

# CLEANENERGYRESULTS

Annual Report to the  
Massachusetts Department of Energy Resources  
Covering January 1, 2015 – December 31, 2015



Easthampton Landfill

2015

Massachusetts Department of Environmental Protection

# TABLE OF CONTENTS

**EXECUTIVE SUMMARY.....2**

**DETAILED PROGRAM UPDATES .....7**

**PROGRAM and POLICY DEVELOPMENT .....19**

**SUMMARY OF GOALS FOR 2016.....19**

## EXECUTIVE SUMMARY

The Clean Energy Results Program (CERP), which was 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) as well as DOER on program activities.

This Annual Report covers MassDEP activities performed from January 1 – December 31, 2015. It is being provided pursuant to the Memorandum of Agreement (MOA) executed between MassDEP and DOER, which also funds the Clean Energy Results Program.

The Clean Energy Results Program continues to initiate and implement clean energy projects across Massachusetts. MassDEP, working with its CERP partners, continued to make significant progress permitting innovative projects, providing technical assistance, and collaborating on policy and regulatory initiatives that promote clean and renewable energy and energy efficiency projects. Two examples include MassDEP's continued work to implement its clean energy and solid waste management goals by implementing the organics waste ban for larger commercial facilities (those generating >1 ton/week of organics) and supporting facilities, such as anaerobic digesters, that will manage those organics; and MassDEP's continued work with our partners at MassCEC and DOER to implement and track the success of the \$1.5 million grant program to assist water and wastewater facilities with investments in energy-saving infrastructure (Gap Grants).

Work done by MassDEP staff directly advanced many clean energy and energy efficiency projects using technology qualifying under the Massachusetts Renewable Energy Portfolio Standard (RPS) and the Alternative Energy Portfolio Standard (APS). The RPS Program requires all retail electricity suppliers in the Commonwealth to obtain a minimum percentage of their supply from eligible renewable energy generation sources such as solar photo-voltaic, solar thermal, wind and biogas from anaerobic digesters. The APS, similar to the RPS, requires a certain percentage of the state's electric load to be met by eligible technologies, which for APS include Combined Heat and Power (CHP), flywheel storage, coal gasification, and efficient steam technologies.

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.

### Water and Wastewater Utilities

MassDEP continued to leverage its CERP partnership efforts to advance economic and environmental results in the municipal water sector. MassDEP, along with its clean energy partners from the Massachusetts Department of Energy Resources (DOER) and the Massachusetts Clean Energy Center (CEC), made progress on implementing the "gap funding" grant approach and, with the assistance of the American Water Works Association and the Policy Navigation Group of Washington, D.C., conducted a cost-benefit analysis of Massachusetts' gap funding investments in water utility energy efficiency.

The gap funding approach promotes clean and efficient energy, benefits air quality, and effectively reduces energy and operating costs at public drinking water and wastewater facilities across the Commonwealth of Massachusetts. This cost-benefit analysis is having an impact on policy at both the national and state levels—demonstrating how cost-effective public funding can not only improve energy efficiency, but can also reduce water ratepayer costs and achieve other environmental objectives. As a result of national outreach by the American Water Works Association and the Policy Navigation Group, the Massachusetts gap funding analysis was presented before public utility commissioners in Michigan, Connecticut, Texas, and Washington. The cost/benefit analysis indicates that the total \$2.5 million Massachusetts investment is expected to result in over \$40.2 million of public benefits over the next 15 years – yielding \$31.1M of energy savings for municipal water facilities and \$9.1 million of public environmental benefits. The projected cost-benefit ratio is over 15:1, meaning that for every public dollar provided, over \$15 of public benefits should be achieved. The full cost/benefit analysis can be viewed at <http://www.mass.gov/eea/agencies/massdep/climate-energy/energy/>.

The Clean Energy Partnership's collaborative model at drinking water and wastewater facilities has been successfully replicated across the six New England states and in 15 other states and US territories. It was named as one of five finalists in the 2015 Innovations in American Government national competition sponsored by the Harvard Kennedy School's Ash Center for Democratic Leadership <https://www.uml.edu/News/press-releases/2015/InnovationsAward050815.aspx>. The Clean Energy Partnership also received a Leading by Example award in 2015 from the Commonwealth of Massachusetts for outstanding energy and environmental efforts.



#### *Massachusetts Clean Energy Partnership for Drinking Water and Wastewater Facilities*

Additionally, MassDEP initiated and led a new statewide Pump System Optimization (PSO) training for municipal drinking water and wastewater facilities. Pumping systems represent a major electrical load and therefore 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). MassDEP and MA DOER are identifying ways to increase long-term pump system efficiencies and bring significant life cycle cost savings to participating municipalities. The first phase of this program engaged partnership resources from the Hydraulic Institute, National Grid, Eversource, and the Massachusetts Water Resources Authority (MWRA).

During 2016, MassDEP will work on expanding the depth and level of partnerships to leverage additional technical and financial assistance resources in order to develop more clean energy projects at municipal wastewater and drinking water facilities.

#### **Organics Diversion and Anaerobic Digestion**

MassDEP's commercial organics waste ban regulations went into effect on October 1, 2014. The waste ban regulation requires businesses and institutions that dispose of >1 ton per week of food materials to divert that material from disposal.

In 2015 MassDEP focused on providing technical assistance to food waste generators impacted by the organics waste ban, largely through RecyclingWorks in Massachusetts, by working with generators to identify and implement organics waste diversion strategies.

MassDEP also continued to work with several private and public partners on anaerobic digestion (AD) projects, providing technical and financial assistance. Several AD projects continue to move forward or have been constructed, including the successful pilot project developed by Commonwealth Resource Management at the Crapo Hill Landfill, Stop & Shop's facility located at their distribution warehouse in Freetown, Pine Island Farm and Barstow Farm, and the Greater Lawrence Sanitary



District's AD expansion project. These facilities will provide significant capacity for management of the source separated organics now subject to the organics waste ban. MassDEP, DOER and MassCEC will continue to provide financial incentives for the diversion of organics and support of anaerobic digestion technology development. MassDEP also continues to foster connections between businesses that generate large amounts of packaged food materials that require disposal with project developers interested in establishing food waste de-packaging facilities. This de-packaged food is a significant potential feedstock for anaerobic digestion facilities.

**GRANTS:** DOER made \$1 million available for grants to anaerobic digestion projects at public entities via MassDEP's Sustainable Materials Recovery Grant Program. In March, 2015, MassDEP and the Greater Lawrence Sanitary District (GLSD) signed a grant agreement that will provide some equipment for GLSD's anaerobic digestion expansion project. GLSD was awarded \$500,000 for this project to expand GLSD's facility to allow for co-digestion of wastewater residuals and organics. In addition, GLSD received a resiliency grant from DOER for \$5M that will enable GLSD to operate in island mode in the event of an emergency, and a construction grant from MassCEC for \$400,000.

### **Clean Energy at Closed Landfills**

From providing technical and permitting assistance to promoting efforts on new projects, MassDEP has continued its highly successful program of helping municipalities and private companies "repurpose" closed landfills into renewable energy facilities.

During 2015, MassDEP issued Post-Closure Use Permits to 14 landfills for a total of 33.1 megawatts (MW) of additional solar capacity, while seven previously permitted solar projects rated at 15.13 MW completed construction and started operation. As of December 2015, MassDEP had approved solar and wind power installations at a total of 65 closed landfills across the state with the potential to generate 140.9 MW of clean electricity. Of those landfills 45 facilities, rated at 95.21 MW, became operational by the end of 2015. Massachusetts leads the nation in the number of landfills permitted for solar installations, accounting for 46% of all the solar-on-landfill projects nationwide and 47% of the installed solar capacity on those landfills. Numerous other landfills have initiated pre-permit discussions with MassDEP and are expected to submit post-closure use permit applications during 2016.

