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**State Innovation Grant Project  
Narragansett Bay Commission  
Final Report**

Project Period: October 1, 2008 – September 30, 2012

**Project Title:** Sustainable Energy Management Practices for Wastewater Treatment Facilities

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## I. Introduction

Municipal wastewater contains pathogens (disease organisms), nutrients such as nitrogen and phosphorus, solids, chemicals from residential and commercial chemicals and industrial hazardous substances. Municipal Wastewater Treatment Facilities (WWTF) thus play an important role in protecting human health and the environment by removing these pollutants from the environment.

WWTF operations however, by their nature, are large energy users and while designed and operated to reduce the environmental impacts of municipal wastewater (i.e. BOD, nutrients, solids) on local receiving waters, they can and do create other environmental impacts particularly through the large consumption of fossil fuels and associated air pollutant emissions (e.g., greenhouse gasses).

Through the “Sustainable Energy Management Practices for Wastewater Treatment Facilities” project the Narragansett Bay Commission (NBC), the Rhode Island Department of Environmental Management (RIDEM), the University of Rhode Island (URI), and the Rhode Island Manufacturers Extension Service (RIMES) (the Project Partners) addressed two important concerns common to all WWTF operations nationally if not worldwide – energy consumption by wastewater collection and treatment operations and the detrimental impacts to sewer systems from the discharge of waste Fats, Oil and Grease (FOG) from the Food Service Industry Sector (i.e. restaurants). The goals of these efforts are to reduce the fossil fuel energy demand of Rhode Island’s 19 WWTFs and to reduce the amount FOG being discharged to NBC’s sewer system while promoting the production of bio-diesel from waste “yellow” grease.

The information contained in this final project report documents the benefits of this innovative approach and will allow efficient for transfer of these innovations to other sectors and States.

## II. Purpose and Goals of the Project

### WWTF Energy Focused Environmental Management Systems (EF-EMS)

As part of these efforts the Project Partners developed and implemented a Sustainable Energy Focused Environmental Management System (EF-EMS) Program for WWTFs, based on the well-established ISO 14001 Environmental Management System (EMS) “Plan-Do-Check-Act” approach, and an Environmental Results Program (ERP) designed to improve the management and collection of FOG waste generated by local food service establishments.

**Project Goal:** The goal of the EF-EMS portion of this project is to reduce grid supplied energy use by Rhode Island’s 19 WWTFs through improved energy management, energy efficiency and conservation, and where applicable the cost effective utilization of available renewable energy resources. The following is a list of identified tasks associated with meeting the project goal:

1. Form an Energy Management System Steering Committee to give guidance to the Project Partners on the development of the overall WWTF EF-EMS Program. Steering Committee members will include, but may not be limited to representatives from: RIDEM, NBC, EPA, RIMES, the Rhode Island Office of Energy Resources, NEWEA, NWPCA, the PEER Center at UMass Lowell, and National Grid.
2. Develop and Implement an Energy Focused Environmental Management System Training Program for WWTFs on how to develop and implement an Energy Management System Plan-Do-Check-Act process for evaluating and implementing a Sustainable Energy Management Program by WWTFs.
3. Hold Project Kick-Off Meeting/Workshop to impart a clear understanding of the project goals and objectives to representatives of RI's 19 WWTFs, encourage the participation of each WWTFs and have each participating WWTF identify an EF-EMS "Champion" or "Champions" from within their organization that have the appropriate professional capability and authority to oversee the development of their EF-EMS.
4. Hold an EPA Energy Guidebook Training Workshop for Participating WWTFs –to train each WWTF representatives on how to develop an Energy Management System for their WWTF using EPA's Energy Guidebook.
5. Develop an energy use baseline for each participating WWTF – Using EPA's Energy Star Portfolio Manager. Hold a ½ day workshop on the use of EPA's Energy Star Portfolio Manager for representatives of each WWTF.
6. Establish a Roundtable to assist each Participating WWTF with implementing their EF-EMS – hold 6 to 12 meetings.
7. Conduct WWTF Energy Use Assessments of Each WWTF.
8. Assess Project Success by:
  - a. Reviewing and analyzing WWTF energy use data collected by participating WWTFs using the Energy Star Portfolio Manager or other tracking system that may be employed by the WWTFs,
  - b. Conducting follow-up site visits of each participating WWTF as needed to collect information on energy related activities, and assess the overall successfulness of the Plan-Do-Check-Act approach of the EF-EMS,
  - c. Equate energy use reduction and increased use of renewable energy with Green-House Gas reductions, and
  - d. Documenting all findings in a final Project Report.

### **Fats, Oil and Grease (FOG) ERP for Food Service Establishments**

Fats, Oil and Grease (FOG) that enters the sewer system from Food Service Establishments (FSE) is a continuing problem for WWTF operations. FOG causes sewer line obstructions, problems with pumps and other WWTF equipment and can inhibit overall wastewater treatment effectiveness.

Restaurants generate two forms of FOG – "Yellow Grease" consisting of used vegetable oil often contaminated with fried food residue and "Brown Grease" consisting of residual FOG removed

from the wastewater stream through the use of Grease Removal Units (GRUs) - NBC limits FOG levels in commercial and industrial wastewater to 125 mg/l. Yellow Grease can be potentially used as a source of renewable energy through the production of bio-diesel and collected Brown Grease can potentially be used in anaerobic digestion of waste sludge to boost methane generation.

**Project Goal:** Reduce the amount FOG discharged to NBC’s WWTFs through the use of Food Service Establishment FOG Best Management Practices and encourage the reuse of waste FOG through local biodiesel production.

The following is a list of identified tasks associated with meeting this project goal:

1. Create a steering committee including representatives from NBC, DEM, URI, Rhode Island based restaurant/hospitality organizations and representatives of Rhode Island bio-diesel production facilities.
2. Identify of industry sector universe.
3. Develop a FOG Management Checklist and set of Best Management Practice (BMP) Factsheets.
4. Perform 2 to 3 trial checklist runs to try out the FOG management checklist. Results and feedback from these trial runs will be used to modify the checklist accordingly.
5. Hold a Project Kick-Off workshop – to announce the new ERP initiative. In cooperation with RI’s restaurant and hospitality networks and direct mailings.
6. ERP Assessments - perform inspections of between 50 to 75% of all permitted restaurants annually.
7. ERP Certification - issue “Self-Certification” forms to applicable food service establishments.
8. Statistical analysis - analyze data gathered from the initial and follow-up assessments.

### III. Projected Outputs and Outcomes

The original Project Work-Plan identified the following projected outputs:

**Table 1. Initial Projected Outputs and Expected Outcomes EF-EMS**

<b>Task</b>	<b>Task Description</b>	<b>Outputs</b>
Project QAPP	Develop an overall Quality Assurance Project Plan	<ul style="list-style-type: none"> <li>• EPA Approved QAPP</li> </ul>
Steering Committee	Form an EMS Project Steering Committee and hold Committee meetings	<ul style="list-style-type: none"> <li>• Member List</li> <li>• Meeting Minutes</li> <li>• List of Incentives</li> <li>• Lessons Learned</li> </ul>

