MBTA
State of the Service:
Orange Line Heavy Rail
June 6th, 2016
Key Facts: Orange Line

- Carries 17% of the system wide ridership with over 211,933 (FY15) average weekday trips
- Direct connections to:
  - 125 bus routes
  - All other subway lines & Silver Line
- Over 2,700 vehicle and 900 bike parking spaces
- 120 vehicles - 96 for peak service
Key Issues: Orange Line

• Fleet Programs
• Infrastructure Condition and Age
• Service Management
• Moving Forward
Build Dates: Orange Line

Assembly opened in 2014—the first new station since 1987
Assets Overview: Orange Line

- 12 ventilation shafts
- 24 ventilation fans
- 146 signals
- 23 directional miles of track & 3rd rail
- 45 miles power cable
- 62,832 tons ballast, 39,500 rail ties
- 362 track circuits
- 106 power switches
- 20 stations
- 7 miles of tunnel section
- Fleet Facilities located in Wellington
Recent Investments: Orange Line

Oak Grove Station Platform resurfacing

Winter resiliency upgrading the 3rd rail heaters and controls

Assembly Station

Malden culvert collapse
Fleet: Orange Line

- In 1979-1980, 120 vehicles went into service.
  - Design life reached in 2004-2005

- Historically 102 peak hour vehicles were used to provide approx. 5 minute headways

- In 2011, reduction to 96 peak hour vehicles for maintenance led to loss of frequency

- Growing ridership, and lengthened scheduled travel times have further reduced frequency—now at 6 minutes in peak periods
Fleet: Orange Line

• Funded maintenance programs need to be protected to ensure current peak hour vehicle levels and frequencies are maintained

• Service, Maintenance, and Reliability (SMR) program began in late 2013; still underway
  – Consists of structural work on car bodies, couplers, doors, and trucks
  – Includes all 120 cars in the fleet

• $20 million budget; ~50% spent
Fleet Performance: Orange Line

Orange Line: Mean Miles Between Failures (MMBF)

Goal: 37,000
Fleet: Orange Line

• Procuring 152 new vehicles
  o Will allow service in the peak period to increase from every 6 minutes to every 4-5 minutes (an increase of 30-35%)
  o Delivery of the first pilot cars is expected to begin in 2018, and the full fleet will be available by 2022
Wellington Car House Expansion Project

- Necessary for receipt and operation of new larger fleet
- Fully funded in FY17 CIP
- At 90% design, on schedule
- Addition of a new bay on the east (station side) of facility
- Tooling and shop improvements
Programs: Orange Line

- Ruggles Station
  - New elevator at lower busway and accessible paths
  - Fire alarm upgrade
- Tufts Station
  - Elevator replacements
  - Electrical, mechanical, life safety improvements
- Forest Hills Station
  - New upper busway
  - New station signage and wayfinding
- Downtown Crossing
  - $13m construction of redundant elevators between Orange Line and Red Line northbound platforms
  - Planning under way for up to three additional elevator locations
Future Investment Needs: Orange Line

Power
- Power Distribution duct bank replacements
- Complete Phase 1 Cable Program
  - Replace all cables along central subway (Back Bay to North Station)
- Station Unit Substations – Southwest corridor station power

Transit Facilities
- Station egress (doors, stairs, walkways)
- Elevator upgrades
- Tunnel leaks

Maintenance of Way (Track)
- Southwest Corridor concrete track structure
- Rail fasteners at Tufts Portal
- Tie renewal

Signals
- Southwest Corridor uses obsolete equipment
  - Draft Capital Plan includes funding to make upgrades to entire signal system
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Back Bay: Orange Line

- January 2015 Master Lease Agreement with Boston Properties
- $37m dedicated to station refurbishment
- Boston Properties will manage concourse, cleaning, tenant management
- Development of air rights over the station granted to Boston Properties
- Simultaneous agreement with MassDOT for development of air rights over adjacent property

Project overview:
- 220,000 SF residential tower with 240 units
  - Located on MBTA Property
- 575,000 SF office space with 30,000 SF retail space
  - Located on MassDOT property
- 380,000 SF residential tower with 360 units and 8,500 SF retail space
  - Located on MassDOT property
Assembly Station: Orange Line

Project Overview

- February 2011 Memorandum of Understanding between Federal Realty Trust and the MBTA to construct a new infill station.
  - Cost of the station was shared between developer and MBTA
  - Station opened September 2014

Development Overview

- 500,000+ SF of retail space
- 2,100 residential housing units
- 1.75 million SF of office space
  - Partners Health scheduled to relocate 4,500 jobs to newly constructed HQ open mid 2016
Critical Management Focus

Service management

- Performance
- Crowding
- Capacity
- Dwell times
Customer Survey: Orange Line

How would you rate the MBTA overall?

