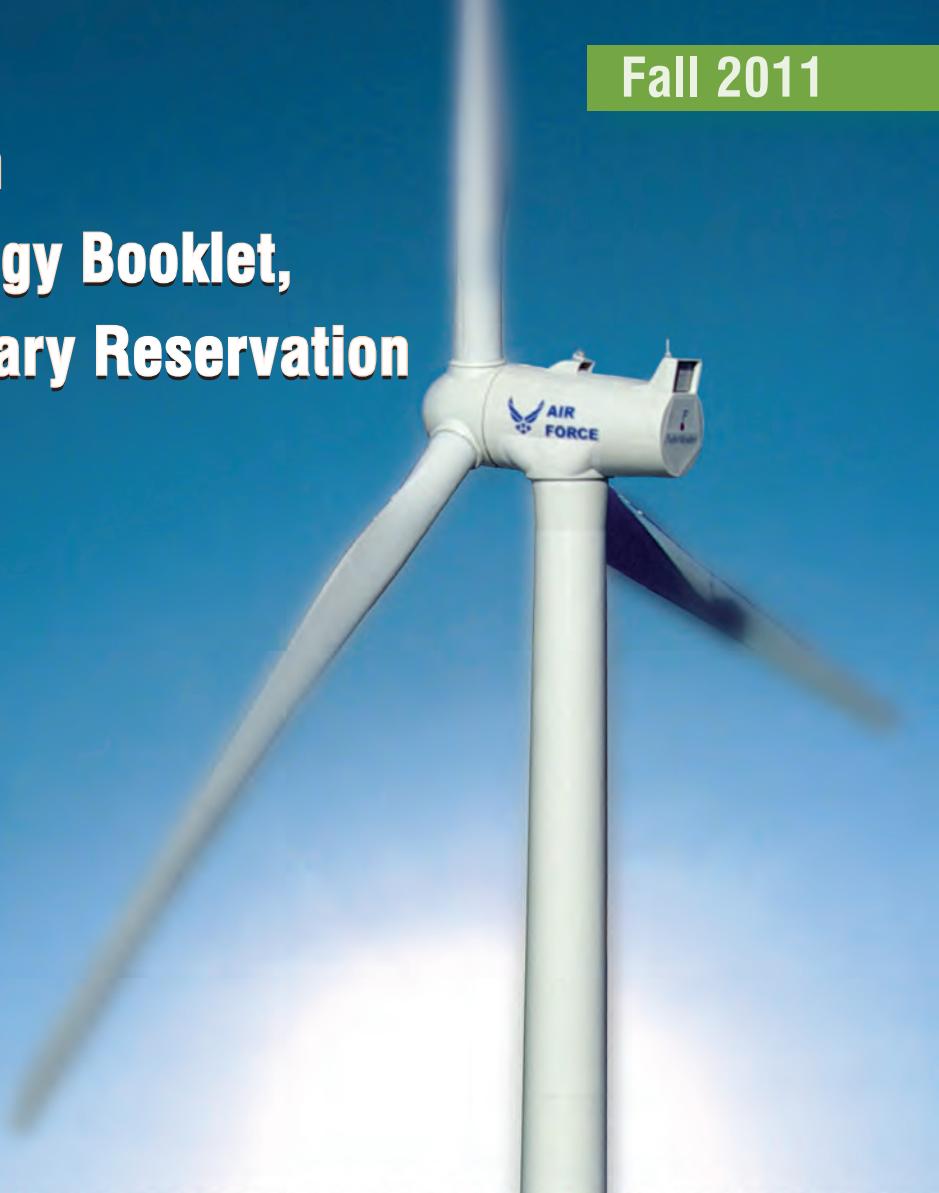


Fall 2011

Energy Conservation and Renewable Energy Booklet, Massachusetts Military Reservation



Turn Words into Action; Turn Action into Results.



The Massachusetts Military Reservation Energy Committee



The Massachusetts Military Reservation (MMR) Energy Committee was formed in 2007 to facilitate energy conservation and use of renewable energy technologies in order to reduce operational costs and minimize the carbon footprint. The committee's goals include increasing energy awareness through education; helping to meet the intent of Executive Order 13514; and advising the Joint Oversight Group (the MMR Commanders) on matters related to the MMR Energy Policy. The committee was established to oversee a reduced impact on the environment, the reduction of costs associated with energy use, the reduction of dependence on foreign oil, and to review renewable energy projects proposed for the MMR.