For a map of permitted landfills and a list of the landfills with copies of those permits, see [Siting Clean Energy at Closed Landfills](#) on the agency's Clean Energy Results Program (CERP) web site.

### **Clean Energy at Contaminated Land, Green Remediation/Greener Cleanups**

During 2015, MassDEP's Bureau of Waste Site Cleanup (BWSC) continued to promote and review renewable energy projects on contaminated land with a total of 18 projects that are now operational with a generating capacity of 38.2 MWs. Six SREC II "Brownfield" Pre-Determination letters were filed with the Department of Energy Resources (DOER) for 19.5 MW of renewable energy. (Pre-determination letters are issued by DOER in response to a Pre-Determination Request submitted by a project applicant. The Pre-Determination Letter provides guidance from DOER as to whether its project is likely to qualify as being on a Brownfield.) Between operational sites and those receiving Pre-Determination letters, this marks the imminent achievement of MassDEP's CERP goal to develop 50 MWs of renewable energy on contaminated land by 2020.

For a map of contaminated sites and a spreadsheet of the sites, see [Siting Clean Energy on Brownfields](#) on the agency's Clean Energy Results Program (CERP) web site.

In October 2014, MassDEP finalized its "Greener Cleanups Guidance" (WSC #14-150). Following publication of the guidance, MassDEP held quarterly Greener Cleanups Workgroup meetings in 2015 and participated in USEPA meetings to promote the principles of greener cleanups and to train Licensed Site Professionals (LSPAs) on how to reduce the net environmental footprint of cleanup assessment and remediation activities.

### **Wind**

Since 2013, the Wind Turbine Noise Technical Advisory Group (WNTAG) has been providing MassDEP and the Massachusetts Clean Energy Center (MassCEC) with technical advice on how to best craft effective regulatory and policy responses to possible noise impacts at wind turbine installations. The MassCEC/DEP Research Study on Wind Turbine Acoustics (RSOWTA)

was completed during 2015 and underwent considerable review. The consultants for the project, Resource Systems Group, with support from Epsilon Associates and Northeast Wind, completed noise testing in 2014 and prepared a draft final report, after having received input from the project management team and WNTAG on the analyses to be included. The draft report covered all of the assessment data from extensive testing of five wind turbine facilities. WNTAG members completed a second review of an amended draft RSOWTA report in 2015. A key goal of the agencies was to make a prepublication copy of the final report available to WNTAG members in 2016, so that they receive all of the extensive information from the study to assist them in providing advice to MassDEP on reviewing the agency's noise regulations.

## **Biomass**

Biomass includes a variety of versatile renewable fuel sources derived from organic plant and animal material, such as wood and crops. These locally produced resources can be used to generate electricity, provide heat, and develop alternative transportation fuels. 2015 saw the continuation of several new biomass pilot incentive programs to assist not only residents but also small businesses, universities, schools, greenhouses and farms to trade in their inefficient residential or commercial wood fired heaters for cleaner, more thermally efficient combustion equipment.

Launched in 2012, the Commonwealth Woodstove Change-Out Program, administered by MassCEC, MassDEP and DOER, allowed qualifying residents to receive a voucher for either \$1,000 or \$2,000 to replace older non-EPA certified stoves with much cleaner and higher efficiency stoves that use less wood and release less air pollution.

In 2015, the Baker-Polito Administration made an additional \$900,000 investment in the change-Out program. Since inception, the program has helped more than 850 residents swap out their dirty, inefficient stoves for newer, cleaner models, with more than 350 of these rebates going to low-income residents. Residents installing new stoves can expect to save money as a result of the greater efficiency of the new, cleaner models installed because EPA-certified stoves on average require one-third of the amount of renewable wood sources to produce the same amount of heat as older models, while releasing 70 to 90 percent less particulate matter, which has been shown to lead to health conditions like asthma. Every 100 new stoves burning one cord of wood each per year reduce an amount of greenhouse gas emissions equal to taking nearly 50 cars off the road.

In addition, MassDEP provided technical support to DOER and MassCEC in developing emission standards and monitoring requirements for Outdoor Wood-fired Hydronic heaters (OWHH) and district heating renewable biomass boiler grant programs. DOER relies on MassDEP as an in-house consultant on low-emissions criteria for these biomass initiatives, as well as qualifying facilities under the biomass-related components of the Renewable and Alternative Portfolio Standard (RPS and APS) programs.

## **Clean Energy Outreach and Support**

Outreach under the Clean Energy Results Program included forums, meetings, technical assistance, compliance assistance and permitting assistance by numerous staff in each of the MassDEP offices.

During 2015, MassDEP continued to work closely with its state partners through the Massachusetts Organics Subcommittee and other forums to tackle regulatory, technical and financial barriers to diverting source-separated organics and siting anaerobic digestion projects. MassDEP continued its efforts to develop an organics collection infrastructure to provide the necessary feedstock for energy production through anaerobic digestion. Technical assistance was provided by MassDEP's partner, Recycling Works, to all sizes of businesses on how to comply with the organics waste ban and how to establish successful organics diversion programs. In addition, MassCEC and MassDEP provided technical assistance to proponents of several new anaerobic digesters.

MassDEP provided municipal officials, environmental consultants and renewable energy developers the tools needed to assess the redevelopment potential for clean energy at Brownfields, federal Superfund sites, and other contaminated sites, as well as how to navigate the federal and state waste site cleanup process and harness state incentives. MassDEP staff continued promotion of green remediation for site cleanups, meeting quarterly with the Greener Cleanups Workgroup. In addition, MassDEP spoke at several national events on the topic. MassDEP also developed a draft policy/fact sheet on using ground source heat pumps in cleanup activities.

MassDEP permitting staff continued to hold numerous pre-application meetings with solar developers looking to install solar PV projects on closed and capped landfills.

In an effort to expand clean energy awareness and future project development in the drinking water and wastewater sector, MassDEP attended numerous meetings and conferences including: Municipal Energy Efficiency Summit; the Regional Forum for Public Water Suppliers; New England Water Works Annual Conference; a tour of the Greater Lawrence Sanitary District; and the Massachusetts Water Pollution Control Association Quarterly Meeting.

In 2015, a new initiative related to food production and processing began. MassDEP teamed up with several other state and federal partners to plan for a series of workshops in 2016 with the food and beverage industry. The goal of these workshops is to assist the industry in making energy and pollution prevention improvements to their facilities and processes, which will benefit both their businesses and the environment. Modeled on the highly successful Clean Energy Partnership for Drinking Water and Wastewater Facilities, MassDEP is working with the Department of Agricultural Resources, DOER, DPH, OTA, TURI, UMass Center for Energy Efficiency and Renewable Energy, UMass Clean Energy Extension, UMass Lowell Center for Sustainable Production and the USEPA. These workshops provide opportunities for businesses to connect with utility partners to provide assessments and technical assistance, and will also afford networking opportunities with other businesses to exchange information on how to increase energy efficiency, increase renewable energy generation, promote safer cleaning and sanitizing products, reduce waste, improve operations and reduce operating costs.

## DETAILED PROGRAM UPDATES

Throughout 2015, the Clean Energy Results Program worked in several key program areas, described below.

