2018) 3323–3332
3. Permitting dFMF No. 609784 **AIR QUALITY PLAN APPROVAL** August, 2020, Mr. Brian A. Quinn Massachusetts Municipal Wholesale Electric Company RE: **PEABODY** Transmittal No.: X273353 Approval No.: NE-17-001 Class: OP2 FMF No. 609784
4. R.S. Follow, "Why you only get 25% of the electricity you pay for" Energy, May 27, 2014
5. K Mongird, PNNL-28866 "Energy Storage Technology and Cost Characterization Report" July 2019
6. Lockheed Martin Energy Storage [LMES], informal footprint estimate.