

# Narragansett Bay Commission

**Climate Change – It's real! Deal with it now!**

*Overview of NBC Efforts to Address Climate Change*

Thomas Uva

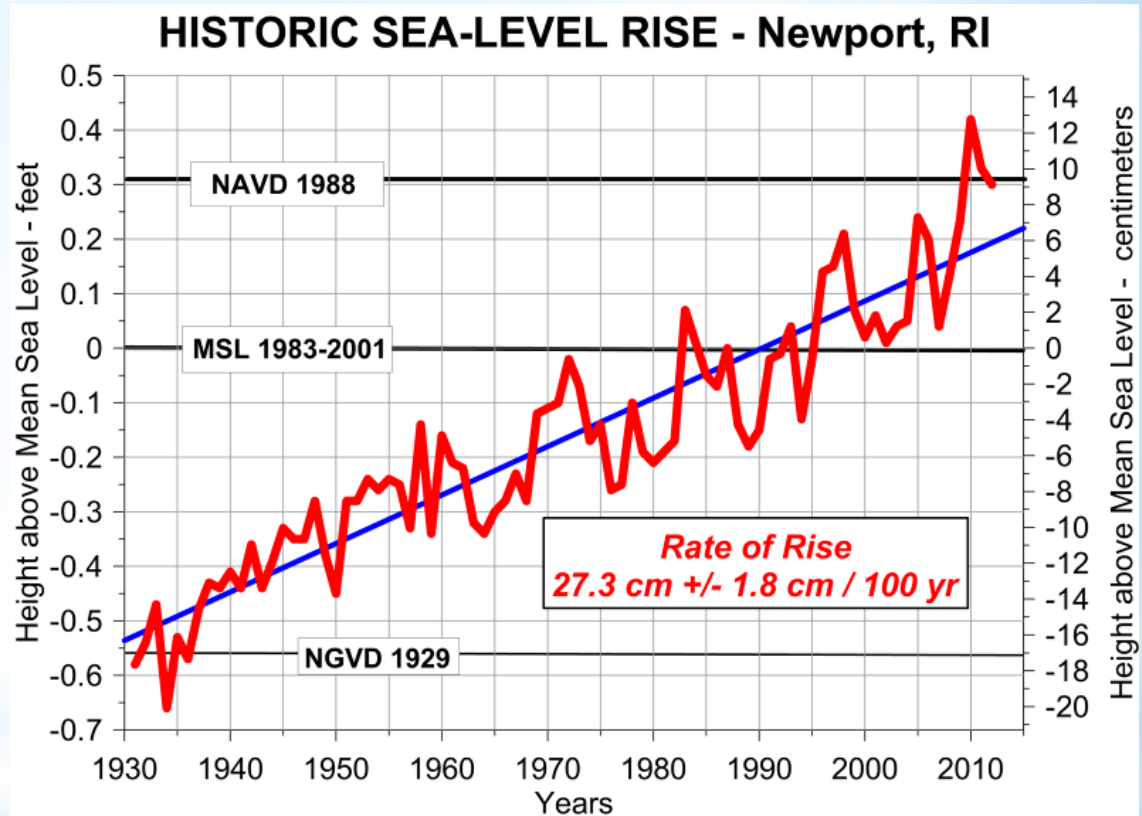
*Director of Planning, Policy & Regulation*

*Narragansett Bay Commission*

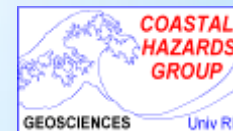


# Climate Change is Real!!!

- ✓ **Historic Sea Level Rise**
- ✓ **Loss of Wetlands & Coastal Buffers**
- ✓ **Ocean Acidification**
- ✓ **Increase in Water & Air Temperatures**
- ✓ **Increase in Extreme Weather Events**



Adapted from: [http://tidesandcurrents.noaa.gov/sltrends/sltrends\\_station.shtml?stnid=8452660%20Newport,%20RI](http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8452660%20Newport,%20RI)



# Sea Level is Rising Faster along the Northeast US Coast

- ✓ Sea-level rise has increased three to four times faster than the global average along the 600-mile stretch of coastal zone from Cape Hatteras, NC to north of Boston, MA since 1990.
- ✓ Likely 8 to 11+ inches above global average SLR by 2100.

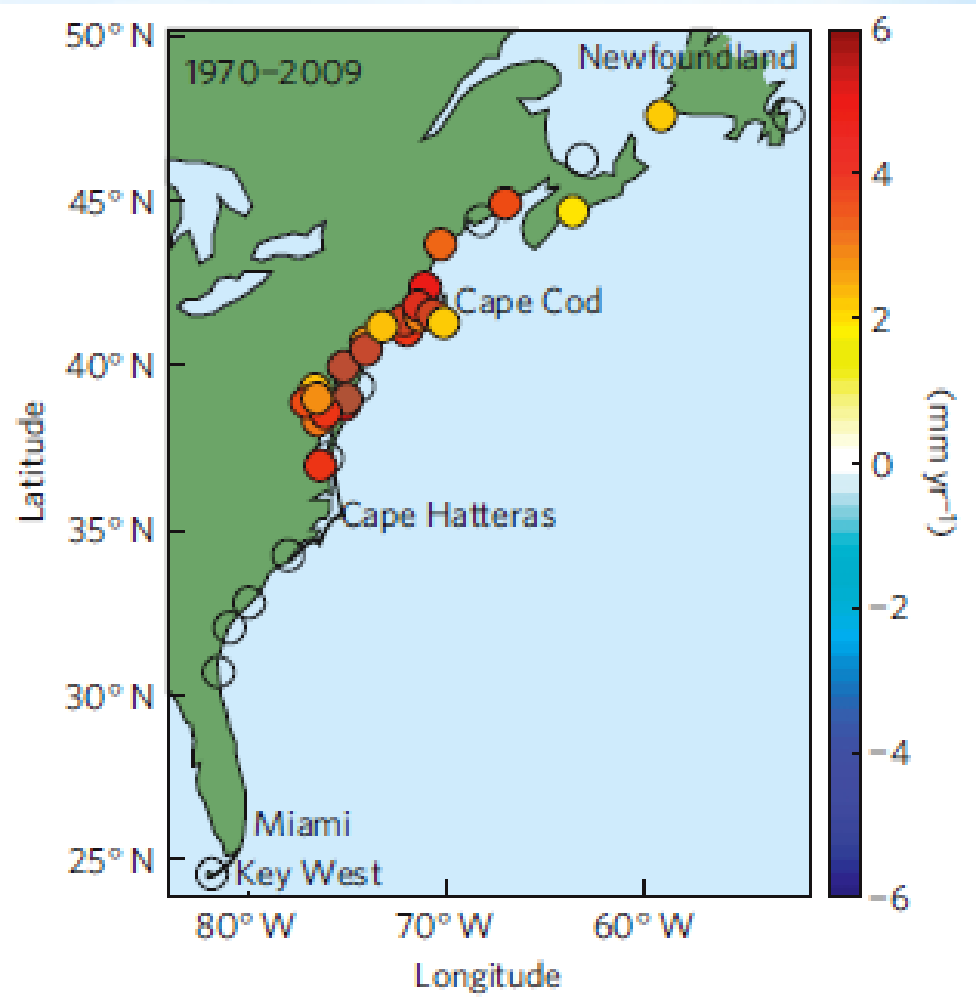
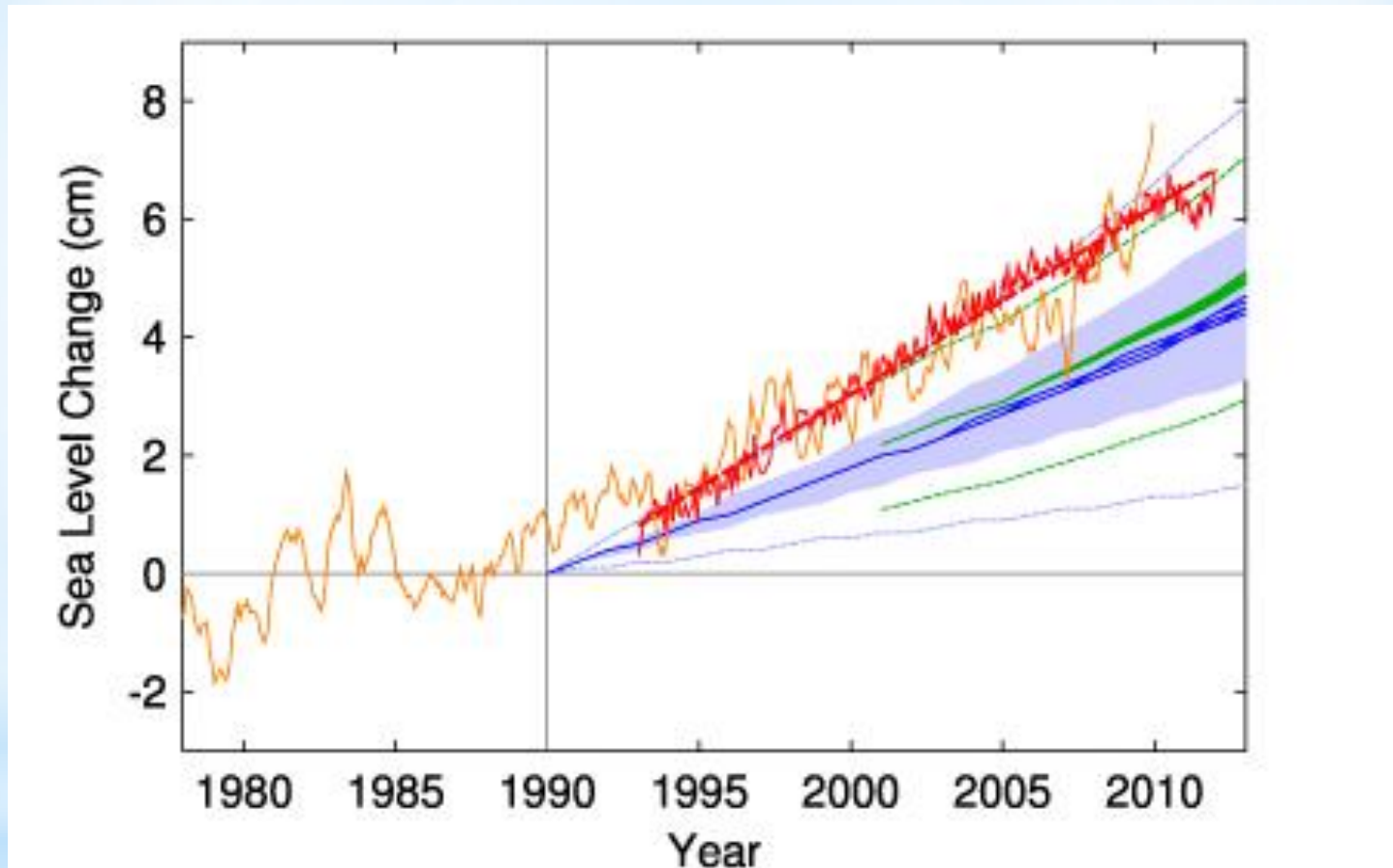


