



A PUBLICATION OF THE MASSACHUSETTS MUNICIPAL WHOLESALE ELECTRIC COMPANY (MMWEC)

MMWEC Retires Half of Its Outstanding Debt, Only \$56M Remaining

MMMWEC retired more than half of its outstanding power supply project debt on July 1, 2016, leaving only \$56 million in MMWEC bonds outstanding.

With the July 1 debt service payments, outstanding principal was reduced from \$113 million to \$56 million. It will fall another 80 percent to \$11 million after the July 1, 2017 payments. Well-funded MMWEC bond reserves will be used after that to cover the final debt service payments, which will eliminate monthly Project Participant billings for debt service.

This diminishing MMWEC debt puts Project Participants in a strong financial position. The overall reduction in debt service payments will help to offset rising regional capacity and transmission costs. This provides Project Participants with competitive advantages, including more stable rates in an environment where the costs of competitors will be increasing.

In fact, debt-free assets represent a perfect hedge against capacity costs, which makes a strong case for generation ownership going forward.

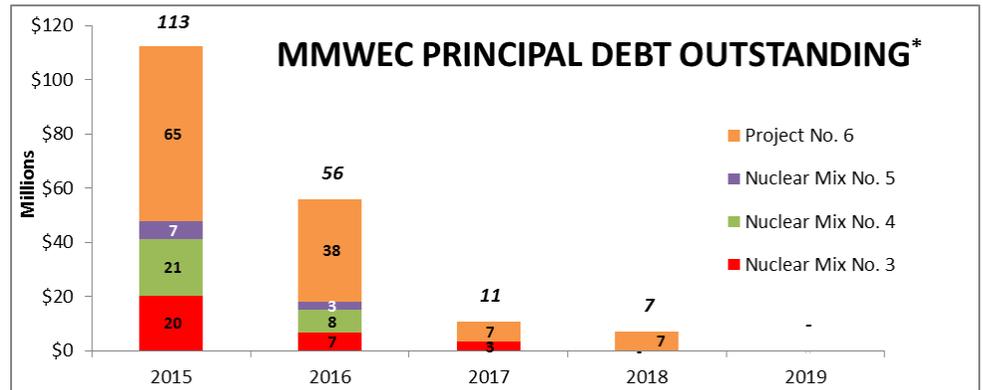
These favorable circumstances are a result of the sound and successful structure of MMWEC's financing method. Disciplined bond financing has proven to

be a valuable resource to finance and secure ownership stakes in generation assets, which will continue to provide benefits for decades after the debt has been retired.

MMWEC has issued more than \$4.7 billion in bonds since 1976 to finance and refinance its ownership interests in several New England electric generating facilities, including Seabrook Station, Millstone 3, the Stony Brook power plant in Ludlow, and Wyman Unit 4 in Yarmouth, ME. All of the debt associated with the Stony Brook and Wyman Unit 4 plants was retired in 2008. By 2019, all of MMWEC's power supply

projects will be debt-free. Seabrook Station and Millstone 3 are expected to operate until at least 2045, long after the related debt is retired.

MMWEC sells power from these plants at cost to 28 Massachusetts municipal utilities and six Vermont utilities, including utilities in Ashburnham, Boylston, Braintree, Danvers, Georgetown, Groton, Hingham, Holden, Holyoke, Hudson, Hull, Ipswich, Littleton, Mansfield, Marblehead, Middleborough, Middleton, North Attleborough, Paxton, Peabody, Reading, Shrewsbury, South Hadley, Sterling, Templeton, Wakefield, West Boylston and Westfield. ∞



*Project No. 6 and Nuclear Mix Nos. 3, 4 and 5 represent MMWEC ownership interests in Seabrook Station and Millstone Unit No. 3. *Balances as of July 1, 20XX*

Battery Storage Prices Continue to Decline With Improved Technology, Demand Increasing

Prices for battery storage continue to decline, as demand increases and government mandates call for increased renewables in the generation portfolio. Battery storage is one of the emerging resources MMWEC's new Emerging Technologies Initiative is pursuing as a potential option for municipal utilities to consider.

