



**Massachusetts Bay  
Transportation Authority**

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# **Energy Management Program Review**

**FMCB Meeting Presentation  
June 10, 2019**



## MBTA Energy Portfolio

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The MBTA is the largest single consumer of electricity in the Commonwealth.

- 435 million kWh of electricity in FY18
  - › 74.4MW of Peak Demand/59MW of Coincident Peak Demand
- In FY18, the MBTA spent \$42.2 million in electricity costs.

Total utility cost for FY18 was \$49.4 million.

- › Heating oil, natural gas, and steam to heat buildings
- › Water consumption at all buildings and facilities

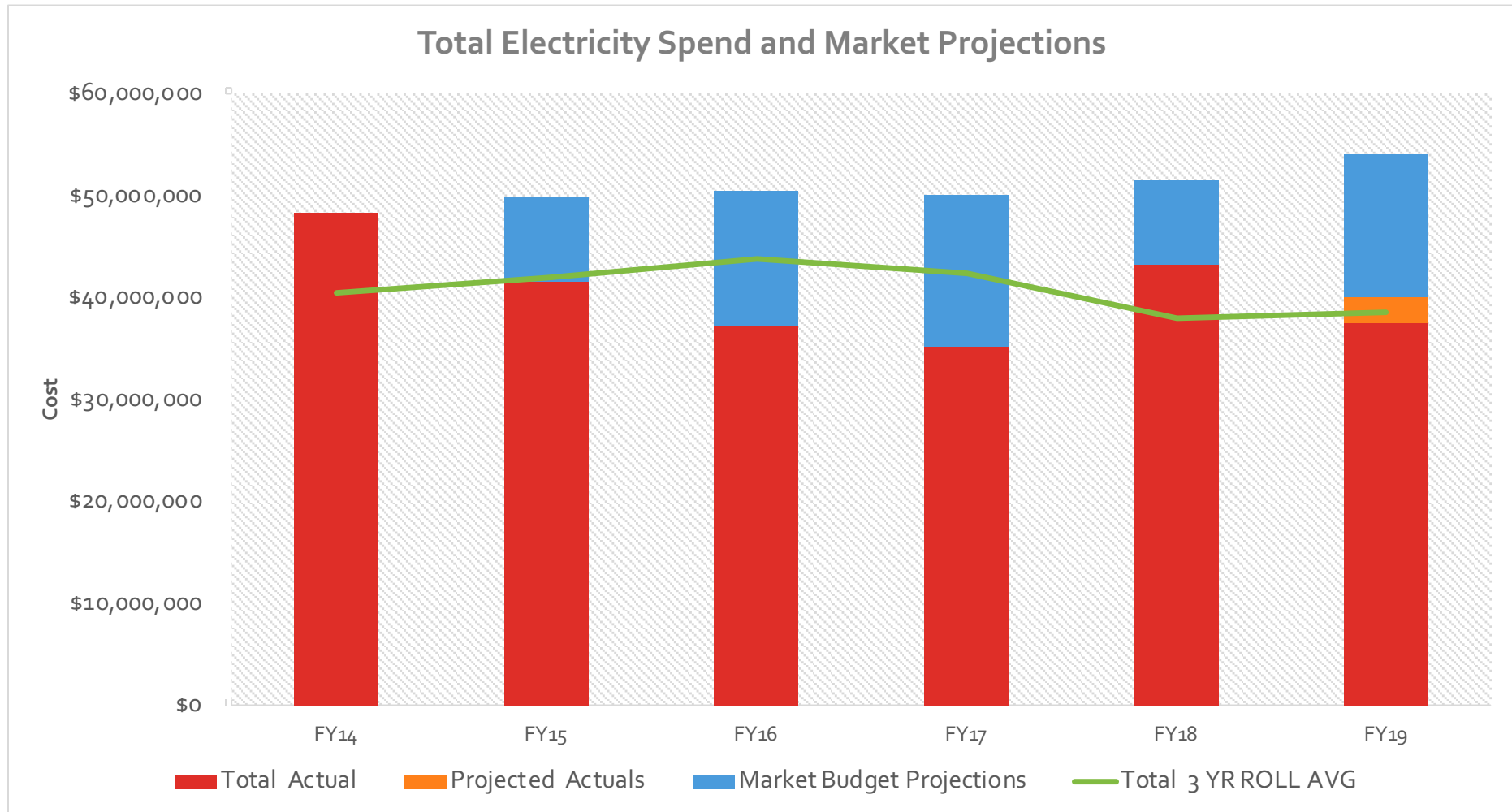
Additionally, the MBTA consumed:

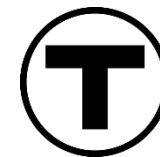
- › 20 million gallons of diesel (buses, commuter rail, and ferries)
- › 2.1 million therms of natural gas (for CNG buses)
- › 2.3 million gallons of gasoline for non-revenue vehicles

## Annual Energy Costs for FY18: \$87.2 million

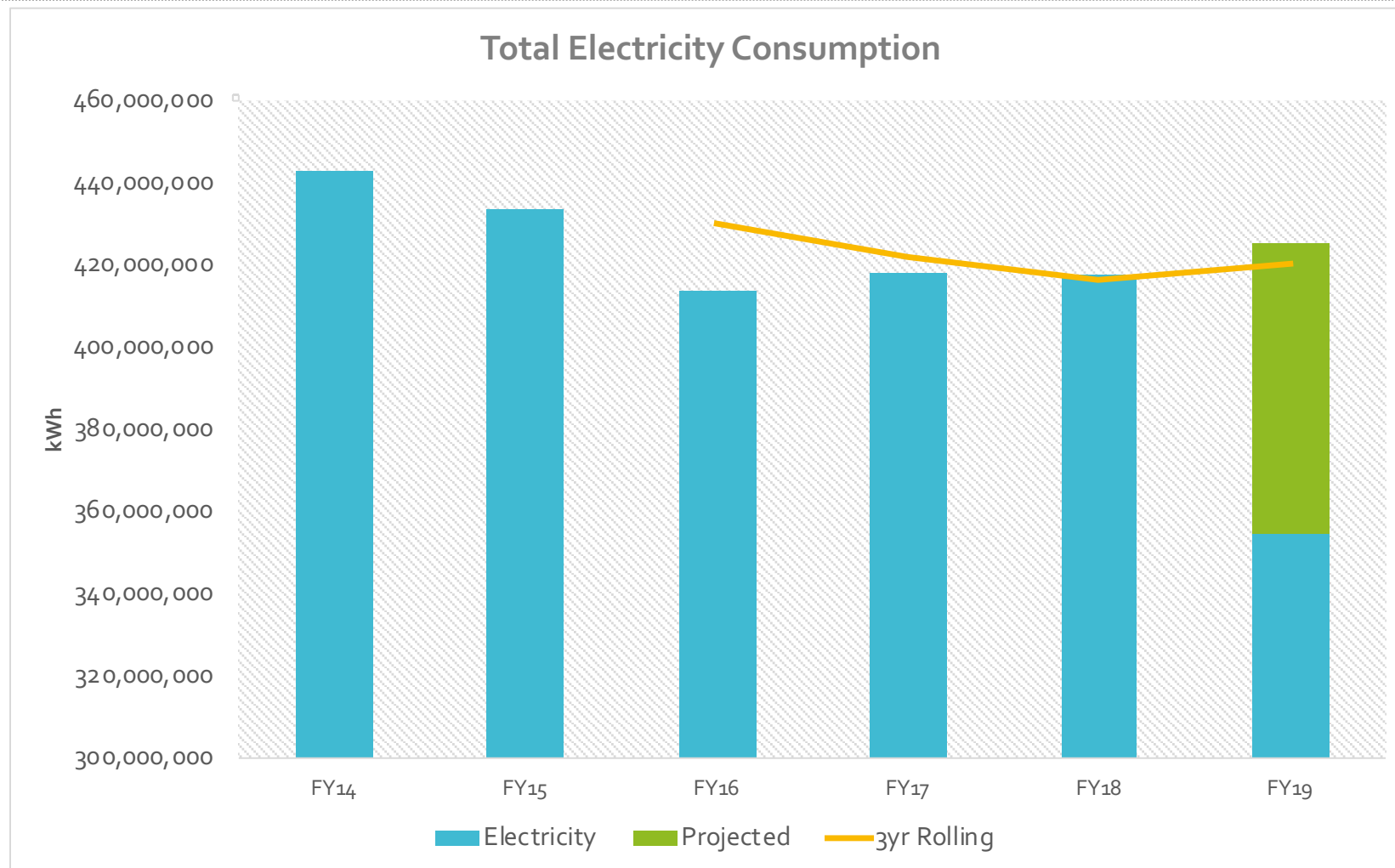


## Total Electricity Spend and Market Projections (FY14–FY19)





## Electricity Consumption in kWh (FY14–FY19)





## Energy Conservation Program to Date

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Over the past few years, the MBTA has implemented over 90 Energy Efficiency projects, including:

- Station lighting
- Facility lighting
- Boilers and HVAC systems
- Equipment (pumps, motors, drives, compressed air, etc.)

Resulted in significant financial and environmental benefits:

- 75 million kWh saved (in the aggregate)
- \$6.1 million utility savings over the same period

The MBTA's unique status as an electricity consumer limited the scope of energy efficiency projects.

