

Executive Office of Energy and Environmental Affairs  
Massachusetts Office of Coastal Zone Management

**ENERGY AND INFRASTRUCTURE**

**Work Group Report**

**2014 Massachusetts Ocean Management Plan Update**

March 31, 2014

## Overview

As part of the update and revision of the 2009 Massachusetts Ocean Management Plan, from July to November 2013, the Massachusetts Office of Coastal Zone Management (CZM) sought input from individuals with important subject-matter expertise, many of whom assisted with similar technical knowledge, insight, and information for the 2009 plan. Initiated via email, and supported by direct input and follow-up from specific individuals and organizations, the work group was asked to help identify and characterize important/notable trends in, or important issues associated with coastal/ocean-related energy and infrastructure, including:

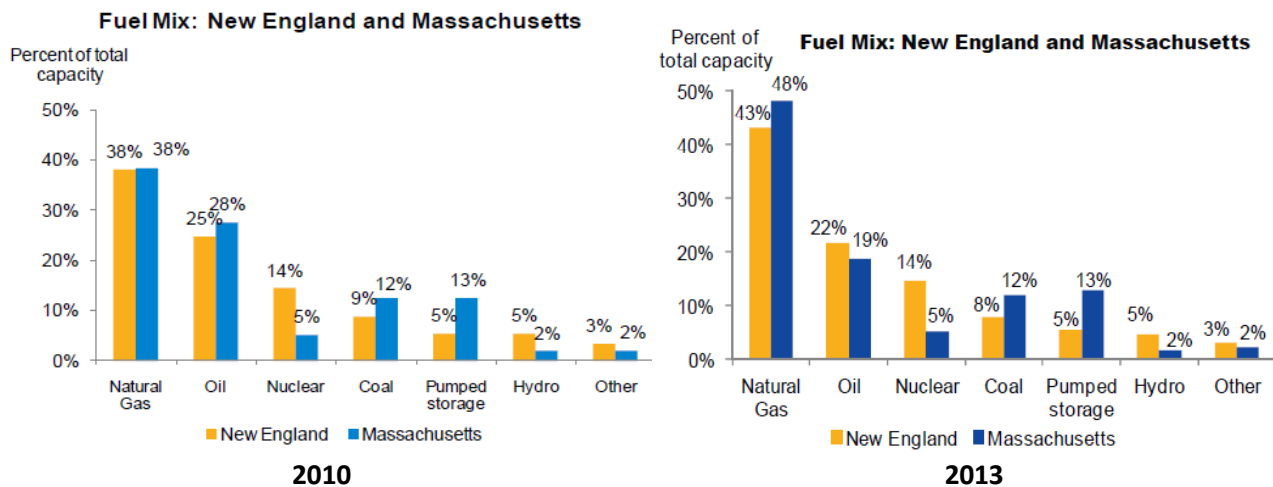
- energy generating facilities,
- energy consumption,
- transmission,
- offshore / marine renewable energy,
- wastewater, stormwater, and industrial facilities discharges, and
- desalination facilities.

The work group was also queried for their input in terms of recommendations for priority data/information actions for the next five years, as well as any other aspects of coastal/ocean-related energy and infrastructure that may have been overlooked in the 2009 plan.

## Energy Generation

Since the release of the 2009 Ocean Plan, energy generation patterns in Massachusetts have shifted, while generation capacity has remained steady. Of particular note, some of the trends include:

- Energy generation fuel mix has changed, with a notable increase in the amount of natural gas utilized for energy generation from 38% in 2010, to 48% in 2012 (*Source: ISO-NE*). See figure below.



- While, the total capacity of generating plants in Massachusetts has remained steady (~13,300 megawatts (MW) in 2010, and 13,100 MW in 2012), peak demand has increased slightly from 11,890 MW in 2009 to 12,429 MW in 2012 (*Source: ISO-NE*).