Task	Task Description	Outputs
		<ul style="list-style-type: none"> <li>• Final Project Report/Recommendations</li> </ul>
Project Kick-Off Meeting	Develop, organize and hold a kick-off meeting with WWTF and Energy Management System project component stakeholders	<ul style="list-style-type: none"> <li>• Workshop Agenda</li> <li>• Attendee List</li> <li>• Speaker Presentations</li> <li>• List of Participating WWTF</li> </ul>
EF-EMS Energy Guidebook Training	Hold a one day training session on developing an EF-EMS using EPA's Energy Guidebook	<ul style="list-style-type: none"> <li>• Curriculum</li> <li>• Agenda</li> <li>• Attendee List</li> </ul>
Portfolio Manager Workshop	Collect and tabulate energy use and operational performance data from participating WWTFs Compile collected energy use and operational performance data into EPA Energy Star Portfolio	<ul style="list-style-type: none"> <li>• WWTF Energy Use Data</li> <li>• WWTF Operational Performance Data</li> <li>• WWTF Energy Use Baseline</li> </ul>
EF-EMS Roundtable Meetings	Hold 6 to 12 monthly EF-EMS Roundtable Meetings	<ul style="list-style-type: none"> <li>• Working EF-EMS for each participating WWTF</li> </ul>
Energy Use Assessments	Conduct on-site Energy Use Assessments of each participating WWTF in order to: <ul style="list-style-type: none"> <li>• Identify specific high energy demand equipment used at each participating WWTF</li> <li>• Implement the Energy Management Systems</li> <li>• Assesses and documenting energy billing procedure use by individual power supply companies</li> <li>• Assess renewable energy opportunities</li> <li>• Assess PDCA cycle at each participating WWTF</li> </ul>	<ul style="list-style-type: none"> <li>• Written summaries and progress reports on identified energy projects</li> <li>• WWTF Equipment Energy Demand Database</li> </ul>
Project Assessment	<ul style="list-style-type: none"> <li>• Assess project success through review of collected data and, as needed, conducting follow-up site visits of participating WWTFs</li> <li>• Assess overall successfulness of the PDCA cycle</li> </ul>	<ul style="list-style-type: none"> <li>• Written summaries and progress reports on identified energy projects</li> <li>• Final Project Report</li> </ul>

**Table 2. Initial Projected Outputs and Expected Outcomes FOG ERP**

<b>Task</b>	<b>Task Description</b>	<b>Outputs</b>
ERP Steering Committee	Organize and form a Steering committee that includes ERP project stakeholders	<ul style="list-style-type: none"> <li>• Minutes from Steering Committee Meeting</li> </ul>
Identification of Sector Universe	Identify all “Yellow” Grease end-users doing business in Rhode Island Contact and conduct site visits of “Yellow” Grease end users Develop “Plan of Action” for conducting “Inspections” of NBC permitted restaurants	<ul style="list-style-type: none"> <li>• List of all NBC Restaurants</li> <li>• List of “Yellow” Grease end-users</li> <li>• Field Reports from site visits of “Yellow” Grease end-users</li> </ul>
Develop ERP Checklist and BMPS	Develop Waste FOG ERP self-certification checklist and BMPs	<ul style="list-style-type: none"> <li>• ERP Draft Checklist</li> <li>• ERP Draft Manual</li> </ul>
ERP Checklist Test	Test out checklist at two to three pre-selected facilities	<ul style="list-style-type: none"> <li>• ERP Final Checklist</li> <li>• ERP Final Manual</li> </ul>
<i>(ERP Kick-off Meeting)</i> ERP Project Follow-Up Meeting	Develop and hold workshop for restaurants and other stakeholders	<ul style="list-style-type: none"> <li>• Workshop attendee list</li> <li>• Workshop Agenda</li> <li>• Presentations</li> </ul>
ERP Assessments	Conduct Initial and Follow-Up FOG Management Assessments of all NBC permitted restaurants Compile Baseline data	<ul style="list-style-type: none"> <li>• Completed Checklists</li> <li>• Baseline Data</li> </ul>
ERP Certifications	Check Self-Certifications	<ul style="list-style-type: none"> <li>• Signed Self-Certifications</li> </ul>
Statistical Analysis	Perform statistical analysis on collected data	<ul style="list-style-type: none"> <li>• Statistical outcome summary report</li> </ul>

The Project Logic Model is included as: Attachment I A – Logic Model WTTTF EF-EMS and Attachment I B – Logic Model Waste FOG ERP.

#### **IV. General Approach Used to Implement Project**

The following discussion describes the methodologies used to implement this project, including a description of stakeholders and project milestones:

##### **EF-EMS Project - General Approach**

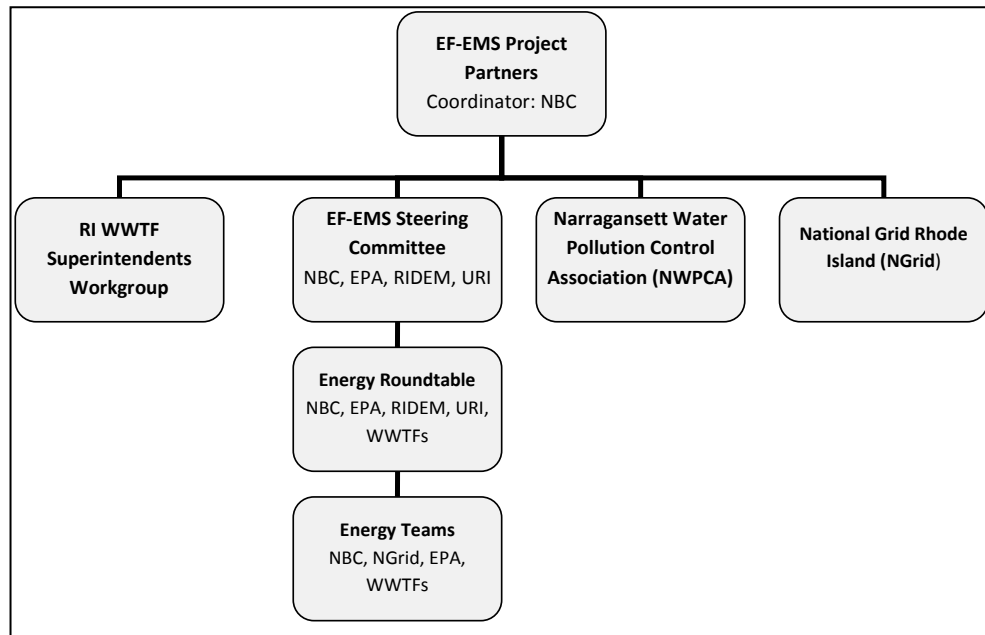
The Project Partners recognized prior to beginning this project that an important aspect of developing individual WWTF EF-EMSs will be the formation of EF-EMS Teams (in this case “Energy Teams” for each individual WWTF). In order to form effective and functional Energy Teams the Project Partners looked for members from within two existing Rhode Island based



WWTF organizations: the Narragansett Water Pollution Control Association (NWPCA) - the Rhode Island “chapter” of the New England Water Environment Association, and the Rhode Island WWTF Superintendent’s Workgroup - a RIDEM headed workgroup whose membership consists of the Superintendents from all 19 Rhode Island WWTFs. Both organizations have crossover membership and meet periodically, separately and combined, to address and discuss issues pertinent to the Rhode Island WWTF community.

In forming the Energy Teams the Project Partners first established an EF-EMS Steering Committee made up of leadership members from NWPCA and the WWTF Superintendents Workgroup. As a result of a Project Kick-Off Meeting held in February 2009, attended by representatives of each Rhode Island WWTF, and several follow-up meetings and discussions, the EF-EMS Energy Steering Committee formed the Rhode Island WWTF Energy Roundtable (Energy Roundtable) consisting of key members (Superintendents and facility Managers) from each WWTF. The EF-EMS Project Organizational Chart is depicted in Figure 1:

**Figure-1 EF-EMS Organizational Chart**



Through the Energy Roundtable individual WWTF Energy Teams were formed for each of the nineteen WWTFs. Each Energy Team consisted of a representative from NBC who was responsible for identifying renewable energy opportunities, a representative from National Grid’s professional energy management contractor who helped identify and quantify potential Energy Efficiency Measures (EEMs), a RIDEM representative responsible for EF-EMS guidance, and representative(s) from the individual WWTF that had firsthand knowledge of the WWTF’s processes and had the authority to implement identified EEMs. On occasion representatives from RIDEM, URI and EPA also participated in team activities. The Energy Team was the backbone of the EF-EMS Planning Stage process; their work established the EF-EMS Fence-Line, the

baseline energy use performance level from which to measure all energy improvements, and identified all potential EEMs.

