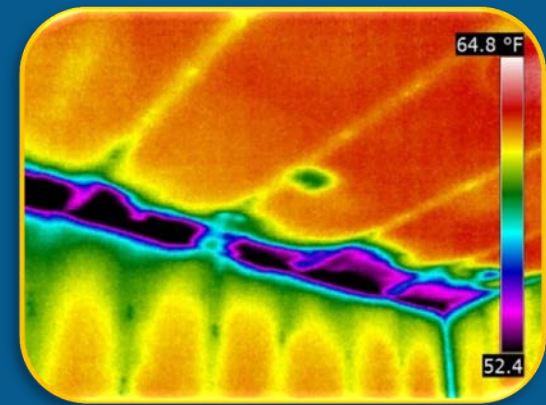


Feasibility Studies – RE and DG at State Facilities



Presentation to the NH PUC Energy Efficiency & Sustainable Energy (EESSE) Board

June 8, 2012



Tighe & Bond
Acadia Engineers & Constructors
Borrego Solar Systems

Project Goals



- **Evaluate all state-owned sites and facilities**
- **Identify 3 to 10 projects**
 - Collectively reduce fossil fuel use by:
 - » 100,000 MMBTU; **or**
 - » Approximately 10% of current use
- **Combination of energy efficiency and renewable energy development**
 - Rooftop Solar PV
 - Wind
 - Hydroelectric
 - Solar Thermal
 - Geothermal
 - Ground Mount Solar PV
 - Tidal
 - Biomass Thermal
 - Large Scale Biomass
 - Energy Efficiency Measures

Overview of Methodology



■ Tier 1

- Reviewed GIS and energy use data
- Identified facilities with high energy use and lands with significant natural resources

■ Tier 2

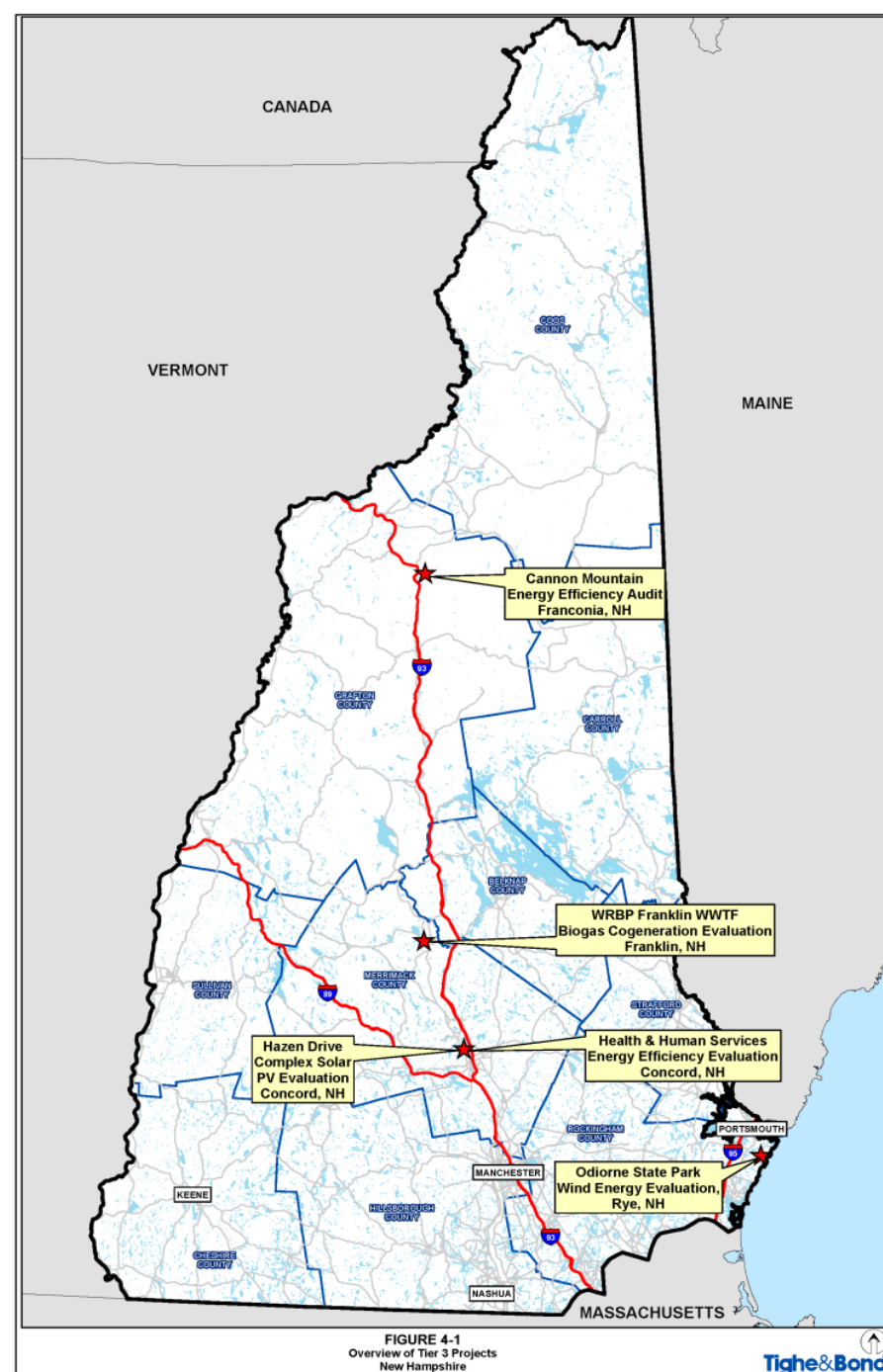
- List of potential projects developed based on results of Tier 1 analysis and criteria specific to energy efficiency measures and each renewable energy technology
- Ranking spreadsheet to score/rank potential projects completed based on quantitative and qualitative factors

