CLEANENERGYRESULTS

Annual Report to the Massachusetts Department of Energy Resources

Covering January 1, 2019 – December 31, 2019

Bernardston Fire & Water District
150-kilowatt (kW) solar photovoltaic system Pratt Field Wellhead area

2019

Massachusetts Department of Environmental Protection

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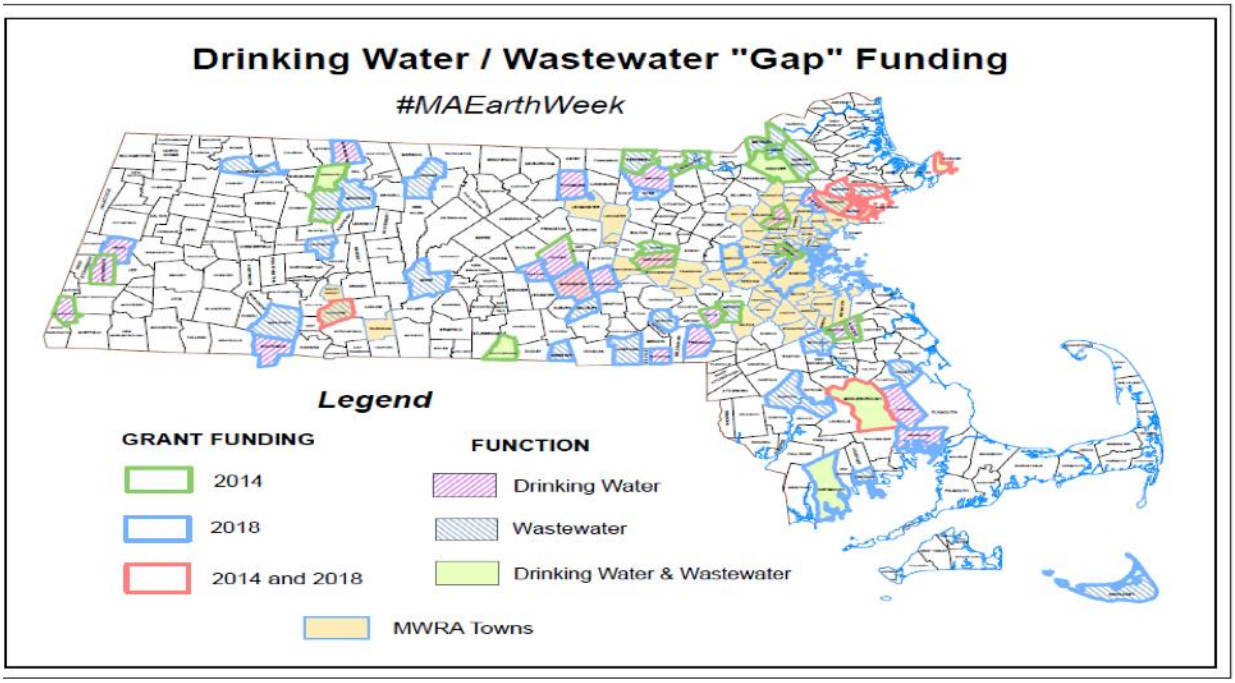
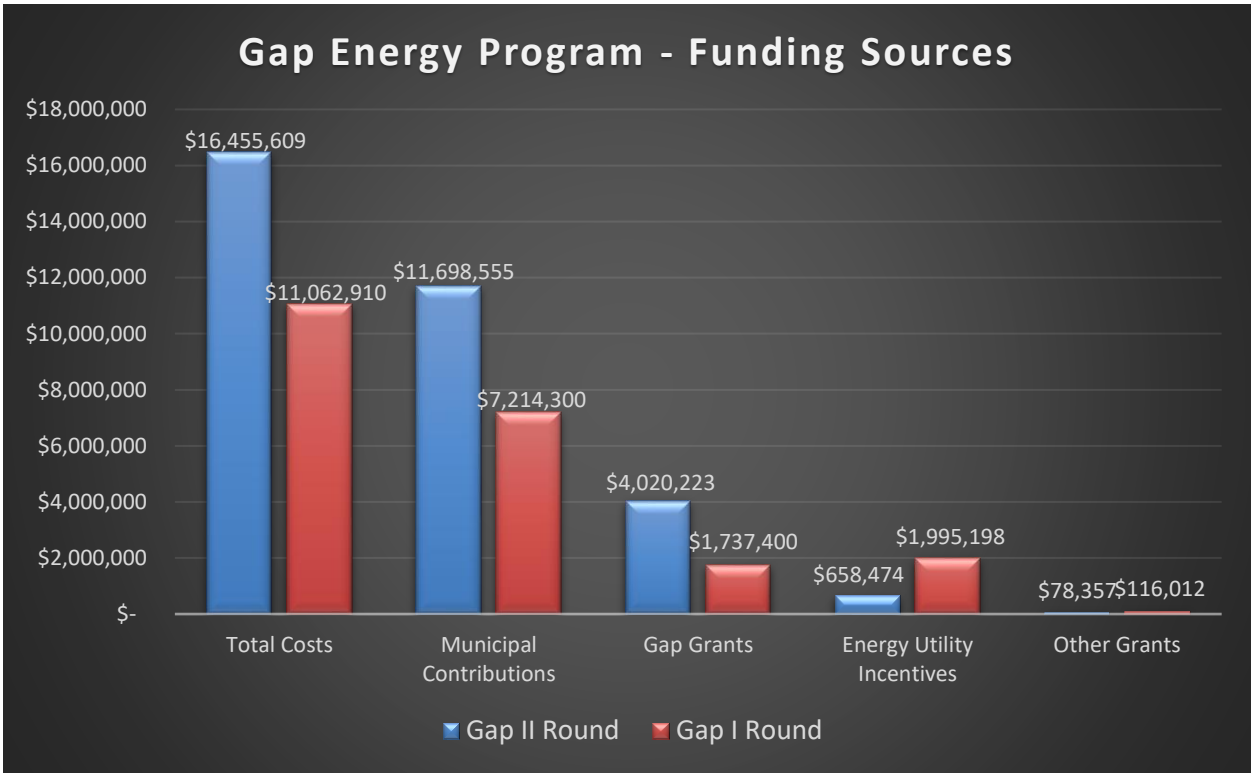
EXECUTIVE SUMMARY

The Clean Energy Results Program (CERP), launched in November 2011, is a first-of-its-kind partnership between the Massachusetts Department of Environmental Protection (MassDEP) and the Massachusetts Department of Energy Resources (DOER). This innovative program builds on MassDEP's regulatory expertise and authority to support DOER in advancing the permitting and development of renewable energy and energy efficiency projects throughout Massachusetts. MassDEP also works closely with the Massachusetts Clean Energy Center (MassCEC) on CERP program activities.

This Annual Report covers MassDEP activities performed from January 1 – December 31, 2019. It is being provided to DOER pursuant to the Memorandum of Agreement (MOA) executed between MassDEP and DOER, which sets the conditions for the Clean Energy Results Program funding. Below are highlights from each key program area. More information on each of these can be found under the Detailed Program Progress section of this report.

MassDEP continued implementing its second round of $4 million in state Gap Grant funding in 2019 for constructing energy efficiency and renewable energy upgrades to 36 drinking water and wastewater treatment facilities. The Gap grant program "fills the gap" by connecting and leveraging incentives from energy utilities and other funding sources to move energy efficiency and clean energy generation projects forward. During two rounds of Gap Funding grants, 67 drinking water and wastewater facilities (18% of the sector) have leveraged more than $2.6 million in energy utility incentives with program awards of more than $5.7 million, to produce more than $28 million in plant efficiency upgrades and clean energy installations. Overall, every year, these community projects are saving more than $2.5 million in energy costs, producing approximately 24,195 megawatt-hours in energy savings, and reducing carbon emissions by 17,977 metric tons.





MassDEP continued to assist with development of clean energy projects across Massachusetts, and in 2019 significant progress was made in permitting innovative projects, providing technical assistance, and collaborating on policy and regulatory initiatives that promote clean and renewable energy and energy efficiency projects. MassDEP reviewed air and waste permits for anaerobic digester projects that will manage source-separated organics, furthering MassDEP's goal of diverting an additional 350,000 tons of organics from disposal by 2020. In addition, MassDEP was part of a team of several Commonwealth agencies, including UMass Lowell and UMass Amherst, along with the United States Environmental Protection Agency (US EPA) that organized workshops with the Food and Beverage Industry. The group focused on providing information and assistance not only on energy efficiency, but also reducing water and chemical use, and substituting safer cleaning materials, all with an eye toward reducing costs and promoting improved operations.

Work done by MassDEP staff directly advanced a number of specific clean energy and energy efficiency projects through review and permit approvals. They included installation of solar PV systems on contaminated sites and closed landfills, construction of anaerobic digestion facilities, promotion of techniques for greener cleanups of contaminated sites, and energy efficiency projects at numerous wastewater and drinking water treatment and industrial facilities.

The CERP program provided assistance to the Bureau of Air and Waste (BAW) by managing the rollout of Round III of the MassCleanDiesel: Clean Markets Grant Program. Round III of the grant program provides grants to replace diesel-powered transportation refrigeration units with all-electric units located at food distribution warehouses and markets to reduce air emissions at those locations.

More information on each program area can be found under the Detailed Program Progress section of this report.

Detailed Program Updates

Anaerobic Digestion/Organics Diversion

Recycling Loan Fund –The Bureau of Air and Waste's Recycling Loan Fund continues to oversee and service approximately $1.5 million in outstanding loans to two Anaerobic Digestor (AD) facilities that will use food waste organics as one of their input streams – Pine Island Farm and Rockwood Farm. The Rockwood AG-Grid project received additional funding in 2019 to install food de-packaging equipment. Recycling Loan Fund loans continue to be available for AD facilities taking in source separated organics.