The committee meets periodically on topics ranging from the Cape Light Compact, NStar and National Grid, to energy policy, potential energy-related projects for MMR, and energy activity discussions between MMR agencies.

More information about the Energy Committee is available at:
<http://states.ng.mil/sites/MA/MMR/energy-committee.htm>



Our Mission

The purpose of the MMR Energy Committee is to facilitate energy conservation and use of renewable energy technologies in order to reduce operational costs and minimize the carbon footprint. Goals include increasing energy awareness through education; help meet the intent of Executive Order 13514; and advise the Joint Oversight Group on matters related to the MMR Energy Policy.

The Energy Committee is comprised of representatives from the major military commands on MMR: US Coast Guard • 6th Space Warning Squadron • Air National Guard 102nd Intelligence Wing and the Army National Guard • Camp Edwards • Massachusetts National Guard Environmental & Readiness Center • Army Environmental Command's Impact Area Groundwater Study Program • Air Force Center for Engineering and the Environment's Installation Restoration Program • Veteran's Affairs Cemetery • US Department of Agriculture • MassDevelopment • Environmental Management Commission • Senior Environmental Corps • MassCEC.

Energy Projects at MMR:

- AFCEE constructed three 1.5 MW wind turbines PAVE PAWS is planning for the installation of two additional utility scale turbines.
- The MMR is considering the installation of solar panel arrays on the landfill.
- The VA cemetery installed a 50 KW wind turbine on their property.
- USCG uses a geothermal heating/cooling system at one of its hangars and is incorporating geothermal in a new hangar construction project.
- The various MMR agencies are actively making improvements in energy efficiency including programs offered by Cape Light Compact.
- New building construction is LEED silver at a minimum.



General information about the MMR is available at: <http://www.mmr-info.org/>
More information about the Energy Committee is available at:
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The Air Force Center for Engineering and the Environment

The Air Force Center for Engineering and the Environment (AFCEE) manages the Installation Restoration Program (IRP) at the Massachusetts Military Reservation (MMR). To address the groundwater contamination, AFCEE constructed nine treatment plants that at one time treated approximately 18 million gallons per day (MGD) of contaminated groundwater containing chlorinated solvents and/or fuel-related compounds. Through optimization and plume remediation, AFCEE is currently treating 10.3 MGD. The treatment systems are energy intensive and have an environmental impact due to the use of fossil-fuel based electric power to run the treatment plants. Annual energy costs range from \$1.5-2.0 million and over thousands of tons of air emissions, such as carbon dioxide, nitrogen oxide and sulfur dioxide, are produced each year to generate the power.

To reduce the electricity costs and environmental footprint of the IRP, AFCEE has implemented a robust optimization program including energy conservation and renewable energy technology.

Optimization activities related to the pump and treat systems and wellfield include:

- optimizing flow rates in extraction wells including turning wells off, pulse pumping wells, and packering the well screens
- evaluating in situ technologies and natural attenuation in place of pump and treat
- conducting life cycle assessments on pumps and motors and replacing them as they age and become less efficient
- turning off booster pumps in treatment plants as flow decreases and removing the impellers to reduce friction (i.e. energy) losses
- installing variable frequency drives to extend lifetimes of pump/motor assemblies and to make them more efficient
- conducting energy audits and replacing inefficient sodium vapor overhead lighting with high efficiency fluorescent lighting
- reusing treated water for irrigation and evaluating it for use in HVAC geothermal applications.



Variable Frequency Drive



In the IRP, thousands of wells have been sampled and hundreds of direct push locations have been drilled. In order to reduce the environmental impact of these activities, AFCEE:

- switched from low flow pumping to using passive diffusion bags for VOCs and Hydrasleeves for metals in over 90% of monitoring wells.
- continuously optimizes the monitoring well network to include reduction in sampling frequency, the number of locations, and the number of analytes.

AFCEE self-performs direct push work using the smaller footprint Geoprobe 6620DT for conducting data gap sampling and installing monitoring wells. Environmentally friendly fuels such as biodiesel and soy-based hydraulic fluid are used in the Geoprobe.