### Clean Energy at Drinking Water and Wastewater Utilities

MassDEP continued to conduct outreach and provide technical and financial assistance to drinking water and wastewater facilities. A core part of our energy efficiency efforts involved connecting and leveraging the mass save<sup>®</sup> Commercial and Industrial program and DOER's resources for water facilities across the state.

### Commonwealth \$1.7 Million "Gap:" Funding Moved \$11 Million of Clean Energy Projects Forward

MassDEP, DOER, and MassCEC continued to work collaboratively in developing a streamlined pathway that leverages technical and financial assistance resources together for implementing energy-saving projects at municipal drinking water and wastewater facilities. In June 2014, the Commonwealth awarded more than \$1.7 million of "gap" grant funding to jump-start nearly \$11 million of clean energy improvement projects at drinking water and wastewater facilities across the Commonwealth. In total, these 30 clean energy projects are anticipated to save facilities \$1.1 million annually; generate approximately 15.3 megawatt hours in annual electricity savings or on-site energy generation; and result in a good public return-on-investment.

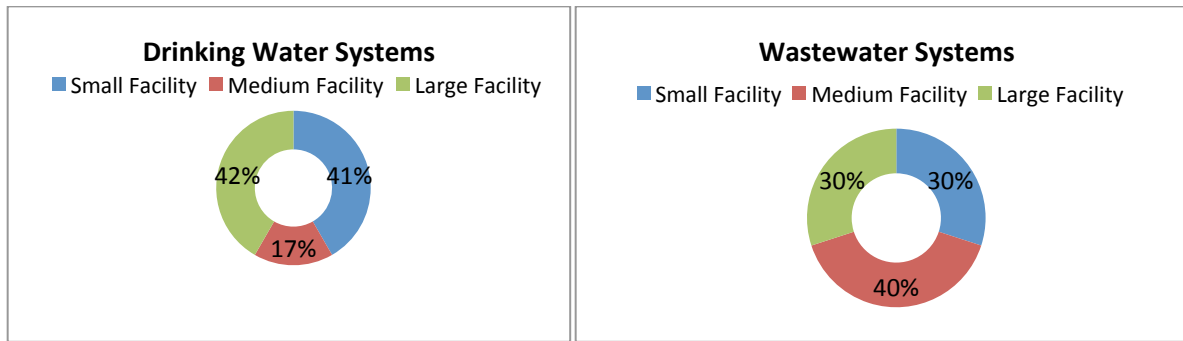
In launching this new grant program, MassDEP and MA DOER had four goals:

- 1) Expedite the installation of clean energy projects that would produce significant cost savings that can be reinvested into facilities' assets.
- 2) Promote a model of collaboration between many partners to leverage all available funding sources for clean energy development.
- 3) Address the challenge of funding smaller clean energy projects that have a cost too large to cover with an operating budget but are too small to warrant financing.
- 4) Provide additional financial incentives for larger clean energy projects requiring financing through a competitive award process.

In 2015, DOER's Green Communities Division handled the implementation and oversight of these CERP gap-funded projects. DOER oversaw contract management and the Regional Green Community Coordinators handled project management. This grant program made possible the implementation of energy efficiency and clean energy generation projects that had been previously assessed and recommended. This program included two tracks: a "competitive track" that provided more than \$1 million to five efficiency and renewable projects, and a "less than \$100,000 track" that provided \$700,000 to 25 projects on a first-come, first-served basis. This program funding was effectively used and distributed among different-sized drinking water and wastewater facilities across Massachusetts. 40% of the total number of projects funded were small drinking water facilities and 30% of those funded were small wastewater facilities (see figure below).



## Distribution of gap funding grant projects by facility size



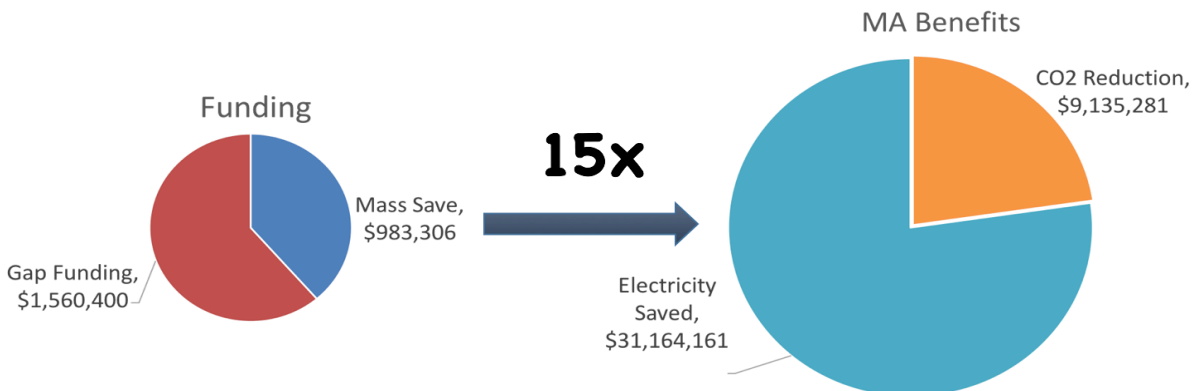
## Public Return on Investment

In the last quarter of 2015, a cost/benefit Analysis of the Massachusetts “Gap Funding” program was developed in partnership with the American Water Works Association (AWWA) and the Policy Navigation Group in Washington, D.C. (More information is available at MassDEP’s CERP website at <http://www.mass.gov/eea/agencies/massdep/climate-energy/energy/>). This analysis evaluated 17 Gap Funding grants for reducing energy consumption at water utilities entirely through energy efficiency projects. Four projects - two grants were solely for electricity generation through solar PV installations, one grant included both efficiency projects and a solar PV installation and one grant was for a combined heat and power project – also received “Gap Funding,” but they were not included in this cost/benefit analysis.

As shown below, the total \$2.5 million Massachusetts investment (“Gap” grant funding plus mass save® - the statewide energy efficiency programs) is expected to result in over \$40.2 million of public benefits over the next 15 years – yielding \$31.1M of energy savings for municipal water facilities and \$9.1 million of public environmental benefits. The projected benefit/cost ratio is over 15 to 1, meaning for every public dollar provided, over \$15 of public benefits should be achieved.

## MASSACHUSETTS RATEPAYERS WIN WITH CLEAN ENERGY PARTNERSHIP AT WATER FACILITIES

### Investing in Water Utility Energy Efficiency Yields Big Savings



The “Gap Funding” grant program shows that government can cost-effectively solve problems. As a result, the economic and environmental benefits of this program were shown to be both immediate and long-term. These energy cost savings and emission reductions are a great public ‘return-on-investment’ for the Commonwealth of Massachusetts and its taxpayers. The Massachusetts ‘Gap Funding’ Model and experiences can be applied to other states interested in promoting improved

energy performance at drinking water and wastewater facilities and achieving both economic and environmental results. A summary of the projects and their implementation status is provided below. MassDEP will work with MA DOER and MA CEC to quantify the actual energy-saving results of these projects and investigate other possible funding sources that could be tapped to expand the reach and success of this effort.