Figure from “Hotspot of accelerated sea-level rise on the Atlantic coast of North America”  
Asbury Sallenger et al., 2012 Nature Climate Change doi:10.1038/NCLIMATE1597

# Observed Sea Level Rise is HIGHER than Projections

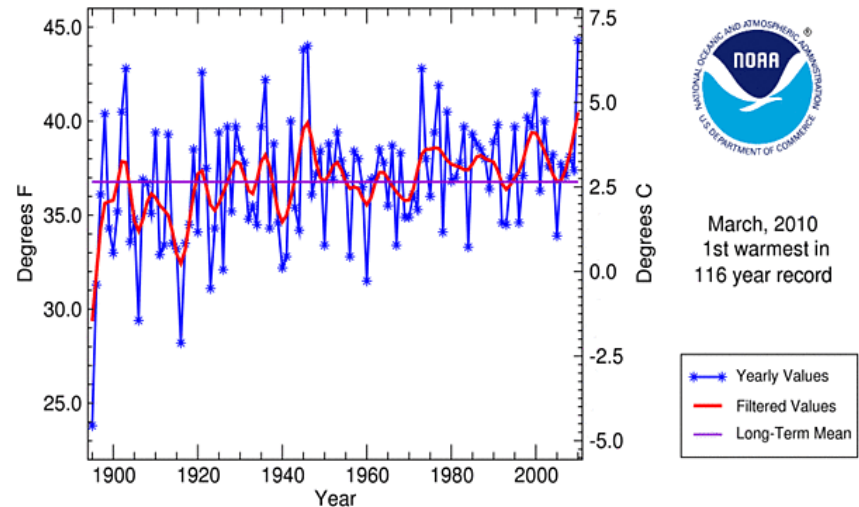


*3.3 mm/year observed (satellite) vs. IPCC FAR estimate of 2.0 mm/year (1993-2011)*

# Climate Change is Real!!!

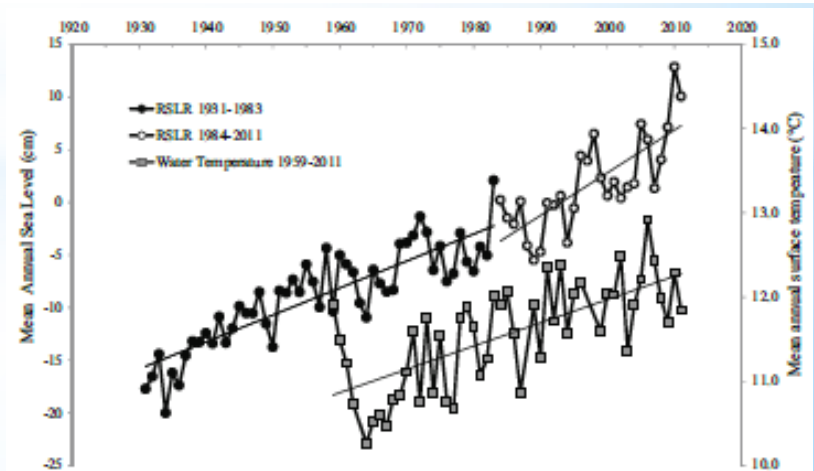
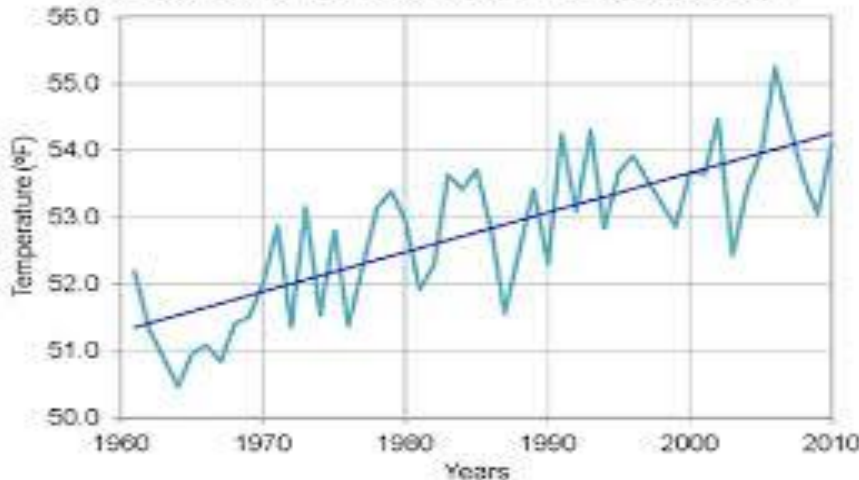
- ✓ Historic Sea Level Rise
- ✓ Loss of Wetlands & Coastal Buffers
- ✓ Ocean Acidification
- ✓ Increase in Water & Air Temperatures
- ✓ Increase in Extreme Weather Events

Rhode Island Statewide Temperature  
March, 1895 - 2010



National Climatic Data Center / NESDIS / NOAA

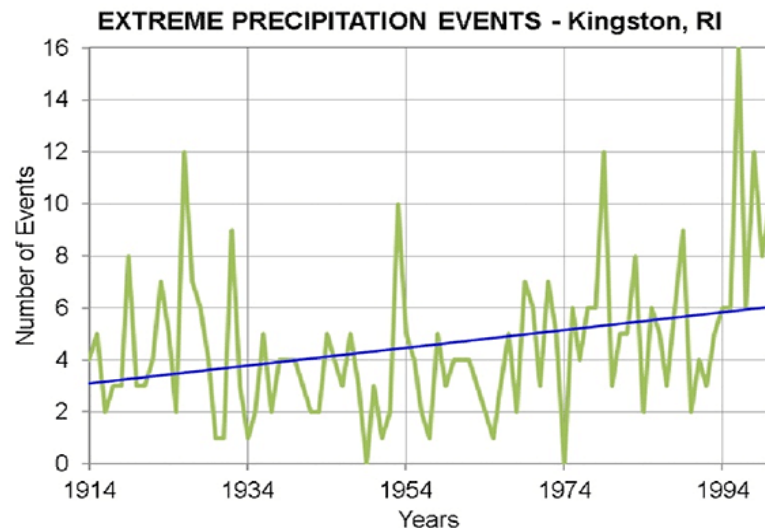
SEA SURFACE TEMPERATURE - Narragansett Bay





# Climate Change is Real!!!

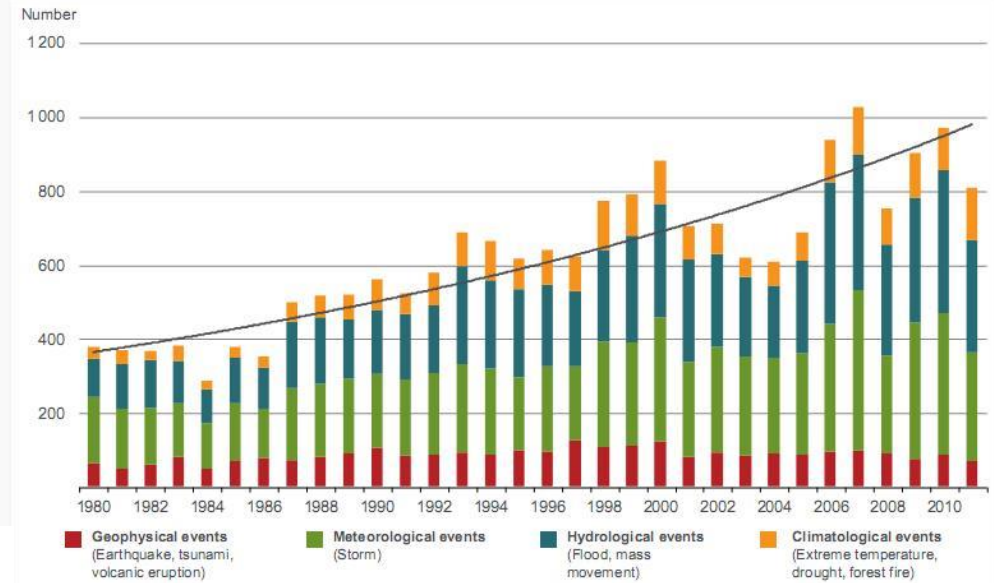
- ✓ Historic Sea Level Rise
- ✓ Loss of Wetlands & Coastal Buffers
- ✓ Ocean Acidification
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NatCatSERVICE