According to Bloomberg New Energy Finance, prices for lithium-ion battery packs for electric vehicles could drop to about \$200 a kilowatt hour (kWh) by 2020. They were priced at \$350 per kWh last year and \$1,000 per kWh

in 2010. The rapid decline in price is attributed to improved technologies and larger production facilities.

Researchers are predicting this trend will continue. As battery storage production for electric vehicles, residential and power grid usage increases, battery costs are expected to continue declining. Greentech Media is projecting that prices for fully installed utility storage projects for energy applications will decrease by 21 to 27 percent between the first quarter of 2016 and 2018. The U.S. Energy Information Administration has predicted that lithium-ion battery

costs will reach a low of \$135 per kWh by 2035.

Solar panel manufacturers and installers are increasingly teaming up with battery producers and energy storage system assemblers, making residential batteries more accessible. Lithium-ion batteries remain the most popular for residential consumers, but other technologies, such as flow batteries, are becoming more common for home use.

Battery storage is a versatile asset and can meet various needs as a resource at the customer level and as a grid resource.

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MMWEC Completes Cyber Security Upgrade to Ensure ISO Compatibility

MMMWEC recently completed a critical cyber security upgrade to ensure compatibility with ISO New England (ISO-NE) to secure MMWEC's participation in the wholesale power marketplace.

The MMWEC upgrade became necessary when ISO-NE updated a data encryption tool. While the encryption tool was once hailed for its simplicity and speed, multiple vulnerabilities have been discovered in it, making it insecure.

This is just one of numerous software and system changes requiring MMWEC to act swiftly and deliberately to safeguard uninterrupted use of Standard Market Design (SMD) applications. The SMD application communicates electronically over the internet with the ISO-NE eMarket system, a web-based application that enables MMWEC to participate in energy, capacity and reserve markets.

MMWEC uses SMD applications that were developed by staff in the late 1990s to report the electric loads of member utilities, deliver generation and load bids, participate in various ISO-NE markets and to settle interchange accounts for member utilities, among other things. These applications, while updated a patched over the years to ensure compatibility with ISO-NE systems, are in line for replacement.

Looking ahead, MMWEC is working on a new Market Man-

agement and Planning SMD solution, which comes at a crucial time when ISO-NE required system upgrades are becoming more frequent and complex. Evolving business requirements, changing power market dynamics, new technology and increasingly stringent security requirements all must be addressed.

Part of the MMP SMD solution includes plans to have the selected vendor assume responsibility for ISO-NE compatibility upgrades going forward. The vendors under consideration have extensive experience in this area and work closely with ISO-NE to ensure system compliance.

"Software as a service is a solution to streamline our ISO-NE compliance,

which is a critical requirement to participating in the wholesale power markets," said MMWEC Information Technology Director Danny Suppin.

MMWEC evaluated five vendors this spring as part of the MMP SMD solution. Following reviews, finalists will be chosen, with an expected implementation date of January 1, 2017.

MMWEC completed a Financial Systems Redesign Project in 2013 to upgrade the organization's accounting and financial reporting systems. Integration of the new financial systems with the market systems will further improve the efficiency of financial, market management and planning activities. ∞

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- IT Director Danny Suppin

Munis, MMWEC Exempt from Reporting Requirements Under FERC Data Collection Rule

Municipal utilities and joint action agencies, including MMWEC, are exempt from certain reporting requirements under a new data collection rule proposed to help the Federal Regulatory Commission (FERC) detect power market manipulation.

In comments on the FERC's initial data collection proposal, MMWEC argued for exemptions on the basis that public power utilities have very limited ability and motivation to manipulate wholesale power markets. In explaining its proposed exemption for Federal Power Act Section 201(f) entities, which include consumer-owned utilities and governmental entities, the FERC states that "due to their financial structures, they have substantially reduced incentives to commit market manipulation." Section 201(f) entities are excluded from FERC jurisdiction for most purposes.

MMWEC filed its comments on the initial proposal jointly with the Connecticut Municipal Electric Energy Cooperative, the New Hampshire Electric Cooperative and the Vermont Public Power Supply Authority.