### Massachusetts Drinking Water & Wastewater “Gap Funding” Implementation

MUNICIPALITY	TOTAL GRANT AWARD	PROJECT DETAILS	Status
<b>Abington/Rockland</b> (Projected savings of \$11,417 and 81,191 kWh / year)	\$77,900	For variable frequency drives at the Hannigan and Great Sandy Bottom drinking water treatment facilities.	Completed
<b>Andover</b> (Projected savings of \$1,800 and 25,714 kWh / year)	\$20,000	For a variable frequency drive at the Andover drinking water treatment facility.	Completed
<b>Andover/Lawrence/Methuen/North Andover</b> (Projected savings of \$239,474 and 1,722,326 kWh / year)	\$200,000	For a pump, motor and variable frequency drive at the Riverside wastewater pumping station, part of Greater Lawrence Sanitary District.	Work-In-Process
<b>Beverly/Danvers/Marblehead/Peabody/Salem</b> (Projected savings of \$500,000 and 11,127,775 kWh of on-site power generation / year)	\$200,000	For a combined heat and power unit at the South Essex Sewerage District in Salem to provide heat and dehumidification for odor control during wastewater treatment.	Work-In-Process
<b>Cambridge</b> (Projected savings of \$117,146 and 1,204,511 kWh / year)	\$200,000	For a variable frequency drive and a 170 kW solar photovoltaic system at the Walter J. Sullivan water purification facility.	Solar Installation Completed
<b>Chicopee</b> (Projected savings of \$5,660 and 47,127 kWh / year)	\$99,000	For an oxygen vaporization system used in aeration for wastewater treatment at the Chicopee water pollution control facility.	Work-In-Process
<b>Deerfield</b> (Projected savings of \$5,612 and 56,103 kWh / year)	\$25,800	For motors, insulation, lighting, exterior lighting and a 36.5 kW solar photovoltaic system at the Old Deerfield wastewater treatment facility.	Completed
<b>Egremont</b> (Projected savings of \$15,509 and 10,186 kWh / year)	\$6,100	For a 9.9 kW solar photovoltaic system at the Egremont drinking water treatment facility.	Completed
<b>Greenfield</b> (Projected savings of \$18,000 and 110,779 kWh / year)	\$33,900	For a variable frequency drive at the Greenfield water pollution control facility and for pumps and variable frequency drives at the Millbrook drinking water wells.	Completed

<b>Holden</b> <i>(Projected savings of \$9,123 and 46,823 kWh / year)</i>	\$9,000	For a variable frequency drive at the Quinapoxet drinking water wells and interior and exterior lighting retrofits at various water and wastewater pumping facilities.	Work-In-Process
<b>Hudson</b> <i>(Projected savings of \$6,482 and 61,002 kWh / year)</i>	\$59,400	For replacement of the main lift pump system at the Hudson wastewater treatment facility.	Completed
<b>Marlborough</b> <i>(Projected savings of \$2,189 / year)</i>	\$26,300	For a new boiler at the Millham water treatment facility.	Completed
<b>Medfield</b> <i>(Projected savings of \$60,980 and 337,200 kWh / year)</i>	\$180,000	For a 200 kW solar photovoltaic system at the Medfield wastewater treatment facility.	Completed
<b>Middleborough</b> <i>(Projected savings of \$141,930 / year)</i>	\$191,000	For fine bubble aeration, variable frequency drives, controls upgrades and building insulation at the Middleborough wastewater treatment facility and pumps, motors and variable frequency drives at the Middleborough water treatment facility.	Work-In-Process
<b>Millis</b> <i>(Projected savings of \$5,773 and 27,604 kWh / year)</i>	\$29,800	To replace the pump and clean the well at one of Millis' drinking water wells.	Completed
<b>Pepperell</b> <i>(Projected savings of \$11,417 and 81,191 kWh / year)</i>	\$49,600	For a pump, aeration blower modifications and dissolved oxygen probes at the Pepperell wastewater treatment facility.	Completed
<b>Rockport</b> <i>(Projected savings of \$19,487 and 110,672 kWh / year)</i>	\$80,000	For a variable frequency drive at Rockport's low lift drinking water pumping station and lighting retrofits at the Rockport water filtration and the wastewater treatment plants.	Completed
<b>Southbridge</b> <i>(Projected savings of \$29,209 and 239,807 kWh / year)</i>	\$64,400	For variable frequency drives at the Southbridge drinking water treatment facility and pumps, motors and variable frequency drives at the Southbridge wastewater treatment facility.	Completed
<b>Stockbridge</b> <i>(Projected savings of \$10,778 and 83,300 kWh / year)</i>	\$39,000	For a water-source heat pump that uses the drinking water as a source of energy to provide heating to the Stockbridge drinking water treatment facility.	Completed
<b>Tyngsborough</b> <i>(Projected savings of \$1,960 and 16,333 kWh / year)</i>	\$88,100	For a pump and motor at Tyngsborough's Mascuppick wastewater pumping station.	Completed
<b>Woburn</b> <i>(Projected savings of \$5,000 / year)</i>	\$45,000	For exterior LED lighting at the Woburn water treatment plant complex.	Completed

## **Energy Savings through Pump System Optimization (PSO)**

In 2015, MassDEP made significant progress in advancing a statewide pump system optimization approach that could increase long-term pumping efficiencies at drinking water and wastewater facilities across the Commonwealth. Identifying and implementing energy efficiency improvements at water and wastewater plants has been a major focus of our energy management efforts.

Pump System Optimization (PSO) involves identifying, qualifying and quantifying energy savings opportunities available through maximizing pump system performance. In addition, energy reduction is typically accompanied by reliability improvements resulting from making mechanical or control modifications to the system. System changes include pump refurbishment or replacement, impeller trim or redesign, installing variable frequency drives, closing recirculation (bypass) lines, turning off motors that are not needed (especially in parallel systems), opening valves, and using epoxy coatings. Additionally, pump sequencing and management can lead to demand cost savings for facilities. Pump system modifications have the potential to reduce electricity costs by 5-60%.

Recognizing that pumping represents a major electrical load at both drinking water and wastewater plants (approximately 90 percent at water and 20-30 percent at wastewater systems), MassDEP worked in partnership with the Hydraulic Institute (New Jersey based), National Grid, Eversource, and Massachusetts Water and Wastewater trade associations to kick off the first statewide Pump System Optimization (PSO) webinar and an on-site PSO management training session for municipal drinking water and wastewater facilities in Westborough. Fifty attendees from thirty wastewater and drinking water facilities participated in the training and simultaneous webinar.

As a direct result of MassDEP's leadership and this training, National Grid and Eversource have adopted this pump system optimization approach and launched a Pilot Study for drinking water and wastewater customers in their service territories. National Grid and Eversource have committed to providing technical and financial support to conduct an energy evaluation of water or wastewater pumping stations (in plant or at distribution/collection system pump stations). The purpose of their energy evaluation is to:

- Determine current energy usage of pumps
- Field testing to provide data on current operating efficiency
- Identify opportunities for energy savings
- Identify if the pumps are eligible for rebuild or replacement
- Identify if the pumps would potentially benefit from the application of epoxy coating

MWRA participated in this training session and they presented their Pump System Optimization (PSO) Program that is under development at the Deer Island Sewage Treatment Plant. MWRA's Program contains both educational and assessment components. The Hydraulic Institute provides educational instruction to MWRA's staff in operating pump systems more efficiently and understanding how a pump system optimization process identifies problematic areas that represent the greatest MWRA opportunities for energy savings improvement. Eversource is planning to conduct performance testing and assessments on MWRA's pump systems at Deer Island. Also, as a follow-up to this training, the Walpole and Westfield water departments, the town of Hull, and United Water in Springfield will be evaluating their energy-saving opportunities in their pumping systems.

