Narragansett Bay Commission

Overview of NBC Energy Programs

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Narragansett Bay Commission
Electricity Costs Comparison

- New England Electric Rates 51% above National average
- Rhode Island Electric Rates 44% above National average
- NBC aggressively pursues energy conservation and alternative energy opportunities
- WWTFs use ~1% of Total US Energy Use
- NBC is also a Large Energy User!

Source: Energy Information Administration - www.eia.doe.gov
NBC Energy Programs

✓ NBC Conducted Comprehensive Energy Evaluations in 2005 with $35,000 EPA Grant
✓ Performed Feasibility Studies of “Low Hanging Fruit” Alternative Energy Concepts with $50,000 in EDC grants:
  ✓ Wind Energy at Field’s Point
  ✓ Biogas CHP at Bucklin Point
✓ Routinely Identify On-site Energy Efficiency & Conservation Opportunities at all NBC Facilities
✓ Continuously Evaluate Energy Usage & Systems - Continuous Improvement!!!
# NBC Energy Efficiency Projects

<table>
<thead>
<tr>
<th>Year</th>
<th>Site</th>
<th>Efficiency Project</th>
<th>kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>BP</td>
<td>Bucklin Point Lighting Upgrade</td>
<td>124,008</td>
</tr>
<tr>
<td>2013</td>
<td>BP</td>
<td>Efficient Blower sand Flexible Aeration</td>
<td>500,000</td>
</tr>
<tr>
<td>2013</td>
<td>COB</td>
<td>Lighting upgrade at Corporate Office Building</td>
<td>63,419</td>
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<tr>
<td>2015</td>
<td>FP</td>
<td>FP Bisulfite Storage Building - Heating</td>
<td>227,308</td>
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<tr>
<td>2016</td>
<td>BP</td>
<td>LED Lighting Upgrade</td>
<td>654,852</td>
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<td>2016</td>
<td>FP</td>
<td>LED Lighting Upgrade</td>
<td>1,231,226</td>
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<tr>
<td>2016</td>
<td>COB</td>
<td>LED Lighting Upgrade</td>
<td>113,505</td>
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<tr>
<td>2016</td>
<td>IM</td>
<td>LED Lighting Upgrade</td>
<td>34,811</td>
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<td>2016</td>
<td>ESPS/TPS</td>
<td>LED Lighting Upgrade</td>
<td>441,243</td>
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<td></td>
<td></td>
<td>Total</td>
<td>3,390,372</td>
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<tr>
<td></td>
<td></td>
<td>Percent of NBC Use</td>
<td>9.81%</td>
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<table>
<thead>
<tr>
<th>Site</th>
<th>Planned Efficiency Project</th>
<th>kWh</th>
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<tbody>
<tr>
<td>FP</td>
<td>FP Base Blower - VFDs</td>
<td>368,808</td>
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<tr>
<td>BP</td>
<td>BP - Replace Sixty 400 W lamps with LEDs</td>
<td>105,694</td>
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<tr>
<td>ESPS</td>
<td>ESPS - 7,000 cfm Energy Recovery Ventilator</td>
<td>153,433</td>
</tr>
<tr>
<td>ESPS</td>
<td>ESPS - Wet Well Energy Recovery</td>
<td>268,593</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>896,528</td>
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</table>

Estimated $373,000/year in Electric Savings!!!
Estimated 1,119 M Tons/Year CO2(e) Reduced
Field’s Point WWTF Operations
✓ 45 MGD Average Daily Flow
✓ 65 MGD Secondary Treatment with Biological Nutrient Removal
✓ 200 MGD Primary
✓ Chlorination/De-chlorination
✓ Sludge Gravity Thickeners
✓ 4 Pumping Stations

Field’s Point WWTF Energy Use
✓ 1.7 MW Electrical Load
✓ 15,330,000 kWh/year (2016)
✓ ~$1.75M Annual Expense

Renewable Opportunities:
✓ Wind Turbines
✓ Small Hydro-Electric Projects
✓ Small Solar Projects
Field’s Point Wind Energy

Field’s Point Wind Energy Project:

✓ RI’s First Wind Farm
✓ 4.5 MW Capacity (3 – 1.5MW Turbines)
✓ Operational since October 2012
✓ Reduced Facility Electric Use by 45% (~21% overall reduction for NBC)
✓ 2,579 Metric Tons CO₂ Offset/Year
✓ Generate ~ 7,000,000 kWh/year from wind
✓ Save ~$770,000 annually in electricity costs (@ 11 cents/kWh)
✓ $1,459,000 in REC Revenue to date
✓ $4,668,000 Total Financial Benefit to date
NBC Bucklin Point WWTF