The initial Connected Entities NOPR would have required all ISO/RTO market participants, including MMWEC and its municipal utility members, to provide ISO-NE with information about "connected entities" that they have ownership, employment, debt or contractual relationships with, as well as details about those relationships. ISO-NE would then have provided

that information to the FERC.

The new proposal presents substantial revisions from what FERC proposed in the Connected Entities NOPR, including a different set of filers, a reworked and substantially narrowed definition of connected entity and a streamlined and simplified submission process.

The new NOPR attempts to avoid duplication, minimize compliance burdens, modernize data collections and make information collected through its programs more usable and accessible for FERC and its staff. These data collection requirements would apply to "all market-based rate sellers and entities trading virtual products or holding financial transmission rights," according to a FERC news release. The proposal exempts certain entities from reporting connected entities data, including municipalities and certain cooperatives, including their associated joint action agencies.

FERC is planning technical workshops to receive input on the new NOPR. The first workshop is scheduled for Thursday, August 11. Comments on the new NOPR are due 45 days from publication in the Federal Register. ∞



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Used by consumers “behind the meter,” battery storage can be used to help consumers with time of use rates to shift their electricity consumption and reduce costs. Some home batteries are enabled to work with distributed solar generation to help reduce peak energy usage by using solar energy stored during off peak periods.

They can also be used as a grid resource. According to the federal government’s June 2016 report, “Incorporating Renewables into the Electric Grid: Expanding Opportunities for Smart Markets and Energy Storage,” battery storage is likely to be considered most valuable as an ancillary services provider.

Other benefits include bidding into capacity markets and helping to reduce the need for additional transmission and distribution infrastructure. In addition, they can be located easily in areas of high demand where additional generation is not an option.

For municipal utilities in Massachusetts, the potential uses for battery storage are continuing to grow as the costs for new installed systems are continuing to decline. Lower costs coupled with improvements in battery technology and financing programs such as the MMWEC pooled loan program can put energy storage within the grasp of MMWEC member utilities. Battery manufacturers now warranty systems to 10+ years or 3,000-5,000 full cycles.

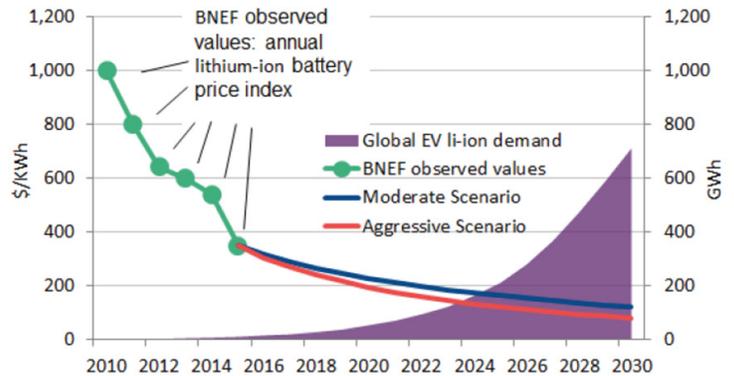
The challenge now for municipal utilities is finding a potential revenue stream or cost avoidance to support debt service and yearly O&M costs. Until battery storage capacity qualifies for payment in the Massachusetts Renewable Portfolio Standard, utilities must look to transmission cost deferral, grant funding, power quality improvements and load shifting (capacity savings) to justify project costs.

With Massachusetts continuing to lead the way in solar deployment and incentives, new opportunities are beginning to emerge by pairing batteries with solar generation. Pairing solar with batteries improves system efficiencies and provides voltage regulation capabilities, which are important with the deployment of large megawatt scale solar arrays.

Load leveling or peak shaving is another use for batteries in New England. With slumping energy prices and power plant closures, capacity prices are increasing. Since a utility’s capacity supply obligation is based upon its peak usage during the system peak, capacity cost savings from peak shaving can help to offset battery project costs.

Similarly, peak shaving offers an opportunity to curb the increasing cost of regional transmission service, which also is based upon peak usage.