Municipal Organics Grants – MassDEP continued to offer several categories of food waste grants under its Sustainable Materials Recovery Municipal Grant Program. In 2019, MassDEP awarded two grants totaling $111,000 to support municipal food waste collection programs. Grants went to the Island Grown Initiative for food waste reduction and composting on Martha's Vineyard, and to Lovin Spoonfuls to purchase a truck to expand their food rescue routes.

RecyclingWorks in Massachusetts – RecyclingWorks in Massachusetts (RecyclingWorks) continued to provide technical assistance to businesses and institutions to increase food waste diversion. In 2019, the RecyclingWorks program:

- Delivered technical assistance to 120 businesses
- Addressed 137 hotline inquiries regarding food waste
- Presented on food waste reduction issues at 19 events
- Prepared new website content to support and inform commercial food waste reduction efforts, including 27 blogs related to food waste.

Commercial Organics Waste Ban Compliance and Enforcement – MassDEP continued to monitor compliance with the commercial organics waste disposal ban at solid waste facilities, and issue enforcement for waste ban violations. In 2019, MassDEP issued 32 notices of non-compliance and five administrative consent orders with penalties for violations of the commercial organics waste disposal ban.

Organics Subcommittee and Progress Report – MassDEP continued to meet with the Organics Subcommittee to work on organics program and policy review and development, holding meetings in March, April and September 2019. MassDEP has prepared updated data on food waste diversion, indicating that 310,000 tons of food materials were diverted from disposal in 2019, an 11 percent increase over 2018 diversion. In 2019, 190,000 tons of food material were sent to anaerobic digestion facilities, an increase of 18 percent over 2018. In addition, the number. of businesses serviced by separate food waste collection has grown by 70%, from 1,350 in 2014 to 2,900 in 2019. Massachusetts has 600,000 tons of Anaerobic Digestion capacity in operation or under development. For more information on the Organics Subcommittee see https://www.mass.gov/service-details/massdep-organics-subcommittee.

Siting and Permitting of New Anaerobic Digestion Facilities

There are now a total of 10 anaerobic digestion facilities that accept food material in Massachusetts. The construction and opening of new and expanding anaerobic digestion facilities continued during 2019.

Facilities under construction in 2019 include:

- Whittier Farm, Sutton

Facilities that started operating in 2019 include:

- Luther Belden Farm in Hatfield
- Rockwood Farm in Granville
- Jordan Heifer Farm in Spencer

In 2019, The Greater Lawrence Sanitary District (GLSD) reached a major milestone by completing its Anaerobic Digestion (AD) expansion "Organics-to-Energy" project, achieving Net-Zero energy status, and offsetting nearly $3 million in energy costs. https://www.glsd.org/wp-content/uploads/2019/12/GLSD-Organics-to-Energy-Press-Release-Dec-10-2019-1.pdf.

The GLSD's Organics-to-Energy project provides a cost-effective outlet for diverted organics and food waste across the Commonwealth as required under the Commonwealth's Solid Waste Master Plan. The Plan calls for diversion of food waste from landfills and incinerators to reduce greenhouse gas emissions, a goal achieved by utilizing electricity at the location of production, which is 60 percent more efficient than obtaining it from the grid. The photos below are courtesy of the Greater Lawrence Sanitary District.

Ariel view of Greater Lawrence Sanitary District located in North Andover, MA

One of two 1.6-Megawatt Caterpillar G3520C co-generation engine.

Clean Energy at Drinking Water and Wastewater Utilities

Gap Energy Grant Program Reduces Energy Use, Air Emissions, and Operating Costs

MassDEP made significant progress in implementing a second $4 million round of Gap II grant funding. The state Gap grant funds were combined with $700,000 of energy utility incentives to jump-start over $17 million of energy efficiency and renewable energy generation construction projects at 36 drinking water and wastewater treatment facilities. These projects are estimated to save facilities $1.3 million annually; generate approximately 8,405 megawatt-hours in annual electricity savings; and result in a good public return-on-investment for these facilities and the Commonwealth.

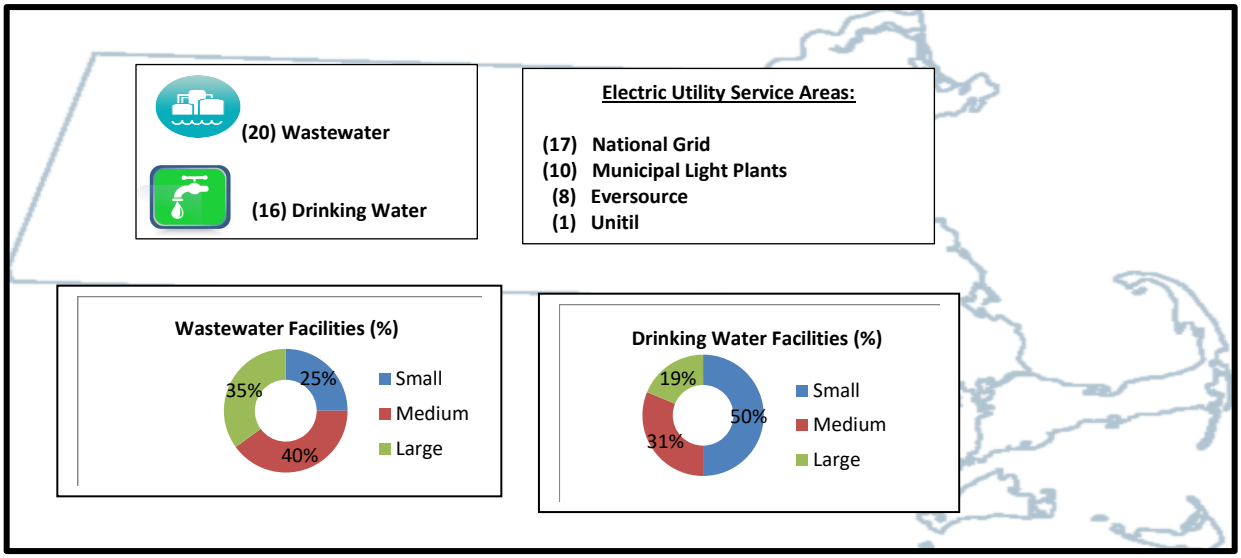
In 2019, a total of 70 Gap II energy-saving projects at 16 drinking water and 20 wastewater plants moved into the contracting and implementation phases. These projects contained a variety of energy efficiency measures and on-site renewable energy development upgrades, including:

- installing solar photovoltaic systems (roof and ground mounted),
- installing variable speed drives (VSD),
- motor and pumping system optimization (refurbishment and replacement),
- drinking water and wastewater treatment process and optimization improvements:
  - retrofitting a biological aeration system with automatic Dissolved Oxygen (DO), temperature and pH sensors and VFD-controlled energy efficient blowers,
  - Converting existing coarse bubble air diffusers and centrifugal aeration blowers to fine bubble air diffusers and rotary hybrid blowers,
  - installing higher efficiency mixing blades into aeration basins,
  - a energy-saving liquid oxygen system for improved drinking water treatment, and
- installing an in-line hydroelectric turbine at a large drinking water supplier.

These projects will strengthen our clean water infrastructure, improve its reliability and resilience, cut the use of fossil fuels, and allow energy savings to be reinvested back into municipal water operations.

The Gap II grant program funding was distributed among different-sized wastewater and drinking water facilities and electric utility service areas throughout Massachusetts; providing a variety of treatment facilities to become more efficient and reduce their operating costs and greenhouse gas emissions.

Distribution of Gap II Grant Projects Funded



Total Gap II Grant Projects – Anticipated Results

- **70** energy efficiency and renewable generation projects are being constructed -- including over **412 kW of solar photovoltaic and 10 kW of in-line hydropower.**

Estimated Annual Savings for Facilities

$1,300,000 of operating costs
8,405 megawatt-hours of electricity or on-site power generation
4,469 therms of natural gas
3,280 gallons of diesel fuel

Estimated Annual Greenhouse Gas Reductions and Equivalents

2,975 Metric tons
1,148 MA homes this could power by electricity
652 Equivalent cars off the road