Bucklin Point WWTF Operations

- 24 MGD
- 46 MGD Secondary Treatment with Biological Nutrient Removal
- 116 MGD Primary
- UV Disinfection
- Anaerobic Digestion
- 3 Pumping Stations

Bucklin Point WWTF Energy Use

- 1.4 MW Average Demand
- 12,618,000 kWh/year (2016)
- ~$1.39M Annual Electric Expense

Renewable Opportunities:

- Biogas Reuse Project
- Large Solar Project
NBC Bucklin Point Biogas Combined Heat and Power Energy Project

$25,000 Grant from State of RI - Feasibility Study

✓ 677 kW Combined Heat and Power (CHP) System
✓ 37% of Bucklin Point Electricity Demand
✓ 90% of BP Digester Heat Demand
✓ 250,000 SCFD Biogas Production (60% Methane)
✓ Estimated Project Cost: $6,440,000
✓ Estimated Annual Operating Cost: $172,000
✓ Estimated Annual Electricity Cost Savings (not including REC sales): $440,000
✓ Heat output satisfies digester demand on all but the coldest of winter days
✓ 1,521 Metric Tons CO$_2$ Offset/Year
✓ Construction On-Going – Completion Spring/Summer 2018
RI Renewable Energy Legislation

Renewable Energy Standard (RIGL Chapter 39-26)
✓ Lists RI eligible renewable resources
✓ Sets RI renewable energy targets 16.5% by 2019
✓ Established RI’s Renewable Energy Fund

Distributed Generation Interconnection (RIGL Chapter 39-26.3)
✓ On-site or Off-Site Projects
✓ Fixed Long Term Rates for Electricity Produced
✓ Streamlines interconnection process

Regional Greenhouse Gas Initiative (RIGL 23-82-1)
✓ Regional GHG cap and trade program
✓ Generates income that can be used to fund new energy projects

Renewable Energy Growth Program (RIGL 39-26.6)
✓ Provides long term funding through a National Grid Tariff for new installations

Net Metering (RIGL Chapter 39-26.4)
✓ Limits nameplate capacity to 5 MW
✓ Allows “public entities” like NBC to virtually Net Meter from Off-Site Locations
17 States have “Remote” or “Virtual” Net Metering

38 States + DC, AS, USVI, & PR have mandatory Net Metering rules.
Off-Site Net Metering Projects - Wind

✓ Off-Site (Virtual) Net Metering Passed in RI
✓ Purchased Three 1.5 MW Vensys Wind Turbines
✓ Located in Coventry Rhode Island
✓ Net Metered to NBC Accounts
✓ 9,421,649 kWh/year
✓ Became Operational in August 2016
✓ 26% of NBC total Electricity Demand
✓ Wind now Provides 47% of NBC Electricity
✓ 3,071 Metric Tons CO₂ Offset/Year
On August 28th, the NBC signed 25 year Net Metering Credit (NMC) agreements for 2 Solar Sites

- No Up Front Costs!!!
- NBC will retain all Renewable Energy Credits (RECs)
- $18.5M financial benefit over 25 yrs
  - Save $13,082,283 on Electric Costs
  - $5,404,748 Estimated REC Income
- Combined 9.83 MW dc/8.4 MW ac
- Produce 12,875,000 kWh/year
- 35.46% of NBC Electric Demand
- Estimated 110,092 Metric tons of CO₂ Offset over 25 years

- Carr’s Terrace - Coventry, RI
  - 3.64 MW ac
  - Total Acres: 17.5 Acres

- Kingstown Street – Richmond, RI
  - 4.72 MW ac total both sites
  - Total Acres: 21 Acres
NBC Typical Energy Needs vs Field’s Point Wind Energy Production

NBC Renewable Energy Projections

21.5% of NBC Energy Demand
NBC Typical Energy Needs vs Field’s Point and Coventry Wind Renewable Energy Projections

47.1% of NBC Energy Demand

NBC Renewable Energy Projections

- Coventry Wind (kWh)
- FP Wind (kWh)
- NBC Average Monthly Demand (kWh)
- NBC Monthly Demand (kWh)
NBC Typical Energy Needs vs Field’s Point & Coventry Wind & Biogas Renewable Energy Projections

