



### MBTA's Energy Management Program

AEENE Energy Outlook Forum

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#### Background: Service

- MBTA Public Transportation:
  - 5<sup>th</sup> Largest Transit System in the Country
  - Serves 175 cities and towns
  - 1.4 Million trips per day
  - 400 million trips per year
  - 1.85 billion passenger miles per year





### Background: Assets



Over 2,000 revenue vehicles



478 bridges



275 stations



20 miles of tunnels



1,193 miles of track



27 maintenance shops



#### Background: Vehicles

- MBTA Revenue Vehicle Fleet:
  - Subway 647
  - Bus & Trackless Trolley 991
    - CNG 358
    - Hybrid Electric 60
  - Commuter Rail 503
  - The RIDE 517
  - Ferry 2





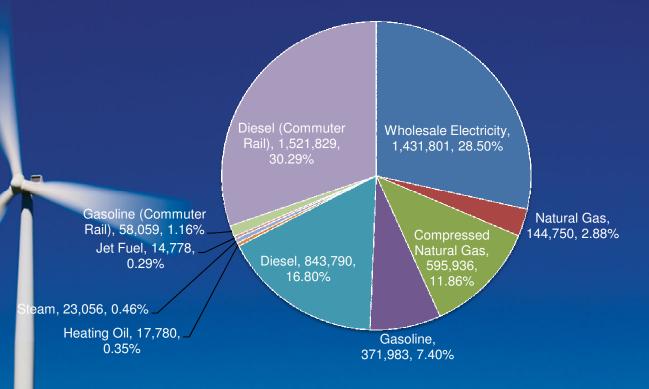
### MBTA's Energy Profile

- Over 453,000,000 kWh consumed in 2013
  - Equivalent consumption of 42,000 Mass. Homes
- 51 Traction Power Substations
  - 50 Unit Substations
- 3 Million Feet of Cable
- Over 600 electrical, natural gas, steam and water/sewer accounts under management



### MBTA's Energy Profile

2013 MBTA Energy Use Measured In MMBTU



	Consumption	% Total	Cost (\$)	% Total	Cost per kWh
	(kWh)	Consumption		Cost	(\$/kWh)
Retail Electricity 2013	16,708,695	4%	2,311,336	6%	0.1383
Wholesale Electricity 2013	436,682,941	96%	38,274,876	94%	0.0876
Totals	453,391,636		40,586,212		



# MBTA's Energy Management Strategy:

- Efficiency Use Energy More Effectively
- Conservation Use Less Energy
- Sustainability Produce Clean Energy
- Accountability Distribute the Responsibility of Energy Management