The WWTF members of the Energy Roundtable were charged with the responsibility of implementing the energy improvements within their individual WWTFs that were identified by their Energy Team. The Project Partners coordinate Roundtable efforts and guide the Energy Roundtable members through the EF-EMS Plan-Do-Check-Act (PDCA) process.

The Energy Roundtable, upon creation, held meetings on a monthly basis for project training and development purposes; but in short time settled into a quarterly formal meeting schedule. While the formal meeting schedule of the Energy Roundtable was sparse, issues associated with the EF-EMS are included in all NWPCA meetings and WWTF Superintendents Workgroup meetings, and as such are continuously being addressed.

The first Energy Roundtable Meeting was held in April 2009 and consisted of a full day training event on the PDCA process presented by a seasoned quality management professional from RIMES. The training focused on use of the EPA Energy Guidebook, EMS terminology, establishing energy goals and objectives and developing an Energy Policy Statement.

#### **FOG-ERP - General Approach**

The NBC in cooperation with the RIDEM, URI and EPA developed an Environmental Results Program (ERP) and a FOG Best Management Practices Workbook to assist Food Service Establishments (FSEs), serviced by the NBC, improve their FOG management practices. The workbook contains NBC's regulatory compliance inspection checklist and an explanation of the reason/necessity of each item outlined in the checklist along with a best management practices (BMP) checklist with similar explanations for each listed BMP.

Self-Certification form is included at the end of the workbook for use by those FSEs that choose to certify their participation in the ERP. FSEs certified in this program will also be recognized as meeting the grease management requirements of the RI Hospitality Green Restaurant Certification Program. The FOG-ERP also helps each FSE comply with R.I.G.L 23-18-17 which requires waste cooking grease in the State of Rhode Island be recycled.

The NBC FOG-ERP has been designed to improve the management of FOG by the local food service industry through a combination of efforts and actions:

1. Compliance Assistance: Pollution Prevention Engineers from the University of Rhode Island and the NBC meet with restaurant owners and managers to help implement sound and sustainable FOG Best Management Practices and better comply with NBC regulations.
2. Self-Evaluation: Restaurant owners and/or operators are given training through Compliance Assistance efforts to self-evaluate their facility in order to certify their FOG management practices utilizing the NBC Oil & Grease Compliance and Best Management Practices Workbook.

3. Regulatory Inspections: The NBC Pretreatment Program continues to inspect all restaurants on a regular basis. Participation in the FOG-ERP helps firms prepare for regulatory inspections and helps them comply with NBC regulations.

4. Certification: Restaurants that demonstrate a superior FOG management performance level are issued a Certification of Best Management Practices which may be displayed in their place of business.

Each FSE located within the NBC serving district was notified by mail about the FOG-ERP and information on the ERP program, along with electronic copies of the workbook and checklists, are available on NBC's website, [www.narrabay.com](http://www.narrabay.com) under Programs and Projects/Pretreatment Program/Grease Control Program.

## V. Key Project Milestones

This section of the report describes activities that were conducted in order achieve project milestones and produce project outcomes:

### Quality Assurance Project Plan (QAPP)

EF-EMS Task 0 - Quality Assurance Project Plan - Develop a Quality Assurance Project Plan

During the September – December 2008 project period a QAPP was developed and submitted to EPA for review. On March 27<sup>th</sup> NBC received notice from EPA that the QAPP was accepted for final approval. The finalized QAPP was subsequently signed and submitted to EPA.

### EF-EMS

EF-EMS Task 1 - Steering Committee - Form an EMS Project Steering Committee and hold Committee meetings

An EF-EMS Steering Committee was formed and an initial meeting was held on December 22<sup>nd</sup> 2008. During this first Steering Committee Meeting the following individuals were in attendance:

- James McCaughey, NBC
- Barry Wenskowicz, NBC
- David Aucoin, NBC
- Richard Enander PhD., RIDEM
- Gene Park, PhD., URI
- John Gilheeny, RIMES
- Beth Termini, EPA
- Gina Snyder, EPA
- Bill Patenaude, RIDEM
- Bill Harritos, QDC – NWPCA

- Dennis Colberg, QDC – NWPCA
- Peter Eldridge, West Warwick WWTF - NWPCA

In addition to those in attendance meeting invitations were sent to the following individuals:

- Anne Leiby, EPA - New England, Region 1
- Thomas Coughlin, National Grid
- Bernard Bishop, Town of South Kingston WWTF - NWPCA
- Brent Herring, Untied Water - NWPCA
- Andy Dzykewicz, Rhode Island Office of Energy Resources

The EF-EMS Steering Committee process performed exceptionally well with each of the attendees contributing useful ideas and suggestions associated with project development and implementation. As a result of this first Steering Committee Meeting the Project Partners: met with a representative of RISE on January 14<sup>th</sup>, 2009, initiated planning activities for a EF-EMS Project Kick-Off Meeting including developing a meeting agenda, identifying speakers, writing a meeting invitation letter, and putting together an attendee mailing list.

The EF-EMS Steering Committee met on February 13<sup>th</sup>, 2009 at the RIMES office in Providence to discuss plans for the February 25<sup>th</sup> Project Kick-Off Meeting. Participants included: Beth Termini, Anne Leiby, and Gina Snyder, (all via telephone conference call) Gene Park, John Gilheeny, Rich Enander, Barry Wenskowicz, Jim McCaughey and Tom Simbro from Wright-Pierce and representing the NWPCA.

On April 20<sup>th</sup>, 2009 EF-EMS Steering Committee members consisting of NBC staff, Eugene Park from URI, Rich Enander from RIDEM, James Brumm and John Gilheeny from RIMES and Bruce Shaffer from Action Energy met to discuss progress being made with respect to the WWTF Energy Audits being conducted as part of the WWTF Sustainable Energy Management Program. During this meeting the “Energy Audit Team” discussed the recent energy assessment conducted at the Bristol WWTF and made arrangements for an assessment of the NBC Field’s Point WWTF.

On June 17<sup>th</sup>, 2010 members of the EF-EMS Steering met with Mr. Ken Payne of the Rhode Island Office of Energy Resources (RIOER) to discuss on-going efforts to reduce energy consumption within the State of Rhode Island’s 19 Municipal Wastewater Treatment Facilities (WWTF) operations. During this meeting Mr. Payne offered to work with the EF-EMS Steering Committee to help secure \$95,000 in grant funds to pay for ½ of the Technical Assessment phase of the WWTF energy audit process (National Grid has agreed to pay the other ½ of the cost).

During the January – March 2011 Project Period the EF-EMS Steering Committee coordinated the issuance of additional funding efforts with Mr. Ken Payne of the Rhode Island Office of Energy Resources (RIOER). On February 21<sup>st</sup>, 2011 the RIOER issued “Letters of Intent” (LOI) asking for energy project ideas to be considered for funding through the use of ARRA funds. These funds are being offered through two related programs:

- LOI# 7448309 – Wastewater Treatment Facilities – Energy Efficiency Technical Assessments
- LOI# 7448314 – Wastewater Treatment Facilities – Energy Efficiency Upgrades

In response to LOI 7448309 NBC requested \$90,000 in ARRA grant funding to help pay for ½ the costs of conducting Energy Efficiency Technical Assessments (EETAs) of each participating RI WWTF with the other ½ of the TA costs being provided by National Grid.