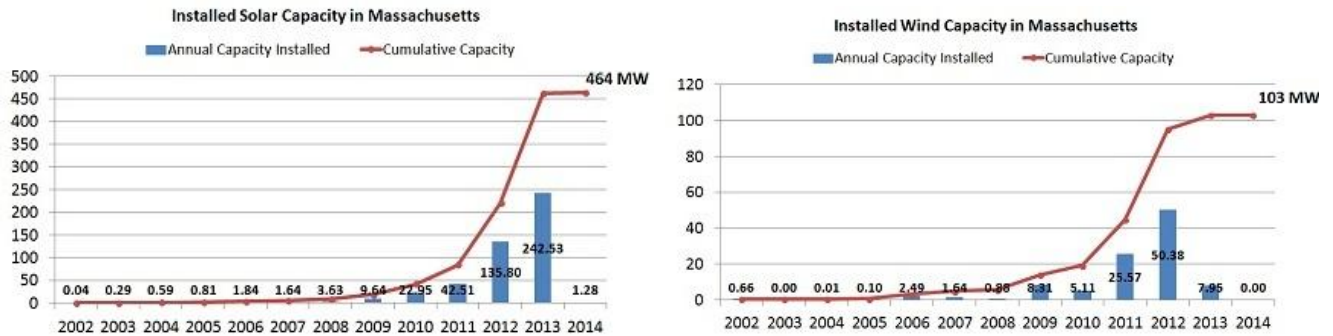
In terms of trends in energy generating facilities, the focus of the characterization contained in the 2009 Ocean Plan was on those facilities adjacent to the Ocean Planning Area (note that the planning area generally begins 1/3 of a nautical mile from mean low water and extends seaward to the extent of state waters). Since the release of the 2009 plan, there have been several important changes in coastal energy generating facilities, including the following:

- In May 2011, Dominion announced that the ~600MW coal and oil fired Salem Harbor Station power plant would shut down by June 2014. In 2012 Footprint Power acquired the Salem Harbor Station and has proposed a quick-start natural gas-fired power plant at the site. In September 2013, Salem Station received what is expected to be its final shipment of coal. The proposed Footprint plant is a natural gas facility and is being designed with closed-cycle cooling, so there will no longer be an intake or discharge flow. In October 2013, the Energy Facilities Siting Board approved the petition of Footprint Power to construct the 692 MW power plant.
- In 2012, Brayton Point Power Station completed retrofits of its once-through cooling to utilize closed-cycle cooling, so its permitted intake/discharge flow is now only 70 mgd. In October 2013, Dominion Energy—owner of the coal-fired Brayton Point Power Station—filed papers with ISO-NE indicating that the plant would cease energy generation in May 2017.
- According to ISO-NE, as of July 2013, New Boston Station, Canal Electric, and Somerset Station no longer operate and are classified as retired.
- Kendall Station will be reducing its intake and discharge by 95% to 3 MGD and will be selling its heat as steam.

Significant changes since the 2009 plan have occurred in Massachusetts renewable energy generation. Considering only solar and wind, major increases in the amount of installed renewable energy have been realized:

- In 2009, the total installed solar capacity was 18.5 MW, and as of March 2014, the total capacity was 464 MW. In May 2013, the Patrick Administration met its 2017 goal to have 250 MW of solar power installed in Massachusetts and announced a new goal of 1600 MW of solar energy by 2020 (*Source: MA-DOER*). See figure below.

- In 2009, the total installed wind capacity was 14 MW, and as of March 2014, the total capacity was 103 MW. The Patrick Administration has set goal of 2000 MW of wind energy by 2020 (Source: MA-DOER). See figure below.



## Energy Consumption

In terms of energy consumption, the most notable trend is continued increase of the implementation of nation-leading energy efficiency measures. Patterns to note include:

- Per capita energy consumption continues to be very low, and Massachusetts is one of the least energy-intensive states in the Nation. Between 2008 and 2011, while the national rank for Massachusetts held steady at 48<sup>th</sup> (out of 51, includes District of Columbia), the per capita demand decreased from 243 million British thermal units (Btu) in 2008 to 211 million Btu in 2011 (Source: US Energy Information Administration)
- As reflected by the nationwide analysis ranking of states by the American Council for an Energy-Efficient Economy (ACEEE), Massachusetts rose from the second place rank in 2009, to first place in 2011, 2012, and 2013.
- Peak demand in Massachusetts, as reported by ISO-NE, went from 11,890 MW in 2009 to 12,429 MW in 2012, consistent with its forecasted annual increase.