■ Tier 3

- Selected projects for comprehensive evaluations based on Tier 2 evaluations and feedback from NH OEP and other state agencies

Tier 3 Projects

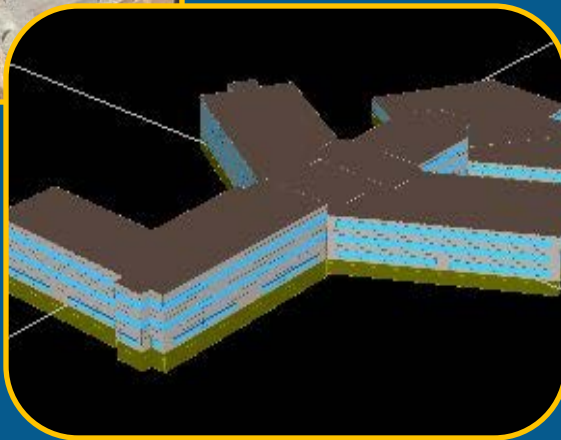
- **Health and Human Services**
 - Energy Efficiency Evaluation
- **Cannon Mountain Ski Area**
 - Energy Efficiency Evaluation
- **Hazen Drive Complex**
 - Rooftop Solar PV
- **WRBP Franklin WWTP**
 - Biogas Cogeneration
- **Odiorne State Park/Other State Facilities**
 - Wind Turbine Generation



Energy Efficiency Audit at Health and Human Services Building



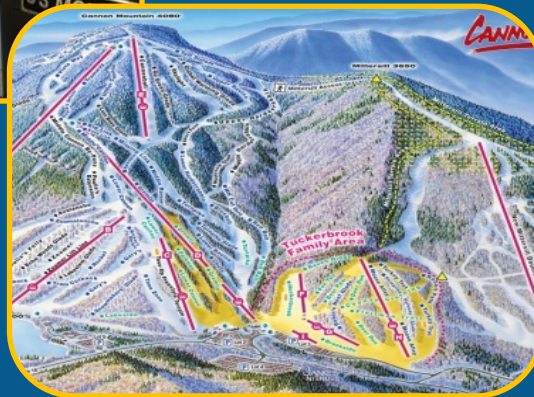
- **Agency:** NH DAS
- **Technically Feasible?** Yes
- **Economically Feasible?** Yes
- **Recommended for Implementation?** Yes
- **HVAC equipment** – intensive and frequent schedules
- **Lab spaces** continuously ventilated at high rates, even unoccupied
- **High heating set points** throughout building
- **Ambient CO₂ levels** indicate intensive mechanical air exchange
- **HVAC control system** difficult to control/schedule
- **Persistent roof leaks**
- **Wide variety of EEMs** are recommended based on cost and effort required to implement