Natural catastrophes worldwide 1980 – 2011  
Number of events with trend

Munich RE



© 2012 Münchener Rückversicherungs-Gesellschaft, Geo Risks Research, NatCatSERVICE – As at March 2012



# March 2010 Floods in Rhode Island

- ✓ March 2010 - Extended Rainfall Hit Rhode Island
- ✓ Over 16 inches of rainfall over 2 weeks (3/14 -3/30/2010)
- ✓ 8.79 inches of rainfall over two days (3/29-3/30/2010)
- ✓ Worst Flooding in over 200 Years
- ✓ Pawtuxet River Crested at 20.79 Feet
  - ✓ River Flood Level = 9 Feet
  - ✓ Crested 4 feet above 100 Year Storm Level
- ✓ 2 Sewage Plants located along River Completely Underwater!!!
- ✓ 3<sup>rd</sup> Plant on river had Pump Station Failure



*Warwick WWTF Berm Designed for 100 Year Storm*



# March 2010 Floods in Rhode Island

## Warwick Wastewater Treatment Facility

- ✓ River Overflowed the 100 year Berm
- ✓ Facility had to be completely rebuilt
- ✓ Berm being Raised to 500 Year Storm Level



*Warwick, RI WWTF under water*



# March 2010 Floods in Rhode Island

## West Warwick Wastewater Treatment Facility

✓ West Warwick Plant  
Underwater

**Wastewater Facilities  
are Vulnerable!!!**

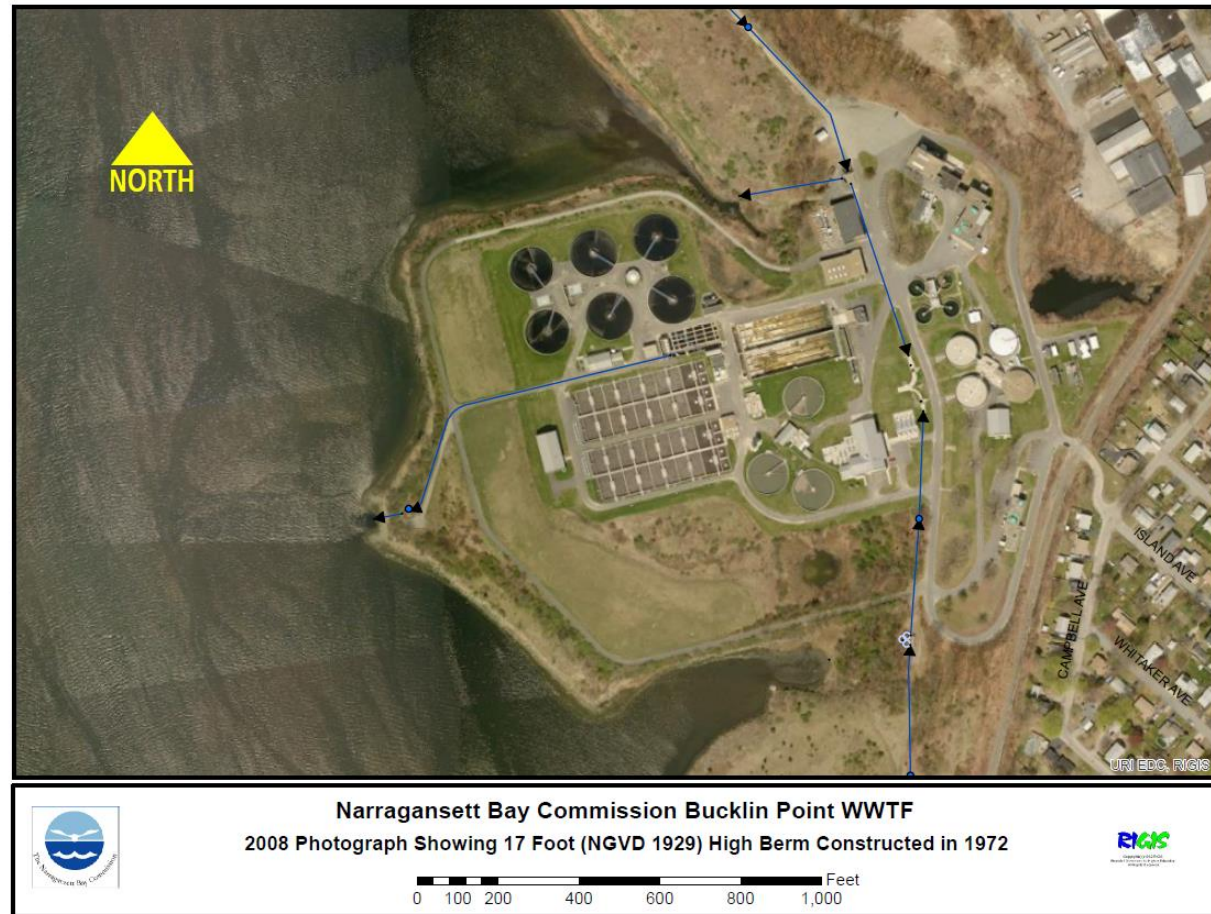
- ✓ WWTFs are typically located at lowest elevations
- ✓ Typically located at sea level along rivers and bays
- ✓ WWTFs need to proactively assess their vulnerability
- ✓ WWTFs need to improve defenses against Sea Level Rise, Extreme Weather Events & Inundation



# NBC is Addressing Climate Change

## *Bucklin Point Berm Replacement*

- ✓ NBC is addressing Flood & Inundation Concerns
- ✓ Original Flood Berm built in 1972
- ✓ Design Basis was 1938 Hurricane
- ✓ Berm was showing signs of Deterioration, and
- ✓ Original Berm design was less than FEMA 100 Year Flood Level





# NBC Bucklin Point Berm Replacement

- ✓ Berm was Upgraded and Raised 2 Feet in 2012
- ✓ New Protection Elevation 19.3 Feet (NGVD 1929)
- ✓ Exceeds 100 Year Flood Level by 0.5 Feet
- ✓ Cost \$2.3 Million



Narragansett Bay Commission Bucklin Point WWTF  
2014 Photograph Showing 19.3 Foot (NGVD 1929) High Berm Constructed in 2012



Narragansett Bay Commission Bucklin Point WWTF  
100 Year Flood Hazard Area in Pink Protected by Berm



## *New Bucklin Point WWTF Berm*

✓ But what Design Standard should we build to????



# New Federal Building Standards

- ✓ January 2015 - President Obama issued an Executive Order Establishing the new Federal Flood Risk Management Standard.
- ✓ Executive Order provides options to qualify for Federal Funding of Projects:
  - ✓ Build two feet above the 100-year floodplain level for standard projects,
  - ✓ Build 3 feet higher for “critical action” projects such as hospitals or nursing homes;
  - ✓ Build to the 500-year floodplain standard;
  - ✓ Or use best available scientific models which often combine flood records with other factors like sea-level rise data.
- ✓ FEMA proposed regulations this month that will adopt the criteria in Executive Order



This document is scheduled to be published in the Federal Register on 08/22/2016 and available online at <http://federalregister.gov/a/2016-19610>, and on [FDays.gov](http://FDays.gov).

Billing Code: 9111-66-P

DEPARTMENT OF HOMELAND SECURITY

Federal Emergency Management Agency

44 CFR Part 9

[Docket ID: FEMA-2015-0006]

RIN 1660-AA85

Updates to Floodplain Management and Protection of Wetlands Regulations to Implement Executive Order 13690 and the Federal Flood Risk Management Standard

AGENCY: Federal Emergency Management Agency, DHS.

ACTION: Notice of proposed rulemaking.

**SUMMARY:** The Federal Emergency Management Agency (FEMA) proposes to amend its regulations on “Floodplain Management and Protection of Wetlands” to implement Executive Order 13690, which establishes the Federal Flood Risk Management Standard (FFRMS). FEMA also proposes a supplementary policy (FEMA Policy: 078-3) that would further clarify how FEMA applies the FFRMS.

**DATES:** Comments must be received no later than [INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

**ADDRESSES:** You may submit comments, identified by Docket ID: FEMA-2015-0006, by one of the following methods:

Federal eRulemaking Portal: <http://www.regulations.gov>. Follow the instructions for submitting comments.