Gap II Energy Grant Successes and Completed Project Results

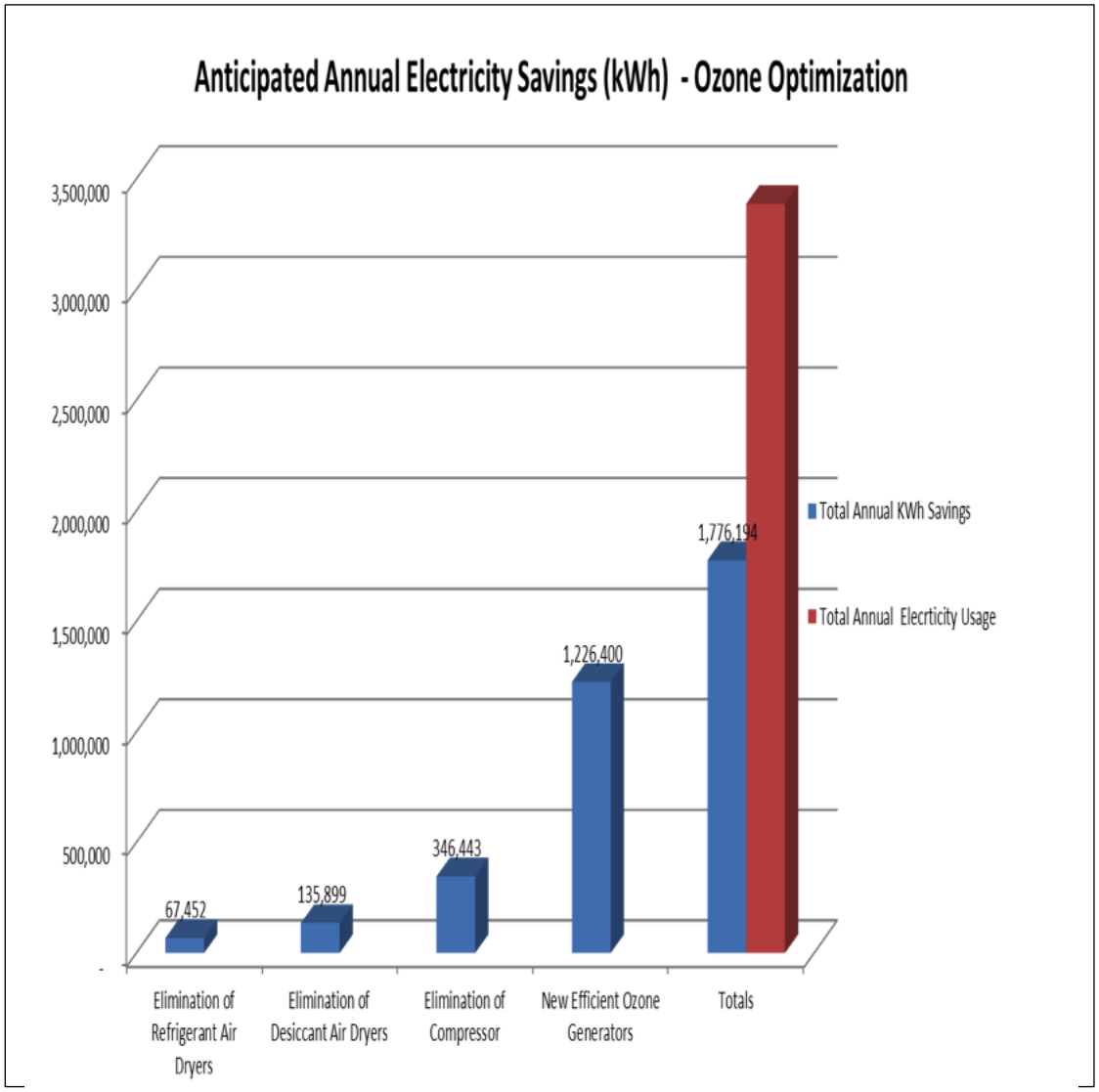
On April 24 and April 26, 2019, as part of the Commonwealth's Baker-Polito Administration celebration of Earth Week, state environmental and local officials and area legislators celebrated the Gap Energy Grant Program's success at the **City of Worcester's Moylan Water Filtration Plant** and **the Rockport Water Treatment Plants.** The press releases can be found here: https://www.mass.gov/news/state-local-officials-celebrate-success-of-worcester-water-treatment-facility; https://www.mass.gov/news/state-local-officials-celebrate-success-of-rockport-water-treatment-facility.
Below are project summaries and photos from these two Gap-funded projects.

Earth Day 2019 Event at the Robert L. Moylan Jr. Water Treatment Facility

City of Worcester - Robert L. Moylan Jr. Water Treatment Facility - Ozone Upgrade and Optimization
The City of Worcester Water Filtration Plant, now the Robert L. Moylan, Jr. Water Filtration Plant, went into service in 1997, treating all of Worcester's drinking water and all or parts of Paxton, Holden, Auburn, Leicester, Millbury and West Boylston. A key treatment process used at the plant is ozonation, which serves as a disinfectant and also enhances the filtration process. Ozonation is accomplished by

taking dry air and passing it through ozone generators which use the energy from electricity to create ozone (O_3) from oxygen (O_2). The ozone generated on site is then passed through the water as it enters the filtration plant. The previous technology in use at the plant was state of the art 20 years ago. The old ozone system included compressors, desiccant air dryers, refrigerant dryers and ozone generators. It was an energy intensive system that consumed roughly 70% of the total electric demand at the plant in the summer.

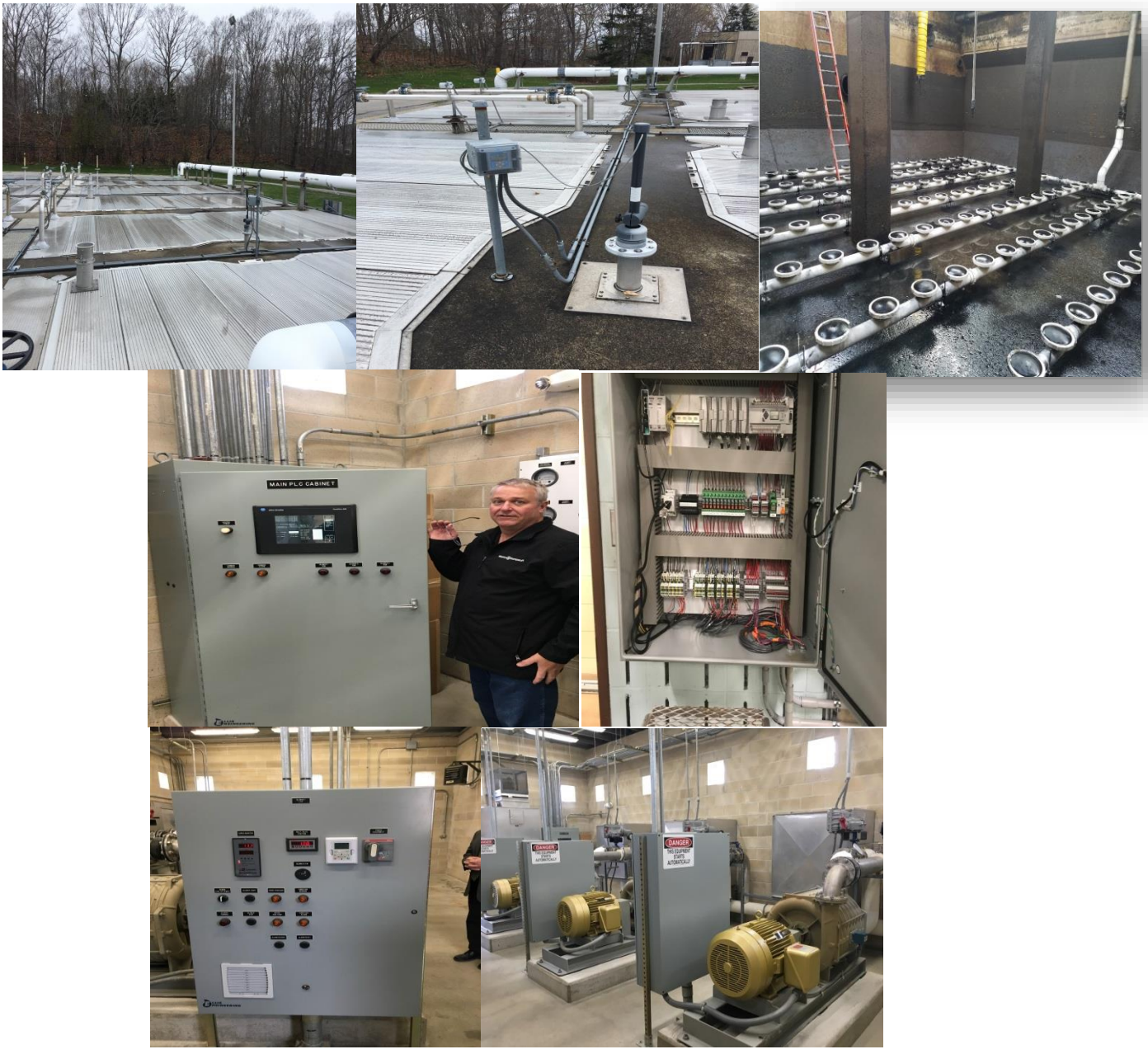
In 2018, the City of Worcester received a Massachusetts $200,000 Gap II energy state grant for replacement of the existing 20-year old ozone generation system with a new Liquid Oxygen System. This $4.9 million upgrade to the plant produces higher ozone concentrations and optimizes water treatment, while using less electricity. This project is estimated to save the City approximately $161,634 in electricity costs; reduce the plant's summer electric demand by approximately 50% (1,776,194 kWh) and ozone electrical demand by 70% per year; and reduce the plant's overall annual greenhouse gas emissions by 598 metric tons.



Town of Rockport, Wastewater and Drinking Water Treatment Plants

The Town of Rockport received Gap I and Gap II grants for energy efficiency measures at the town wastewater and drinking water treatment facilities. Under Gap I, Rockport received $80,000 for a variable frequency drive at their low-lift drinking water pump station and lighting retrofits at the water filtration and the wastewater treatment plants. Under Gap II, Rockport received $81,081 for aeration blower control and digester blower control system improvements. The facility upgrades from both Gap I and Gap II are projected to result in more than $97,000 in annual cost savings to Rockport and save 584,000 kilowatt-hours.

Energy Conservation Measure #1: Aeration Basin and Blower Control Improvements



Energy Conservation Measure #2: Aerobic Digester Blower Control Optimization

The 2019 Earth Week Event included a tour of Rockport's wastewater plant energy upgrades with officials from Rockport, Greater Lawrence Sanitary District, South Essex Sewage District, Weston & Sampson Engineers, and MassDEP.

The following additional Gap II projects were completed in 2019 resulting in good public return on investment for facilities and the Commonwealth. These cost-effective investments address needed work and efficiency upgrades on aging water and wastewater infrastructure, while reducing the carbon footprint of the plants.

Town of Ayer: Wastewater

Project: Performed pumping system control optimization at the Central Avenue station.

Results: 1.2-year payback with increased operator control and pumping efficiency

Total Project Costs:		$59,942
Less: Gap II Grant Award:	$46,785	
National Grid Incentive:	$ 7,417	
Subtotal:		$54,202
Town of Ayer (10% cost share amount):		**$ 5,740**
Annual Cost Savings:		**$ 4,877**
Annual Electricity Savings:		**29,688 kWh**

Bernardston Fire & Water District: Drinking Water

Project: Installed a 150-kilowatt (kW) solar photovoltaic (ground-mounted) system at the Pratt Field Wellhead area; installed a soft start and variable speed drive to the Sugar House pumping station.