NBC Renewable Energy Projections

59.8% of NBC Energy Demand

CHP Biogas Projected (kWh)
Coventry Wind (kWh)
FP Wind (kWh)
NBC Average Monthly Demand (kWh)
NBC Monthly Demand (kWh)
NBC Typical Energy Needs vs FP & Coventry Wind, Biogas and Solar Renewable Energy Projections

NBC Renewable Energy Projections

- 78,870 kWh would exceed 125% limit (0.22% of annual)
- 95.2% of Average 3yr NBC Energy Demand

Diagram shows:
- Solar Projected (kWh)
- CHP Biogas Projected (kWh)
- Coventry Wind (kWh)
- FP Wind (kWh)
- NBC Average Monthly Use (kWh)
- NBC Monthly Demand (kWh)
- Total Renewable (kWh)
- 125% of NBC Average Monthly Use
Diverse Renewable Energy Portfolio

Solar, 35%

Bucklin Point CHP Engine, 13%

Coventry Wind, 26%

Field’s Point Wind, 21%

Estimated Annual Production:
34,580,137 kWh
(95% of NBC Demand)
### Off-Site Solar Net Metering Projects

<table>
<thead>
<tr>
<th>Solar Site</th>
<th>kW DC</th>
<th>kW AC</th>
<th>kWh</th>
<th>Estimated Cumulative % of NBC Demand</th>
<th>COD</th>
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</thead>
<tbody>
<tr>
<td>Coventry</td>
<td>4,280</td>
<td>3,638</td>
<td>5,495,000</td>
<td>15.13%</td>
<td>3/31/2018</td>
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<tr>
<td>Kingstown 1</td>
<td>1,704</td>
<td>1,448</td>
<td>2,262,000</td>
<td>6.23%</td>
<td>12/31/2017</td>
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<tr>
<td>Kingstown 2</td>
<td>3,854</td>
<td>3,276</td>
<td>5,118,000</td>
<td>14.09%</td>
<td>12/31/2017</td>
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<tr>
<td><strong>Total</strong></td>
<td>9,838</td>
<td>8,362</td>
<td>12,875,000</td>
<td><strong>35.46%</strong></td>
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</table>

### Combined NBC Renewable Energy Projects

<table>
<thead>
<tr>
<th>NBC Demand (3 year average): 36,312,890 kWh/Year</th>
<th>kWh/Year</th>
<th>Cumulative kWh</th>
<th>% of NBC Demand</th>
<th>Cumulative % of NBC Demand</th>
<th>CO₂ Offsets (MT/Year)</th>
<th>Cumulative CO₂ Offsets (MT/Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Renewable Resource</strong></td>
<td>kWh/year</td>
<td>Cumulative kWh</td>
<td>% of NBC Demand</td>
<td>Cumulative % of NBC Demand</td>
<td>CO₂ Offsets (MT/Year)</td>
<td>Cumulative CO₂ Offsets (MT/Year)</td>
</tr>
<tr>
<td>FP Wind</td>
<td>7,806,587</td>
<td>7,806,587</td>
<td>21.50%</td>
<td>21.50%</td>
<td>2,579</td>
<td>2,579</td>
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<tr>
<td>Coventry Wind</td>
<td>9,296,000</td>
<td>17,102,587</td>
<td>25.60%</td>
<td>47.10%</td>
<td>3,071</td>
<td>5,651</td>
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<tr>
<td>BP Biogas</td>
<td>4,602,550</td>
<td>21,705,137</td>
<td>12.67%</td>
<td>59.77%</td>
<td>1,521</td>
<td>7,171</td>
</tr>
<tr>
<td>Solar Coventry</td>
<td>5,495,000</td>
<td>27,200,137</td>
<td>15.13%</td>
<td>74.90%</td>
<td>1,816</td>
<td>8,987</td>
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<tr>
<td>Solar Kingstown 1</td>
<td>2,262,000</td>
<td>29,462,137</td>
<td>6.23%</td>
<td>81.13%</td>
<td>747</td>
<td>9,734</td>
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<tr>
<td>Solar Kingstown 2</td>
<td>5,118,000</td>
<td>34,580,137</td>
<td>14.09%</td>
<td><strong>95.23%</strong></td>
<td>1,691</td>
<td><strong>11,425</strong></td>
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</tbody>
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### Historic Energy Use & Projected Renewables