# NBC is Addressing Climate Change

## *Comprehensive Energy Evaluations*

✓ **NBC Conducted Comprehensive Energy Evaluations in 2005 with \$35,000 EPA Grant:**

□ **Project Identified Alternative Energy Opportunities:**

“Low Hanging Fruit”:

- ✓ Wind Energy at Field’s Point
- ✓ Biogas CHP at Bucklin Point

□ **Project Identified On-site Energy Efficiency & Conservation Opportunities at all NBC Facilities**



# NBC Energy Efficiency Projects

Year	Facility	Energy Improvements Completed	Energy Saved (kWh <sub>eq</sub> /year)
1985	FP	Solar hot water heating system	na
1985	FP	RASI VFDs	na
1993	FP	Admin Building Lighting Upgrade	na
1996	FP	RASII VFDs	na
2003	BP	VFD on Recycle Pumps	81,858
2003	BP	Energy Efficient Blower	618,757
2003	FP	Pitot Tube Air Station Sensors	24,788
2004	FP	Upgrade Sludge Management	na
2004	BP	Optimal DO and Blower Control	502,416
2006	FP	Power Washing Diffuser Heads	25,266
2006	FP	Fields Point Lighting Upgrade	63,347
2006	FP	VFDs on Blowers 1, 2, & 3	198,345
2011	ESPS	VFDs on pumps #2,#3,#6,#7	66,971
2012	FP	Plant Water VFDs	na
2012	BP	40 VFDs	na
2013	BP	Bucklin Point Lighting Upgrade	124,008
2013	COB	Lighting upgrade at COB	63,419
2013	BP	Efficient Blowers & Flexible Aeration	500,000
2015	FP	FP Bisulfite Storage Building -ERU	227,308
Total Energy Saved (kWh/yr)			2,496,483
% NBC Use			7.0%

Facility	Energy Improvements Planned	Energy Saved (kWh <sub>eq</sub> /year)
FP	Install 500 hp VFDs on new centrifugal blowers	368,808
FP	RSPSII 18,000 CFM ERU/Heat Pipe	262,492
FP	PSPS 7,000 CFM ERU	153,433
FP	Lighting Upgrade	1,367,255
BP	Lighting Upgrade	654,852
Total Energy Saved (kWh/yr)		2,806,840
% NBC Use		7.9%



Estimated \$464,000/year in Electric Savings!!!  
 Estimated 1,732 M Tons/Year CO2(e) Reduced

# NBC is Addressing Climate Change

## *Alternative Energy Projects*

- ✓ **Conducted Alternative Energy Feasibility Studies to thoroughly evaluate “low hanging fruit”**
- ✓ **Performed Wind Energy Feasibility Study for Field’s Point with \$25,000 state grant**
- ✓ **Performed Biogas Combined Heat & Power Feasibility Study for Bucklin Point with \$25,000 state grant**





# NBC Field's Point WWTF

## 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

- ✓ 1.8 MW Electrical Load
- ✓ 15,930,000 kWh/year (2015)
- ✓ ~\$1.75M Annual Expense
- ✓ **Now obtain 7,200,000 kWh/year from wind**
- ✓ **Save ~\$1.1M annually in electricity costs**



## Renewable Opportunities:

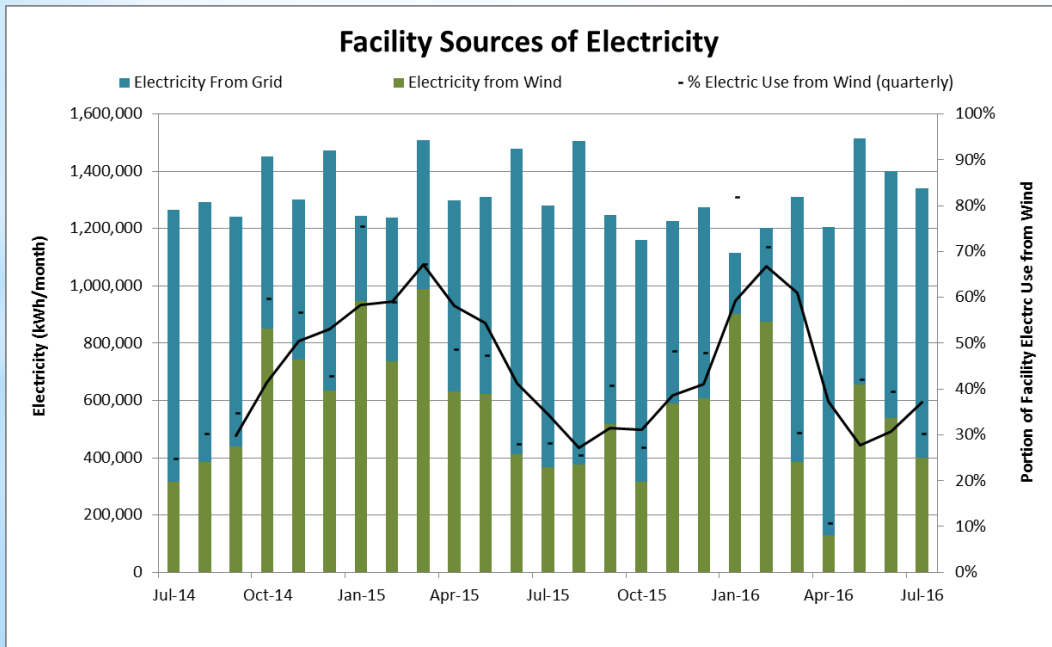
- ✓ Wind Turbines
- ✓ Small Hydro-Electric Projects
- ✓ Small Solar Projects



# Field's Point Wind Energy

## Field's Point Wind Energy Project:

- ✓ **RI's First Terrestrial Wind Farm**
- ✓ 4.5 MW Capacity (3 – 1.5MW Turbines)
- ✓ Operational since October 2012
- ✓ **Reduces Facility Electric Use by 45% (21% reduction for NBC Overall)**
- ✓ **GHG CO<sub>2</sub>(e) Offsets: 2,325 Metric Tons/Year**
- ✓ **\$1,365,576** in REC Revenue to date
- ✓ **\$ 3,642,508** Total Financial Benefit to date (8/16)



# Other Field's Point Projects Under Investigation:

## Solar Carports

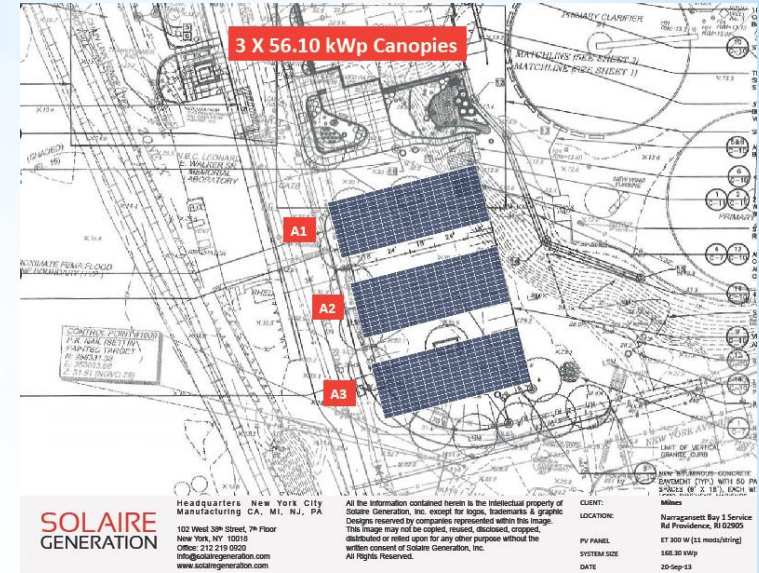
### Hydroelectric Turbine



### Typical Siphon Turbine Installation

#### Estimated Project Values

Turbine Design Flow (min)	30 MGD
Average Available Head	10.5 Feet
Theoretical Energy	41.2 kW
Turbine Efficiency	72%
Nameplate Power	29.7 kW
Total Project Cost	\$684,237 (Waterline)
Installed Cost	\$23,009 per kW
Capacity Factor	96%
Output	250,656 kWh/yr
Estimated Net Electric Value	\$0.16 per kWh
Annual Savings	\$40,105
Useful Life	20 years
Unsubsidized Payback	17 years



Number of Modules	166	Total
Capacity	49,800 W	\$34,860
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%	\$0
RI Grant	20%	\$34,860
Customer Cost		\$139,440
RECs Generated	52.3 MWh/yr	
Forecasted Rec Value	\$40 /MWh	
REC Annual Amount	\$2,094 per year	
Payback Period	14 years	





# 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
- ✓ 12,460,000 kWh/year (2015)
- ✓ ~\$1.37M Annual Electric Expense



## Renewable Opportunities:

- ✓ Biogas Reuse Project
- ✓ Large Solar Project

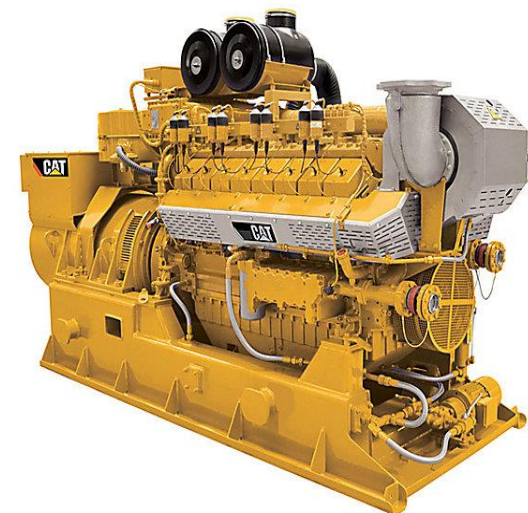
# NBC Bucklin Point Biogas Combined Heat and Power Energy Project

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

- ✓ 600 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

## Project Status as of August 2016

- ✓ Feasibility Study completed: December 2009
- ✓ Design completed: December 2014
- ✓ RFP for construction issued February 2015
- ✓ Proposals received in February and economic feasibility finalized
- ✓ Grants to be utilized from sources including RIREF, RGGI and National Grid
- ✓ Board Approval March 2015
- ✓ Currently Negotiating Air Permit with RIDEM