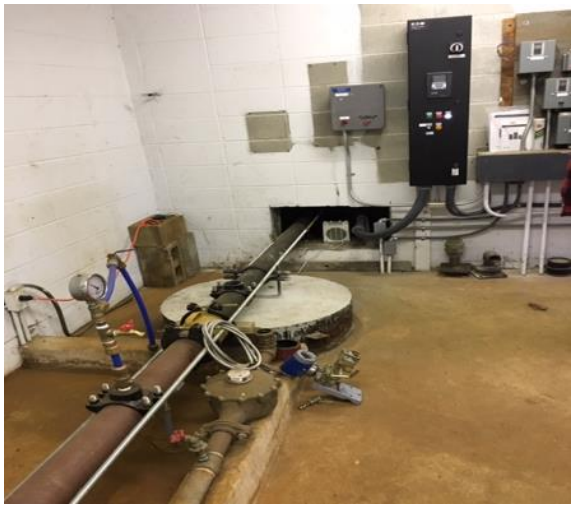
Results: Achieved Net-Zero Energy status and positive cash flow

Total Project Costs:		$ 366,500
Less: Gap II Grant Award:	$200,000	
Eversource Incentive:	$ 3,000	
Subtotal:		$ 203,000
Bernardston (cost share amount):		**$ 163,500**
Annual Cost Savings:		**$ 58,900**
Annual Electricity Savings:		**208,500 kWh**

Town of Blackstone: Drinking Water
Project: Decommissioned well #5 and installed a new variable frequency drive-controlled submersible high-lift pump in Well #5A.

Results: 9-month payback with increased well efficiency

Total Project Costs:		$56,000
Less: Gap II Grant Award:	$42,521	
National Grid Incentive:	$ 8,755	
Subtotal:		$51,276
Town of Blackstone (10% cost share amount):		**$ 4,724**
Annual Cost Savings:		**$ 6,657**
Annual Electricity Savings:		**35,108 kWh**



City of Brockton: Wastewater
Project: Installed a turbo blower to the aeration system.
Results: 1.7 - year payback with increased oxygen transfer and treatment

Total Project Costs:		$ 304,566
Less: Gap II Grant Award:	$200,000	
National Grid Incentive:	$ 35,137	
Subtotal:		$ 235,137
City of Brockton (cost share amount):		**$ 69,429**
Annual Cost Savings:		**$ 40,994**
Annual Electricity Savings:		**292,812 kWh**

Town of Fairhaven: Wastewater

Project: Installed a variable frequency drive to aeration blower #3 and retrofitted the emergency generator with a new heat pump system for more efficient pre-heating of the diesel fuel.

Results: 2-month payback with annual cost savings of $12,038

Total Project Costs:		$ 43,302
Less: Gap II Grant Award:	$ 23,924	
Eversource Incentive:	$ 16,720	
Subtotal:		$ 40,644
Town of Fairhaven (cost share amount):		**$ 2,658**
Annual Cost Savings:		**$ 12,038**
Annual Electricity Savings:		**66,876 kWh**

Town of Franklin: Drinking Water

Project: Installed 10 high efficiency motors to five drinking water wells and two booster pump stations.

Results: 4.3 - year payback with annual cost savings of $10,329

Total Project Costs:		$ 131,872
Less: Gap II Grant Award:	$ 79,380	
Eversource Incentive:	$ 8,260	
Subtotal:		$ 87,640
Town of Franklin (cost share amount):		**$ 44,232**
Annual Cost Savings:		**$ 10,329**
Annual Electricity Savings:		**76,217 kWh**

Town of Groton: Drinking Water

Project: Installed variable speed pumps and electrical controls to Whitney Well drinking water (Pumps #1 & #2) for both energy efficiency and peak electrical demand management.

Results: The town optimized and reconfigured how they pump water and postponed spending $2-$3 million for development of a new well for at least five years.

Collaboration with DEP: Big Savings, Increased Capacity, Cleaner Water, Groton Herald Article

Total Project Costs:		$ 341,800
Less: Gap II Grant Award:	$ 83,295	
Groton Light Incentive:	$ 8,000	
Subtotal:		$ 91,295
Town of Groton (cost share amount):		**$ 250,505**
Annual Cost Savings:		**$ 8,000**
Annual Electricity Savings:		**55,158 kWh**

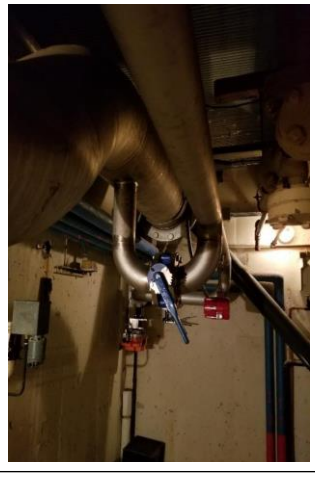
Photo: Courtesy of Groton Herald Article

Town of Hull: Wastewater

Project: Performed aeration blower optimization; installation of a variable speed drive to the odor control fan and an emergency generator block heater at the wastewater treatment plant

Results: 3-month payback with annual cost savings of $26,161

Total Project Costs:	$ 66,576
Less: Gap II Grant Award:	$ 59,918
Town of Hull (cost share amount):	**$ 6,658**
Annual Cost Savings:	**$ 26,161**
Annual Electricity Savings:	**174,404 kWh**



Town of Kingston: Wastewater

Project: Replaced the existing cast iron boiler with a new 94% efficient condensing boiler; optimized the glycol circulation in the heating system by replacing the motors and installing a variable speed drive

Results: 4.6-year payback with annual cost savings of $5,511

Total Project Costs:		$ 112,359
Less: Gap II Grant Award:	$ 76,020	
Eversource Incentive:	$ 11,000	
Subtotal:		$ 87,020
Town of Kingston (cost share amount):		**$ 25,339**
Annual Cost Savings:		**$ 5,511**
Annual Electricity Savings:		**8,892 kWh**
Annual Fuel Savings:		**3,128 therms**

Lynnfield Water District: Drinking Water

Project: Replaced oversized motors and pumps on #1 & #2 and installed a variable speed drive to optimize their booster pumping system; upgraded the heating system with a more-efficient natural gas fired boiler.

Results: 1.2-year payback and increased pumping system efficiencies

Total Project Costs:	$ 88,270
Less: Gap II Grant Award:	$ 79,443
Town of Lynnfield (cost share amount):	**$ 8,827**
Annual Cost Savings:	**$ 7,348**
Annual Electricity Savings:	**38,470 kWh**

Massachusetts Water Resources Authority: Wastewater & Drinking Water
Project: Installed variable frequency drives on two pumps at Union Park Treatment Facility; installed 222 lineal feet of water pipe insulation at Loring Road Facility.

Results: 1.5-year payback with annual cost savings of $15,795

Total Project Costs:		$ 126,950
Less: Gap II Grant Award:	$ 81,027	
Eversource Incentive:	$ 22,756	
Subtotal:		$ 103,783
Town of Kingston (cost share amount):		**$ 23,167**
Annual Cost Savings:		**$ 15,795**
Annual Electricity Savings:		**80,950 kWh**

Town of Middleborough: Drinking Water
Project: Installed a 9.75 kilowatt (kW), ground-mounted, dual-access tracker, solar photovoltaic system to the new Water Treatment Plant. This innovative project will provide over 14,558 kWh of clean renewable generation per year by effectively tracking and maximizing the sun's power.

Results: 2.2-year payback **that will provide over 14,558 kilowatt-hours(kWh) of clean renewable generation per year by effectively tracking and maximizing the sun's power.**

Total Project Costs:	$ 44,928
Less: Gap II Grant Award:	$ 40,435
Town of Middleborough (cost share amount):	**$ 4,493**
Annual Cost Savings:	**$ 2,020**
Annual Electricity Savings:	**14,558 kWh**

Town of Millbury: Wastewater

Project: Installed a 25 kilowatt (kW) solar photovoltaic carport system and installed a 1.5-ton air source heat pump to the DPW office / sewer building.

Results: 1.6-year payback with annual cost savings of $11,028

Total Project Costs:		$ 175,850
Less: Gap II Grant Award:	$ 155,385	
National Grid Incentive:	$ 3,200	
Subtotal:		$ 158,585
Town of Millbury (cost share amount):		**$ 17,265**
Annual Cost Savings:		**$ 11,028**
Annual Electricity Savings:		**33,045 kWh**

Town of Paxton: Wastewater

Project: Replace the two existing 20-year-old 100hp motors with NEMA premium efficient motors; upgrade existing dehumidification system; and install ductless mini-split for building heating and cooling at the pumping station.

Results: A 2.4-year payback that will provide annual energy savings of $1,069 and 8,734 kWh / year

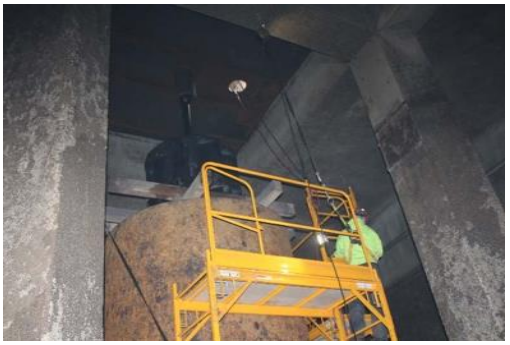
Total Project Costs:	$ 25,349
Less: Gap II Grant Award:	$ 22,814
Town of Millbury (cost share amount):	**$ 2,535**
Annual Cost Savings:	**$ 1, 069**
Annual Electricity Savings:	**8,734 kWh**

South Essex Sewerage District (SESD): Wastewater

Project: Replaced the existing three trains of aeration mixer blades with a higher-efficiency blade system at the South Essex Sewage District.

Results: Annual energy cost savings of $52,600 and 375,700 kWh; increased oxygen transfer for biological treatment and decreased maintenance costs.