In response to LOI# 7448314 NBC coordinated efforts with RIDEM and National Grid to encourage all RI WWTFs to request funding in order to implement “Prescriptive” Energy Efficiency Measures (EEMs) identified as part of the Scoping Studies performed previously in cooperation with National Grid. Prescriptive EEMs are those measures that have known qualitative energy benefits and do not require the more detailed EETA study. At the time of this writing the actual number of responses to the LOI received by the RIOER is not available.

As a result of these efforts during the April – June 2011 Project Period NBC received \$86,000 in ARRA grant funding to help pay for ½ the costs of conducting Energy Efficiency Technical Assessments (TAs) of each participating RI WWTF with the other ½ of the TA costs being provided by National Grid and more than \$3,100,000 was awarded to 6 WWTFs to initiate 22 individual Energy Efficiency Measures.

Throughout the January – March 2012 Project Period the EF-EMS Steering Committee continued to coordinate efforts with RIOER with respect to conducting Energy Efficiency Technical Assessments and Wastewater Treatment Facilities Energy Efficiency Upgrades. NBC received approval to utilize \$23,000 in ARRA grant funds remaining from the first round of 11 TAs to pay for ½ the costs of conducting additional TAs of potential energy efficiency projects at participating RI WWTF. The other ½ of the TA costs being provided by National Grid. In February 2012 NBC received a two month extension to June 30, 2012 to complete the remaining TA studies. The Phase II studies included:

- Bristol - Solids handling
- East Providence - Pump station
- Fields Point - Bisulfite Building
- Fields Point - Pump Station
- Newport - Solids Handling
- South Kingstown - Pump stations and Solids Handling
- Warwick – Pump Stations
- West Warwick – Head-Works and Solids Handling
- Westerly – Pump Stations

During the April – June 2012 Project Period all sixteen WWTF TAs were completed.

EF-EMS Task 2 – Project Kick-Off Meeting - Develop, organize and hold a kick-off meeting with WWTF and Energy Management System project component stakeholders

On February 25<sup>th</sup> a Sustainable Energy Management Systems for WWTFs Project Kick-Off Meeting was held in the NBC's Corporate Office Building in Providence. Approximately 30 representatives from fifteen Rhode Island WWTFs were in attendance along with representatives from NBC, RIDEM, National Grid and Synagro, a bio-solids management contractor. During this meeting Dr. Gene Park from URI, Dr. Rich Enander from RIDEM, Gina Snyder from EPA, Jim McCaughey from the NBC and John Gilheeny from RIMES presented information on project plans and goals. Each WWTF in attendance signed on to attend an Energy Management Planning Workshop scheduled for April 1<sup>st</sup>. See Section VI for a list of attendees and meeting hand-outs.

EF-EMS Task 3 - EF-EMS Energy Guidebook Training - Hold a one day training session on developing an EF-EMS using EPA's Energy Guidebook

On April 1<sup>st</sup> a full day workshop was held on how to use EPA's "Energy Management Guidebook for Wastewater and Water Utilities". The workshop was held at the University of Rhode Island's Narragansett Bay Campus and was attended by more than twenty representatives from fifteen of Rhode Island's nineteen municipal WWTFs. The workshop covered key aspects of the EPA Guidebook and the Plan-Do-Act-Check Process including:



- Establishing Energy Goals,
- Benchmarking Energy Use,
- Developing an Energy Policy,
- Establishing Energy Objectives and Targets

At the conclusion of the workshop attendees were given a demonstration of the EPA Energy Star Portfolio Manager system by Barry Wenskowicz, NBC's Pollution Prevention Engineer. See Section VI of this report for details on the EPA Energy Guidebook Workshop.

EF-EMS Task 4 - Portfolio Manager Workshop - Collect and tabulate energy use and operational performance data from participating WWTFs and compile collected energy use and operational performance data into EPA Energy Star Portfolio

On April 29<sup>th</sup> the Project Partners organized and held a ½ day workshop on how to use EPA's Portfolio Manager Software to enter and efficiently track monthly energy use. The workshop was held at the Barry Hall computer training room within the Pastore Center in Cranston and was attended by eleven representatives from eight of Rhode Island's nineteen municipal WWTFs. Attendees setup accounts for their respective WWTFs, entered multiple building locations, entered at least one year's worth of energy usage (gas, oil, electric), shared their data with EPA and other RI WWTFs and received an 'energy rating that will be used as the basis



for measuring future improvements. NBC's P2 Engineer distributed materials on how to track Power Factor and kW Demand at the conclusion of the workshop. See Section VI of this report for details on the Portfolio Manager Workshop.

#### EF-EMS Task 5 - EF-EMS Roundtable Meetings - Hold 6 to 12 monthly EF-EMS Roundtable Meetings

The EF-EMS Roundtable is made up of various representatives from the nineteen WWTFs located in the State of Rhode. Through these meetings Roundtable Members are learning how to implement a "Plan-Do-Check-Act" approach to establishing more efficient energy management practices at their facilities, how to measure and benchmark their current energy use, and how to identify and assess potential renewable energy use opportunities.

On May 27<sup>th</sup> 2009 a ½ day WWTF Sustainable Energy Management Roundtable Meeting was held at the Warwick WWTF. The Roundtable was facilitated by John Gilheeny of the Rhode Island Manufacturers Extension Services (RIMES). Sixteen representatives from 12 Rhode Island WWTFs were in attendance. As part of the Roundtable Meeting participants develop an Energy Policy Statement for their individual facilities and National Grid representatives gave a talk on how to interpret commercial electric bills. See Attachment 4 of this report for details on this Roundtable meeting.



On June 24<sup>th</sup>, 2009 the Project Partners organized and held a ½ day EF-EMS Roundtable meeting in the NBC Board Room. During the Roundtable meeting at NBC, attendees participated in a live webcast sponsored by the Water Environment Federation (WEF), which focused on how to upgrade process controls and modify equipment management in order to optimize energy efficiency and save money. See Attachment 5 of this report for details on this Roundtable meeting.

On September 18<sup>th</sup> 2009 the third EF-EMS Roundtable Meeting was held as part of the NWPCA's Annual Trade Show. This meeting took the form of a project activity.

On October 21<sup>st</sup> 2009 the fourth "WWTF Sustainable Energy Roundtable Meeting" was held at the Warwick Public Library. As part of this meeting Mr. Steve Boles of Process Energy Services made a presentation on assessing pump efficiencies. The Roundtable meeting was attended by approximately 12 representatives of 5 WWTFs.

On May 13<sup>th</sup> 2010 a half-day Sustainable Energy Management Roundtable meeting was held at Save the Bay's facility in Providence. The meeting was attended by representatives from several RI WWTFs, Save-the-Bay, RIDEM, National Grid, EPA and the Atlantic States rural Water and

Wastewater Association. Featured presentations included Grant Writing 101, National Grid's EPO Program, and an update on EF-EMS Project activities.

On Thursday, September 23, 2010, NBC's Pollution Prevention Engineer organized a tour as part of the EF-EMS Roundtable allowing 15 people to visit a 1.65 MW wind turbine at Falmouth WWTF and Otis Air National Guard Base in MA.



On Wednesday, February 16, 2011, NBC held an Energy Roundtable Meeting at the South Kingstown wastewater treatment facility. Speakers at the meeting included Ken Payne (RIOER), Joseph Megale (Synagro) and Wendy Carriero (National Grid). A live EPA Presentation on EPA's Evaluation of Energy Conservation Measures for WWTFs, that prominently featured energy upgrades at Bucklin Point, was presented. The meeting concluded with a tour of new turbo blowers installed at the South Kingstown WWTF that were incentivized by National Grid.