# Other Bucklin Point Projects Under Investigation:

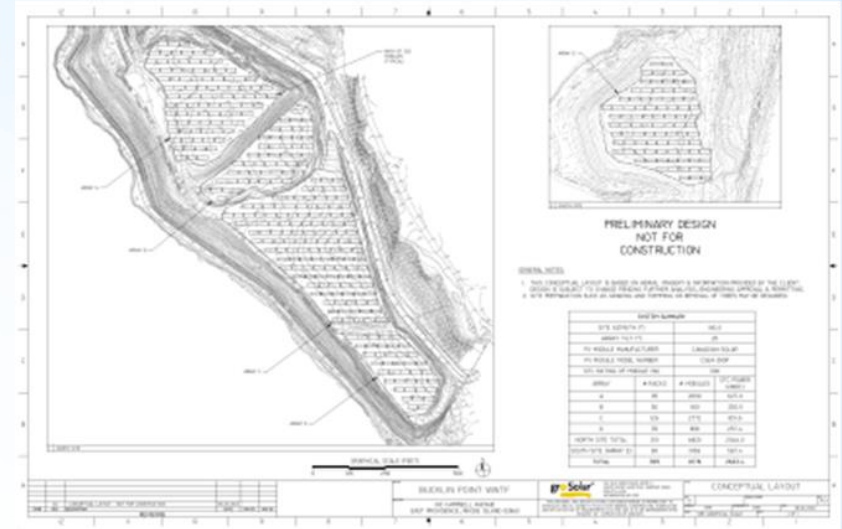
## *Large On-Site Solar Energy Project*

### Photovoltaic System

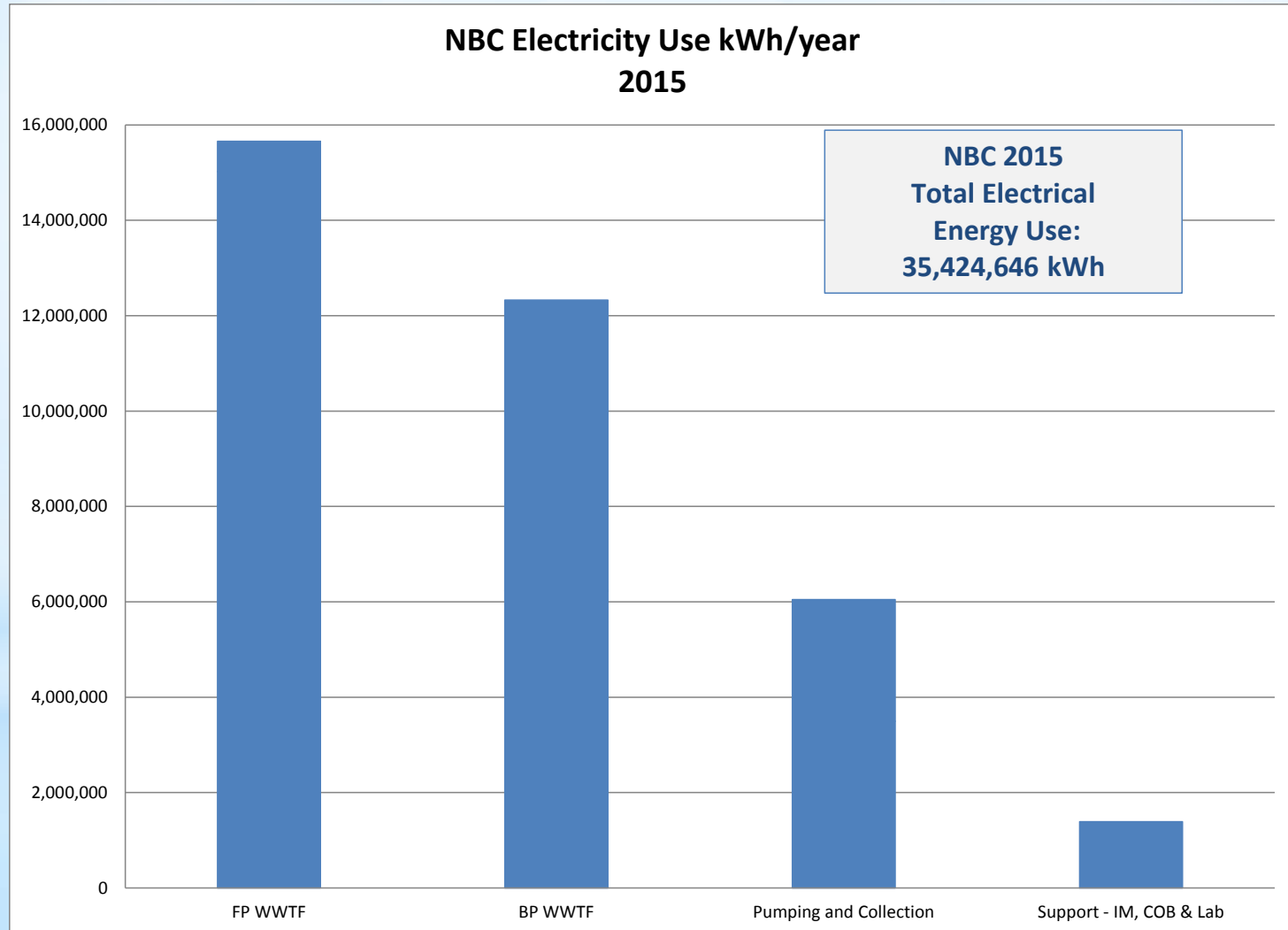
- ✓ 2.6 MW Array on Closed Landfill
- ✓ **22% of BP Electricity Demand**
- ✓ 2,251,000 kWh/year
- ✓ 11.4 acres – Former Landfill
- ✓ Estimated Cost \$8,348,470
- ✓ Will need to be done in phases

### Project Status as of March 2015

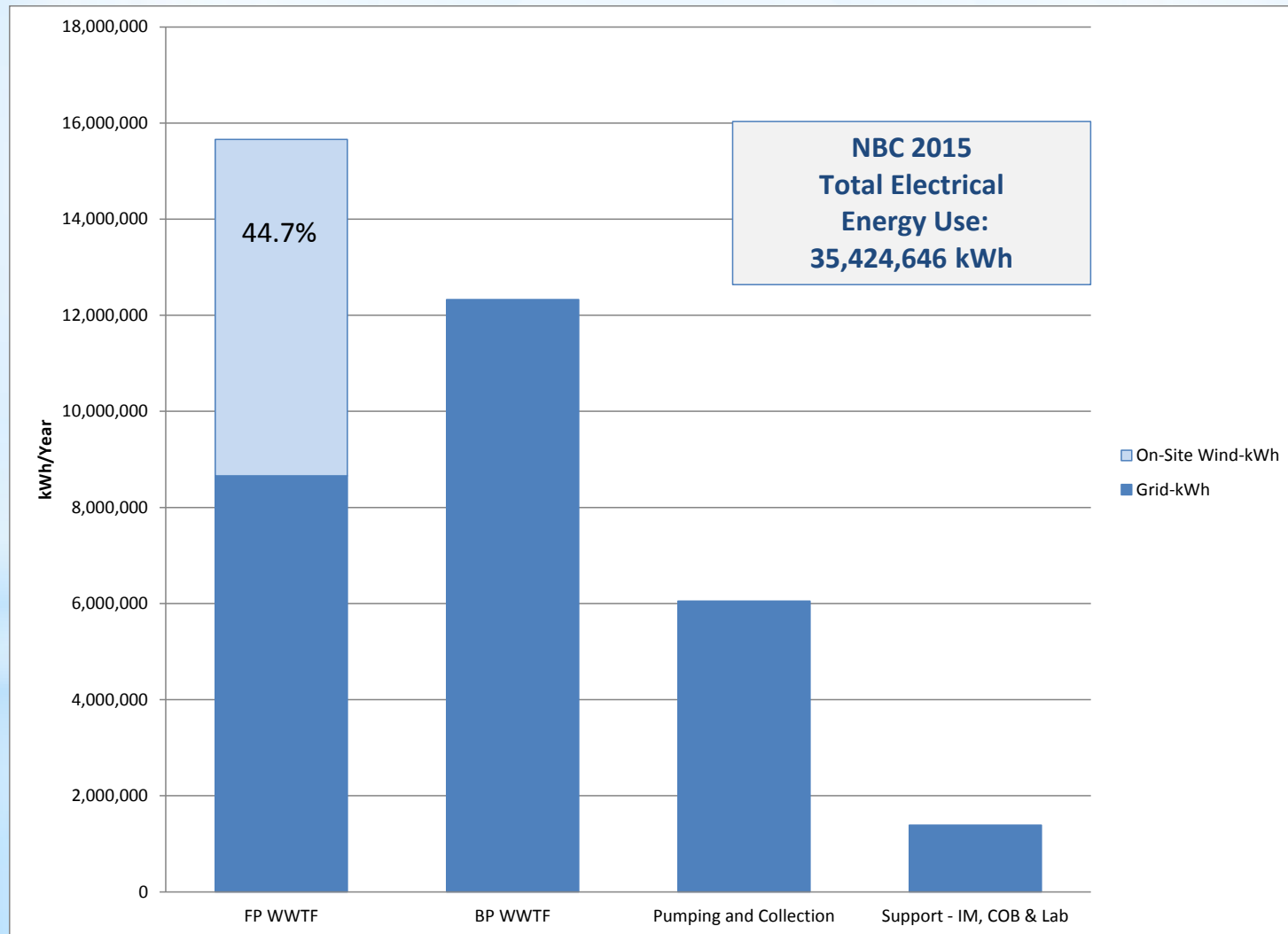
- ✓ Internal feasibility study finalized
- ✓ RFQP for civil work feasibility study completed
- ✓ Project on Hold – Will need Land for Construction of Phase III of NBC CSO Project