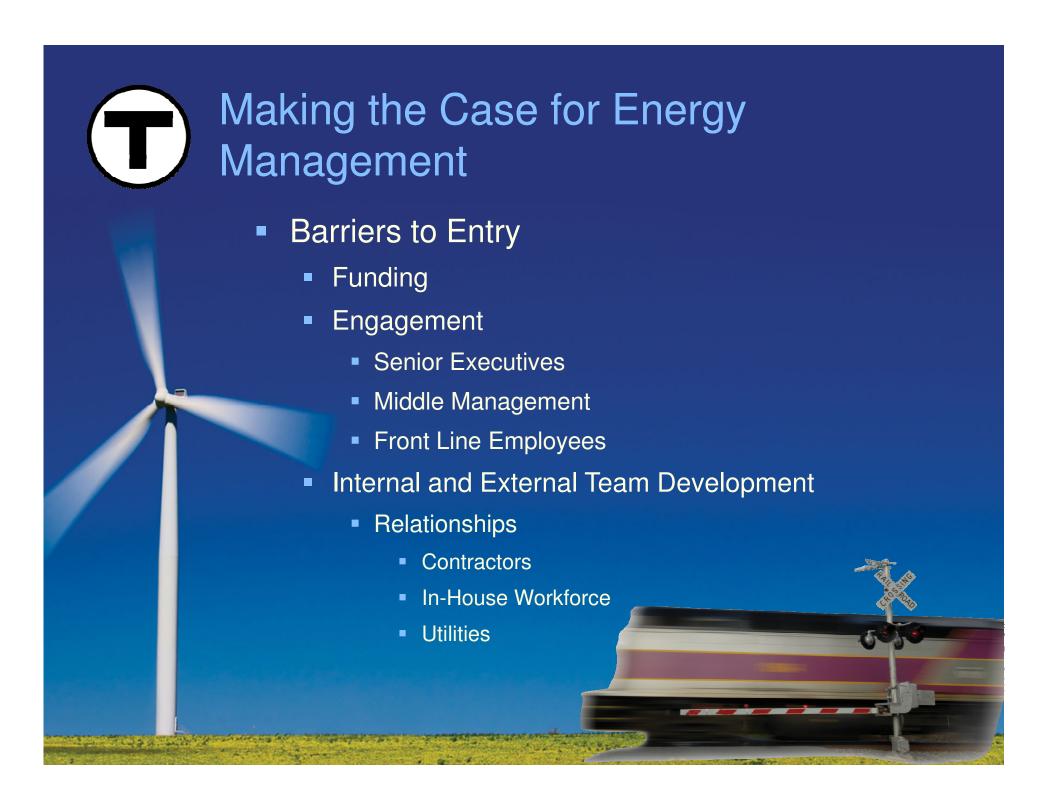
#### **Energy Management Benefits**

Successful Energy Management...

 Functions as a hedge against volatile short and long-term energy costs



- Stabilizes the MBTA's Operating budget and future budget planning
- Demonstrates optimal use of public funding
- Reduces MBTA's environmental impact





### History of Energy Efficiency at the MBTA

- Five (5) pilot locations completed in 2010
- Sixty-one (61) projects completed to date
- Six (6) projects expected to be complete 1/31/15
- Project Targets:
  - Stations
  - Maintenance Buildings
  - Tunnels
  - Rights of Way
  - Traction Power Equipment
  - Revenue Vehicles

- ECMs:
  - Lighting
  - Heating
  - Steam
  - Process Systems
  - Oil to Gas Conversions



#### Energy Management Program - Environmental Savings

Total Energy Saved to Date\*:

25.3M kWh

Total Power Saved:

2,120 kW

**Total GHG Savings:** 

21.1M lbs

Carbon Dioxide CO2

20.9M lbs

Methane CH<sub>4</sub>

48.7K lbs\*

Nitrous Oxide N2O

114.6K lbs\*

\*CH4 and N2O Converted to CO2 Equivalents

\*From 2010 to present





# Energy Management Program - Cost Savings

Total Project Cost To Date

\$4.43M

Utility Contribution:

48%

MBTA Contribution:

31% (\$1.4M)

DOER/ARRA Contribution:

21%

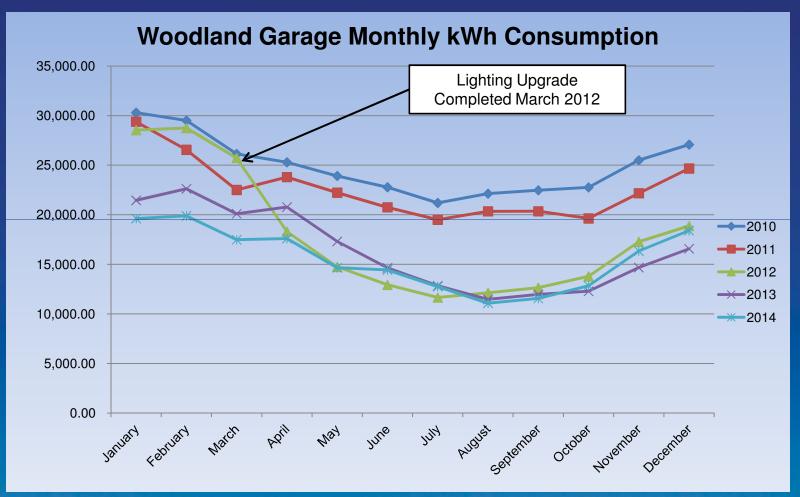
Total Project Cost Avoided: \$3.01M

Average Payback Period: < 1 Year</p>

Total Cost Saved Annually: \$1.44M



#### Energy Use Profile – Woodland Garage



38% Decrease in 2014 from 2010 and \$25,607.73 saved to date!