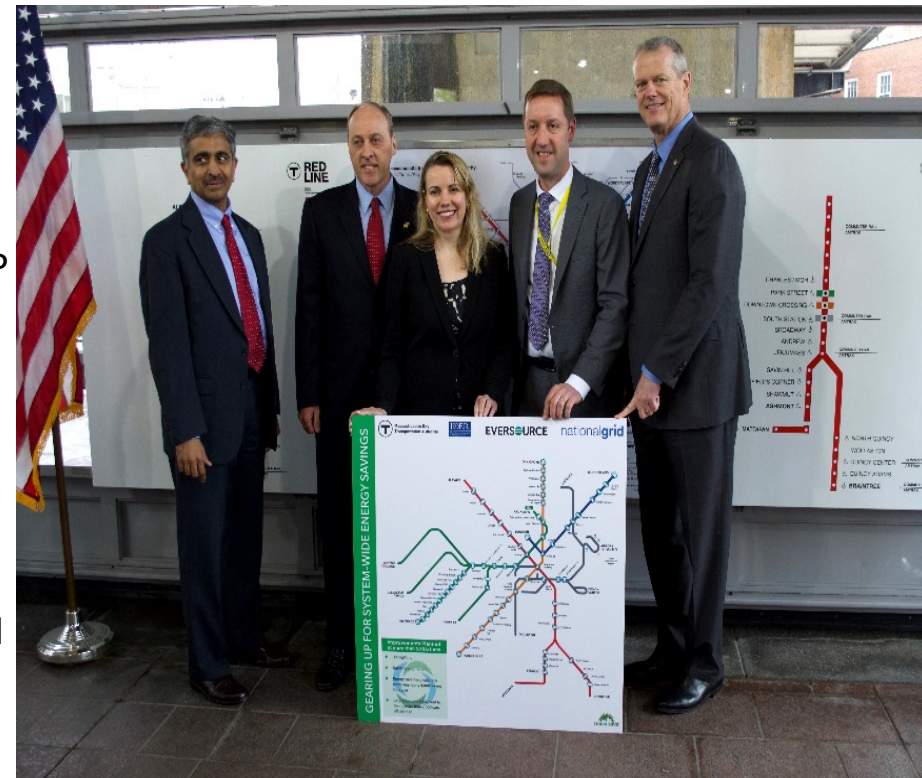


## New Opportunities for Energy Conservation

Partnered with local utilities and Department of Energy Resources

### Three Year (FY20–FY22) Program

- \$28 million in Capital Investments for energy upgrades at 85 locations:
  - \$10 million in MBTA funds currently in CIP
  - \$3.5 million in grant from Department of Energy Resources
  - \$8.1 million in energy incentives from local utilities
  - Remaining funding to be part of future CIPs
- Upon completion of the projects, the MBTA will realize:
  - Over \$4.3 million in reduced electricity costs
  - Over 30 million kWh electricity saved
  - Over 23,000 tons of greenhouse gases avoided





## Example Project: Everett Rail Facility

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Will upgrade 400 light fixtures:

- Previously had 400W Metal Halide fixtures (circa 2000)
- Upgraded to 125W LED fixtures

Total project cost of \$270,000:

- \$225,000 in utility incentives from Eversource
- \$45,000 in MBTA costs

Total annual savings:

- Net annual electricity savings of \$67,000/year
- 8 month payback of the MBTA's investment

Total annual environmental benefits:

- 902,000 kWh of electricity saved
- 1.4 million lbs. of greenhouse gases avoided



## Example Project: Third Rail and Switch Heater Control Project

Energy efficiency upgrades to the track and switch heater systems to dramatically curb energy usage.

Total project cost of \$10.5 million:

- \$9 million in utility incentives from Eversource and NGrid
- \$1.5 million in MBTA capital costs

Total annual savings:

- Anticipated net annual electricity savings of \$2.56 million/year
- 7 month payback of the MBTA's investment

Total annual environmental benefits:

- 31 million kWh of electricity saved
- 48.3 million lbs. of greenhouse gases avoided





## Renewable and Alternative Energy

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### Wind Energy

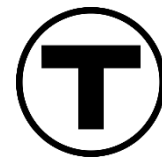
- Two wind turbines in operation:
  - › 100kW Kingston Turbine
  - › 750kW Bridgewater Turbine
- Total annual output of >1.5M kWh