The IRP uses granular activated carbon (GAC) in the pump and treat systems to remove the contamination from the groundwater. Several optimization activities have been conducted by AFCEE/MMR to reduce carbon costs, extend the life of the carbon, and operate the carbon treatment in the most sustainable manner:

- using reactivated GAC instead of virgin material
- evaluating alternative GACs to determine the most efficient product for our situation
- evaluating pretreatment of the influent using an oxidizer to extend the life of carbon
- evaluating on site regeneration of the GAC using two different technologies: (1) microwave technology, and (2) hot water desorption followed by advanced oxidation

AFCEE has also conducted energy audits of the facilities and replaced inefficient lighting and windows, installed occupancy sensors, programmable thermostats, and LED exit lights. The geothermal content of the groundwater is used to heat the treatment plants.

AFCEE/MMR enrolled 860 kW in the Energy Demand Response program and also evaluates utility rate structures to ensure accounts are on the most appropriate rate plan.

AFCEE has also evaluated renewable energy to offset the electric cost and impacts from air emissions associated with the power sources for the pump and treat systems. In 2009, AFCEE installed a \$4.6M 1.5 MW Fuhrlaender wind turbine (Wind I). Since startup on Dec. 2, 2009 through the end of June 2011, Wind I saved the taxpayer over \$600,000 and eliminated tons of carbon dioxide and other air emissions from being generated. Due to the success of Wind I, AFCEE developed Wind II, two 1.5 MW General Electric wind turbines. A construction contract was awarded in September 2009 for \$9.4 million and the two turbines were installed during Summer 2011. Wind II is expected to be operational in Fall 2011. The combination of Wind I and Wind II is anticipated to offset electrical use and air emissions by nearly 100% within the next five years.



U.S. Department of Agriculture



The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS) safeguards the nation's agricultural and natural resources from invasions of foreign pest organisms. This APHIS facility, Otis Pest Survey Detection and Exclusion Laboratory, provides operational support for national efforts to exclude and detect introductions of exotic pests. The laboratory also provides support for the control of pests, such as the emerald ash borer, Sirex wood wasp, Asian longhorned beetle, Asian gypsy moth, and offshore port monitoring programs.

The USDA has initiated several energy saving projects/initiatives over the last few years, the most important of these is a major renovation project currently underway in Building 1398. While this project is a Life Safety upgrade project, we are also installing a new energy efficient boiler for the building and replacing the existing one zone HVAC system with a system that will utilize Direct Digital Control (DDC) zone controls and an ERU (Energy Recovery Unit) for all of the fume hoods in the building.

The facility has also had an energy audit performed in recent years, and as a result of this audit, has retrofitted all of the lighting fixtures to T-8 fixtures.



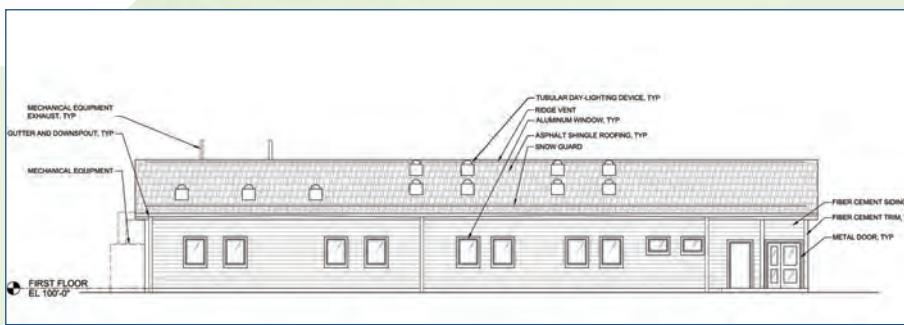
Asian gypsy moth



Asian longhorned beetle



Sirex wood wasp



The USDA is also constructing a new facility that will be built following Leadership in Energy and Environmental Design (LEED) Silver guidelines.

Future projects include upgrading the existing windows and replacing existing refrigeration units with more efficient units. As a support research laboratory for APHIS one of our unit charges is to develop more efficient and cost effective technology for safeguarding our agricultural and nature systems.