Energy Efficiency Audit at Cannon Mountain



- Agency: NH DRED
- Technically Feasible? Yes
- Economically Feasible? Yes
- Recommended for Implementation? Yes



- Large and aging distribution system
- Energy intensive ski lifts & snow making equipment
- Energy intensive electrical heaters
- No incentive for food service contractor to reduce high energy consumption
- Mechanical systems exceeded expected service life
- Wide variety of EEMs recommended based on cost and effort required to implement

Solar PV at Hazen Drive

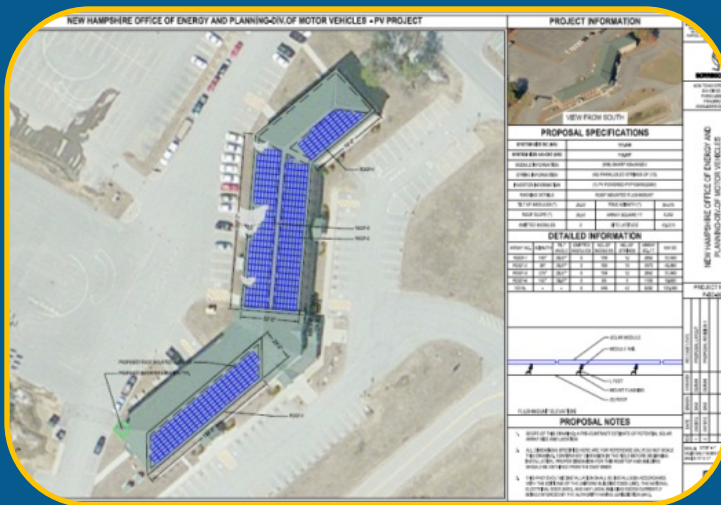


- **Agency:** NH DAS
- **Technically Feasible?** Yes, structural deficiencies may be limiting factors
- **Economically Feasible?** No*
- **Recommended for Implementation?** No*

- **Evaluation of 6 sites; narrowed down to 3**
- **System size driven by utility and NH PUC interconnection standards and incentive program system size limit of 100 kW**

- Health & Human Services: 121.7 kW
- Division of Motor Vehicles: 127.9 kW
- Morton Building: 131 kW

- **Not economically feasible**
 - System cost and kWh production within industry norms for economic viability
 - Inability of state to monetize federal tax credit pivotal
 - Value of revenue streams (avoided cost of kWh, available incentives, SREC's) inadequate



Biogas Cogeneration at Franklin Wastewater Treatment Plant



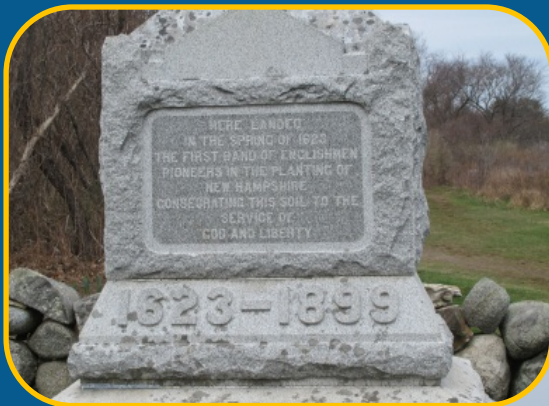
- **Agency:** NH DES/ WRBP
- **Technically Feasible?** Yes
- **Economically Feasible?** Yes, moderate returns
- **Recommended for Implementation?** Yes, with further study

- Currently biogas produced during anaerobic digestion used to heat digesters and flared in summer
- Opportunity to use biogas to generate electricity and recover heat to serve existing heating load while reducing amount of biogas that is flared
- Evaluated 250 kW cogeneration system
- Offset electricity use and satisfy majority of heating load
- Approximately 6 year payback period if owned by DES
- Some issues require follow-up study



Wind at Odiorne State Park

- **Agency:** NH DRED
- **Technically Feasible?** Yes*
- **Economically Feasible?** No
- **Recommended for Implementation?** No*
- **Evaluation chose 15 sites**
 - Temple Mountain
 - Odiorne State Park
- **Community-scale turbine sized to meet Science Center's load**
- **Complicated site permitting**
- **Unfavorable economics**
 - High cost of project per kWh generated
 - Low cost of electricity
 - Unfavorable incentives
- **Other sites identified in Tier 2 have potential for wind turbine development**
- **Wind in NH likely to be economically feasible at larger scale**
 - Cost of project per kWh generated decreases with project size



