



**Massachusetts Bay
Transportation Authority**

Energy Management Program Review

**FMCB Meeting Presentation
June 10, 2019**



MBTA Energy Portfolio

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

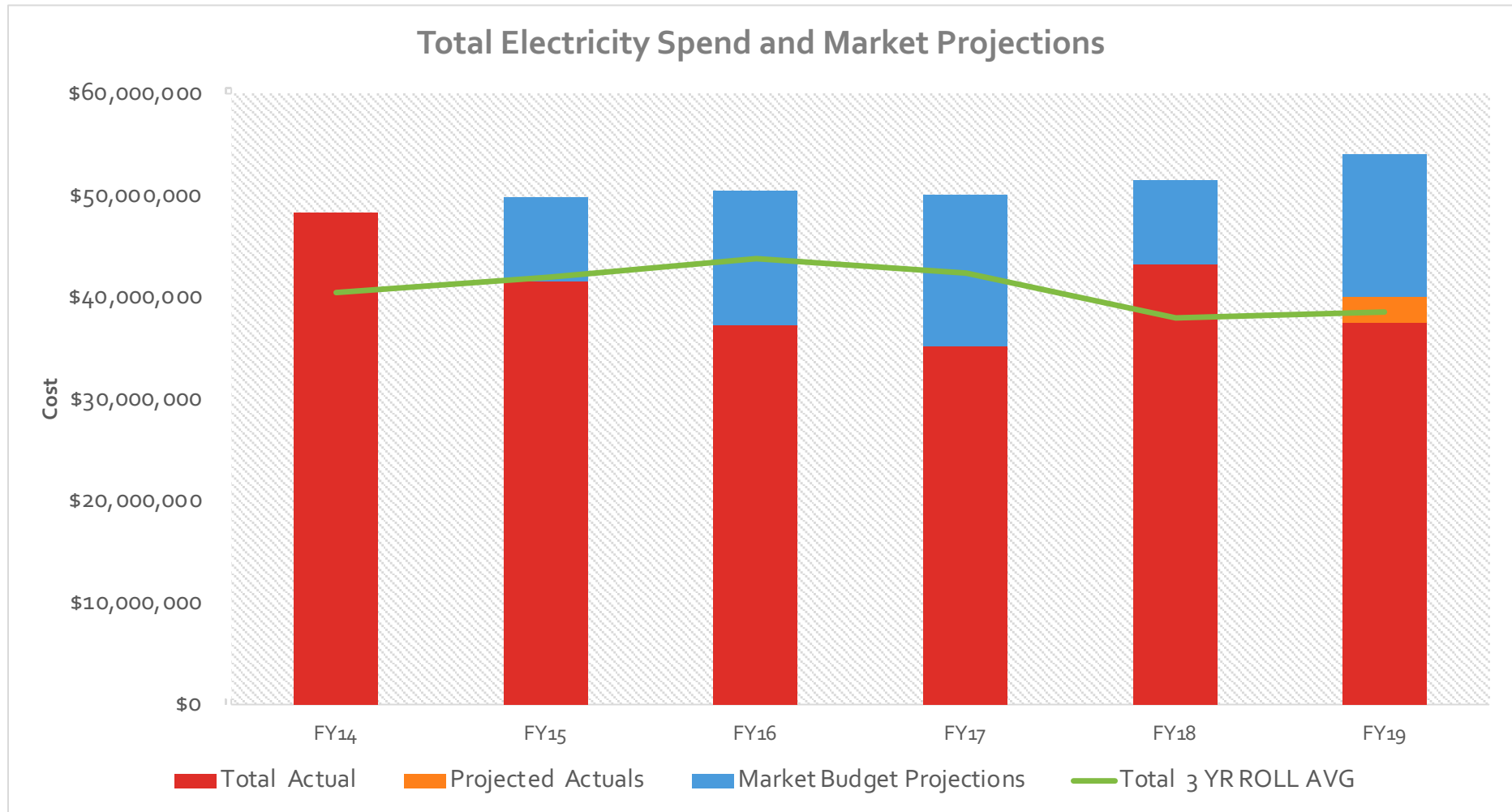
Additionally, the MBTA consumed:

- › 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

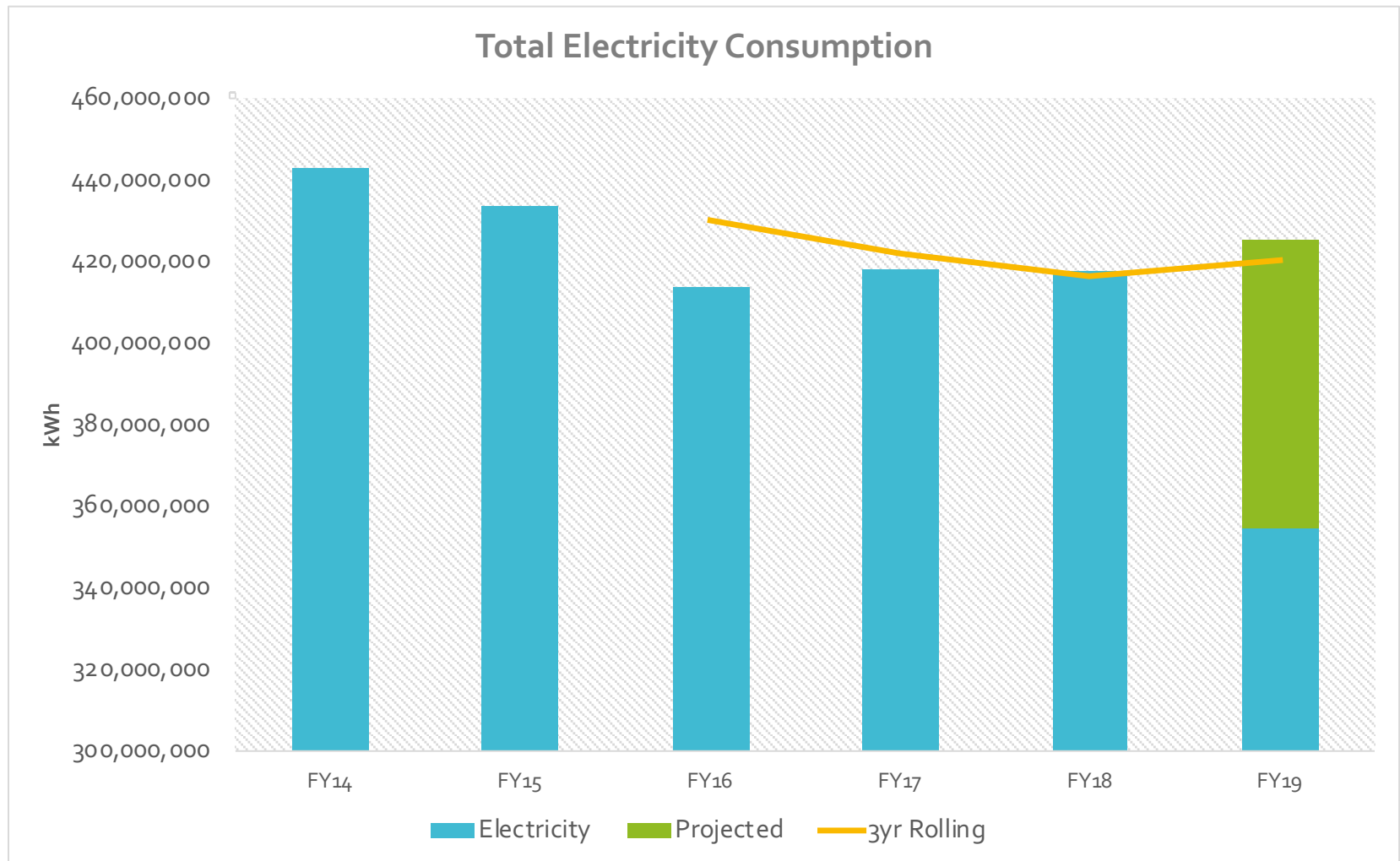


Total Electricity Spend and Market Projections (FY14–FY19)





Electricity Consumption in kWh (FY14–FY19)





Energy Conservation Program to Date

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.

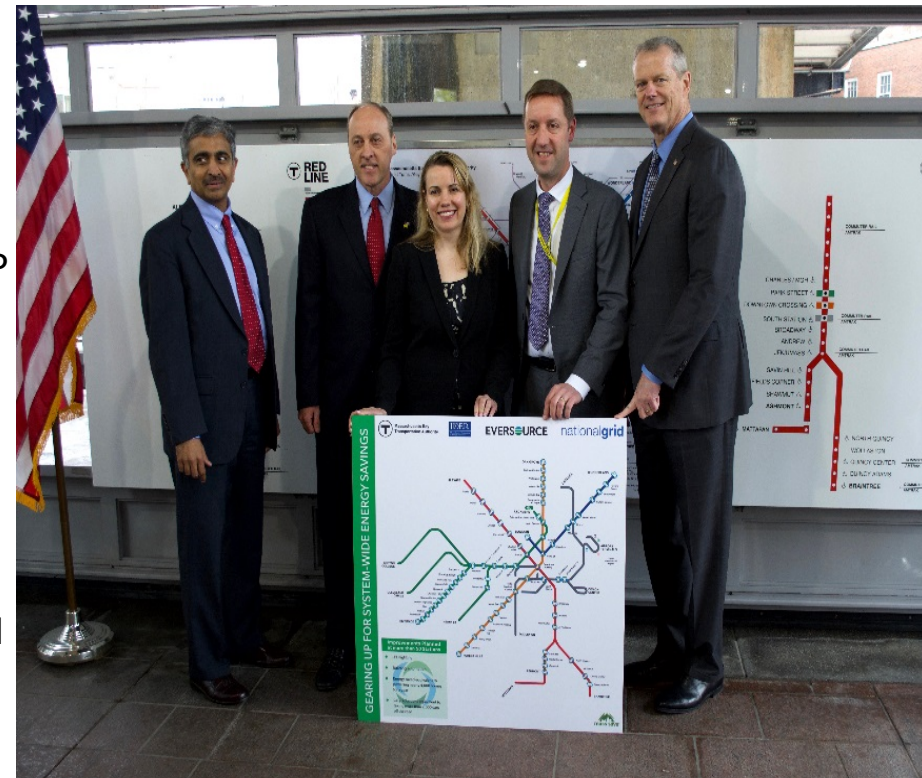


New Opportunities for Energy Conservation

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

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

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

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