<table>
<thead>
<tr>
<th>NBC Electricity Use</th>
<th>kWh</th>
<th>Estimated % Renewables</th>
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<tbody>
<tr>
<td>2014</td>
<td>36,822,026</td>
<td>93.91%</td>
</tr>
<tr>
<td>2015</td>
<td>35,950,155</td>
<td>96.19%</td>
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<tr>
<td>2016</td>
<td>36,166,489</td>
<td>95.61%</td>
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<tr>
<td><strong>Average</strong></td>
<td><strong>36,312,890</strong></td>
<td><strong>95.23%</strong></td>
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</table>
Typical Siphon Turbine Installation

<table>
<thead>
<tr>
<th>Estimated Project Values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Turbine Design Flow (min)</strong></td>
</tr>
<tr>
<td><strong>Average Available Head</strong></td>
</tr>
<tr>
<td><strong>Theoretical Energy</strong></td>
</tr>
<tr>
<td><strong>Turbine Efficiency</strong></td>
</tr>
<tr>
<td><strong>Nameplate Power</strong></td>
</tr>
<tr>
<td><strong>Total Project Cost</strong></td>
</tr>
<tr>
<td><strong>Installed Cost</strong></td>
</tr>
<tr>
<td><strong>Capacity Factor</strong></td>
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<tr>
<td><strong>Output</strong></td>
</tr>
<tr>
<td><strong>Estimated Net Electric Value</strong></td>
</tr>
<tr>
<td><strong>Annual Savings</strong></td>
</tr>
<tr>
<td><strong>Useful Life</strong></td>
</tr>
<tr>
<td><strong>Unsubsidized Payback</strong></td>
</tr>
</tbody>
</table>

**Solar Carports**

- Number of Modules: 166
- Total Capacity: 49,800 W
- Percent of Building: 30\% of estimated peak
- Installed Cost: $3.50 per Watt from NREL
- Total Cost: $174,300
- Unit Cost Adjustment: 0\%
- Final Cost: $174,300
- Capacity Factor: 12\% annual average
- Output: 52,350 kWh/yr
- Avg 15 yr elec Cost: $0.14 per kW
- Electric Savings: $7,548 per year
- ITC (for eligible entity): 0\%
- Ri Grant: 0\%
- Customer Cost: 20\% of $34,860
- REC Generation: 52.3 MWh/yr
- Forecasted REC Value: $40 /MWh
- REC Annual Amount: $2,094 per year
- Payback Period: 14 years
# Energy Focused Environmental Management System

**Sustainable Energy Management Program for WWTFs**

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

- NBC Applied for EPA State Innovations Grant in 2008
- $275,000 Grant Award Received
- Leveraged 1.2 M in additional funding
- Project Grew with other Support to $1.54 Million
- EPA Energy Management Guidebook for Wastewater and Water Utilities
- Energy Star Portfolio Manager
  - Measure and Benchmark Energy Use Performance
  - Energy Conservation and Efficiency
  - Renewable Energy Opportunity Assessments

## Funding Sources

<table>
<thead>
<tr>
<th>URI Match</th>
<th>$33,512</th>
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<tbody>
<tr>
<td>NBC Match</td>
<td>$75,000</td>
</tr>
<tr>
<td>EPA SIG</td>
<td>$275,000</td>
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<tr>
<td>ARRA TA</td>
<td>$55,904</td>
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<tr>
<td>National Grid Energy TA</td>
<td>$49,147</td>
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<tr>
<td>ARRA EEMs</td>
<td>$985,460</td>
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<tr>
<td>National Grid Incent.</td>
<td>$65,000</td>
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<tr>
<td><strong>Total:</strong></td>
<td><strong>$1,539,023</strong></td>
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</table>
**Projects Outcomes**

- Energy Assessment of all 19 WWTFs
- **4,470,000 kWh/year of potential energy savings**
- **11,000 kWh/year of clean renewable energy opportunities**
- Heightened energy use awareness
- Improved energy related communications

**WWTF Sustainability Project Outcomes**

- Annual Electric savings of 7 - 9% from all POTWs attained depending on how data is normalized