- Avoided electricity costs of \$150,000 annually

### Solar

- Developing solar canopy lease with True Green Capital
- Agreement to build nearly 32MW of solar-generating capacity at 37 locations
- Solar canopies at MBTA surface lots and structured parking
- Has the potential to earn over \$42 million in revenue over the life of the project

### Geothermal

- Hingham Intermodal Facility has Geothermal Heat Exchange System
- System utilizes the moderate temperature of the ground underneath the building to heat and cool the facility



## Energy Focus on Capital Asset Management and Development

Incorporating sustainable and energy-focused elements into Capital Projects and Asset Management

### Capital Delivery

- New standards for lighting
- Building control and energy management systems
- High-efficiency systems

### Asset Management

- Focus on procurement of most efficient asset upgrades:
  - Compressors
  - HVAC Systems





## New MBTA Vehicles

Improvements to the bus fleet designed to reduce the consumption of diesel fuels:

- Expansion of the hybrid fleet
- Transition of all electric/battery powered vehicles into the bus fleet
  - New electric buses going into service shortly (the “No/Low Buses”)
  - New electric bus for the Silver Line/Waterfront
  - Facility improvement plan will focus on implementing the infrastructure to accommodate BEB (charging stations, sufficient power, etc.)

New Orange and Red Line vehicles more efficient and focused on energy management:

- Traction power motors significantly more efficient than the existing/outdated motors
- New vehicles have internalized regenerative braking capacity (up to 40%)





## Innovative and Emerging Technologies for Energy Management

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### **Regenerative Breaking:**

- Woojin Project at Airport Station
- Helix Power – Flywheel technology
- Viridity – Battery Storage

### **Internet of Things Opportunities:**

- Lighting Controls
- Automated Building Controls
- Third Rail Heater Weather Station
- Data Monitoring for Energy Consumption