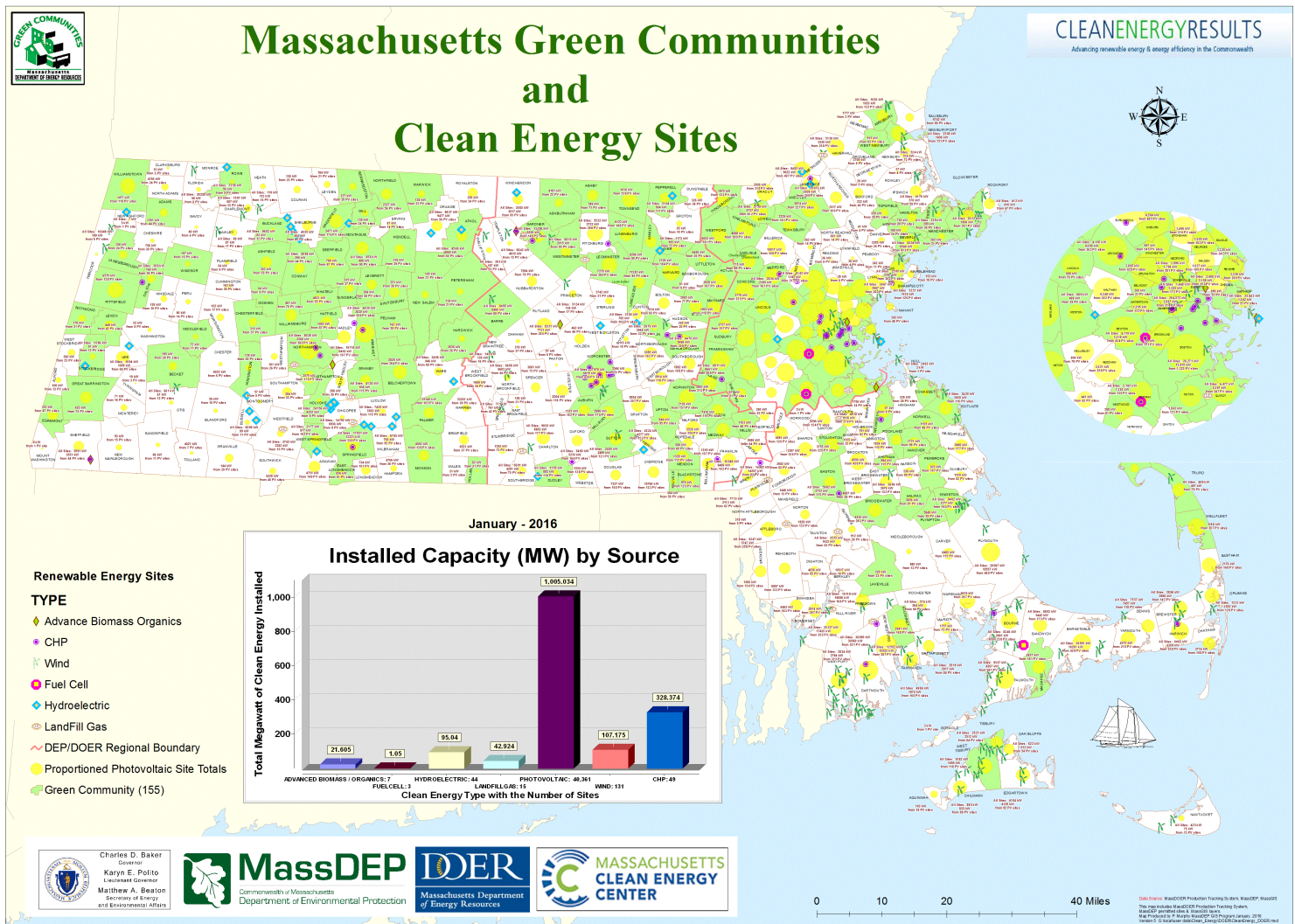
## **Drinking Water Program Advances Solar Energy Generation on Public Water Supply Lands**

MassDEP's drinking water program continued to provide technical assistance to water suppliers interested in developing solar photovoltaic projects on public water supply lands.

MassDEP streamlined the review process for solar and wind projects on public water supply lands in 2011. Under this program, a solar power purchase agreement is made between the energy developer and the water supplier to provide solar electricity at guaranteed long-term rates or generate income from leasing the land. The energy developer provides design, financing, maintenance and support for all the elements of the solar electricity system.



Since 2011, MassDEP has approved 13 solar PV projects on public water supply lands that are generating over 20 megawatts of electricity statewide.



## MassDEP Continued its CERP Assistance for Anaerobic Digestion at Wastewater Treatment Plants

MassDEP, DOER and MassCEC have been supporting the development of anaerobic digesters (AD) at wastewater treatment facilities as an effective method for managing sludge from WWTPs and to generate biogas gas that is suitable for use as fuel, generally in a combined heat and power engine to generate electricity. WWTP AD facilities can also co-digest food waste organics with the sludge to increase the production of biogas. AD facilities at WWTPs reduce costs of disposal of sludge and food waste organics and reduce energy costs by the facility.

The Greater Lawrence Sanitary District (GLSD), a Regional Wastewater District serving five communities, is pursuing a two-phase construction project to accept source-separated organics (SSO) and produce electricity and heat for its main plant and electricity for its pump station. On December 31, 2014, MassDEP presented the Final 2015 Intended Use Plan (IUP), which

details the projects that will be offered financing through the Clean Water State Revolving Fund (CWSRF) program, a federal-state loan program that provides subsidized low-interest rate loans to improve or protect water quality in the Commonwealth. Funding for the GLSD organics-to-energy project was included in the IUP for the amount of \$24.895 million. A MassCEC grant for \$400,000 will be used by GLSD for a hybrid pilot/construction project to test co-digestion of SSO and to prepare for the installation of a combined heat and power system (CHP) and a fourth anaerobic digester.

Additionally, GLSD has received a total \$5 million Community Clean Energy Resiliency Grant from the Department of Energy Resources to support Phase 2 of this project, which includes adding biogas metering and monitoring improvements, biogas treatment and storage and combined heat and power (CHP) generators to generate power from the biogas and move GLSD even closer to SSO acceptance, co-digestion, and full AD utilization, which includes the addition of a fourth anaerobic digester. These upgrades to the facility will allow GLSD to operate independently of the grid during an outage.

A MassDEP Sustainable Materials Recovery Program (SMRP) Municipal Grant of \$500,000 was also provided to GLSD in 2015 to support the installation of a blend tank and high pressure pumping equipment that will facilitate GLSD's use of source-separated organics.

## **Food and Beverage Processing Energy Efficiency**

In 2015 several state and federal agencies and academic institutions teamed up to plan for rolling out a series of workshops in 2016 with the food and beverage industry to assist the industry in making energy and pollution prevention improvements to their facilities and processes, which will benefit both their businesses and the environment. Modeled on the highly successful Clean Energy Partnership for Drinking Water and Wastewater Facilities, MassDEP, the Department of Agricultural Resources, DOER, DPH, OTA, TURI, UMass Center for Energy Efficiency and Renewable Energy, UMass Clean Energy Extension, UMass Lowell Center for Sustainable Production and the USEPA are working together to develop the workshops. The goal of these workshops is to provide technical assistance and networking to increase energy efficiency, renewable energy use, promote use of safer cleaning and sanitizing products, reduce waste, improve operations and reduce operating costs. The first workshop will be held in spring, 2016.