---

**Energy Flow (Volume)**

<table>
<thead>
<tr>
<th>WWTF ID</th>
<th>Population</th>
<th>Electricity kWh</th>
<th>Gas therms</th>
<th>Oil gallons</th>
<th>Energy Mbtu</th>
<th>Flow MGD</th>
<th>Volume MG/Yr</th>
<th>Electric kWh/MG</th>
<th>Heat kBtu/MG</th>
<th>Total kBtu/MG</th>
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</thead>
<tbody>
<tr>
<td>RI-WWTF-2</td>
<td>1,720</td>
<td>247,300</td>
<td>3,000</td>
<td>1,324</td>
<td>0.54</td>
<td>195</td>
<td>1,266</td>
<td>2,150</td>
<td>6,777</td>
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<tr>
<td>RI-WWTF-1</td>
<td>750 / 8500</td>
<td>322,418</td>
<td>0</td>
<td>1,100</td>
<td>0.11</td>
<td>38</td>
<td>8,378</td>
<td>0</td>
<td>28,586</td>
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<tr>
<td>RI-WWTF-4</td>
<td>16,361</td>
<td>492,600</td>
<td>1,900</td>
<td>2,288</td>
<td>0.70</td>
<td>255</td>
<td>1,932</td>
<td>2,137</td>
<td>8,973</td>
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<tr>
<td>RI-WWTF-3</td>
<td>6,000</td>
<td>496,534</td>
<td>2,000</td>
<td>2,014</td>
<td>0.54</td>
<td>196</td>
<td>2,532</td>
<td>1,428</td>
<td>10,269</td>
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<tr>
<td>RI-WWTF-5</td>
<td>8,000</td>
<td>750,700</td>
<td>7,158</td>
<td>3,707</td>
<td>0.84</td>
<td>306</td>
<td>2,453</td>
<td>3,274</td>
<td>12,111</td>
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<tr>
<td>RI-WWTF-8</td>
<td>13,000</td>
<td>979,874</td>
<td>9,427</td>
<td>4,852</td>
<td>2.01</td>
<td>734</td>
<td>1,335</td>
<td>1,798</td>
<td>6,609</td>
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<tr>
<td>RI-WWTF-6</td>
<td>2,500</td>
<td>1,051,878</td>
<td>20,350</td>
<td>5,624</td>
<td>1.08</td>
<td>393</td>
<td>2,676</td>
<td>5,177</td>
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<td>RI-WWTF-7</td>
<td>8,000</td>
<td>1,095,268</td>
<td>0</td>
<td>6,300</td>
<td>1.90</td>
<td>694</td>
<td>1,579</td>
<td>3,234</td>
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<td>RI-WWTF-9</td>
<td>25,396</td>
<td>1,277,575</td>
<td>17,500</td>
<td>7,159</td>
<td>2.89</td>
<td>1,056</td>
<td>1,210</td>
<td>2,321</td>
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<td>RI-WWTF-10</td>
<td>16,900</td>
<td>1,431,124</td>
<td>10,569</td>
<td>6,118</td>
<td>3.65</td>
<td>1,333</td>
<td>1,073</td>
<td>909</td>
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<td>RI-WWTF-19</td>
<td>10,000</td>
<td>2,234,168</td>
<td>4,800</td>
<td>8,391</td>
<td>2.70</td>
<td>986</td>
<td>2,267</td>
<td>682</td>
<td>8,514</td>
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<td>RI-WWTF-15</td>
<td>38,385</td>
<td>2,703,613</td>
<td>23,758</td>
<td>11,601</td>
<td>11.83</td>
<td>4,318</td>
<td>626</td>
<td>550</td>
<td>2,687</td>
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<td>RI-WWTF-13</td>
<td>47,935</td>
<td>2,776,279</td>
<td>48,531</td>
<td>14,326</td>
<td>7.42</td>
<td>2,710</td>
<td>1,025</td>
<td>1,791</td>
<td>5,286</td>
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<td>RI-WWTF-11</td>
<td>28,000</td>
<td>3,159,000</td>
<td>27,469</td>
<td>13,525</td>
<td>5.01</td>
<td>1,829</td>
<td>1,727</td>
<td>1,502</td>
<td>7,395</td>
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<td>RI-WWTF-12</td>
<td>30,000</td>
<td>4,776,225</td>
<td>0</td>
<td>19,420</td>
<td>6.45</td>
<td>2,354</td>
<td>2,069</td>
<td>1,154</td>
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<td>RI-WWTF-16</td>
<td>77,000</td>
<td>7,874,578</td>
<td>58,735</td>
<td>32,742</td>
<td>13.92</td>
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<td>1,550</td>
<td>1,156</td>
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<td>RI-WWTF-14</td>
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<td>8,716,754</td>
<td>4,195</td>
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<td>12,097</td>
<td>721</td>
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<td>RI-WWTF-18</td>
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<td>10,486,807</td>
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<td>6.47</td>
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<td>590</td>
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<td>RI-WWTF-17</td>
<td>119,809</td>
<td>12,507,940</td>
<td>39,883</td>
<td>19,411</td>
<td>11.83</td>
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<td>1,576</td>
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<td>RI-WWTF-19</td>
<td>709,949</td>
<td>63,380,636</td>
<td>310,284</td>
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<td>260,973</td>
<td>60,276</td>
<td>1,052</td>
<td>713</td>
<td>4,330</td>
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Climate Change Legislation & Regulations