## Transmission

Trends since 2009 in energy transmission for Massachusetts included new electric grid system upgrades, regional planning to address known deficiencies for the ISO-NE area, the suspension of a deepwater LNG port and its delivery of natural gas through marine pipelines, and the first approval under the MA Ocean Plan for a shared electric and telecommunications cable across Vineyard Sound.

- A major transmission upgrade project to address system reliability concerns in the lower southeastern Massachusetts area, which includes Cape Cod, is scheduled for completion in

September 2013. The project includes adding a new 345 kV transmission line from the Carver substation to a new 345/115 kV substation west of Barnstable on Cape Cod.

- The ISO is studying reliability needs and developing transmission solutions to meet long-term reliability needs for the Northeast Massachusetts (NEMA)/Boston Area. This area is 43.6% of the state's load and the most concentrated load center in New England. Due to expected load growth and planned retirement of the entire Salem Harbor Station, ISO has found that additional resources or transmission upgrades are needed to ensure future system reliability. As part of this effort, the ISO is also examining a proposed a hybrid transmission solution that consists of AC components as well as a high-voltage direct current submarine cable extending from Seabrook, New Hampshire to Boston (SeaLink).
- In July 24, 2012, the US Department of Transportation's Maritime Administration approved a request from Neptune LNG LLC to amend its federal Deepwater Port License to include a five-year temporary suspension of port operations. Neptune's request indicated that recent conditions within the Northeast region's natural gas market had significantly impacted the Neptune Port's operational status and its ability to receive a consistent supply of natural gas imports. As a result, the Neptune Port has remained inactive over the past several years and will likely remain inactive for the foreseeable future. The suspension period became effective on June 26, 2013, and will extend for a period of five years.
- Following thorough pre-application consultation and comprehensive marine surveys and characterization, the Comcast/NStar bundled submarine fiber optic communications/electric cable completed its final MEPA review with confirmation in the Secretary's Certificate in September 2012 that the proponent had satisfactorily demonstrated that the project would not significant alter SSU resources or existing water-dependent uses defined in the plan. The Department of Environmental Protection (DEP) issued its Chapter 91 license and 401 Water Quality Certification in October 2013. Installation of the bundled cables is expected to begin in November.

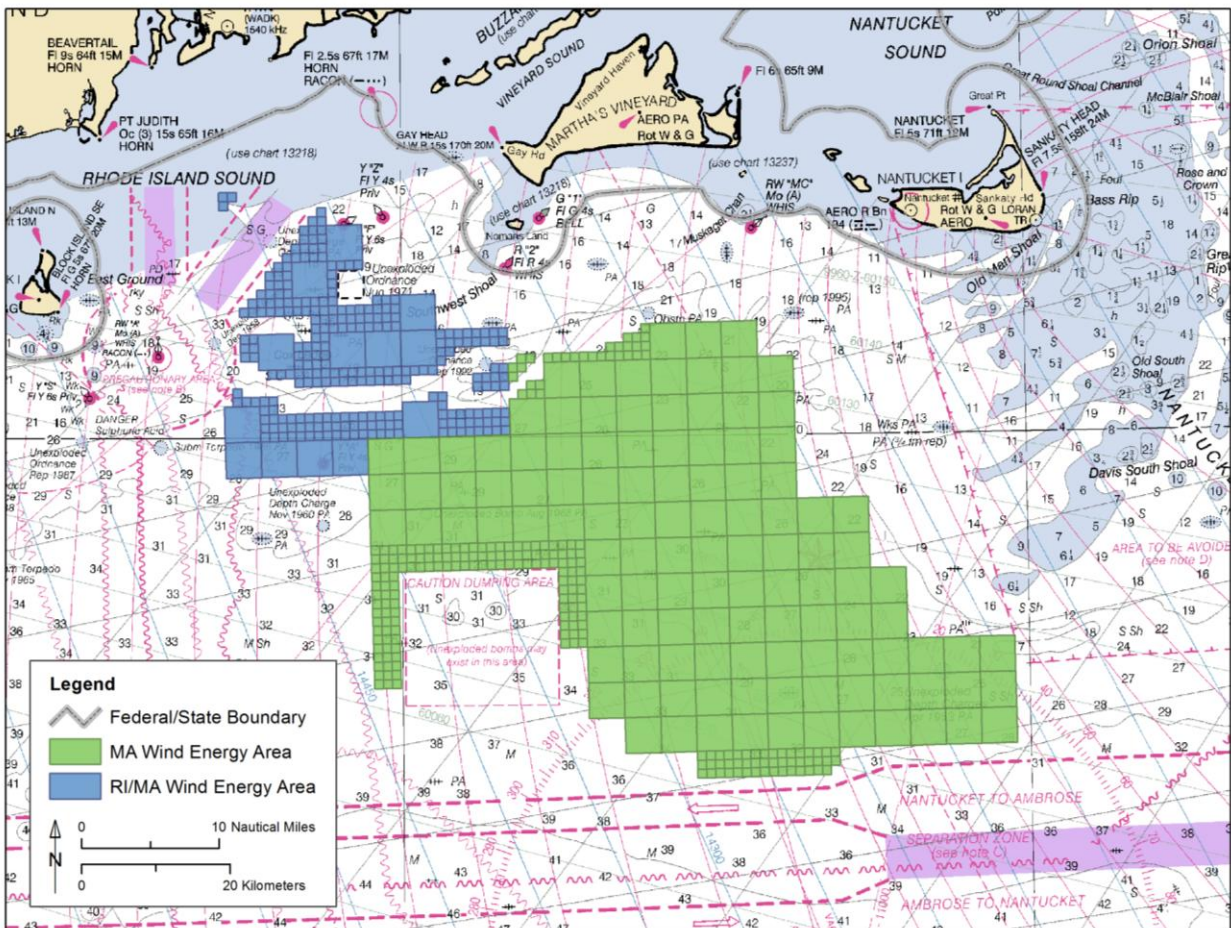
### **Marine / Offshore Renewable Energy**