## **Anaerobic Digestion/Organics Diversion**

MassDEP continues to work closely with its state partners through the Massachusetts Organics Subcommittee and other forums to promote and support diversion of source-separated organics and siting anaerobic digestion projects. During 2015 several projects made significant strides forward. In support of AD projects, MassDEP expanded its efforts to develop an organics collection infrastructure to provide the necessary feedstock for energy production through anaerobic digestion. MassDEP also updated its Organics Action Plan to reflect progress. Strong emphasis over the last 12 months has been on educating generators that may fall under the ban on how to comply and successfully divert their organics. The updated Organics Action Plan may be viewed on the MassDEP web site at: <http://www.mass.gov/eea/docs/dep/public/committee-3/orgplanf.pdf>

## **Creation of Framework/Infrastructure for Increased Organics Diversion**

MassDEP, through RecyclingWorks in Massachusetts, provided information and assistance to hundreds of commercial generators of organics on how to establish a successful organics diversion program. The RecyclingWorks website received more than 70,000 visits in fiscal year 2016, and more than 1,000 people called the RecyclingWorks hotline. Direct technical assistance was provided to more than 200 businesses, with much of this assistance devoted to helping businesses to comply with the commercial organics waste ban. RecyclingWorks created three new case studies in both written and video form, available on the RecyclingWorks website, [RecyclingWorks](#). In addition, RecyclingWorks produced a video featuring MassDEP Commissioner Martin Suuberg, discussing the successful implementation of the commercial organics ban. MassDEP Municipal Assistance Coordinators have provided technical assistance to several communities looking to pilot organics collection for residents including Newton, Ipswich, Manchester, Cambridge, Salem and Hamilton.

## **Financial Incentive Programs**

With \$3 million in funding from DOER, MassDEP targeted funds to support its Recycling Loan Fund (RLF) for investments in anaerobic digestion. MassDEP finalized the agreement with its RLF administrator, Business Development Corporation, and announced the new funding in July, 2013. To date, a total of \$2,260,000 in loans have been disbursed to three Massachusetts facilities. The Recycling Loan Fund continues to market the availability of loans for anaerobic digestion facilities, helping these facilities to secure additional financing and investment.

A final grant agreement for \$500,000 was signed with the Greater Lawrence Sanitary District (GLSD) on March 20, 2015 to provide equipment for the expansion of the GLSD facility to allow it to co-digest organics with the biosolids generated by the facility.

## **Siting of Anaerobic Digestion**

The siting of new anaerobic digestion facilities has proceeded on several fronts. Following the evaluation of state properties for the potential for siting anaerobic digestion, MassDEP and the Division of Capital Asset Management and Maintenance (DCAMM) narrowed the list to three candidate properties that were evaluated further through feasibility studies conducted during 2013 at: MCI-Shirley, MCI-Norfolk and the Amherst Wastewater Treatment Plant (on the UMass-Amherst campus). Following the completion of the studies, community meetings were held to get feedback for each of the three sites. Ultimately it was determined to move forward with two sites - MCI-Shirley and the Amherst Wastewater Treatment Plant. Because MCI-Shirley requires either legislative approval or an exemption granted through DCAMM's Asset Management Board to enter into a long-term power purchase agreement (PPA), DCAMM prepared and presented, with MassDEP's assistance, a draft Project Proposal seeking authority from DCAMM's Asset Management Board (AMB) to proceed with a long-term PPA for an AD project. On September 16, 2015, the AMB voted to approve the Final Project Proposal, allowing the MCI-Shirley project to proceed with procurement and to implement a long-term PPA with a selected vendor. DCAMM then proceeded to develop an RFQ to be advertised in 2016.

The Amherst AD project needed to have further field investigations conducted to better delineate wetlands resources prior to issuing an RFR. Those additional studies were completed in 2015, but raised concerns about the extent of wetlands on the proposed site. Alternative sites have been considered, but at this time no decision has been made to move forward with procurement.

MassDEP and MassCEC also worked with several other communities during 2015 that have expressed interest in pursuing AD projects, including Fitchburg, Commonwealth Resource Management/New Bedford Regional Refuse Disposal District, and Plymouth.

MassDEP and Vanguard Renewables held several meetings during 2015 to discuss Vanguard's plans for developing more farm-based AD facilities beyond the two existing facilities at Jordan Farm and Barstow Farm.

## **Permitting and Construction**

MassDEP issued permits for Stop & Shop's proposed digester to be located at their distribution facility in Freetown, MA in 2014. Stop & Shop started construction in April, 2015 with a goal of starting operation in the first quarter of 2016. MassCEC issued a \$400,000 grant to Stop & Shop to assist with construction in July, 2015.

MassDEP started permit review in 2015 for the Greater Lawrence Sanitary District (GLSD) anaerobic digestion project which will expand the existing AD facility and allow for co-digestion of biosolids with organics and use of the biogas to generate power to be used by the facility.

MassDEP issued an air permit to Ken's Foods in March 2015 to add a 1.2 MW CHP engine to their existing digester facility to generate power for use by their food manufacturing facility. The CHP was installed over the summer and started operation in the fall of 2015.

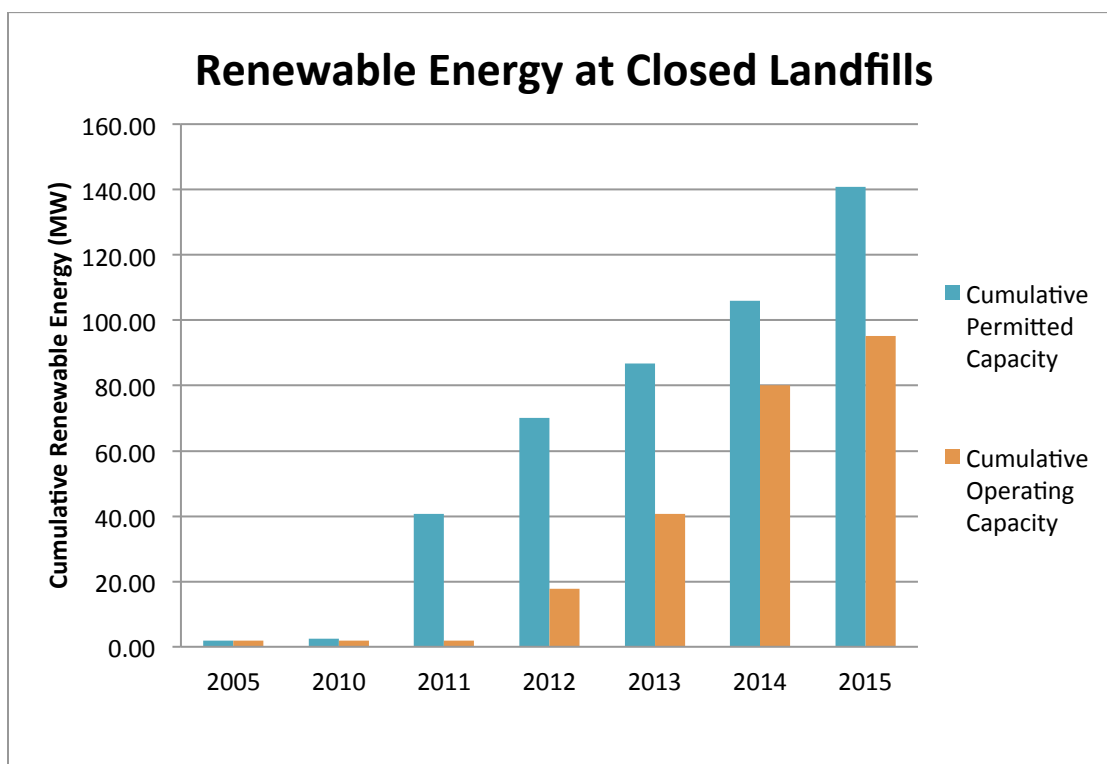
MassDEP issued a Recycling, Composting or Conversion (RCC) permit to Barway Farm early in 2015 with an addendum to that permit issued in July 2015.