During this meeting Dr. Ken Payne from the RIOER informed the group that \$3.1 M in ARRA funding is being made available to Rhode Island WWTFs for energy improvements. \$2 M is earmarked for the three WWTFs that were damaged during last year's floods (Warwick, West Warwick, and Cranston), \$100,000 is earmarked to pay for ½ the cost of conducting Energy Efficiency Technical Assessments of each RI WWTF (the other half will be by National Grid), and \$1M is available to the other 16 WWTF's for energy efficiency upgrades – no matching funds are required. Dr. Payne stated that project solicitations will be made available shortly on the Internet and must be submitted within 30 days of being issued. All projects must meet the ARRA March 31, 2012 timeline. As such projects that improve WWTF energy use and that are ready to move will be given funding priority. The RIOER Solicitation documents will ask for information on energy savings, project costs and installation/implementation timelines. In addition to the above funding opportunities Dr. Payne stated that between \$4 to 6 M in renewable energy ARRA funding that was committed to project that could not meet the 2012 deadline will soon be re-released to help fund both WWTF efficiency and renewable energy projects. Barry Wenskowicz from the NBC will be putting together information on potential renewable energy projects for the Roundtable. At the conclusion of the meeting Joseph Megale from Synagro made a presentation on on-going and planned energy recovery projects involving sewage sludge and Jessica Cajigas from NIWPCC discussed planned efforts to assist WWTFs with addressing climate change impacts on their operations.

On Wednesday, March 9, 2011, NBC's ESTA P2 Engineer arranged for Steve Bolles of Process Energy Systems to present a one-day hands-on training sessions on how to use the Department of Energy's Pumping System Assessment Tool (PSAT) to assess the energy efficiency of operating pumping systems. Those in attendance included representatives from the wastewater treatment facility of Jamestown and various NBC departments including Interceptor Maintenance, Engineering/Maintenance, Permitting and ESTA. The training included a classroom lecture and a demonstration of field measurements at the NBC Washington Park Pump Station and at the NBC Saylesville Pump Station. Steve Bolles generated useful results that showed how energy could be saved at each pump station.



On June 15<sup>th</sup> NBC, the Rhode Island Office of Energy Resources (RIOER), and the Rhode Island Department of Environmental Management hosted a 2-hour workshop for WWTFs that received “Round-1” ARRA Energy Efficiency Grants from the RIOER. During the last hour of the workshop NBC presented information on developing applications proposals for Round 2 grants.

**Additional Project Outreach Efforts:**

**National Grid Energy Workshop:** On December 2<sup>nd</sup> National Grid sponsored workshop on “Improving Energy Efficiencies in Wastewater Treatment Facilities” at the Inn at the Crossings in Warwick. The workshop was attended by more than 40 representatives of WWTF from Rhode Island and South Eastern MA.

**Massachusetts Energy Roundtable:** On October 6<sup>th</sup> NBC’s Pollution Prevention Engineer attended a meeting of the Massachusetts Water and Wastewater Facility Energy Roundtable.

**WWTF Superintendent’s Meeting:** On December 4<sup>th</sup> NBC attended a Rhode Island WWTF Superintends Meeting held at NBC to discuss WWTF energy issues. NBC’s Pollution Prevention Engineer gave a presentation on renewable energy opportunities for WWTFs.

**RIDEM WWTF Boot-Camp:** On December 17<sup>th</sup> NBC attended a RIDEM Boot-Camp meeting. During this meeting NBC’s Pollution Prevention Engineer presented information on Portfolio Manager.

**WWTF Energy Audits:** On Thursday, September 30, 2010; as part of a RIDEM’s quarterly POTW Supervisor’s meeting, Eric Struder of DMI presented an update on EF-EMS Energy Use Audit (Scoping Studies) activities.

**Water Environment Federation Water and Energy Conference:** On August 1<sup>st</sup> 2011 NBC’s Environmental Program Manager presented a poster and Power Point presentation on the EF-EMS Project for the 2011 WEF Water and Energy Conference in Chicago.

EF-EMS Task 6 - Energy Use Assessments - Conduct on-site Energy Use Assessments of each participating WWTF

An energy assessment, performed by an Energy Team, is an essential part of the EF-EMS Planning process. As noted in the EPA Energy Guide many energy utilities offer audit services as part of energy conservation/efficiency programs. In the State of Rhode Island National Grid offers these services, to large industrial customers, free of charge in the form of “Scoping Studies.”

A Scoping Study consists of first collecting information on baseline energy use and operational performance (accomplished here through the use of Portfolio Manager) and then conducting an on-site walkthrough of the WWTF by the Energy Team with the objective of identifying and documenting potential Energy Efficiency Measures (EEMs). A National Grid Scoping Study is

overseen by a professional energy management company with experience in the specific operations being studied - in this case wastewater treatment.

In preparation for the walk through portion of the Scoping Study the Energy Team (consisting of representatives from NBC, the WWTF being audited, URI, and RIDEM) conduct a detailed review the facility’s operations collecting operational data on average daily flow, BOD, nitrogen, and TSS loadings, overall removal efficiencies, and average energy use. This collected data, as noted above, is analyzed and benchmarked using EPA’s Portfolio Manager. The walkthrough portion of the Scoping Study identifies EEM opportunities ranging from light fixture replacements to blower upgrades and focuses on those particular EEMs that can be funded through National Grid’s Energy Efficiency Incentives Program.

As part of each Scoping Study, NBC’s Pollution Prevention Engineer performed a site specific renewable energy use assessment looking for wind energy, biogas production opportunities, and hydro-electric energy applications.

All Scoping Study findings are summarized in a Scoping Study Report issued to the participating WWTF, National Grid and the NBC and all renewable energy assessment finding are summarized in a Renewable Energy Report issued directly to the WWTF.

Scoping Studies were completed for 18 of the 19 Rhode Island WWTFs (New Shoreham had a combined Scoping Study/TA). Table-3 contains a summary of general EEM categories identified as part of these Scoping Studies:

**Table 3 Summary of Scoping Study EEMS**

<b>EEM Category</b>	<b>Number of WWTFs with Identified EEMs</b>	<b>Number of EEM Identified</b>
Aeration Control	11	17
Heating/Cooling	15	39
Insulation	17	3
Lighting	17	21
Miscellaneous	1	2
Motor Replacements	8	9
Process Control	5	7
Process Monitoring	3	3
Pumping	8	13
Solids Handling	3	3
VFD	4	8
Renewable Energy	2	3
<b>Total</b>	<b>84</b>	<b>128</b>

Identified EEMs are classified as either “Prescriptive” or “Custom.” Prescriptive EEMs can directly apply for National Grid Energy Efficiency Incentives while Custom EEMs require additional study in the form of an Energy Efficiency Technical Assessment (TA) in order to fully quantify project costs and energy savings. Technical Assessments were completed for 11 WWTFs.