U.S. Coast Guard Air Station Cape Cod



U.S. Coast Guard Air Station Cape Cod (ASCC), with its four helicopters and four jets, is the only Coast Guard Aviation facility in the northeast. As such, ASCC is responsible for the waters from New Jersey to the Canadian border. Centrally located at the Massachusetts Military Reservation on Cape Cod, ASCC maintains the ability to launch a helicopter and/or jet within 30 minutes of a call, 365 days-a-year, 24 hours-a-day, and in nearly any weather conditions. Our mission is to protect life, property and the marine environment in service to the public and our country.

Average annual energy costs to support ASCC is \$2.4 million for natural gas and electricity combined and over thousands of tons of air emissions are produced each year from these power sources. To reduce the energy costs and environmental impact, ASCC has implemented several conservation strategies and utilizes green energy technology.

In June 2009, ASCC signed agreements with Cape Light Compact, an inter-municipal energy service organization that is funded by all consumers of electricity on Cape Cod and Martha's Vineyard. The purpose of the venture was to make the existing Coast Guard infrastructure more energy efficient. Since then, Cape Light Compact has worked to re-lamp and re-ballast lighting fixtures and exit signs, install occupancy sensors, and upgrade refrigeration units in 34 buildings. The partnership will be finalized by the close of 2012, which will result in a total estimated savings of \$200,000 for project costs and \$80,000 on ASCC's annual electric bill.



Air Station Cape Cod Airfield



ASCC is enrolled in the Energy Demand Response program in Massachusetts. Participants in this program are paid to curtail load during peak grid use. ASCC is enrolled for 100 kilowatt (kW) with plans to add to the curtailment load. In 2010 a comprehensive Energy Assessment Survey was conducted. Based on the assessment a number of optimization and energy conservation measures are planned for implementation. ASCC provides the energy conservation portion of the annual environmental fair held on the MMR for local school children.

In addition to energy conservation and demand response, ASCC has installed green energy technology in two aircraft hangers. In 2004, ASCC installed a geothermal system in the aircraft ready hanger. Not interconnected directly to the grid; rather the geothermal system is used inside the hangar as an HVAC system. The system offsets energy use in place of a 60 ton air conditioning system. Plans for similar system are underway for use in the Maritime Patrol Aircraft (MPA) hanger, which is currently under construction. The new geothermal system is expected to be operational in 2012. The LEED Silver certification of the MPA hanger deems a 75% total energy cost savings over the ASHRAE 90.1-2007 Baseline design.

ASCC runs a robust recycling program, taking in paper, cardboard, newspapers, magazines, glass, plastic, tin, metal, wood, electronic waste, batteries, waste oil, JP-8, light bulbs, cooking grease/oil, food waste, tires, and household hazardous waste generated by employees and residents living on base. Each year this program removes approx 300 tons of material from the solid waste stream that would typically go to landfills, and re-directs the material into recycled resources. Partnering with the Town of Bourne, the Coast Guard avoids costly tipping and disposal fees normally associated with on-base trash removal.

ASCC also requires contractors to purchase green products when available, to recycle, and to source products and subcontractors locally.

102nd Intelligence Wing, Otis Air National Guard Base



Think Green, Build Green, Fly Blue

In accordance with the Air Force and Air National Guard Energy goals and objectives the 102nd Intelligence Wing is committed to reduce demand, increase supply, and affect a culture change within the organization to improve our energy footprint.

The 102nd has implemented a number of initiatives to reduce energy consumption. How we save, conserve, and efficiently use energy has a direct impact on our mission here at Otis Air National Guard Base. We have changed the way we design, construct, and operate our buildings. For many years our Wing leadership has been a strong proponent of recycling initiatives that have expanded to include paper, cardboard, metals and construction materials. Since 2007 the Air Force has required compliance with LEED standards. Currently the 102nd has one building in design and close to 70,000 square feet of facilities under construction on track to receive Silver certification in the LEED program. This includes a Distributed Ground Station (DGS) facility that will be the first of its kind in the Air Force to receive any level of certification.



We are exploring renewable energy opportunities with a potential solar array at the old landfill site that could provide up to 12 megawatts (MW) of clean renewable power. In addition we have contracted for the study and design of a geothermal project that could service the majority of our new campus area. We have recently completed a level II Energy Audit on all of our facilities that will assist us in programming projects and programs to achieve both short and long term goals. Some of these include replacing lower efficiency boilers and optimizing their scheduling, applying demand control ventilation, and the retrofit of lighting and controls.