Summary of All Tier 3 Projects



Project Site	Who Conducted Study	Type of Technology	Technically Feasible?	Economically Feasible?	State Investment (State-Owned) ^{1,2}	Average Annual Savings to the State ^{1,3} (State-Owned)	Payback Period ^{1,3,4} (State-Owned)	State Investment (Privately-Owned)	Average Annual Savings to the State (Privately-Owned)
Health & Human Services	Acadia Engineers & Constructors	Energy Efficiency Measures	Yes	Yes	Tier 1: \$88,770 Tier 2: \$256,500 Tier 3: \$1,132,490	Tier 1: \$52,350 Tier 2: \$129,100 Tier 3: \$255,460	Tier 1: 4 years (avg) Tier 2: 5 years (avg) Tier 3: 7 years (avg)	N/A	N/A
Cannon Mountain	Acadia Engineers & Constructors	Energy Efficiency Measures	Yes	Yes	Tier 1: \$30,990 Tier 2: \$294,950 Tier 3: \$1,638,000	Tier 1: \$22,070 Tier 2: \$20,600 Tier 3: \$194,200	Tier 1: 2 years (avg) Tier 2: 7 years (avg) Tier 3: 13 years (avg)	N/A	N/A
Hazen Drive	Borrego Solar Systems	Rooftop Solar PV	Yes	No	H&HS: \$383,119 DMV: \$386,797 Morton: \$397,286	H&HS: \$18,970 DMV: \$19,520 Morton: \$18,930	H&HS: 23 years DMV: 23 years Morton: 24 years	\$0.00	Not Feasible
Franklin WWTP	Tighe & Bond	Biogas Cogeneration	Yes	Yes	\$462,700	\$65,600	3 years	\$0.00	\$11,000
Odiorne State Park	Tighe & Bond	50 kW Wind Turbine	Yes	No	\$330,000	(\$10,450)	> 20 years	\$0.00	Not Feasible

¹ Developed based on a simple cash flow for EEMs and based on a discounted cash flow life-cycle analysis for renewable energy projects; averaged over project life

² Before financing

³ After financing for Franklin WWTP and Odiorne State Park

⁴ (avg) indicates average for multiple EEMs with payback periods varying from 0 to 15

Note: Data above taken from DRAFT report, subject to change prior to Final Report.

General Findings on New Hampshire Energy Market



- **Implementation of energy efficiency measures is a significant opportunity, supported by ability to enter a performance contract**
- **State has abundant supply of renewable energy resources on state-owned land**
- **Opportunities for public-private ownership development models (PPA, EPC, leases) exist**
 - Renewable energy market must be attractive to private developers
- **Current NH renewable energy market conditions are not favorable for private developers**

Renewable Portfolio Standards (RPS)



- **NH Utility investment in renewable energy is leaving the state**
- **RPS requirements need to be competitive to other states in ISO-NE region**
 - NH has lower RPS requirement as a percentage of Utilities' peak load, lower alternative compliance payments
 - NH does not have protocol for REC sales or procurement
 - » Long-term contracts for purchase of RECs
 - » Floor price for REC market
 - Third-party generation reporting requirement induces additional cost to small projects
 - Perception of unsupported/insecure market with potential regulatory changes

Net Metering



- **Net Metering policy results in project size dictated by on-site electricity load at single account**
 - Other states allow excess generation to be allocated to offset consumption on other accounts
 - Interconnection location limited to the meter with the most load
- **State currently developing “group net metering” policy which will likely address this**

Summary



- **NH has significant opportunities to implement energy efficiency measures at State facilities**
- **NH needs to better align its incentives in order to achieve RPS goals**
- **State needs to increase attractiveness of developing renewable projects in NH over other states to keep utility investment local**
- **Large wind, biomass and/or solar projects are most feasible way to achieve State's aggressive energy reduction goals**

Comments/Questions?



177 Corporate Drive
Portsmouth, NH 03801-6825
603.433.8818
www.tighebond.com



90 Main Street
Newmarket, NH 03857
603.200.0096
www.aecon.com



BORREGO SOLAR

1115 Westford Street,
2nd Floor
Lowell, MA 01851
888.898.6273
www.borregosolar.com