**Table 4 Scoping Studies and TAs**

<b>Facility</b>	<b>Date</b>	<b>Energy Team Leader</b>
Jamestown WWTF	July 1, 2009	Action Energy
Narragansett WWTF (Scarborough)	July 14, 2009	Action Energy
Bucklin Point WWTF	July 22, 2009	Action Energy
QPDC WWCP	August 25, 2009	NBC
Burriville WWTF	February 23, 2010	DMI
Smithfield WWTF	March 10, 2010	DMI
Cranston WWTF	March 24, 2010	DMI
South Kingstown	April 7, 2010	DMI
Quonset Point	April 21, 2010	DMI
Newport	April 28, 2010	DMI
Warren	May 5, 2010	DMI
East Greenwich	May 12, 2010	DMI
Bucklin Point	May 19, 2010	DMI
Jamestown	May 26, 2010	DMI
Westerly	June 9, 2010	DMI
West Warwick	June 16, 2010	DMI
East Providence	July 8, 2010	DMI
Bristol	May 2011	TNZ-TA
Bucklin Point WWTF	May 2011	TNZ-TA
East Providence	May 2011	TNZ-TA
Jamestown	May 2011	TNZ -TA
Scarborough	May 2011	TNZ -TA
Smithfield	May 2011	TNZ -TA
South Kingstown	May 2011	TNZ -TA
West Warwick	May 2011	TNZ -TA
Westerly	May 23, 2011	TNZ -TA
Woonsocket	May 2011	TNZ -TA
New Shoreham	June 29, 2011	TNZ -TA

EF-EMS Task 7 - Project Assessment - Assess project success through review of collected data and, as needed, conducting follow-up site visits of participating WWTFs and asses overall successfulness of the PDCA cycle

Data on WWTF energy use and potential energy savings are summarized in Table 5:

**Table 5 – Energy Assessments Summary of Findings**

WWTF ID	Average Daily Flow (MGD)	Annual Electric Use (kWh) 2008	Annual Natural Gas Use (therms)	Annual Liquid Propane Use (gallons)	Fuel Oil Use (gallons)	Nutrient Removal	Identified Energy Savings New Projects (kWh/yr)	GHG Avoided (MT)	Identified Energy Savings Efficiency Modifications (kWh/yr)	GHG Avoided (MT)	Renewable Energy Wind	Renewable Energy Biogas	GHG Avoided (MT)	Total GHG Avoided (MT)
RI-WWTF-1	0.12	84,119	0		18,040	No	123,921	47.15	128,449	49				96
RI-WWTF-2	0.45	293,700	0		3,000	No			3,168	1.21				1
RI-WWTF-3	0.50	737,600	0		2,000	No			8,200	3.12				
RI-WWTF-4	0.61	492,600		3,033	1,900	No			5,880	2.24				
RI-WWTF-5	0.89	759,300	0		7,390	Yes			41,900	15.94				
RI-WWTF-6	1.1	1,055,600	23,192		0	Yes								
RI-WWTF-7	1.9	1,125,579	15,551		0	No								
RI-WWTF-8	2.1	1,138,000	0		9,427	Yes	41,943	15.85						16
RI-WWTF-19	2.7	2,234,168	0		11,234	Yes	409,663	155.05	476,778	181.45				337
RI-WWTF-10	2.7	1,356,958	0		22,006	No	0	0.1						
RI-WWTF-11	4.1	1,416,400	10,569		1,112	No			13,402	5.05				5
RI-WWTF-12	5.0	3,159,000	27,469		0	Yes	696,536	263.6						
RI-WWTF-13	6.2	5,007,000	0		20,928	Yes	367,373	139	367,373	139				278
RI-WWTF-14	7.3	3,186,320	37,506		0	No	535,552	202.05	535,552	202.05				404
RI-WWTF-15	8.6	8,716,754	4,073		3,085	Yes								
RI-WWTF-16	11.4	2,582,400	23,066		0	No			71,889	27.2				27
RI-WWTF-17	13.9	10,860,000	58,735		0	Yes								
RI-WWTF-18	21.9	12,568,456	117,547		0	Yes	208,398	78.85				4,777,200	1,807	1,886
RI-WWTF-19	47.1	12,998,486	75,009		0	No	86,146	32.6	348,300	133.6	6,200,000		2,359	2,525
							2,469,532	934	2,000,891	760	6,200,000	4,777,200	4,166	5,575

Throughout the April – December 2012 NBC and EPA developed a Project Assessment Checklist to be used to assess the overall successfulness of the EF-EMS effort and conducted on-site interviews at the following WWTFs:

**Table 6 – WWTF Project Assessment Interviews**

WWTF	WWTF Contact	Interviewer(s)	Date
Woonsocket		JCMC/GS	04/17/12
South Kingstown	Kathy Perez	JCMC	08/09/12
West Warwick	Bernie Bishop	JCMC/GS	09/12/12
East Providence	Dave Gaipo	BW	12/11/12
Smithfield	Karen Goffe	BW	12/12/12
Jamestown	Doug Quellette	BW	12/13/12
East Greenwich	Mike Pacillo	BW	12/18/12

JCMC – James McCaughey, NBC

GS – Gina Snyder, EPA

BW – Barry Wenskowicz, NBC

Representatives from each WWTF interviewed expressed great interest in marinating project efforts into the future particularly with respect to holding future Roundtable meeting and continued monitoring of energy use. See section VI of this report for a copy of the checklists used during the interview process and a summary of interview results.

## FOG-ERP

FOG-ERP Task 1 - ERP Steering Committee - Organize and form a Steering committee that includes ERP project stakeholders

The Project Partners identified the following potential FOG-ERP Steering Committee members:

- James McCaughey, NBC
- Kerry Britt, NBC
- Abigail Sweeney, NBC
- Barry Wenskowicz, NBC
- David Aucoin, NBC
- Richard Enander PhD., RIDEM
- Gene Park, PhD., URI
- Beth Termini, EPA
- Gina Snyder, EPA
- Anne Leiby, EPA - New England, Region 1
- Dale Venture, Rhode Island Hospitality Association

FOG-ERP Task 2 - Identification of Sector Universe - Identify all “Yellow” Grease end-users doing business in Rhode Island. Contact and conduct site visits of “Yellow” Grease end users Develop “Plan of Action” for conducting “Inspections” of NBC permitted restaurants

A review of NBC permit files and records identified 400 restaurants/food service facilities in the Field’s Point servicing district and 200 restaurants/food service facilities in the Bucklin Point Serving District. All identified restaurants/food service facilities are potential participants in the project.

URI and RIDEM selected a random sampling of 200 various restaurants/food service facilities for baseline data collection using the developed FOG BMP. Baseline data collection will be conducted by NBC Pretreatment staff and is scheduled to take place between the months of April and July 2009.

FOG-ERP Task 3 - Develop ERP Checklist and BMPS - Develop Waste FOG ERP self-certification checklist and BMPs

During the January – March 2009 Project Period NBC, URI, RIDEM and EPA finalized a combined regulatory compliance and FOG BMP checklist.

On December 30<sup>th</sup> 2010 ESTA staff received the final draft of the Restaurant FOG Self-Certification Workbook from URI's Center for Pollution Prevention and Environmental Health.

During the January – March 2011 Project Period the FOG-Self Certification Workbook was finalized and circulated to RIDEM, URI and the RI Hospitality Association for final review and comments.

During the January – March 2012 Project Period a finalized FOG Self-Certification Workbook has been posted on [narrabay.com](http://narrabay.com) for access by local restaurants and food-service businesses.

On June 25<sup>th</sup> 2012 a letter was sent from NBC's Pretreatment Program Manager to all NBC permitted restaurants and food service facilities encouraging them to utilize FOG Self-Certification Workbook posted on [www.narrabay.com](http://www.narrabay.com).

FOG-ERP Task 4 - ERP Checklist Test - Test out checklist at two to three pre-selected facilities

On November 13<sup>th</sup> 2008 the Project Partners accompanied NBC Pretreatment Technicians conducted on site visits of three food service establishments located in the City of Pawtucket in order to perform a trial run of a FOG BMP Checklist and the overall FOG ERP Assessment process. As a result of these trial runs and subsequent discussions with EPA several modifications were made to the initial checklist including: elimination of redundant questions, clarification on questions regarding the management of the two identified FOG waste streams (i.e. Brown Grease vs. Yellow Grease), and collection of quantitative data on the amounts of fresh oil being used by those restaurants that utilize friolaters. No additional Trial Runs were deemed necessary.