In terms of marine-based renewable energy, there have been some important trends since 2009, which include:

- Cape Wind now has two long term contracts with Massachusetts electric distribution companies, approved by the Department of Public Utilities (DPU), for 15 years; one contract is for 234 MW, one is for 127.5 MW.
- Significant progress has been made in the planning, analysis and leasing stages of offshore wind development in federal waters adjacent to Massachusetts. This work is led by the Bureau of

Ocean Energy management (BOEM) in close coordination and consultation with EEA, CZM, and other agencies and through two Offshore Wind Intergovernmental Task Forces and state-led working groups on fisheries and habitat. Major milestones and outcomes since 2009, include:

- December 2010 - BOEM issued Request for Interest (RFI) for an area off Massachusetts, seeking developer interest and input as to resources and concerns.
- May 2011 - At the request of the Patrick Administration, the “RFI” area was reduced to protect areas critical to commercial fisheries, marine fauna, and navigation.
- February 2012 - BOEM identifies Wind Energy Area on the OCS adjacent to Rhode Island and Massachusetts (RI-MA Wind Energy Area, see figure below).
- May 2012 - BOEM identifies Wind Energy Area on the OCS adjacent to Massachusetts (MA Wind Energy Area, see figure below).
- June 2013 – BOEM issues Finding of No Significant Impact for Environmental Assessment and Final Sale Notice for the RI/MA Wind Energy Area.
- July 2013 – BOEM held the first-ever competitive lease sale for offshore wind renewable energy in federal waters for two lease areas in the RI-MA Wind Energy Area. Deepwater Wind New England, LLC was awarded both areas.



- In May 2013, a ground-breaking event marked the launch of construction on the state's New Bedford Marine Commerce Terminal. Work is underway and once constructed, the Terminal will be the first facility in the nation designed to support the construction, assembly, and deployment of offshore wind projects. The terminal will also be able to handle high-volume bulk and container shipping, as well as large specialty marine cargo.
- Notable trends have occurred on the tidal energy front since 2009 as well. The 2009 Plan identified four tidal projects in Massachusetts state waters that had applied for preliminary permits under the Federal Energy Regulatory Commission's hydrokinetic licensing process. As of September 2013, only one project—the Muskeget Channel Tidal Energy Project—holds a valid preliminary permit and meeting the FERC-specified schedule of activities, target dates, and reporting on the status of studies. The Muskeget Project is a partnership of the town of Edgartown on Martha's Vineyard and the University of Massachusetts' Marine Renewable Energy Center (MREC) and School for Marine Science and Technology (SMAST). The proposed project includes installation of 14 tidal energy units with a nameplate capacity of five MW, suspended approximately 25 feet below the sea surface and anchored to the seabed in areas of the channel at least 100 feet deep. A total of approximately 206 acres of channel area is required for all 14 units, including the anchoring system and space between units. A submarine cable will connect the tidal energy units to an on-shore site at either Chappaquiddick or Katama. The Secretary's MEPA certificate on the ENF required the preparation of a Draft Environmental Impact Report (DEIR) and provided a scope for the DEIR that included pre- and post-deployment monitoring of potential impacts to fisheries, marine mammals, large pelagic species, sea turtles, and avian species. Since the issuance of the Secretary's Certificate, the proponent has been conducting pre-deployment monitoring and preparing the DEIR.