- Extremely Dissatisfied: 1%
- Very Dissatisfied: 8%
- Somewhat Dissatisfied: 13%
- Neutral: 7%
- Somewhat Satisfied: 42%
- Very Satisfied: 25%
- Extremely Satisfied: 4%

How would you rate this trip overall?

- Extremely Dissatisfied: 2%
- Very Dissatisfied: 5%
- Somewhat Dissatisfied: 13%
- Neutral: 14%
- Somewhat Satisfied: 28%
- Very Satisfied: 34%
- Extremely Satisfied: 5%

The MBTA provides reliable public transportation services.

- 11% Extremely Dissatisfied
- 15% Very Dissatisfied
- 18% Somewhat Dissatisfied
- 11% Neutral
- 16% Somewhat Satisfied
- 26% Very Satisfied
- 1% Extremely Satisfied

Source: April 2016 Customer Opinion Panel (N=89)

Discussion & Policy Purposes Only
Performance: Orange Line

Orange Line Reliability Performance
March 21st - May 23rd, 2016

- Headway adherence
- Percent Waiting Less Than Scheduled Headway
Orange Line Average Weekday Unlinked Trips
As reported to National Transit Database

Discussion & Policy Purposes Only
The dashed line shows policy capacity, assuming 5 trains per half hour, ideal distribution of passengers and even headways.
Drop backs to improve reliability

Driver 2
Starts Inbound trip

Driver 1
Finishes Outbound trip

325 feet
Testing “Wait Here” Markings
Moving Forward: Orange Line

• Sustain existing fleet through 2022

• Complete Wellington shop expansion and related infrastructure

• Accept and integrate new fleet

• Capacity strategy for Orange and Red Line
Appendix
Fleet: Orange Line

Fleet History

- #12 Orange Line (1979)
  - 120 Vehicles

- Service Life
- Replacement
- End of Design Life
# Ridership By Station: Orange Line

## Heavy and Light Rail

<table>
<thead>
<tr>
<th>Station</th>
<th>Station Entries (FY15)</th>
<th>Line</th>
<th>System Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Downtown Crossing</td>
<td>21,875</td>
<td>Orange/Red</td>
<td>3</td>
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<tr>
<td>State Street</td>
<td>16,714</td>
<td>Orange/Blue</td>
<td>5</td>
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<tr>
<td>Back Bay</td>
<td>16,663</td>
<td>Orange</td>
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<tr>
<td>North Station</td>
<td>16,262</td>
<td>Orange/Green</td>
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<td>Forest Hills</td>
<td>14,248</td>
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<tr>
<td>Haymarket</td>
<td>12,904</td>
<td>Orange/Green</td>
<td>11</td>
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<tr>
<td>Malden Center</td>
<td>11,335</td>
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<tr>
<td>Ruggles</td>
<td>10,295</td>
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<td>17</td>
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<tr>
<td>Sullivan Square</td>
<td>9,417</td>
<td>Orange</td>
<td>19</td>
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<tr>
<td>Wellington</td>
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<td>Orange</td>
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<td>Mass. Ave</td>
<td>6,300</td>
<td>Orange</td>
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<td>Oak Grove</td>
<td>6,190</td>
<td>Orange</td>
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<td>Chinatown</td>
<td>6,087</td>
<td>Orange/Silver</td>
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<td>Tufts Medical Center</td>
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<tr>
<td>Community College</td>
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<td>Roxbury Crossing</td>
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<tr>
<td>Assembly</td>
<td>1,864</td>
<td>Orange</td>
<td>58</td>
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Crowding: Orange Line

- **Crowding/frequency:** passenger loads are heavy, and passengers can be left behind due to crowding
  - Fall 2010 peak hour headway was 4-5 minutes
  - In 2011, peak hour headways were stretched to 5-6 minutes due to lack of vehicles
  - In 2015, headways were further stretched to 6 minutes—25% peak capacity reduction

<table>
<thead>
<tr>
<th>Time</th>
<th>Passengers left on platform (approximate)</th>
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<tbody>
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<td>16:34</td>
<td>0</td>
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<td>16:45</td>
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<td>16:50</td>
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<td>0</td>
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<tr>
<td>17:11</td>
<td>17</td>
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<tr>
<td>17:17</td>
<td>3</td>
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<tr>
<td>17:25</td>
<td>34</td>
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<tr>
<td>17:30</td>
<td>8</td>
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<td>17:37</td>
<td>22</td>
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<td>17:44</td>
<td>14</td>
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<tr>
<td>17:52</td>
<td>35</td>
</tr>
<tr>
<td>17:58</td>
<td>2</td>
</tr>
<tr>
<td>18:02</td>
<td>0</td>
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<tr>
<td>18:10</td>
<td>4</td>
</tr>
<tr>
<td>18:22</td>
<td>87</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>350</strong> <strong>people passed by full trains in PM peak</strong></td>
</tr>
</tbody>
</table>

Point checks at State Street in July 2015 showed heavy loads, 350 people passed by full trains in PM peak.