Total Project Costs:		$ 1,300,000
Less: Gap II Grant Award:	$ 200,000	
National Grid Incentive:	$ 138,168	
Subtotal:		$ 338,168
SESD (cost share amount):		**$ 961,832**
Annual Cost Savings:		**$ 52,600**
Annual Electricity Savings:		**375,700 kWh**



City of Taunton: Wastewater

Project: Installed a variable frequency drive on aeration blowers #1 and #3 (100HP) motors at the wastewater plant.

Results: A 2.3-year payback that will provide annual energy savings of $11,158 and 177,000 kWh / year

Total Project Costs:	$ 61,458
Less: Gap II Grant Award:	$ 35,500
City of Taunton (cost share amount):	**$ 25,958**
Annual Cost Savings:	**$ 11,158**
Annual Electricity Savings:	**177,000 kWh**

Town of Uxbridge: Wastewater

Project: Converted the existing coarse bubble air diffusers and centrifugal aeration blowers to fine bubble air diffusers and rotary hybrid blowers; upgrade the existing oil-fired heating and electric HVAC system with a natural gas-based system. Anticipated Results: energy cost savings of $356,482 and 1,980,485 kWh / year.

Results: Annual energy cost savings of $356,482 and 1,980,485 kWh; increased oxygen transfer for biological treatment and decreased maintenance costs.

Total Project Costs:		$ 4,708,857
Less: Gap II Grant Award:	$ 200,000	
National Grid Incentive:	$ 15,000	
Subtotal:		$ 215,000
Uxbridge (cost share amount):		**$ 4,493,857**
Annual Cost Savings:		**$ 356,482**
Annual Electricity Savings:		**1,980,485 kWh**

Town of Ware: Wastewater

Project: Installed three new motors, variable speed drives, and dissolved oxygen, pH and temperature sensors into the aeration basins.

Results: A 5-month payback that will provide annual energy cost savings of $ 46,660; resulting in a 41% reduction of plant electrical usage by saving 259,217 kWh / year.

Total Project Costs:		$ 245,671
Less: Gap II Grant Award:	$ 160,782	
National Grid Incentive:	$ 66,604	
Subtotal:		$ 227,386
Town of Ware (cost share amount):		**$ 18,285**
Annual Cost Savings:		**$ 46,660**
Annual Electricity Savings:		**259,217 kWh**

City of Westfield: Wastewater

Project: Perform pumping system optimization by rebuilding and epoxy coating 4 Influent wastewater pumps.

Results: Results: A 5-month payback that will provide annual energy cost savings of $ 7,820; resulting in a 24% reduction of pumping electrical usage and increasing pumping efficiency by 14%.

Total Project Costs:		$ 53,100
Less: Gap II Grant Award:	$ 39,424	
Westfield Electric Incentive:	$ 9,296	
Subtotal:	$ 48,720	
City of Westfield (cost share amount):		**$ 4,380**
Annual Cost Savings:		**$ 7, 820**
Annual Electricity Savings:		**54,684 kWh**

Influent Pump Flows (GPM)

Pump	Before	After	% Increase
1	3744	4006	7.0
2	3855	4000	3.8
3	3910	4042	3.4
4	2917	4048	38.8
Average	**3607**	**4024**	**13.2**

Massachusetts Continues to Optimize Pumping Systems in the Water and Wastewater Sectors

Over the course of four years, MassDEP has worked in collaboration with National Grid, Eversource and pumping system specialists to assess and implement pumping optimization opportunities at municipal drinking water and wastewater facilities statewide. Pumping systems represent a major electrical load for this sector and therefore represent an opportunity for plants across Massachusetts to increase efficiency and reduce costs. Pumping represents approximately 90% of electric usage for water facilities and 20-30% at wastewater facilities. Identifying and implementing energy efficiency improvements at water and wastewater plants has been a major focus of our energy management efforts.

As a result of Massachusetts' energy-saving efforts and the issuance of our Gap II grant funding, six additional pumping system optimization projects were funded and were completed in 2019. In total, these projects are now saving facilities $120,436 / year and reducing their annual electrical usage by over 697,000 kilowatt hours. The final results for these optimization projects are described in Table 1 below.

Table 1. Pump System Optimization Projects

Facility	Electric Utlity	Electricity Savings (kWh/year)	Project Cost	Annual Cost Savings	Utility Incentives	Gap II Grant	Simple Payback (years)[1]
Ayer - Wastewater	National Grid	29,668	$59,942	$4,877	$7,417	$46,785	1.1
Blackstone – Drinking Water	National Grid	35,108	$56,000	$6,657	$8,755	$42,521	0.7
Dartmouth – Wastewater & Drinking Water	Eversource	460,674	$389,329	$83,509	$138,917	$107,057	1.7
Lynnfield – Drinking Water	Municipal	38,470	$ 88,270	$7,348	----------	$79,443	1.2
Webster - Wastewater	National Grid	78,652	$52,379	$10,225	$26,351	$26,351	
Westfield - Wastewater	Municipal	54,684	$53,100	$7,820	$9,296	$39,424	0.6
Totals		**697,256**	**$699,020**	**$120,436**	**$190,736**	**$341,581**	**1.4 (average)**

Advancing MassCEC's Wastewater Treatment Innovation Technology Pilot Grants

Since its inception in August 2016, MassDEP has actively participated in MassCEC's wastewater treatment innovation technology pilot grant program. The primary goal of the Program is to assist publicly owned Massachusetts Wastewater Treatment districts and authorities by funding the piloting of innovative water technologies with strong potential to increase the energy efficiency of the wastewater treatment process.

MassDEP continued to provide technical assistance, outreach and assist in reviewing grant applications with the Innovation Group at MassCEC. MassDEP served on the grant review team and evaluated innovative wastewater technology grant proposals – ranging from low-energy membrane biological wastewater treatment reactor, an artificial intelligence platform that would increase operational plant

[1] Simple payback is based on the total cost of the project, minus utility incentives and the Gap II grant, divided by the annual cost savings. It represents the time needed for project savings to exceed or "pay back" the municipal funding investment.

efficiency, a nitrogen-based aeration control system along with sampling equipment, a wastewater source heat pump for producing consistent heating, cooling, and hot water to the treatment plant, and optic nutrient sensors for enhanced process control for nutrient removal. In May 2019, MassCEC awarded $759,556 in grants to support six innovative technical advancements for wastewater treatment facilities in Plymouth, Hull, Haverhill, Amherst, and Palmer https://www.masscec.com/about-masscec/news/baker-polito-administration-announces-funding-innovative-technologies-0. MassDEP will continue our inter-agency collaboration with MassCEC to advance wastewater innovation and efficiency work across the state in 2020.

Outreach and Sustainability Education Efforts

MassDEP continued to provide additional technical assistance and education to municipal drinking water and wastewater managers in Massachusetts, as well as water managers for other state programs, on opportunities to reduce energy and greenhouse gas emissions at facilities. The MassDEP CERP program presented its Gap Funding grant project results at the Massachusetts Rural Water Association's Annual Trifecta Event in Northfield, MA. Also, MassDEP was a judge at WPI's 11th Annual Student Sustainability Project Competition, which included innovative energy-saving devices and projects.

Worcester Polytechnic Institute Project - Addressing Vulnerabilities and Emergency Power Capacities in the Wastewater Sector of Massachusetts

When power outages occur in wastewater treatment facilities, there can be very serious consequences. Any overflow, bypass or backup of untreated sewage into the community or receiving waters can present serious health risks from parasites and harmful bacteria. Therefore it is vital to ensure that wastewater treatment facilities continue to operate even when the main electrical grid goes out. In response, MassDEP is taking the initiative to document the emergency power capabilities in the water sector of Massachusetts.

Partnering with WPI, MassDEP worked with a student team to combine emergency power survey data, conduct interviews, and help pinpoint vulnerabilities and emergency power capacities in the wastewater sector of Massachusetts. This led to the creation of a map prototype that visually represents facilities' vulnerabilities, and an informational resource pamphlet for facility managers. These tools can be used by response agencies and the facility managers to strengthen emergency preparation efforts in wastewater treatment plants.

To build upon the student team's work, an additional DEP intern began further outreach to complete data gaps. Additional work in this area is planned.

Recommendations from the Student Team:

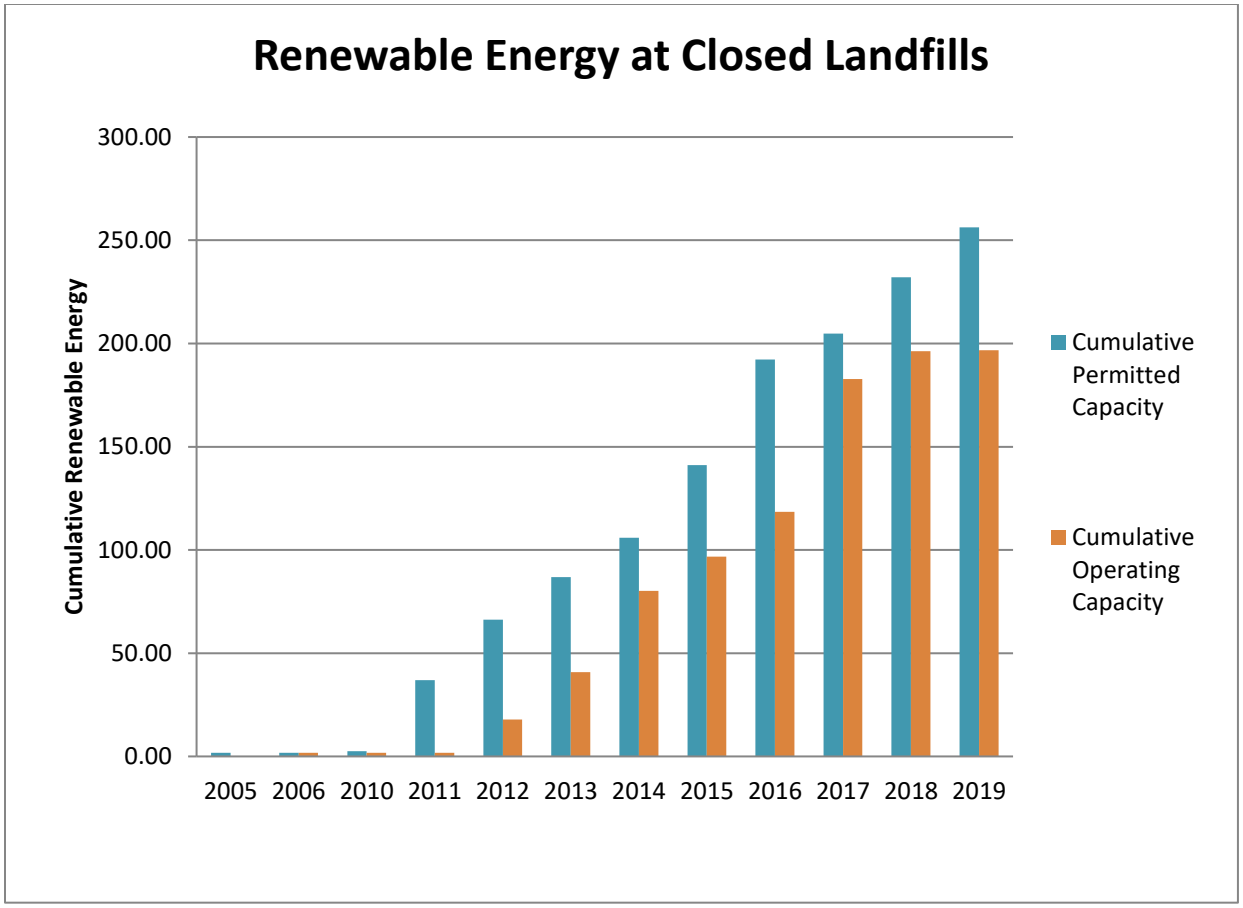
1. MassDEP should implement a system for more reliable and accurate data gathering.
2. MassDEP should improve on informational resources to support emergency planning.
3. MassDEP should create a self-assessment tool for facility managers.
4. MassDEP should create targeted funding source for backup power and provide information on funding opportunities through a website.
5. MassDEP should conduct similar vulnerability assessments on the drinking water facilities in Massachusetts.

Renewable Energy on Closed Landfills

During 2019, MassDEP continued to review and approve solar photovoltaic (PV) projects at closed landfills, while several previously approved projects completed construction and came online. Through the end of 2019, 108 landfills had received post-closure use permits for a total of 256.18 MW of solar and wind and 84 projects generating 196.74 MW are now operating. A map of the solar and wind projects can be seen at http://maps.env.state.ma.us/dep/arcgis/js/templates/RenewablesAtLandfills/

Below is a list of landfill projects that had activity in 2019:

- **Amesbury / Titcomb Pit Landfill**: 4.6 MW – project permitted in 2018, started construction in 2019. A detailed update of this project is provided in the Northeast Regional Summary.
- **Beverly / Brimbal Avenue Landfill**: 4.9 MW – project permitted in 2018, modification approved in 2019, started construction in 2019. A detailed update of this project is provided in the Northeast Regional Summary.
- **Haverhill/Old Groveland Road Landfill**: 3.4 MW – project permitted in 2019 (This landfill is listed on the National Priorities List (NPL) under CERCLA.) A detailed update of this project is provided in the Northeast Regional Summary.
- **Hamilton Landfill**: 930 kW – project permitted in 2018, construction began in 2019. A detailed update of this project is provided in the Northeast Regional Summary.
- **Somerset Landfill:** 3.3 MW – project permitted in 2019. MassDEP issued a Post Closure Use permit to the Town of Somerset and Brayton Point Solar, LLC approving construction of a 3.3 MW DC PV array on the Somerset Landfill. The landfill footprint is partially owned by the Town of Somerset and partially owned by the Estate of Myra Sonnenschein Velozo (Velozo). The landfill covers approximately 22 acres of which 9.07 acres will be used for installation of the PV array. A Financial Assurance Mechanism (FAM) in the amount of $139,500 is required for future decommissioning of the 1.95 MW DC PV array to be installed on the Velozo property. MassDEP does not require decommissioning FAMs for PV arrays located on a municipally owned landfill when the applicants include a municipality. Accordingly, no FAM was required for the 1.362 MW DC portion of the array located on the Town-owned property.
- **Former Cape Resources Landfill Solar Project, Barnstable:** 4.99 MW– approval issued for new developer. MassDEP issued an approval for the installation and operation of a 4.99 megawatt AC photovoltaic array (PV) on the site of the Former Cape Resources Landfill (Landfill), located at 0 & 280 Old Falmouth Road, Barnstable. The project was proposed by Old Falmouth Road LLC solar company and will involve the installation of photovoltaic panels covering an area of approximately 13.7 acres of the 38 acres property. On July 28, 2016, MassDEP had approved a 3.70 MW AC solar project to a different developer at the site who chose to not proceed with the project.



Renewable Energy on Contaminated Sites

Goal 1: Renewable Energy on Contaminated Land

BWSC's efforts to develop 50 MW's of renewable energy/solar PV on contaminated land by 2020.

MassDEP's Bureau of Waste Site Cleanup (BWSC) continued its national leadership role in ongoing stewardship around the Commonwealth of the support for development of solar photovoltaic renewable energy generation units on contaminated land such as Brownfields. The CERP goal to achieve 50 MW of solar generating capacity on contaminated sites by 2020 has been exceeded.

Capacity as of November 19, 2019:

	Operational (MW)	**Proposed (MW)**	**TOTAL (MW)**
Solar Photovoltaics	92.71	68.30	**161.01**
Wind	6.5	0.0	**6.5**
Total	**99.2**	**68.30**	**167.51**

BWSC CERP activity during 2019 includes the following:

PROJECTS: *SREC II*-SMART "BROWNFIELD" PRE-DETERMINATION LETTERS FILED WITH DOER IN 2019

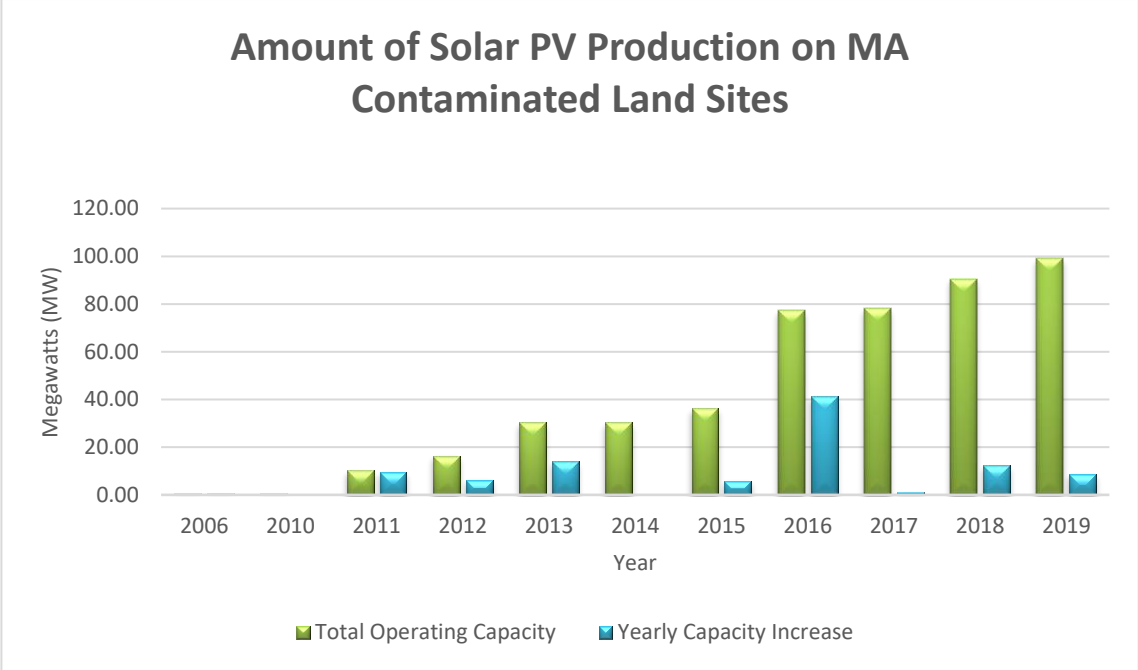
MassDEP issues pre-determination letters on proposed solar PV projects that may be located on a "Brownfield." These letters provide guidance to DOER as to whether a project is likely to qualify for the financial incentive provided under the SMART program for projects located on a Brownfield as that term is defined in 225 CMR 20.02.

Letters recommending Brownfield designation were sent to DOER in 2019 for the following projects:

- Holliston, FMR Bird Property, 52 acres, 6 MW, 7/30/19, RTN- 0000060
- Woburn, Wells G&H, 5 acres, 1 MW, 9/11/19, RTN 3-0001424
- Acton, WR Grace, 14 acres, 5 MW, 11/19/19, RTN 2-0000010

MassDEP sent pre-determination letters that did not support Brownfields designation for the following project in 2019:

- Kingston, Town Offal Pits, 5/2/19, location did not have a Release Tracking Number



Goal 2: BWSC CERP Climate Change and Resilience within Sustainable Remediation

In conjunction with the Commonwealth's Executive Order 569 – "Establishing an Integrated Climate Change Strategy for the Commonwealth" and the Sustainable Remediation Forum's Technical Initiative for Climate Resilience with Sustainable Remediation, BWSC is assessing the vulnerability of its universe of waste sites to the potential impacts of climate change and evaluating mitigation and adaptation options with an emphasis on improving energy efficiency, reducing emissions and expanding the use of renewable energy resources where practicable.