FOG-ERP Task 5 – FOG-ERP Kick-Off Meeting - Develop and hold workshop for restaurants and other stakeholders

A FOG-ERP Kick-Off meeting for project stakeholders and restaurants was not held. Efforts on the part of the Project Partners to coordinate such a meeting with the Rhode Island Hospitality Association were unsuccessful. In place of the Kick-Off meeting NBC put great effort into educating the targeted Food Service Establishments (FSE) through:

- On-site regulatory inspections - NBC Pretreatment Program inspectors fill out the BMP checklist with the FSE representatives (more than 63 regulatory/BMP inspections have been conducted as of October 2012 and these efforts continue)
- On-site technical assistance - NBC technical assistance staff fill out the FOG BMP certification checklist with the FSE representative (5 Technical Assistance visits have been taken place as of December 2012 these efforts are on-going)
- Direct mailings – letters were sent announcing the FOG-ERP to all FSEs serviced by the NBC in August 2012
- Internet Posting – NBC has a posted webpage dedicated to the FOG ERP - <http://www.narrabay.com/>

#### FOG-ERP Task 6 - ERP Assessments - Conduct Initial and Follow-Up FOG Management Assessments of all NBC permitted restaurants and Compile Baseline data

Seventy-Seven baseline data collection assessment were conducted by NBC Pretreatment staff between the months of April and June 2009 and additional 106 were conducted between July 1<sup>st</sup> and September 30<sup>th</sup>, 2009. During the October – December 2009 reporting period NBC Pretreatment Staff completed the remaining baseline assessments of the randomly selected facilities. Approximately 200 baseline assessments were completed. Almost ½ of the selected facilities were found to be either out-of-business or did not generate any FOG waste. As a result of these baseline data collection efforts 109 facilities are included in the baseline study.

Upon completion of all baseline assessments NBC Pretreatment staff continue to perform combined regulatory/BMP inspections of all remaining restaurants and food service facility serviced by the NBC.

#### FOG-ERP Task 7 - ERP Certifications - Check Self-Certifications

The Project Partners developed a Self-Certification process where a participating FSE, utilizing the FOG-ERP Self-Certification Checklist in the FOG ERP Workbook, can self-assess their BMPs. Completed and signed form can then be submitted to NBC for certification consideration. FSE that meet Certification criteria are visited by NBC's technical assistance staff and if all BMP criteria is found to be in place a certificate is issued. If a FSE is deficient in any BMP criteria assistance is offered to help the FSE put in place the missing BMPs prior to issuing a certificate.

By voluntarily completing the FOG BMP Self-Certification Form and submitting it to the NBC's Pollution Prevention Program, participating restaurants that demonstrate superior FOG management practices will be issued a Certification of Best Management Practices which may be displayed in their place of business (see Section VI for a copy of the FOG ERP Certificate).

#### FOG-ERP Task 8 - Statistical Analysis - Perform statistical analysis on collected data

Data gathered from the initial assessments has been compiled and a statistical analysis of the collected data has been performed using the Environmental Business Practice Indicators (EBPI) Processor 1.0 spreadsheet (see Section VI for information on the EBPI Processor 1.0 and a summary of the data analysis).

#### **Table 7 – Summary Table of Initial FOG BMP Assessments**

## Rhode Island FOG Inspector Checklist

### Estimated Proportion of Facilities Properly Addressing Each EBPI

#### Single Round of Random Inspections

Start of Collection: 4/30/2008 Eligible Facilities: 109  
 End of Collection: 8/13/2009 Confidence Level: 95%

EBPI Number	EBPI Description	Percentage of Facilities			Counts		
		Lower Bound	Point Estimate	Upper Bound	Positive Responses	Valid Response	Eligible Response
C1	Has grease removal system been installed according to NBC approved plans?	95.7%	<b>97.9%</b>	100.0%	86	86	86
C3	Unit accessible?	95.6%	<b>97.8%</b>	100.0%	84	84	84
C4	Power supplied to GRU?	85.9%	<b>91.9%</b>	98.0%	54	57	57
C5	GRU solids basket was present and operational?	93.9%	<b>96.9%</b>	100.0%	59	59	59
C6	Solids basket had been emptied?	84.1%	<b>90.6%</b>	97.1%	55	59	59
C7	GRU wiper blades were fully operational?	75.5%	<b>84.0%</b>	92.5%	50	58	58
C8	GRU trough was clean and operational?	79.5%	<b>87.2%</b>	94.8%	52	58	58
C9	GRU timer was fully operational?	81.7%	<b>88.8%</b>	96.0%	53	58	58
C10	GRU installed in accordance with NBC requirements?	93.4%	<b>96.6%</b>	99.7%	80	81	81
C11	Sample prt was properly installed?	95.6%	<b>97.8%</b>	100.0%	83	83	83
C12	Grease container present?	88.6%	<b>93.8%</b>	98.9%	57	59	59
C13	Unit has been properly cleaned?	82.7%	<b>88.7%</b>	94.7%	76	84	84
D2a	Cleaning and emptying of solids basket?	57.9%	<b>68.9%</b>	79.9%	40	57	57
D2b	Cleaning of wiper blades?	57.9%	<b>68.9%</b>	79.9%	40	57	57
D2c	Cleaning of trough?	57.9%	<b>68.9%</b>	79.9%	40	57	57
D2d	Estimated amount of grease removed?	63.5%	<b>72.8%</b>	82.1%	54	73	73
D2e	Wet vacuuming of the GRU?	53.2%	<b>63.5%</b>	73.9%	45	70	70
D2h	Maintenance preformed?	43.8%	<b>56.2%</b>	68.5%	30	53	53
E1	Educate users about each of the following:	42.1%	<b>50.4%</b>	58.8%	55	109	109
E1a	NBC Grease Removal Program	43.8%	<b>52.2%</b>	60.6%	57	109	109
E1b	Permit / Logbook Requirements	3.6%	<b>8.0%</b>	12.5%	7	107	107

Software generating this presentation created by The Cadmus Group, Inc.

Statistical calculations based upon: "Vermont Department of Environmental Conservation (DEC) Pilot Environmental Results Program (ERP) for Retail Gas Stations: Sampling Options and Analytical Approaches." DRAFT, August 5, 2005. Krop, Richard and Michael Crow. The Cadmus Group, Inc. ([http://www.epa.gov/perfmist/erp/roadmap/resources/Vt\\_retailgas\\_statmeth\\_8-5-2005\\_draft.pdf](http://www.epa.gov/perfmist/erp/roadmap/resources/Vt_retailgas_statmeth_8-5-2005_draft.pdf))

The results of this analysis indicate that effort is needed to have these facilities perform better maintenance of their GRUs (EBPIs: D2a, D2b and D2c). This is addressed as part of the FOG-ERP BMPs.

Post BMP implementation data collection is on-going and a follow-up report documenting the degree of improvements with Project Baseline Performance levels as they may relate to BMP implementation will be assessed within that report. Anticipated completion of data collection actions: July 2013, anticipated completion of final data analysis and issuance report of findings: October 1, 2013.