In 2011 alone the 102nd has reduced its facility square footage by nearly 100,000 square feet of space, including the demolition of 19 buildings, and our entire Petroleum, Oils, Lubricants (POL) facility with over 1 million gallons of fuel capacity. This footprint reduction will greatly enhance our ability to optimize our energy performance by economizing space and replacing old antiquated structures with new, state of the art, energy efficient facilities.

We recently removed almost 8 acres of impervious pavements. This material is recycled locally, reduces runoff and pollution, and allows for more natural drainage. This reduces maintenance and subsequently reduces energy consumption.

6th Space Warning Squadron



The 6th Space Warning Squadron (6 SWS) is one of the largest single users of electricity on Cape Cod. For Fiscal Year (FY) 2010, we consumed approximately two million kilowatt hours (KWH) of electricity at a cost of just under \$2 million, averaging \$5,100 per day. We've been working hard to reduce energy consumption and costs through several initiatives.

Electricity Contracts: We purchase our electricity supply through the Defense Logistics Agency Energy. As part of a regionally competed contract, we are able to receive our electricity at a much lower rate than the local utility company can offer. Since January 2010, our new contract price reduced the supply cost by just under \$0.02 per KWH or approximately \$40,000 per year.

Cape Light Compact (CLC): The CLC works with our local utility provider to manage energy conservation projects for Cape Cod. They have conducted energy audits of our site and have funded a project to replace lights, motors, and install variable frequency drives on many of our systems including the array chilled water supply. So far, they have funded over \$300,000 at no additional cost to the Air Force. The project is expected to save over \$150,000 annually. They are currently reviewing our Satellite Communications facility to see if additional energy savings could be generated by improving its energy efficiency.



Cape Cod Air Force Station



Operators monitor consoles for missile warning and space surveillance at Cape Cod Air Force Station, 2011

AFCESA aims for construction to start in FY 2012. One of the turbines will be located on Cape Cod Air Force Station (AFS) property. Due to siting constraints, the second turbine would be situated on Camp Edwards property, adjacent to Cape Cod AFS. The Massachusetts Army National Guard and the Massachusetts Military Reservation Environmental Management Commission helped identify the second site.

Chiller Replacement Project: We awarded a project to replace our two, 450 ton chillers with new units that include variable frequency drives, direct digital controls, and a plate and frame heat exchanger. The first of the new chillers is already installed and undergoing its testing period. Installation of the second chiller, which got underway in October 2011, should be complete in early 2012. Ultimately, replacing our chillers could yield energy savings of approximately \$100,000 per year.

Construction of Two Wind Turbines: We are working with Air Force Space Command and the Air Force Civil Engineering Support Agency (AFCESA) to construct two 1.5 megawatt (MW) wind turbines. These wind turbines will offset 50% of the site's electricity costs per year.



Wind Turbine

Massachusetts Military Reservation Energy Committee: Cape Cod Air Force Station was one of the charter members of the MMR Energy Committee. This group brings together all the organizations on the MMR to review energy savings opportunities and appraise MMR commanders, through the Reserve's Joint Oversight Group, of new and ongoing energy initiatives.

Massachusetts Army National Guard's (MAARNG) Camp Edwards Training Site



The Massachusetts Army National Guard's (MAARNG) Camp Edwards Training Site is the primary training facility for National Guard and Army Reserve soldiers throughout New England. Camp Edwards' primary mission is to prepare soldiers for combat missions overseas as well as missions to serve and protect the homeland stateside. The MAARNG has programs in place at the base to ensure the military's commitment to excellent environmental stewardship. A major component of this commitment is supporting the use of renewable energy and reducing the amount of energy consumed at Camp Edwards.

In 2008 the MAARNG spearheaded a partnership with the military and state agencies to identify sites at the base for possible turbine development. The two newest turbines were constructed within sites in the Camp Edwards training area identified through this process and in coordination with the MAARNG. The Army contributed to the funding of the three wind turbines installed at MMR by AFCEE, the Air Force groundwater cleanup program.