✓ Many new Regulations & Legislation being proposed & enacted annually to address Climate Change
✓ Regulations & Goals Vary Widely
✓ WWTFs will eventually have to meet Greenhouse Gas Reduction Targets

Various GHG Reduction Targets

(H 7904):
✓ 25% below 1990 levels by 2025
✓ 50% below 1990 levels by 2035
✓ 85% below 1990 levels by 2050

(S 7952A) 10% below 1990 levels by 2020
✓ 45% below 1990 levels by 2035
✓ 80% below 1990 levels by 2050

Renewable Energy Portfolio Standard
✓ Obtain 38.5% electricity from renewable resources by 2035

RIDEM
✓ CO₂ Budget Trading Program – RGGI participation

Regional Greenhouse Gas Initiative (RGGI)
✓ Cap and reduce power sector CO₂ emissions
✓ 10% Reduction by 2018

RI Climate Change Council
✓ Develop strategies to reduce RI GHG emissions (below 1990 levels):
✓ 10% by 2020,
✓ 45% by 2035, and
✓ 80% by 2050

Off-Site (Virtual) Net Metering
EPA Mandatory Reporting of GHGs
40 CFR 98 (2010)

List Categories Regulated

➢ Listed Source (Table A–3 ) Category
  ✓ Specifies Industry Types Regulated
  ✓ WWTFs were listed in Proposed Regs, but deleted – Thank You NACWA!!

➢ Listed Source (Table A–4 )
  ✓ Emits 25,000 metric tons CO₂e or more per year

➢ Not a Listed Source Category but:
  ✓ 45% below 1990 levels by 2035
  ✓ Has stationary fuel combustion units with 30 mmBTU/hr nameplate capacity or greater, and
  ✓ Emits 25,000 metric tons CO₂ equivalents or more per year in combined emissions from all stationary fuel combustion sources

✓ NBC is Well Below the 25,000 metric ton cut-off

✓ NBC is NOT Regulated YET!!!

✓ But we are being Proactive and Preparing for Future Regulation!!!
**Floating chamber placed on water surface to measure GHG concentrations**

**GHG analyzer that uses cavity ring down spectrometry to measure the ppm concentrations of GHGs: CO\(_2\), N\(_2\)O and CH\(_4\)**

**Preliminary Findings:**

- % of TKN emitted as N\(_2\)O is lower than literature values
- Grams of CH\(_4\) m\(^{-2}\) d\(^{-1}\) and g CO\(_2\) m\(^{-2}\) d\(^{-1}\) can vary from reference values and vary widely depending on process operating parameters
Carbon Footprint of NBC Facilities

✓ Emission values are estimates based on plant data and published emission factors

✓ Off-site sludge incineration (teal colored wedge) is the largest portion (47%) of NBC GHG emissions

✓ Note that sludge incineration is a beneficial reuse because the incinerator uses an off-gas energy recovery turbine

✓ BNR BOD removal (orange colored wedge) is the second largest contributor (22%) of emissions
Conclusions & Recommendations

✓ Be Proactive and be prepared to increased regulation to reduce CO₂ emissions
✓ Continually monitor your electric usage and costs and continually assess conservation opportunities
✓ Have open communications with your local Electric Utility
  • Investigate incentives from your Electric Utility and take advantage of them
✓ Monitor Local Legislation and actively pursue favorable legislation
✓ Seek out small grants to perform feasibility studies for renewable energy projects
✓ Educate your directors and board about feasibility study findings and financial and environmental benefits
✓ Communicate proposed Renewable Projects to the public to avoid potential issues
✓ Continue to “Chip Away” to complete small projects and go after “Low Hanging Fruit” specific to your site on your goal to energy independence
Any Questions?

Special Thanks to our NBC Energy Team:

Jim McCaughey - Environmental, Safety & Technical Assistance Manager
Barry Wenskowicz – Environmental Sustainability Engineer

And to our NBC Teams in Engineering, Operations, Construction, Finance & Legal that also assisted on these important project!!!

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