# NBC Electrical Energy Use By Source kWh/year

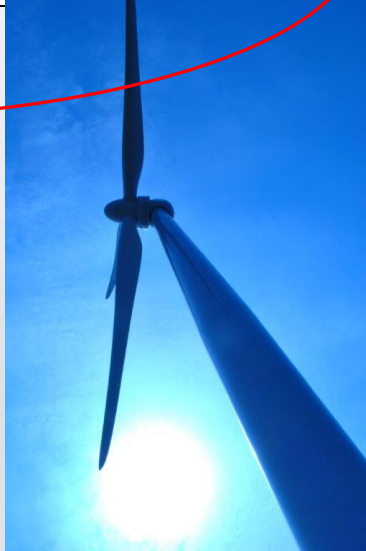


# NBC Electrical Energy Use By Source kWh/year



# 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**





# Off-Site Net Metering Projects - Solar

## Photovoltaic Solar Farms in Planning Phase

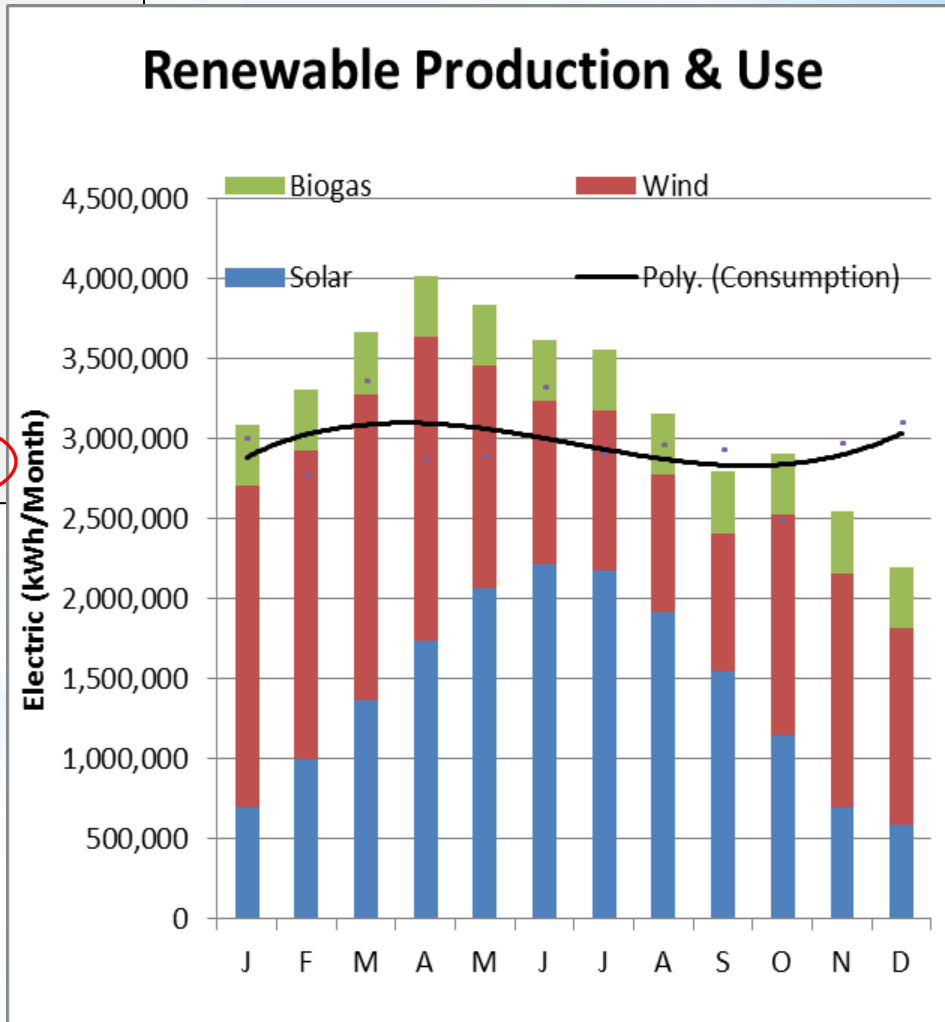
- ✓ NBC to acquire two - 5 MW Off-Site Solar Photovoltaic Energy Farms
- ✓ Will provide **48%** of NBC Electricity Demand
- ✓ 17,160,600 kWh/year
- ✓ **Request for Project Proposals to be Issued this fall**



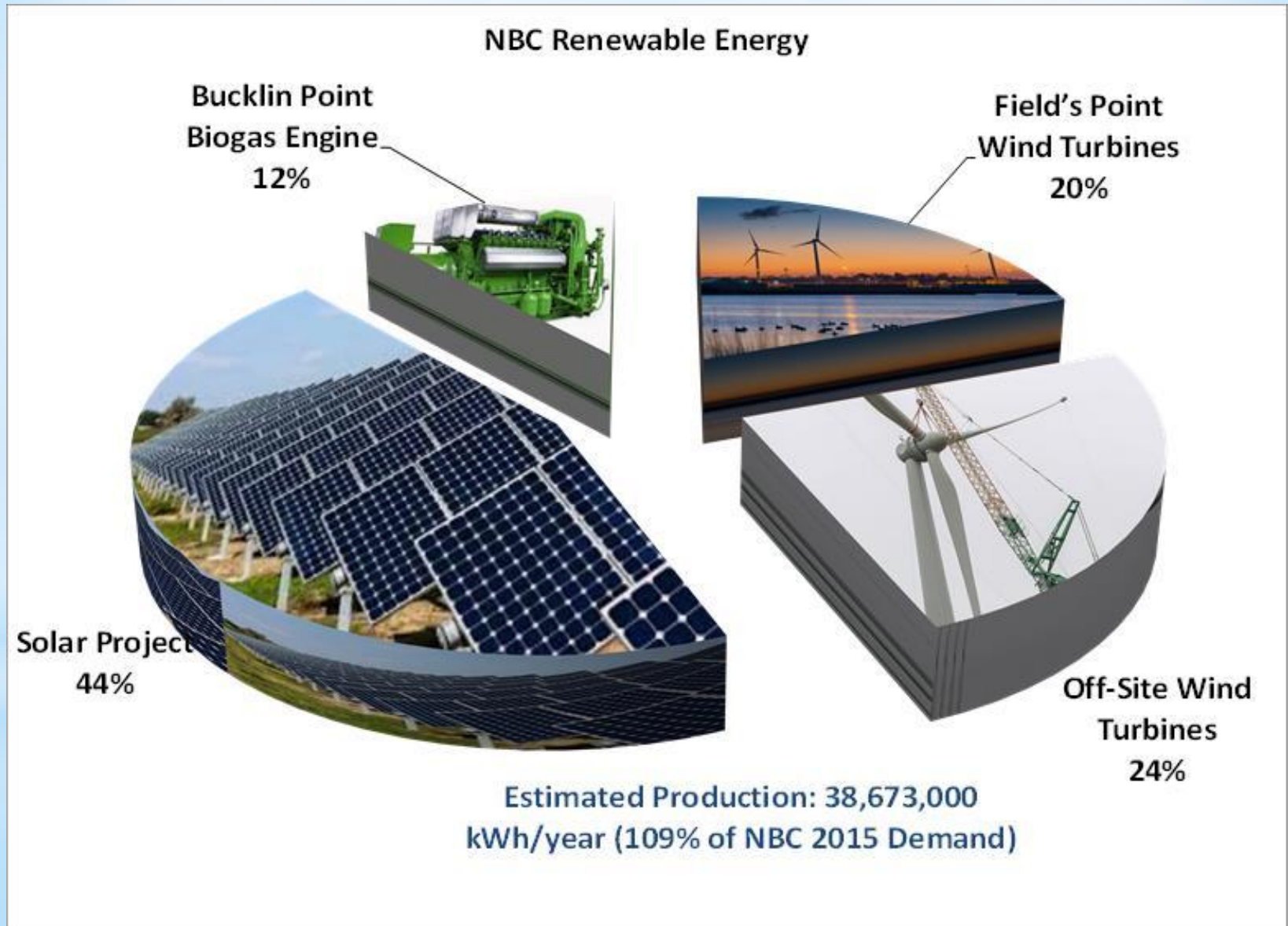
# NBC Goal: 100% Sustainable Electrical Energy

Project	% NBC Demand	
Field's Point Wind Turbines	7,524,978 kWh/year	21%
Off-Site Wind Turbines	9,421,649 kWh/Year	26%
Off-Site Solar PV Project	17,160,567 kWh/Year	48%
Bucklin Point Biogas Engine	4,565,413 kWh/year	13%
<b>NBC Total Renewable Energy Portfolio</b>	<b>38,672,606 kWh/year</b>	<b>109%</b>

✓ Diverse Renewable Energy Portfolio!!!