## Environmentally Challenged Property

MassDEP continues to encourage new clean and efficient sources of energy at environmentally challenged property.

### Clean Energy at Closed Landfills

MassDEP continues to help municipal officials, solid waste consultants and renewable energy developers assess the redevelopment potential for solar and wind facilities at closed landfill sites, navigate the permitting process, and harness state and federal financial incentives for clean energy projects.



During 2015, MassDEP issued 14 Post-Closure Use Permits for 14 landfill solar installations with the potential to generate 33.1 megawatts (MW) of clean electricity. These included landfills in Amesbury, Boxford, Foxborough, Lee, Norton, Palmer, Rehoboth, Shirley, Stoughton, Webster, Weston, Williamstown and Woburn. In 2015, seven previously permitted solar projects rated at 15.13 MW completed construction and started operation. As of December 2015, MassDEP had approved solar and wind power installations at a total of 65 closed landfills across the state with the potential to generate 140.9 MW of clean electricity. Of those landfills 45 facilities, rated at 95.21 MW, had become operational by the end of 2015.

To learn more about MassDEP's efforts to spur the "recycling" of old landfills into renewable energy facilities and obtain a complete list of communities that are proceeding with projects, see [Siting Clean Energy at Closed Landfills](#) on the agency's Clean Energy Results Program (CERP) web site.

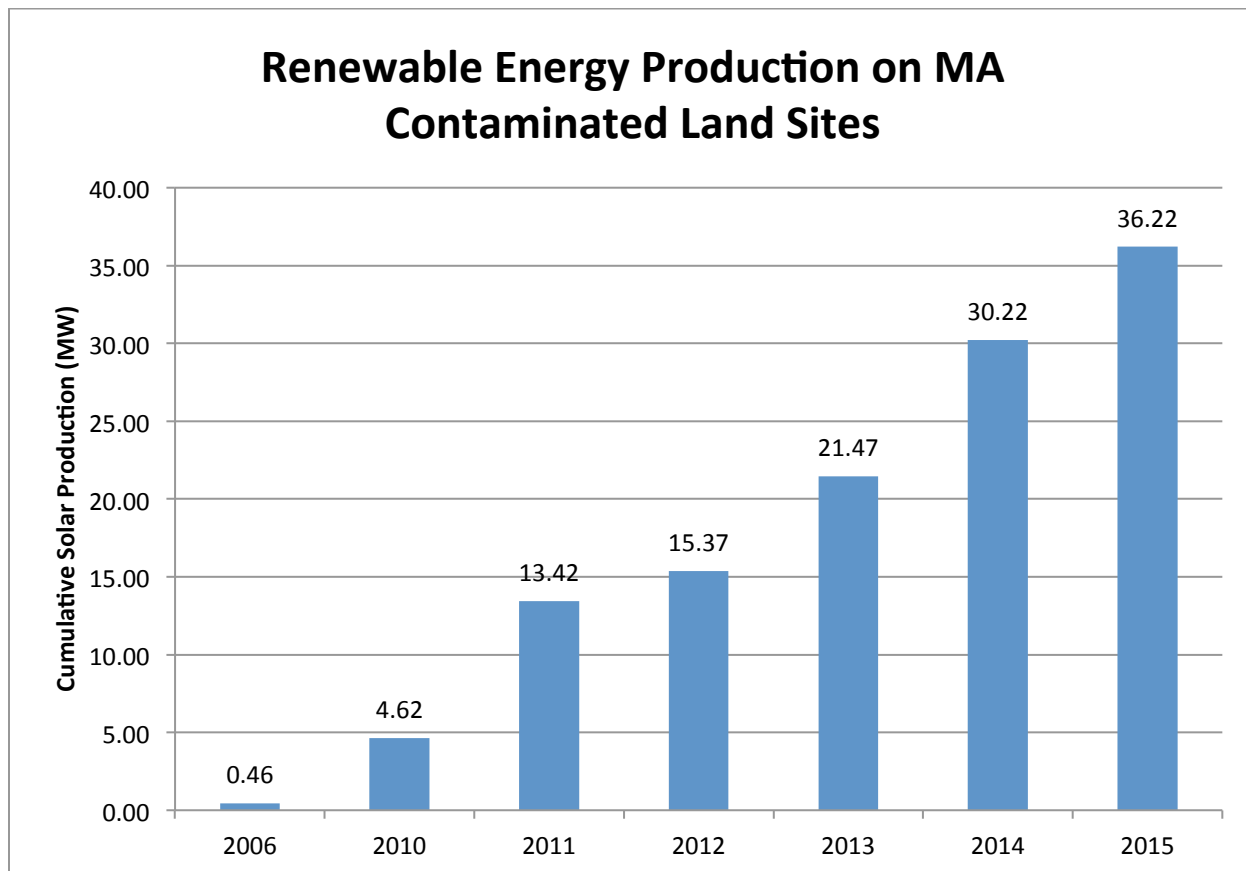
### Clean Energy at Contaminated Land

MassDEP has provided municipal officials, environmental consultants and renewable energy developers with the tools needed to assess the redevelopment potential for clean energy at brownfield's, federal Superfund sites and other contaminated sites, navigate the federal and state waste site cleanup process and harness state incentives. In 2015, MassDEP's Bureau of Waste Site Cleanup (BWSC) continued to promote and review renewable energy projects on contaminated land. There are now a total of 18 projects that are operational with a generating capacity of 38.2 MWs. Six



SREC II “Brownfield” Pre-Determination letters were filed with the Department of Energy Resources (DOER) for 19.5 MW of renewable energy. Between operational sites and those receiving Pre-Determination letters, this 57.7 MW marks the imminent achievement of BWSC’s CERP goal to develop 50 MWs of renewable energy on contaminated land by 2020. For a complete list of properties where clean energy is being developed on contaminated land sites, please visit the Clean Energy Results Program website at <http://www.mass.gov/eea/agencies/massdep/climate-energy/energy/contaminated-land-and-brownfields/>

In addition to the operational sites and those that have received Pre-Determination letters, there are numerous other contaminated sites with which MassDEP has on-going discussions or consultations with potential solar developers. These sites include the GDF Suez/Mt. Tom closed coal-fired power plant, the General Latex/Dow-Pan Am Iron Horse Park site, the former Shell Terminal in Fall River and the Charles George Landfill Superfund site.



#### Promoting Green Remediation/Greener Cleanups

Building on progress from 2014 to promote greener assessment and remediation activities at contaminated sites, MassDEP held quarterly Greener Cleanup Workgroup meetings in 2015. One of the major activities was to begin development of a Greener Cleanup Leadership Recognition Program to identify and recognize successful remediation projects that have adopted greener cleanup techniques. The recognition program will be implemented in 2016.

MassDEP developed a draft policy/fact sheet entitled “Geothermal/GSHP Application Opportunities under the MCP – A Component or Repurposing of Greener Cleanup Remedies”. In May, 2015 the Licensed Site Professionals Association (LSPA) hosted a geothermal training program for Licensed Site Professionals developed by the LSPA, MassDEP, DOER and MassCEC. MassCEC followed up later in 2015 by authorizing \$30 million in funding for clean heating and cooling programs through 2020.