### Before and After: Dudley Square Station











After





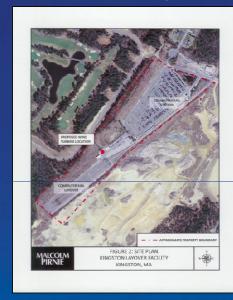
# Energy Management Program – Renewable Energy

- REC Purchases
  - 20% of MBTA Wholesale Load (85,000 MWh) is from Renewable Energy Sources
- Wind
  - Kingston January 2012
  - Bridgewater July 2015
- Solar
  - Wonderland Garage May 2015
  - Readville 5 Yard June 2015
- NPV of estimated lifetime savings from the four projects: \$2,350,000



### Energy Management Program - Wind

Kingston, MA 100kW







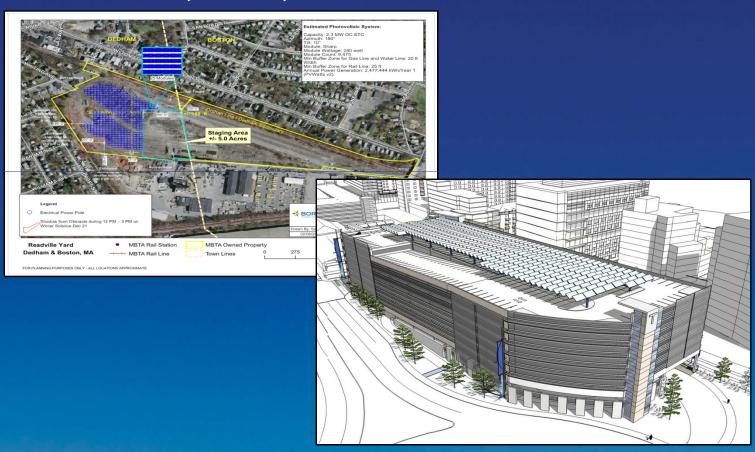


Bridgewater, MA 750kW



### Energy Management Program - Solar

#### Readville Yard, Dedham, MA 2.3MW



Wonderland Garage, Revere, MA 200kW



### Energy Management Program - EVCS

MBTA Operates and Maintains 32
 Level II Electric Vehicle Charging
 Stations (EVCS) at 8 locations



 Have achieved GHG savings of 37,919 lbs since December 2012







# Energy Management – Standards for Design and Construction

- Incorporate Energy/Sustainability Review at 10% Design
- Liaise with utilities and MBTA project managers to ensure all available incentives are utilized
- Working to make projects compliant with applicable codes and standards:
  - LEED, ASHRAE, EnergyStar, ISO 14001, ISO 50001, GreenDot, etc.

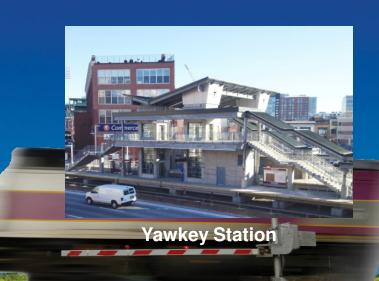


# Energy Management – Project Highlights

- Recent Project Completions
  - Orient Heights Station
    - Solar
    - Energy Efficient Lights, HVAC
    - Green Roof
  - Yawkey Station
    - First Net-Zero Station
  - Beverly Garage
    - Solar
    - Level I Charging Stations



**Orient Heights Station** 





# Energy Management – Project Highlights

- 3<sup>rd</sup> Rail and Track Switch Heaters
  - Require heat in Winter months to prevent snow & ice build up



- Efficient Heaters
  - 4,000W per element from 8,000W (50% Reduction)
  - Projected Annual Savings: 6,000,000 kWh
- Heater Control
  - Reduce run time from 24hrs/180 days to on demand remote control (estimate 60% reduction)
  - Projected Annual Savings: 19,000,000 kWh
- Total Projected Annual Savings: 25,000,000 kWh!



#### Recent Recognition

 May 2014 – AEENE, "Best Public Facilities Energy Project



August 2014 – APTA
 Sustainability Commitment
 Gold Rating



 October 2014 – Leading By Example Award for Public Agencies







# Energy Management Program – Looking Ahead

- Further diversify energy efficiency measures
- Implement Enterprise Energy Management System
  - Building > Sub-Panel > End-Use > Circuit
- Communicate
  - Internal senior, middle and frontline employees
  - External customers, local gov't, non-profits, private industry
- Innovate
  - Review and promote new solutions to old problems