## VI. Project Final Materials

The following is a list of final project materials generated in connection with project activities and reference to the attachments where they can be found:

**Attachment x - EF- EMS Kick-Off Meeting Materials**  
**Attachment x - EF-EMS Guidebook Training Materials**  
**Attachment x - EF-EMS Portfolio Manager Training Materials**  
**Attachment x - EF-EMS Project Scoping Studies**  
**Attachment x - EF-EMS Project Technical Assistant Reports**  
**Attachment x - EF-EMS Renewable Energy Reports**  
**Attachment x - EF-EMS Energy Assessments Summary of Results**  
**Attachment x - Project Assessment Checklist and WWTF Interview Results**

**Attachment x - FOG ERP Workbook**  
**Attachment x - FOG ERP Pamphlet Checklist and Certification Form**  
**Attachment x - FOG ERP Certificate**  
**Attachment x - FOG ERP Certificate**  
**Attachment x - FOG ERP Baseline Data Statistical Analysis**  
**Attachment x - EBPI Processor 1.0**  
**Attachment x - FOG ERP Follow-Up Data Base**  
**Attachment x – Biodiesel Glycerin BNR Pilot Study Results**

## VII. Project Information Dissemination Methods

The Project Partners plan to continue project efforts as follows:

### EF-EMS Program

- The RI WWTF Energy Roundtable will continue as part of the RIDEM WWTF Supervisor Meetings. Specifically a portion of each meeting will be dedicated to discussions of on-going and planned energy projects.
- NBC will continue to promote the use of Portfolio Manager by all RI WWTF through continued training and education efforts.
- The model used for the RI WWTFs has been adopted by the Rhode Island Office of Energy Resources to help Rhode Island Water Supply Utilities achieve energy savings through the Rhode Island Public Energy Partnership (RIPEP). The RIPEP Project is partially funded through a U.S. Department of Energy Grant.

### FOG ERP

- NBC will continue to monitor FOG influent discharges to its two WWTF.
- The FOG BMP Certification Program will continue through on-site technical assistance and Pretreatment regulatory compliance efforts.

- FOG BMP efforts put forth by local Food Service Establishments will, where applicable, recognized by NBC through the annual NBC Environmental Merits Awards Program.

## VIII. Project Analysis

### EF-EMS Project

#### **EPA's Energy Management Guidebook for Wastewater and Water Utilities**

The PDCA model as employed through an EF-EMS using EPA's Energy Management Guidebook for Wastewater and Water Utilities has been shown to be readily applicable to the development of this multi-jurisdictional WWTF Energy Focused Environmental Management System in the State of Rhode Island. The methodologies used to coordinate these efforts should be readily adaptable by other states and/or state political subdivisions.

As a result of this project Rhode Island's nineteen WWTFs, working together have achieved and are expected to achieve additional measurable reductions in energy use and subsequent reductions in the generation of greenhouse gases while accomplishing the same or improved levels of wastewater treatment. Positive project outcomes include improved working relationships between Rhode Island's WWTFs, improved overall environmental conditions, and sustainable energy efficient wastewater treatment operations.

#### **Energy Use Assessments**

The effort in Rhode Island to improve the energy performance of 19 municipal wastewater treatment plants was facilitated by the relatively small number of facilities, the close working relationship between regulatory authorities and plant operators, the availability of federal grant funding, and the availability of well-developed utility incentive programs. Following is list of "lessons learned" that may be helpful to other jurisdictions attempting to undertake a similar sector-wide efficiency effort.

1. The direct involvement of the regulatory agency responsible for wastewater infrastructure was a key factor to project success since all WWTFs are accustomed to responding to this authority.
2. It is important that municipal officials be involved in the review, study, and grant application process in facilities managed by an independent operator. It is very helpful to understand the municipality/operator working relationship at each participating WWTF. Energy efficiency may be more highly valued by one party, and this party may not have the direct authority to undertake the necessary capital improvements.
3. Utility incentive programs provide a common structure within which cost effectiveness can be determined.
4. Maintaining involvement by a core group of individuals familiar with the details of the each WWTF was important to keeping the project on track and moving forward. With various and many state, utility, and technical advisors involved with the project over its 4 year project period, continuity within this core group prevented details from being 'lost

through the cracks.’ NBC’s Pollution Prevention Engineer, National Grid’s Project Manager, and National Grid’s technical consultant Eric Studer of TNZ/DMI serviced in this capacity.

5. A comprehensive record must be maintained regarding progress on each potential project to keep all projects on the table. This comprehensive record proved to be very helpful when staff changes occurred at National Grid.
6. While initial site assessments identify the most obvious improvement opportunities, it is unlikely that all potential improvements will be found in a single scoping visit. The grant funding mechanism particularly that associated with ARRA funding, needed to be flexible in order to permit new measures to be added for consideration provided that there is room in the budget.
7. Similarly, some upgrades are found to be less attractive after further study. These projects should be removed from consideration and the rationale for dropping them be recorded.
8. Many opportunities for energy savings lie in plant support systems such as heating, cooling, ventilating, and lighting. It seems that few plant operators and designers optimize the energy performance of these systems.
9. There are time lags associated with the state/federal procurement process that need to be taken into account by those who are not accustomed to working through these funding sources. In the case of this the study assistance grant, the energy studies could not begin for many weeks after the initial kickoff meetings. This compressed the amount of time available to do the actual work.
10. The process of performing the initial walkthrough assessments and follow-up technical studies requires a fairly long period of time. In general, one person can perform, at most, one Level I or Level II energy audit per week and generate a detailed report. Custom studies typically require between two and eight weeks depending on the availability and responsiveness of those who must be involved and the technical complexity of the analysis.
11. The interaction between capital grant funding and the utility incentive programs should be fully understood by the state grant authority, the utility, the technical consultant, and the facility owner early in the process.
12. The fact that an initial survey of the sites was completed prior to the availability of state grant funding was very helpful in determining how the grant money could be spent. It was also helpful that NBC had been working with the operators to raise awareness of energy issues for a year prior to the start of the initial walkthrough work.

## **FOG-ERP**

### **FOG BMP Informational Sources**

During the development stages of the FOG-ERP Workbook a review of internet resources uncovered a vast collection of FOG management information most notably:

- EBMUD – EBMUD: [Visit EBMUD-FOG](#)

- Bellvue, WA: [FOG BMP Manual for Bellvue, WA](#)
- Colorado Springs, CO: [A description of FOG BMP requirements for Colorado Springs, CO](#)
- Georgia: [FOG Initiative](#)
- King County, WA: IRAC (Interagency Resource for Achieving Cooperation) - [A Guide to Restaurant Grease Management](#)
- National Food Processors Association, Washington DC: [Describes technologies to remove fats, oils and greases from food processing waste water](#)
- Oregon Association of Clean Water Agencies - [Provides FOG BMP information, pollution prevention, and compliance information for publicly-owned treatment plants](#)
- Oregon Association of Clean Water Agencies: [FOG Inspection and Installation Checklists](#)
- Texas: [TexasFOG.org](#) video, poster, BMPs
- South Carolina:  
<http://www.columbiasc.net/depts/engineering/downloads/CommercialFOGBrochure.pdf>

It is highly recommended that any organization that is initiating a FOG program take full advantage of the information available through these sources.

#### **FOG ERP Certification**

The Project Partners have found high interest among the FSE community in obtaining certification on FOG BMPs however, response to filling out the Self-Certification check list without on-site assistance is low. As of December 2012 only one FSE completed the entire process without on-site assistance. To address this NBC is actively contacting high profile FSEs (restaurants in the downtown Providence RI area) to encourage and assist them to implement the FOG- ERP BMPs and self-certify. It is anticipated that high profile FSEs obtaining and demonstrating certification will encourage other FSEs to do the same.

The Project Partners strongly recommend to others involved with FOG projects that similar efforts be coordinated with a local FSE trade association. To this end NBC will continue to try and work with the RI Hospitality Association to encourage its members to participate in the NBC FOG-ERP.