MassDEP also issued new Site Assessment and Remediation Support Services (SARSS) contracting language to promote greener cleanups by MassDEP contractors in February 2015. SARSS contractors are used by MassDEP when it is required to conduct cleanup activities at a site where no responsible party is conducting the cleanup activity.

### **Outreach and Technical Support - Clean Energy on Contaminated Land, Green Remediation/Greener Cleanups**

- MassDEP worked with USEPA on their RE-Powering America's Land initiative, providing updates on the number of renewable energy projects located on Massachusetts landfills and brownfields as well as providing feedback and assistance on USEPA's electronic decision tree tool which can be used to identify and evaluate sites for renewable energy development.
- MassDEP met with USEPA Region 1 for bi-monthly collaboration meetings on renewable energy development at brownfield sites.
- LSPA Article – September 2015 – Net Metering (CL), Renewable Thermal Grant Program, GC annual "Leadership Awards"
- USEPA Sustainability Focus Event, September 2015, RESOLVE Superfund Site, Dartmouth, MA – "Where sustainability/green works in the cleanup programs"
- Sustainable Remediation Forum (SURF) – February 2015 – "An Overview of Massachusetts' Clean Energy Goals and Promotion of Greener Cleanups"
- Brownfield 2015 Conference – September 2015 – "Grave to Cradle: Where Remediation Meets Sustainable Design"
- AEHS Soil, Sediment, Water and Energy Conference, UMass Amherst, October 2015 – "Greener Cleanups" Quantitative Evaluations Workshop; and "Greener Cleanups" platform session with USEPA
- Assisted towns of Westford and Seekonk with evaluating the potential provided by non-powered dams at contaminated sites to install hydropower to help pay for the cleanup.

## **Wind Turbines**

In 2015, MassDEP continued several activities to address reported noise impacts of wind turbines.

### **Wind Turbines Field Noise Studies**

MassDEP did not conduct any direct field studies in 2015, but assisted communities or supervised field studies conducted by others. MassDEP staff continued to consult with both wind turbine owners and town officials in the Town of Kingston and the wind turbine operators for Hoosac Wind (Iberdrola).

MassDEP was also on-call to assist MassCEC staff in reviewing applications for MassCEC assistance in funding studies and implementation. In particular, MassDEP staff review acoustic studies for proposed wind projects, including pre-project ambient sound level surveys, modeling analyses to predict changes to ambient sound levels that may result from project operations, and evaluation of risks that a project may result in complaints from neighbors, or violation of MassDEP Noise Regulation and Policy.

MassDEP participated in MassCEC review of acoustic aspects of wind energy project proposals in Otis (Town of Otis), Gardner (City of Gardner), and West Boylston (Worcester County Sheriff's Department).

### **Technical Assistance to Communities – Wind**

MassDEP continued to provide technical assistance to municipalities and other partners to help interpret the agency's noise policy and applicable regulations.

## **Kingston**

The final report on noise sampling of the Kingston wind turbines was released in April, 2015 and a final meeting was held with the Kingston Board of Health on June 18, 2015. Two events were found to have sound levels in excess of MassDEP's 10 dBA policy.

## **Hoosac Wind**

MassDEP also worked with Iberdrola Renewables, the owner/ operator of Hoosac Wind, a multi-turbine wind farm in Florida and Monroe, to oversee the study of sound impacts from that installation. MassDEP's Western Regional Office is the contact for and has been documenting citizen complaints as well as meeting with affected parties since the project commenced operation. A sound study was begun in December 2013 and continued into early 2014. The sound sampling was conducted by a third party contractor with the results subject to review by MassDEP.

Similar to the activity in Kingston, the results from sound sampling of the Hoosac Wind Project indicate an exceedance of MassDEP's 10 dBA threshold for the turbines on one ridge. This has been communicated to the affected citizens and town officials. Subsequent to that finding Iberdrola submitted a mitigation plan for MassDEP review. The mitigation plan calls for selective shut down of some of the turbines during the conditions when sound was most prevalent (icing events and winter conditions) as well as retrofit to some of the turbines with hardware to modify the trailing edge of the blade to reduce turbulence.

For both projects and in addition to the sampling, MassDEP has met with a number of developer and citizen groups to discuss our noise regulation and the methods we use to determine if the levels defined as noise in our noise policy have or have not been exceeded.

## **MassCEC Research Study on Wind Turbine Acoustics**

The final Research Study on Wind Turbine Acoustics (RSOWTA) was completed in 2015. A final meeting to discuss the results of the RSOWTA will take place in early 2016.

## POLICY and PROGRAM DEVELOPMENT

During 2015, the CERP Director continued to meet monthly with the Inter-Agency Management Team (consisting of senior officials from DOER, MassCEC and MassDEP) to ensure clean energy work across the three agencies is fully aligned and to provide updates on agency program updates, grant program rollouts and regulations and policies impacting clean energy activities.

### Staffing & Program Activities

MassDEP continues to engage existing agency staff in its Boston and regional offices on tasks necessary to accomplish key activities and goals identified under the Clean Energy Results Program. The Clean Energy Points of Contact and Clean Energy Director have continued to work with MassDEP staff on program activities, implement action plans and track and report progress.

During 2015, 47 MassDEP staff dedicated a significant portion of time (between 10-100% FTE) to perform activities under the program and many other staff charged time back to CERP for CERP related activities such as permit reviews of clean energy facilities.

### Mapping

The MassDEP GIS program continues to maintain Clean Energy GIS data and generate maps for display at meetings and presentations and to maintain maps and information presented on MassDEP's website.

## SUMMARY OF GOALS FOR 2016

MassDEP will continue to work with DOER and MassCEC to pursue energy efficiency and renewable energy projects at facilities across the Commonwealth in 2016 as well as look for opportunities, such as with the food and beverage industry, to expand our work to new categories of facilities.

- “Gap” Grant Two – If funding allows, issue program for a second round of “Gap” grants
- Continue to issue post-closure use permits for utility scale solar projects on old capped and closed landfills
- Continue to work with developers to install utility scale solar projects at contaminated land/brownfield sites and bring such sites back into productive use
- Continue to promote green and sustainable remediation practices including the deployment of energy efficiency measures and renewable energy technologies in site cleanup applications
- Continue to promote the application and installation of renewable thermal technologies/Ground-Source Heat Pumps for building heating and cooling and remedial process water qualifying under the Alternative Portfolio Standard (APS)
- Explore opportunities for hydroelectric development of non-powered dams through the small hydroelectric power net metering facilities provisions of the Energy Diversity Act (H 4568).
- Explore opportunities for deployment of climate change adaptation and resiliency measures inclusive of energy storage and standby power applications for remedial systems supported by the Energy Diversity Act (H 4568) and Governor Baker's Executive Order 569.
- Hold workshops, modeled on the highly successful Clean Energy Partnership for Water and Wastewater Facilities, with the food and beverage industry to promote energy efficiency, waste reduction, toxics reduction and greener cleaning
- Continue to work with development of anaerobic digester projects (Vanguard farm digester projects, GLSD, Plymouth, MCI-Shirley, UMass Amherst, CRMC – Crapo Hill Landfill AD expansion, City of Fitchburg) to provide infrastructure for managing diverted waste organics
- Use every opportunity to work with partners, DOER and MassCEC, to encourage businesses and facilities that MassDEP regulates to consider conducting assessments and implementing energy efficiency measures and/or renewable power