# Future NBC Renewable Energy Portfolio





# 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 \$ 1.54Million
- ✓ 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

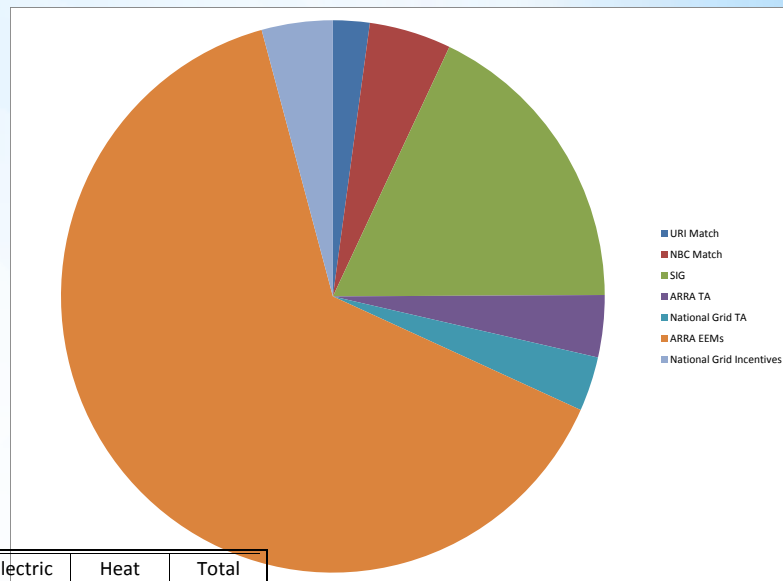


<b>URI Match</b>	\$33,512
<b>NBC Match</b>	\$75,000
<b>EPA SIG</b>	\$275,000
<b>ARRA TA</b>	\$55,904
<b>National Grid Energy TA</b>	\$49,147
<b>ARRA EEMs</b>	\$985,460
<b>National Grid Incent.</b>	\$65,000
<b>Total:</b>	\$1,539,023

# WWTF Sustainability Project Outcomes

## 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

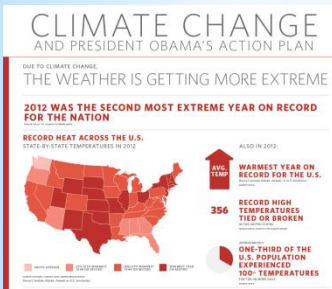


WWTF ID	Population	Electricity kWh	Gas therms	Oil gallons	Energy Mbtu	Flow MGD	Volume MG/Yr	Electric kWh/MG	Heat kBtu/MG	Total kBtu/MG
RI-WWTF-2	1,720	247,300	0	3,000	1,324	0.54	195	1,266	2,150	6,777
RI-WWTF-1	750 / 8500	322,418	0	0	1,100	0.11	38	8,378	0	28,586
RI-WWTF-4	<b>16,361</b>	492,600	2,790	1,900	2,288	0.70	255	1,932	2,137	8,973
RI-WWTF-3	6,000	496,534	0	2,000	2,014	0.54	196	2,532	1,428	10,269
RI-WWTF-5	8,000	750,700	0	7,158	3,707	0.84	306	2,453	3,274	12,111
RI-WWTF-8	13,000	979,874	0	9,427	4,852	2.01	734	1,335	1,798	6,609
RI-WWTF-6	2,500	1,051,878	20,350	0	5,624	1.08	393	2,676	5,177	14,307
RI-WWTF-7	8,000	1,095,268	0	16,018	6,300	1.90	694	1,579	3,234	9,084
RI-WWTF-9	25,396	1,277,575	0	17,500	7,159	2.89	1,056	1,210	2,321	6,782
RI-WWTF-10	16,900	1,431,124	10,569	1,112	6,118	3.65	1,333	1,073	909	4,588
RI-WWTF-19	10,000	2,234,168	0	4,800	8,391	2.70	986	2,267	682	8,514
RI-WWTF-15	38,385	2,703,613	23,758	0	11,601	11.83	4,318	626	550	2,687
RI-WWTF-13	47,935	2,776,279	48,531	0	14,326	7.42	2,710	1,025	1,791	5,286
RI-WWTF-11	28,000	3,159,000	27,469	0	13,525	5.01	1,829	1,727	1,502	7,395
RI-WWTF-12	30,000	4,776,225	0	19,411	19,402	6.45	2,354	2,029	1,154	8,242
RI-WWTF-16	77,000	7,874,578	58,735	0	32,742	13.92	5,079	1,550	1,156	6,446
RI-WWTF-14	52,200	8,716,754	4,195	3,085	30,655	33.14	12,097	721	70	2,534
RI-WWTF-18	208,743	10,486,807	74,004	0	43,181	48.67	17,765	590	417	2,431
RI-WWTF-17	119,809	12,507,940	39,883	0	46,665	21.75	7,938	1,576	502	5,879
	709,949	63,380,636	310,284	85,411	260,973		60,276	1,052	713	4,330

- ✓ Annual Electric savings of 7 - 9% from all POTW's attained depending on how data is normalized

# 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**

- ✓ CO<sub>2</sub> Budget Trading Program – RGGI participation

## **Regional Greenhouse Gas Initiative (RGGI)**

- ✓ Cap and reduce power sector CO<sub>2</sub> 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)

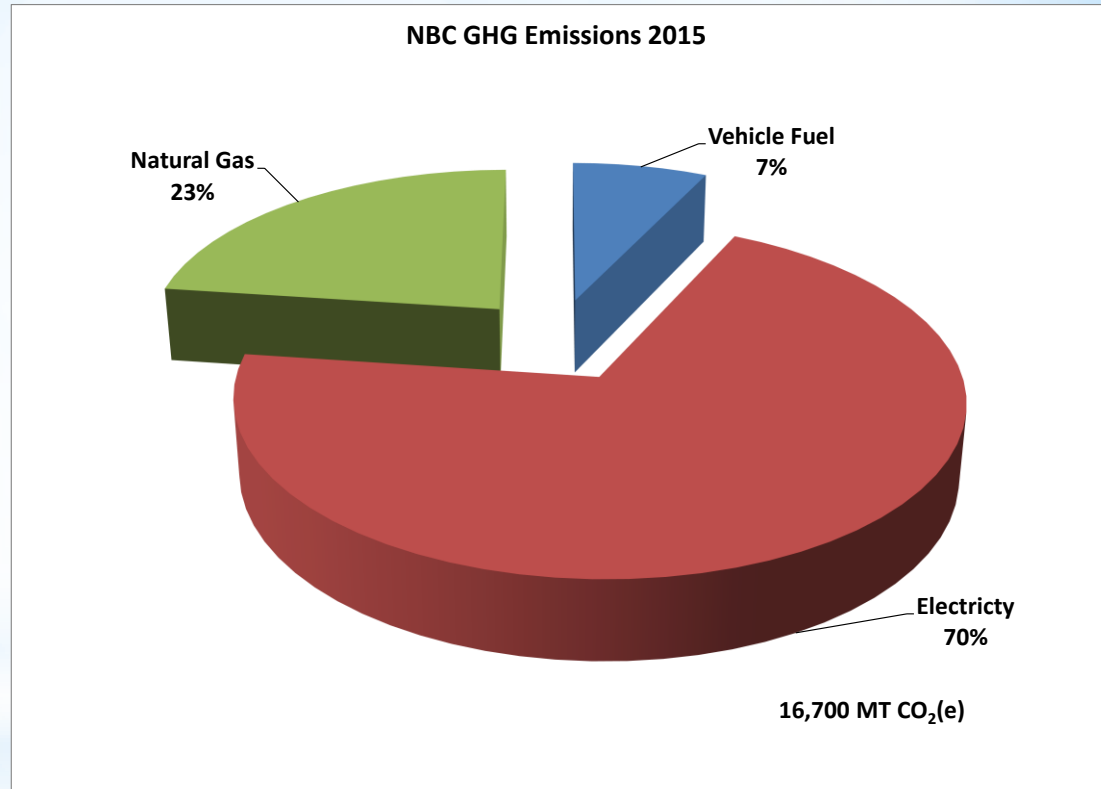
### List Categories Regulated

- 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 CO<sub>2</sub>e 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 CO<sub>2</sub> 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!!!*



*GHG Emissions in Red are not Reportable under present regulations*

# GHG Emissions Analysis of Treatment Processes



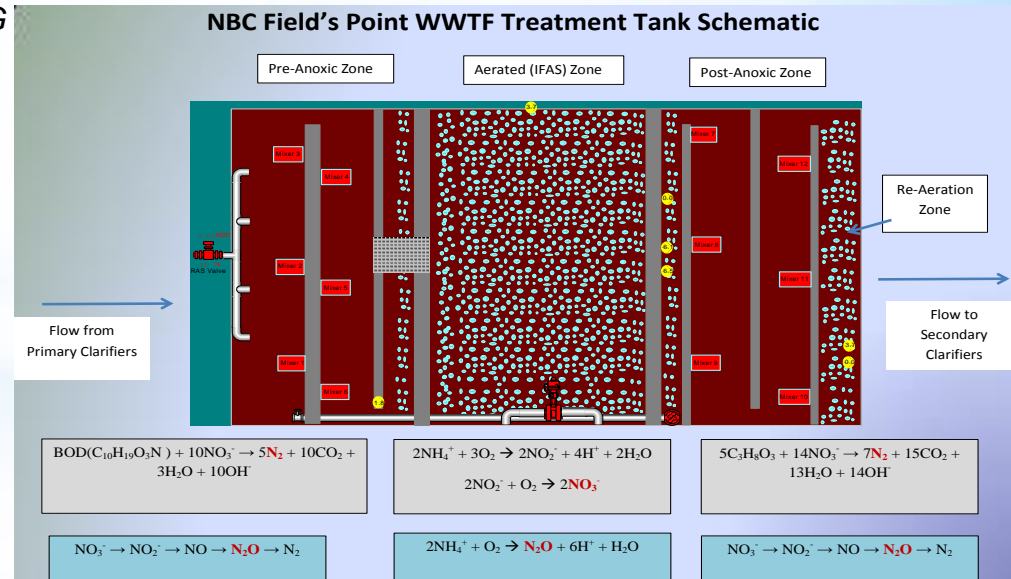
Floating chamber placed on water surface to measure GHG concentrations