BWSC Resilience activity during 2019 includes the following:

PROJECTS: DRAFT AMENDENTS TO MASSACHUSETTS CONTINGENCY PLAN (MCP)

BWSC proposed regulatory amendments to require consideration of projected climate change impacts at disposal sites regulated under the MCP (310 CMR 40.0000). These provisions require: identifying and assessing foreseeable climate impacts that may affect the permanency and protectiveness of the cleanup at vulnerable sites; and taking reasonable measures to reduce vulnerabilities and increase resilience.

Regional Office and Boston Summaries

Western Region 2019 CERP Summary

- **3/18, Pine Island Farm, Sheffield:** MassDEP issued a renewal of the Recycling, Composting or Conversion (RCC) permit for the Pine Island Farm anaerobic digester.

- **3/18, Wales Solar LLC., Wales:** MassDEP issued a Unilateral Order to Wales Solar, LLC to cease and desist from discharging sediment to Wetlands Resource Areas from its solar development project in Wales.

- **3/26, Park Avenue Solar Solutions, LLC., Blandford:** MassDEP issued a Unilateral Order to Park Avenue Solar Solutions, LLC to cease and desist from discharging sediment to Wetlands Resource Areas from its solar development project in Blandford.

- **4/5, Town of Montague Landfill and Kearsarge Montague BD LLC, Montague:** MassDEP issued permits to both the Town of Montague and Kearsarge Montague BD LLC for the closure of an old burn dump/landfill and the subsequent development of a 3.22 MW solar array. The closure permit was issued to the Town of Montague and the post closure use permit was issued to both parties.

- **5/9, Ken Egnaczek Cheshire:** MassDEP conducted a pre-permit meeting with Mass Division of Fisheries and Wildlife (MADFW) regarding Mr. Egnaczek's proposed micro-hydro power facility.

- **6/10, Wales Solar LLC., Wales**: MassDEP concluded an Administrative Consent Order with Penalty (ACOP) with Wales Solar, LLC in connection with discharges to two intermittent streams proximate to the project site during the development of a solar project. The ACOP provides for the payment of a penalty in the amount of $20,000 of which $5,000 is suspended contingent upon compliance with the requirements of the ACOP.

- **6/14, Becket Motel, Becket:** MassDEP conducted a pre-permitting meeting with the owners of the Becket Motel regarding the reactivation and expansion of the motel with a visitor center and solar component.

- **7/24, Agawam ORF 1, LLC (Vanguard), Agawam:** MassDEP issued a permit to Agawam ORF approving a food de-packaging operation to further support Vanguard's Anaerobic Digestor (AD) units in the area. This site will receive liquid and solid food waste and use these feedstocks to create slurry to be stored in tanks onsite pending shipment to Vanguard's local AD Units.

- **10/03, Eversource and Cottage Developers, Springfield:** MassDEP issued a permit allowing for the repair/reconstruction of an access road at the former Cottage Street Landfill and Eversource Solar Array. This access road has experienced erosional effects on several occasions since the landfill closed and the array was constructed.

- **10/25, Rockwood Ag-Grid Organics LLC, Granville:** MassDEP issued a final Recycling, Composting or Conversion (RCC) permit to AG-Grid Organics approving the construction of a food material de-packager to be installed adjacent to the anaerobic digester located at the Belden Farm in Granville.

- **11/4, Western Region Transportation & Climate Initiative (TCI) Community Engagement Workshop, Holyoke:** EEA, MassDEP, and MassDOT hosted the final session of the TCI workshop series in Holyoke to gather public feedback on the recently released draft framework for a regional program that would cap and reduce greenhouse gas emissions from the transportation sector across the Northeast and Mid-Atlantic.

- **11/25, Ondrick Material and Recycling, LLC. Chicopee:** MassDEP issued a draft Class A, level III Recycling Permit to Ondrick Material and Recycling, LLC for recycling petroleum contaminated soil to be processed to manufacture cold mix asphalt at its facility in Chicopee. The recycled material will be used at landfills permitted to accept the material as per the landfill's solid waste permit.

Northeast Region 2019 CERP Summary

The Northeast Regional Offices' Solid Waste Group continues to review and approve post-closure use permits for solar photovoltaic (PV) projects at closed landfills.

Below is a list of landfill projects that had activity in **2019**:

- **Amesbury / Titcomb Pit Landfill:** 4.6 MW – project permitted in 2018, started construction in 2019, began operation 2/1/2020. Solar Photovoltaic Power Generating Facility, South Hunt Road and Route 150, Amesbury: The BAW Solid Waste Section issued a Post Closure Use Permit to Kearsarge Amesbury, LLC (Kearsarge) and the City of Amesbury (City) to construct and install a 4.6 -megawatt (MW) solar photovoltaic power generating facility (PV Facility) on a 14.5-acre portion of the approximately 17-acre parcel that includes the Landfill. The City will enter into a ground lease agreement with Kearsarge for installation of the PV Facility. The proposed PV Facility will consist of approximately 11,376 PV modules. The system will be connected to the National Grid electric utility grid and includes an approximate 3,485 kilowatt hour (kWh) containerized energy storage system. Each energy storage system container generally includes a battery system, power conversion system, and control system. Grounding plates and grounding conductors installed on the landfill cap will be placed in the soil cover above the landfill cap membrane. A permanent access road will also be installed on top of the landfill cap to allow vehicle access to the solar arrays, energy storage system, and inverter and transformer pad equipment for inspection and maintenance services. Kearsarge will be responsible for the mowing and maintenance of the vegetative cover of the Landfill within the fenced area of the PV Facility. Post-closure operation and maintenance of the Landfill and environmental monitoring of the site will continue to be performed by Waste Management Disposal Services of Massachusetts, Inc. (WMDSM) pursuant to the Landfill's existing post-closure environmental monitoring and maintenance plan (the PCMMP), last revised on December 1, 2015, Transmittal Number: X268177.

- **12/30 - Beverly / Brimbal Avenue Landfill**: 4.9 MW – project permitted in 2018, modification approved in 2019, started construction in 2019. MassDEP issued a Post-Closure Use Permit to BWC Rams Horn Channel, LLC (Blue Wave Solar) for modifications to the approved design of a 4.9-megawatt (MW DC) solar photovoltaic power generating facility on a 20-acre portion of the closed Brimbal Avenue Landfill, located off of Otis Road. In 2018, MassDEP approved the post-closure use design for the solar facility, including a proposed main access road for the solar development and to connect the adjacent landlocked parcels located to the northeast of the landfill. Subject to conditions set forth in the approval, Blue Wave will construct only a portion of the road to access the solar facility, and the remaining portion of the road to the landlocked parcels will be constructed in the future. Blue Wave will also make minor adjustments to the solar panel layout and associated equipment. The City of Beverly owns the landfill; Blue Wave will install and operate the solar facility. This renewable energy project was under construction in 2019.

- **12/17 - Haverhill/Old Groveland Road Landfill**: 3.4 MW – project permitted in 2019 (This landfill is listed on the National Priorities List (NPL) under CERCLA.) MassDEP issued a Post-Closure Use Permit to Kearsarge Haverhill, LLC (Kearsarge) and the City of Haverhill (City) which permits the installation and operation of a 3.4 megawatt (MW DC) solar photovoltaic power generating facility on the closed Haverhill Landfill (Landfill), located off Old Groveland Road. The City and Aggregate Industries-Northeast Region, Inc. own the Landfill. Kearsarge will install and operate the solar

facility. The proposed solar facility will be constructed on a 7.8 acre portion of the South Mound area of the Landfill and will be connected to the National Grid electric utility grid. Capping of the South Mound was completed in 2013 and certified closed pursuant to the Solid Waste Regulations in 2015. The Landfill is listed on the National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, also known as Superfund). NERO staff coordinated with BWSC federal facilities staff and consulted EPA in its review of the post-closure use solar application. This renewable energy project was under construction in 2019.

- **Hamilton Landfill**: 930 kW – project permitted in 2018, construction began in 2019. MassDEP issued a Post Closure Use permit to the Town of Hamilton approving the construction of a 930.24 kW DC solar photovoltaic power generating facility (PV Facility) on a 3.1-acre portion of the approximately 12.7-acre Landfill. The Town has entered into a lease and energy purchase arrangement with Ameresco, Inc. doing business as Chebacco Road Solar PV, LLC (the Developer) for the installation and operation of the PV Facility. The proposed PV Facility will consist of approximately 2,736 solar modules. The system will be connected to the National Grid electric utility grid. The Developer will be responsible for the mowing and maintenance of the vegetative cover of the Landfill within the fenced area of the facility following installation of the PV Facility. Post-closure operation and maintenance of the Landfill and environmental monitoring of the site will continue to be performed by the Town pursuant to the Landfill's approved Post-Closure Plan. On October 30, 2020, MassDEP approved the request of the Town to extend its 2018 Post-Closure Use Permit due to delays associated with installation of the utility poles for interconnection of the PV Facility to the electric grid. The 2018 Permit established an expiration date for the approved post-closure use until December 31, 2038 (Condition 17). However, as the 20-year PPA is not expected to commence until the end of 2020, the Town has requested an extension of its December 31, 2038 termination date. This approval also includes the Town's request for an additional year (to the extension) to allow for further assessment of either continued operation of the system or decommissioning at the end of the PPA agreement. MassDEP extended the Town's 2018 Permit until December 31, 2042.

Southeast Region 2019 CERP Summary

04/23 Earth Week 2019: Electric Vehicle Incentive Program, Brockton: MassDEP joined Mayor Carpenter and other local officials and legislators at this event, marking Earth Week 2019 and to announce Grant Funding through the Massachusetts Electric Vehicle Incentive Program.