Several large buildings at Camp Edwards have been completely renovated to make them more useful and energy efficient.

Funds from the American Recovery & Reinvestment Act were used to retrofit the base's WWII era gymnasium and seven 1950's era barracks buildings, making the buildings more energy efficient and resulting in long term energy cost savings. The old Post Headquarters building (also from the World War II era) is the next building to be modernized. Design for that project is currently underway and energy efficiencies will be included in the plans. The current Unit Training Equipment Site building will be replaced with a new building that will meet LEED certification standards for energy efficiency.

The MAARNG has conducted extensive energy audits of the groundwater treatment facilities that clean and monitor groundwater at the base and retrofitted lighting and other equipment wherever possible to reduce energy use. This was facilitated at no cost to the taxpayers using the services of Cape Light Compact, a government agency funded through surcharges on the electricity that the MAARNG purchases. Upcoming building improvements at Camp Edwards will likely include modernization of lighting fixtures, improved insulation, installation of occupancy sensors, and broader use of programmable thermostats. The MAARNG has also upgraded several smaller existing facilities with new windows, insulation, occupancy controls, programmable thermostats, LED exit lighting, and by installing Energy Star rated appliances.

The MAARNG is planning on deploying small scale solar recharging systems at remotely located mechanized targets in the training areas a part of ongoing improvements to make training more realistic. This may lead to more widespread use of solar energy to power Camp Edwards to include utilizing roof space on many buildings for solar panels.



The recently-renovated Camp Edwards gymnasium.

Massachusetts National Cemetery



The wind turbine at the Massachusetts National Cemetery.

On April 22, 2011, the Massachusetts National Cemetery officially flipped the switch on green tech, and their new 50-kilowatt Endurance Wind Turbine went live. The 151-foot turbine is expected to meet 95% of the cemetery's energy needs, resulting in an annual savings of \$16,800. In an era of economic belt-tightening, that is a budgetary boost that will be spent to directly enhance Veterans' lives and their experience with the Veterans' Administration while exceeding environmental and energy conservation goals.

In recognition of this incredible achievement and notable dedication to conservation, the wind turbine project team, including cemetery director Paul McFarland, has recently been named a 2011 recipient of the prestigious Federal Energy and Water Management Award – a program that honors individuals and organizations who make “significant contributions” to further national goals regarding energy conservation and sustainability.

In 2008 The Massachusetts National Cemetery completed work improving the efficiency of their Irrigation System by tying into the treated discharge from the Air Force Center for Engineering and the Environment's Land Fill (LF) 1 Pumping System. This project requiring joint effort and coordination transferred the load from a 75HP submersible pump with a Variable Frequency Drive (VFD) drive to an inline 60 Horsepower Booster Pump.

The newly launched Massachusetts National Cemetery Phase 3 Expansion Construction Project includes new Administration and Maintenance buildings built to the internationally recognized LEED Silver Certification Level. These new buildings for the staff and visitors to the National Cemetery replace energy inefficient buildings constructed in 1979.

The Massachusetts National Cemetery is administered by the U.S. Department of Veterans Affairs and is the only National Veterans' Cemetery in New England. It occupies 750 acres on the Massachusetts Military Reservation.

“The wind turbine project team has recently been named a 2011 recipient of the prestigious Federal Energy and Water Management Award”

Contact Information

HQ AFCEE/MMR

Installation Restoration Program

Douglas Karson, Community Involvement Lead
508-968-4678, x2
douglas.karson@us.af.mil

Massachusetts National Guard Environmental & Readiness Center

Lynda Wadsworth
508-968-5152
lynda.e.wadsworth@us.army.mil
www.eandrc.org

US Department of Agriculture

Vic Mastro, 508-563-9303, ext. 0
www.aphis.usda.gov

US Coast Guard Air Station Cape Cod

Air Station Cape Cod Quarterdeck, 508-968-6800
www.uscg.mil/d1/airstaCapeCod/

Massachusetts Air National Guard

102nd Intelligence Wing
Public Affairs, 508-968-4003
www.102iw.ang.af.mil



Cape Cod Air Force Station

6th Space Warning Squadron
Public Affairs, 508-968-3283 or 508-968-3277

Massachusetts National Cemetery

Paul McFarland
508-563-7113
www.cem.va.gov

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