## Preliminary Findings:

- ✓ % of TKN emitted as  $N_2O$  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



GHG analyzer that uses cavity ring down spectrometry to measure the ppm concentrations of GHGs:  $CO_2$ ,  $N_2O$  and  $CH_4$

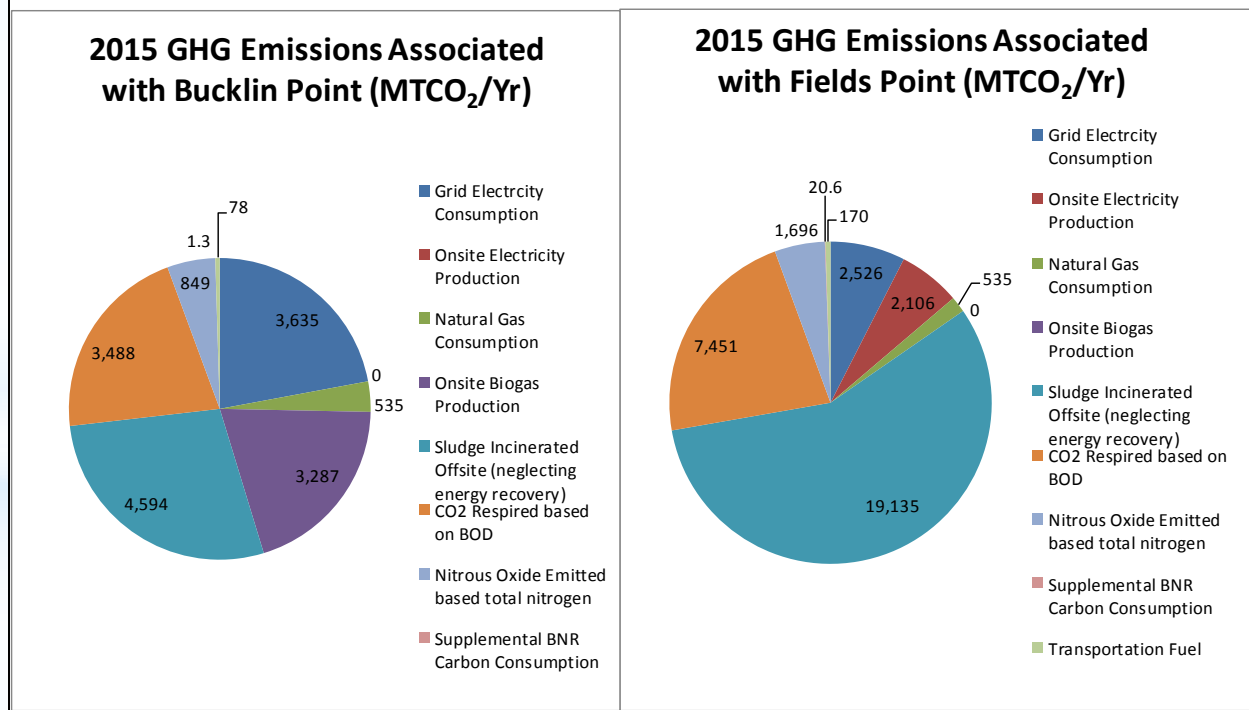


# Carbon Footprint of NBC Facilities

- ✓ 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

Greenhouse Gas Emission Source	Bucklin Point	Fields Point	Units	CO <sub>2</sub> Emission (Mt <sub>eq</sub> /yr)	
	WWTF	WWTF		Bucklin Point WWTF	Fields Point WWTF
Grid Electricity Consumption	12,458,000	8,658,845	kWh/yr	3,635	2,526
Onsite Electricity Production	0	7,217,000	kWh/yr	0	2,106
Natural Gas Consumption	109,502	100,947	Therms/yr	535	535
Onsite Biogas Production	115,414,532	0	SCF/Yr	3,287	0
Sludge Incinerated Offsite (neglecting energy recovery)	2,125	7,761	DTY shipped offsite	4,594	19,135
CO <sub>2</sub> Respired based on BOD	3,402	7,265	TPY BOD removed by BNR	3,488	7,451
Nitrous Oxide Emitted based total nitrogen	790	1,578	TPY Influent TN	849	1,696
Supplemental BNR Carbon Consumption	810	12,480	GPY MicroC used	1.3	20.6
Transportation Fuel	8,728	19,042	GPY Gasoline Purchased	78	170
Totals				16,468	33,639

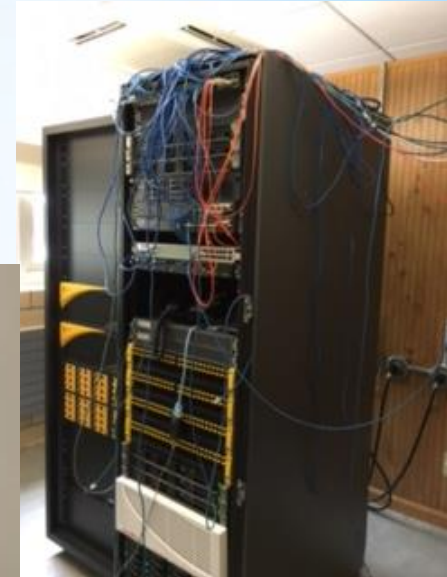
WWTF = Wastewater Treatment Facility





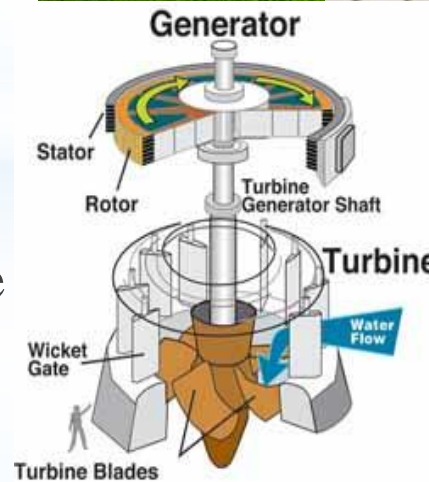
# NBC Disaster Recovery

- ✓ Be Prepared for a Major Disaster!!!
- ✓ If Disaster Strikes your main facility, will you be able to:
  - ✓ Pay salaries and invoices?
  - ✓ Issue bills to customers?
  - ✓ Collect payments from customers?
  - ✓ Access your computer system, vital data and records?
- ✓ NBC Established a Disaster Recovery Plan
  - ✓ NBC Built a Disaster Relief Area at another facility with:
    - ✓ Back-up Computer System
      - Receives back-up data every 15 minutes from main computer system;
      - Ensures no loss of data or records, ability to issue bills, etc.
    - ✓ Area to set up for customer service staff to collect payments



# Additional NBC Activities

- ✓ Participating in RI DEM Project to Assess Climate Change Vulnerability at all state WWTFs
- ✓ Conduct an Engineering Analysis of NBC Infrastructure when new flood and inundation criteria are developed.
- ✓ RFQ/P to be issued this fall to identify off-site Virtual Net Metering Solar Energy Projects
  - ✓ Final Step for NBC to Become Net Zero and Carbon Neutral!!!
- ✓ Continue to participate in all RI state Climate Change Activities.





# Rhode Island Climate Change Efforts

## ✓ Executive Climate Change Coordinating Counsel (EC4)

- Coordination of RI Climate Change Activities by all Executive State Agencies: DEM, CRMC, DoA, EMA, OER, CommerceRI, DOT
- Goal to coordinate activities to reduce emissions, strengthen the resilience of communities, and prepare for the effects of climate change

## ✓ Many State Resources include:

- STORMTOOLS – Developed for RI CRMC
  - ✓ SLR & Inundation On-Line Mapping Tool
- Ocean Special Area Management Plan (SAMP)
  - ✓ Project facilitated speedy permitting of 1<sup>st</sup> US Offshore Windfarm
- Beach SAMP
  - ✓ RI Shoreline Change Special Area Management Plan
- DEM Statewide Vulnerability Assessments of all Water & Wastewater Plants

RIEC<sup>4</sup>





# Some Final Thoughts

## *Utility's of the Future will Proactively:*

- ✓ Determine and Reduce their Carbon Footprint
- ✓ Evaluate Alternative Energy & Energy Efficiency
- ✓ Assess and Address their Vulnerabilities
- ✓ Plan, Prepare & Protect!!!



*Deepwater Wind's Block Island Turbines America's First Off-Shore Wind Farm*

## *But, we have many unanswered questions?*

- ✓ What is the 100 Year Storm today?
- ✓ What Design Criteria should we build to?
  - ✓ 100 year storm?
  - ✓ 100 year storm + 1 - 2 Feet?
  - ✓ 500 year storm?
- ✓ Work with Federal & State Partners to get answers sooner rather than later.

*Addressing Climate Change will be Expensive, but not addressing it will be More Expensive!*

# Questions?

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