MMWEC’s Emerging Technology teams are committed to assisting municipal utilities in taking advantage of falling battery storage prices and improved technologies. Support is available every step of the way, from feasibility studies through project completion. Assistance related to grant solicitation, project scoping, technology questions and the creation of financial models can be provided. ∞



Source: Bloomberg New Energy Finance

BloombergBriefs.com

This chart shows the costs of lithium-ion batteries declining while global demand electric vehicle batteries increases.



A 100-ton transformer is hoisted from its pad at the 527-megawatt Stony Brook power plant, which is principally owned and operated by MMWEC. The transformer is being shipped off-site for repair, while a rental transformer is installed to keep Stony Brook Peak-ing Unit 2A available for service.

MMWEC GO Program Creates “How-To” Videos for Contractors

In an effort to simplify the rebate application process for contractors using the MMWEC GO Program for commercial and industrial energy efficiency, MMWEC has created “how-to” videos to streamline the procedure.

Contractors who work with Green Opportunity, or GO Program municipal utility participants were invited to a recent training session in Shrewsbury. The contractors were walked through the lighting and HVAC prescriptive rebate process step-by-step to help them avoid the pitfalls that may stall their rebate applications. The session was videotaped so that contractors who missed the training could see it, and contractors who attended could refer back to the information provided.

Contractors learned how to determine if the equipment they intend to buy is eligible, and how to search the Design Lights Consortium and Energy Star online systems. In addition, they learned how to properly complete a prescriptive rebate application and estimate energy savings as a result of their project.

Short, informational videos have been created for contractors’ use. They have been posted on the GO Program website, www.mmwecgoprogram.org, for viewing anytime.

“We offered this training program to help contractors un-



derstand the application process,” said Kim Grant, MMWEC Energy Efficiency Program Manager. “Our hope is that by providing this service and recording it for future reference, the application and pre-approval process can be expedited for the customer.”

The GO Program offers comprehensive efficiency program services for commercial and industrial customers, as well as local government facilities. In addition to prescriptive lighting and HVAC, the custom retrofit GO Program helps commercial and industrial businesses identify and implement electric energy efficiency projects in existing buildings. The custom new construction and major renovation program supports the integration of energy efficiency technologies and building practices in new construction and renovation of C&I buildings by providing technical assistance and financial incentives specific to the needs of each individual project.

The project-specific services provided include energy auditing, project tracking and program management, measurement and verification. Using MMWEC as the service administrator eases the burden for municipal utilities, which do not need to dedicate staff to these tasks.

The municipal utilities currently subscribed to the MMWEC GO Program include light departments in the towns of Ashburnham, Chicopee, Holden, Ipswich, South Hadley, Shrewsbury, Sterling and West Boylston. ∞

Richard A. Miller, Jr., Hull Municipal Light Plant Operations Manager, Remembered

Richard A. “Dick” Miller Jr., Operations Manager for the Hull Municipal Light Plant, died June 24, 2016.

Miller worked as a journeyman lineman for Local 104-IBEW at the light plant before working in the private sector for several years. He returned to the Hull municipal utility, where he was hired as operations manager in 2007.

Miller was elected the South Shore Nominating Committee representative for the MMWEC Board of Directors beginning in 2008.

He will be remembered for making numerous contributions to the light plant, according to Town Manager Philip Lemnios.



“Dick Miller was resourceful, hard-working and dedicated to the town,” Lemnios said. “Over the last eight years, Dick successfully brought the light department through a phase of capital renewal, which has resulted in a better managed and more reliable system for the residents of Hull. All of us at Town Hall extend our gratitude and sympathies to Mr. Miller’s family.”

Panos Tokadjian, who has been named Operations Manager of the light plant, said Miller served as a mentor to him.

“He worked to improve the system and make it as reliable as possible,” Tokadjian said. “He helped to build the system to withstand the harsh (coastal) environment here. He brought the light plant back to the solid financial footing it enjoys today, and laid the foundation for his successors to build upon, and move it forward.” ∞

Massachusetts Municipal Wholesale Electric Company

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A non-profit, public corporation and political subdivision of the Commonwealth
Joint Action and economies of scale for Massachusetts municipal utilities

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