### **Wastewater, Stormwater, and Industrial Facilities Discharges**

Important trends in wastewater, stormwater and other major water discharges to Massachusetts coastal waters since 2009, include:

- The Massachusetts Water Resources Authority (MWRA) made significant progress on its Combined Sewer Overflow (CSO) abatement plan, closing 37 outfalls by 2011. Of the 35 projects in the plan, 31 were complete and operational by 2013; three projects benefitting the Reserved Channel and the Alewife Brook were in construction; and the final project, also benefitting the Alewife Brook, will move into construction in 2014. Eleven of the 46 outfalls proposed to remain are predicted not to activate during the typical rainfall year. This leaves 35 outfalls that are predicted to discharge, cumulatively, up to 170 times in the typical rainfall year for a total average annual volume of up to  $1.55 \times 10^6 \text{ m}^3$  (410 million gallons), of which 381 million gallons (93%) will be treated. CSO discharges have been eliminated or effectively eliminated (i.e., eliminated up to and including the 25-year storm) at 12 outfalls (BOS 081-BOS 090, BOS093, and BOS095) adjacent to or upstream of the beaches of Dorchester Bay (including South Boston beaches). At Constitution Beach in East Boston, CSO discharges were eliminated with the closing

of outfall MWR207 in 2000. The MWRA is also exploring the benefits and costs of "co-digestion", that is the introduction of non-wastewater derived organic waste material into the wastewater anaerobic digestion process. Digester gas is already used as a high-value green energy source at the Deer Island Treatment Plant. Recent state regulatory changes encourage the diversion of organic wastes from landfills and incinerators, to energy production. Co-digestion could potentially substantially increase digester gas production and electricity generation at Deer Island.

- The Lynn Water and Sewer Commission (LWSC) operates four CSOs, one to the Saugus River, two to Lynn Harbor, and one to Nahant Bay (King's Beach). LWSC remains under the terms and conditions of a 2001 Consent Decree with MassDEP and EPA which requires the Commission to proceed with projects to eliminate CSO discharges to King's Beach and Lynn Harbor. Lynn completed a Supplemental CSO Facilities Plan in October 2004 after the Commission determined that elimination of CSO discharges may not be feasible. Since the 2004 Plan was completed, the Commission has focused all the construction work on mitigating CSO discharges to King's Beach. CSO discharges for the last three years, based on CSO metering, went from 360 million gallons/year in 2010 to 46 million gallons/year in 2012. As a result of the considerable sewer separation work done in Lynn, especially in the East Lynn area tributary to King's Beach, the annual activations have dropped dramatically, from a baseline range of 38-43 events a year at all outfalls prior to implementing CSO controls. At this time, the Commission has engaged the services of CH2M Hill Engineers to complete a review of the 2004 Supplemental CSO Plan, and generate new recommendations to cost-effectively address the remaining CSO discharges. The CH2M Hill Report is due in the Fall of 2013. The 2001 Consent Decree has not been modified at this time.
- The City of Gloucester has been under a Consent Decree with MassDEP and EPA since September 2, 2005. The City completed a Long-Term CSO Control Plan (LTCP) in June 2005, which recommended targeted sewer separation projects intended to minimize CSO discharges at all the City's CSOs. The focus was largely on the area tributary to CSO 002 to minimize discharges to the beach area. During design for a portion of the sewer separation work, the City and their engineers determined that another outfall, identified as 009 discharges to the Inner Harbor. The City also determined that an alternative combination of sewer separation projects would be a more cost-effective approach to achieve the same high level of CSO control. The updated recommended plan includes \$7.4 million in sewer separation work, which is projected to close three CSO regulator structures and limit CSO's to 1-2 per year at all of the CSO locations (excluding outfall 009). The Consent Decree was modified in 2012 to incorporate the updated plan to require work to address overflows at outfall 009. Over the last three years, based on a combination of CSO metering/modeling, CSO activations/volumes went from 6.6 million gallons/year in 2010 to 1.3 million gallons/year in 2012. The status of outfall 009 as a CSO or Sanitary Sewer Overflow (SSO) location has not been fully clarified. In accordance with the modified CD, the City has completed an evaluation report for outfall 009, which is under review by the regulatory agencies.