4/24 Somerset Landfill Photovoltaic Array, Somerset: MassDEP issued a Post Closure Use permit to the Town of Somerset and Brayton Point Solar, LLC approving construction of a 3.3 MW DC PV array on the Somerset Landfill. The landfill footprint is partially owned by the Town of Somerset and partially owned by the Estate of Myra Sonnenschein Velozo (Velozo). The landfill covers approximately 22 acres of which 9.07 acres will be used for installation of the PV array. A Financial Assurance Mechanism (FAM) in the amount of $139,500 is required for future decommissioning of the 1.95 MW DC PV array to be installed on the Velozo property. BAW does not require decommissioning FAMs for PV arrays located on a municipally owned landfill when the applicants include a municipality. Accordingly, no FAM was required for the 1.362 MW DC portion of the array located on the Town-owned property.

05/08 Buzzards Bay Citizens Action Committee, Lakeville: MassDEP met with members of the Buzzards Bay Citizens Action Committee (BBCAC), including Bourne and Plymouth residents, to listen and take

comments relative to the four 2.0-MW Future Generation Wind, LLC turbines located off Head of the Bay Road in Plymouth.

06/07 Vineyard Wind LLC Project, Barnstable: MassDEP received an appeal of the Order of Conditions issued by the Barnstable Conservation Commission for the Vineyard Wind LLC project proposing to connect the buried cable lines from the offshore wind farm to the mainland in Barnstable. The appeal was filed on behalf of an abutter group. BWR wetland staff will promptly schedule a site visit and will expedite review of this clean energy project.

08/01 Future Generation Wind Turbines, Plymouth: At the request of the Town of Plymouth, based on a technical review of information provided to date, including the sound study report and all subsequent supplemental information provided by ConEdison Solutions, MassDEP provided written comments to the Town of Plymouth, who is the permitting authority for the four Future Generation Wind Turbines.

09/24 Former Cape Resources Landfill Solar Project, Barnstable: MassDEP issued an approval for the installation and operation of a 4.99-megawatt AC photovoltaic array (PV) on the site of the Former Cape Resources Landfill (Landfill), located at 0 & 280 Old Falmouth Road, Barnstable. The project was proposed by Old Falmouth Road LLC solar company and will involve the installation of photovoltaic panels covering an area of approximately 13.7 acres of the 38 acres property. On July 28, 2016, MassDEP had approved a 3.70 MW AC solar project to a different developer at the site who chose to not proceed with the project.

12/13 Lithium-ion Battery Energy Storage System, Provincetown: MassDEP issued an approval to Eversource Energy for the installation of a 24.9 megawatt lithium-ion battery energy storage system ("ESS") at the Town of Provincetown Transfer Station property located at 90 Race Point Road in Provincetown. The Town of Provincetown is the owner of the transfer station and has entered into an agreement with Eversource to develop the lithium-ion battery on a 1.5 acre area of undeveloped woodland on the transfer station which is also located approximately 230 feet from the closed and capped Provincetown Landfill. The energy storage system ("ESS") is designed to provide back-up power through storms and improve electric reliability for residents in Provincetown, Truro, and Wellfleet. The area of the outer cape that will benefit from the ESS is currently served by a single electrical distribution line with no back-up supply line in the event of a disruption. Construction of the ESS will also avoid the need to construct a 13-mile-long electrical distribution through the Cape Cod National Seashore. The Provincetown energy storage system could become the Commonwealth's first energy storage facility. The ESS project was showcased at SERO's EBC Regional Leadership Program held in October 2019.

Central Region 2019 CERP Summary

Norfolk: MassDEP continues to work with private developer NextGrid Patriots LLC to prepare a contaminated site at 15 Lincoln Road (RTN 2-0016473) to house a 999 kW photovoltaic facility with associated drainage and infrastructure. MassDEP held pre-permitting meetings for this solar development in 2019 and NextGrid recently submitted a Phase I/Tier Class/ Eligible Person Status, and a RAM Plan to MassDEP. NextGrid Patriots intends to install a photovoltaic system on the 102,000 square foot site.

Acton: MassDEP held multiple meetings with NextGrid Patriots LLC to discuss a potential photovoltaic facility at 55 Knox Trail in Acton, which is a Brownfields site.

Boston 2019 CERP Summary

1/5/19 – Brockton Wastewater site visit to verify Gap II energy grant project installation. CERP staff visited the Advanced Water Reclamation Facility to verify the installation of the new, energy-efficient turbo blower to the biological aeration system.

1/15/19 – Fairhaven Wastewater site visit to verify Gap II energy grant project installation. CERP staff visited the Wastewater Treatment Plant to verify the installation of the new, variable frequency drive to aeration blower #3 and a new heat pump system that was retrofitted to the existing emergency generator.

4/8/19 – Blackstone Water site visit to verify Gap II energy grant project installation. CERP staff visited the Water Department to verify the installation of the new VFD-controlled high-lift pump in Well # 5A and the decommissioning of Well #5.

4/8/19 Taunton Wastewater site visit to verify Gap II energy grant project installation. CERP staff visited the Wastewater Treatment Plant to verify the installation of (2) new, variable frequency drives to aeration blowers #1 and #3.

4/24/19 Gap II energy grant successes event in Holden was held as part of the Commonwealth's celebration of Earth Week. State environmental, City and town officials celebrated the statewide successes of the agencies' Gap II grant funding for energy efficiency and renewable energy upgrades at 36 water and wastewater facilities. This event highlighted the City of Worcester's replacement of their existing 20-year-old ozone generation system with a new Liquid Oxygen System. This $4.9 million upgrade to the plant, which included a $200,000 Gap grant, produces higher ozone concentrations and optimizes water treatment, while using less electricity. This project is estimated to save the City approximately $161,634 in electricity costs; reduce the plant's summer electric demand by approximately 50% (1,776,194 kWh) and ozone electrical demand by 70% per year; and reduce the plant's overall annual greenhouse gas emissions by 598 metric tons.

4/24/19 – Paxton Water site visit to verify Gap II energy grant project installation. CERP staff visited the pumping station to verify the installation of (2) new premium efficient 100 hp motors and a mini-split air source heat pump system for more efficient building heating and cooling.

4/26/19 Gap energy grant successes event in Rockport was held as part of the Commonwealth's celebration of Earth Week. State environmental, energy officials and area legislators celebrated the successes of the agencies' Gap II grant funding for energy efficiency and renewable energy upgrades at 36 water and wastewater facilities. The upgrades will improve treatment efficiency, leverage Mass save® incentives, lower operating costs and cut greenhouse gas emissions. The Town of Rockport received Gap I and Gap II grants for energy efficiency measures at the town wastewater and drinking water treatment facilities. The facility upgrades from both Gap I and Gap II are projected to result in more than $97,000 in annual cost savings to Rockport and save 584,000 kilowatt-hours annually.

5/9/19 Ayer Wastewater site visit to verify Gap II energy grant project installation. CERP staff visited the Central Avenue wastewater pumping station to verify the installation of installing three (3) new Variable Frequency Drives (VFDs) and programming the pumping system for flow pace control.

5/19/19 – Ayer Wastewater site visit to verify Gap II energy grant project installation. CERP staff visited the Central Avenue wastewater pumping station to verify the installation of installing three (3) new variable frequency drives and programming of the pumping system for flow pace control.

6/7/19 – Ware Wastewater site visit to verify Gap II energy grant project installation. CERP staff visited the Wastewater Plant to verify the installation of (3) new, high-efficiency motors, variable speed drives, and dissolved oxygen, pH, and temperature sensors into the aeration basins.

6/17/19 – Franklin Water site visit to verify Gap II energy grant project installations. CERP staff visited the Water Department to verify the installation of (12) new high efficiency motors to (6) drinking water wells and (2) booster stations.

6/17/19 – Uxbridge Wastewater site visit to verify Gap II energy grant project installations. CERP staff visited the Wastewater Treatment Plant to verify the installation of the new fine-bubble air diffusers and rotary hybrid aeration blowers; and upgrades to the existing oil heating system and electric HVAC system with a new high efficient natural gas heating system.

6/19/19 – Massachusetts Water Resources Authority (MWRA) site visit to verify Gap II energy grant project installations. CERP staff visited the Union Park Wastewater Treatment facility to verify the installation of (2) variable frequency drives on water pumps; and the Loring Road Water Facility to verify the installation of 222 lineal feet of water pipe insulation to reduce the need for dehumidification in the underground vault.

6/20/19 – Hull Wastewater site visit to verify Gap II energy grant project installation. CERP staff visited the Wastewater Treatment Plant to verify the aeration blower optimization improvements; the installation of a new variable speed drive to the odor control fan; and a new heat pump system that was retrofitted to the existing emergency generator.

7/2/19 – Kingston Wastewater site visit to verify Gap II energy grant project installation. CERP staff visited the Wastewater Treatment Plant to verify the installation of a new 94% efficient condensing boiler and installing new motors and VFDs onto the heating system.

8/5/19 – Bernardston Fire and Water District site visit to verify Gap II energy grant project installation. CERP staff visited the Pratt Field Wellhead area and the Sugar House pumping station to verify the installation of a 150 kW ground-mounted solar photovoltaic system and a soft start variable speed drive.

8/28/19 – Middleborough Water site visit to verify Gap II energy grant project installation. CERP staff visited the East Main Street Water Plant to verify the installation of a 9.75 kW dual-access solar photovoltaic tracking system.

8/28/19 – Westfield Wastewater site visit to verify Gap II energy grant project installation. CERP staff visited the Wastewater Treatment Plant to verify the installation of (4) rebuilt and epoxy-coated Influent wastewater pumps.

09/18/19 - The MassDEP CERP program presented its Gap Funding grant project results at the Massachusetts Rural Water Association's Annual Trifecta Event in Northfield, MA. This training and educational event draws in hundreds of wastewater and drinking water operators, consultants, and environmental professionals from across the state.

Acknowledgements

This report was written with information from MassDEP's Clean Energy Results Program coordinators. These program activities have helped to advance MassDEP's environmental and energy results at many facilities across the Commonwealth. A special thanks to MassDEP' s Clean Energy Results Program staff, including Ann Lowery, Jamie Doucett, and Michael DiBara.