## **Desalination Facilities**

There are two desalination facilities in the state. Updates on their status and trends since 2009, include:

- The Swansea Water District has had a National Pollutant Discharge Elimination System (NPDES) permit since 2008 but did not begin withdrawing water until 2013. The NPDES permit allows the District to withdraw 3.89 million gallons per day (mgd) of brackish water from the Palmer River for desalination and to discharge 2.71 mgd of brine back to the river. The salinity of the discharge must be less than 32 parts per thousand and the dissolved oxygen concentration must be greater than or equal to 6 milligrams per liter. The District plant uses a cylindrical wedge-wire screen constructed of 0.25-inch mesh buried under five feet of stone and crushed stone to keep organisms out of the intake. The District has an ambient monitoring program to verify the dilution provided by the diffuser, to confirm the size of the mixing zone (about 32 feet from the diffuser ports), and to confirm that water quality standards are met at the edge of the mixing zone. The first environmental monitoring report was received by state agencies in 2013 and contained information on water quality, ichthyoplankton, fish and crabs, infaunal and benthic invertebrates, and sediment type in the vicinity of the intake and discharge.
- The Taunton River Desalination Plant has a NPDES permit to withdraw up to 10 mgd and discharge up to 5.4 mgd of brackish water from the Taunton River. The salinity of the discharge must be within two parts per thousand of the ambient salinity of the river during the discharge cycle. Because the Taunton River is one of the state's most important anadromous fish habitats, the Taunton River Desalination Plant uses multiple redundant fish exclusion devices including a flat wedge-wire screen with, two cylindrical wedge-wire screens, and between March 1 and November 15, a filter fabric curtain called a Gunderboom. Monitoring in the vicinity of Taunton River Desalination Plant has been ongoing since 2007. The data show that very few larvae make it through the exclusion devices to the raw water pump station. However, in each year several hundred river herring and other species have been found to be trapped between the Gunderboom system and the shore. Taunton River Desalination Plant staff are required to seine and return these trapped fish to the Taunton River. Despite the low numbers of ichthyoplankton entering the plant's raw water system, agencies still require annual monitoring because the plant has only been withdrawing enough water to keep its pumps and reverse osmosis system operable. The City of Brockton, the Taunton River Desalination Plant's only client, has not requested water from the plant in large quantities, with monthly totals for March/April, May, and June 2013 being only 6.8, 15.4, and 7.2 million gallons respectively, well below the potential monthly withdrawal of 300 million gallons.

## **Priority Data/Information Actions**

Feedback from work group members on recommendations for priority data/information actions for the next five years indicated a preference to continue work to regularly update spatial information on the special, sensitive, and unique marine habitats, seafloor mapping and characterization, and for areas of

concentrated water-dependent uses. This information supports the potential siting of future energy and infrastructure projects. At this point, no other recommendations were offered.

**Work Group**

The following individuals with important subject-matter expertise—many of whom assisted with the 2009 Ocean Plan—were asked to help identify and characterize important/notable trends in, or important issues associated with coastal/ocean-related energy and infrastructure.

Bruce Carlisle	CZM – work group lead
Joe Newman	National Grid
Brian Mulcahy	National Grid
Mark Reed	NSTAR
Anne George	ISO New England
Hayley Dunn	ISO New England
Mark Rodgers	Cape Wind
Fara Courtney	US Offshore Wind Collaborative
Stephen Barrett	Harris Miller Miller & Hanson, Inc.
John Miller	MREC
Bill White	CEC
Ben Davis	DPU
Bram Claeys	DOER
Steve McCurdy	DEP
Wendy Leo	MWRA
Peter Ralston	MWRA
Todd Callaghan	CZM