Massachusetts Bay Transportation Authority

Capital Needs Assessment

May 13, 2019

FMCB Presentation

Agenda

1. Background

2. 2019 Capital Needs Assessment – Process

3. 2019 Capital Needs Assessment – Results

4. Alignment with 5-year CIP

5. Alignment with long-term capital plan

Background

Background: Why we've been working on a capital needs assessment

1. New FTA Transit Asset Management requirement for asset inventory and condition ratings

- MBTA-wide effort throughout 2018 produced the most detailed asset inventory collected to-date, with updated approaches for counts and condition rating, per FTA guidance

- Regulatory requirement presented an opportunity to leverage comprehensive asset inventory and condition data for other purposes

2. Powerful decision-support tool for capital planning and investment prioritization

- Connecting asset inventory and condition data with cost estimates provides valuable insights for decision-making

- Initial results of capital needs assessment used to identify needs, adjust investment programs, and prioritize projects
    - e.g. More investment in power infrastructure in FY20-24 CIP

3. Necessary foundation for long-term capital plan called for by Special Panel and FMCB

- *Governor's Special Panel (2015):* "The MBTA should also prepare 5- and 20-year capital plans, laying out a phased program for the complete restoration of the physical assets of the MBTA, a plan to address the failings within the existing capital program, and clear recommendations for funding needs."

- *FMCB Strategic Plan (2017):* "Develop a five and 20-year capital plan that fulfills fleet, facilities, State of Good Repair and capacity needs"

2019 Capital Needs Assessment – Process

Capital Needs Assessment: Process Overview

- New FTA Transit Asset Management Final Rule required agencies to develop and maintain an asset inventory – first reporting due October 2018

- FTA encourages agencies to use this information for investment prioritization, but does not require any cost data or analysis in annual TAM reporting

- Beginning in summer 2018, MBTA initiated an exercise to use the FTA asset inventory data as a starting point to refresh our capital needs to inform short- and long-term planning

- Capital Needs Assessment was executed by:
  1. Identifying assets in need of replacement due to documented age or condition,
  2. Assigning a cost estimate to those in need of replacement, and
  3. Aggregating those costs by asset category.
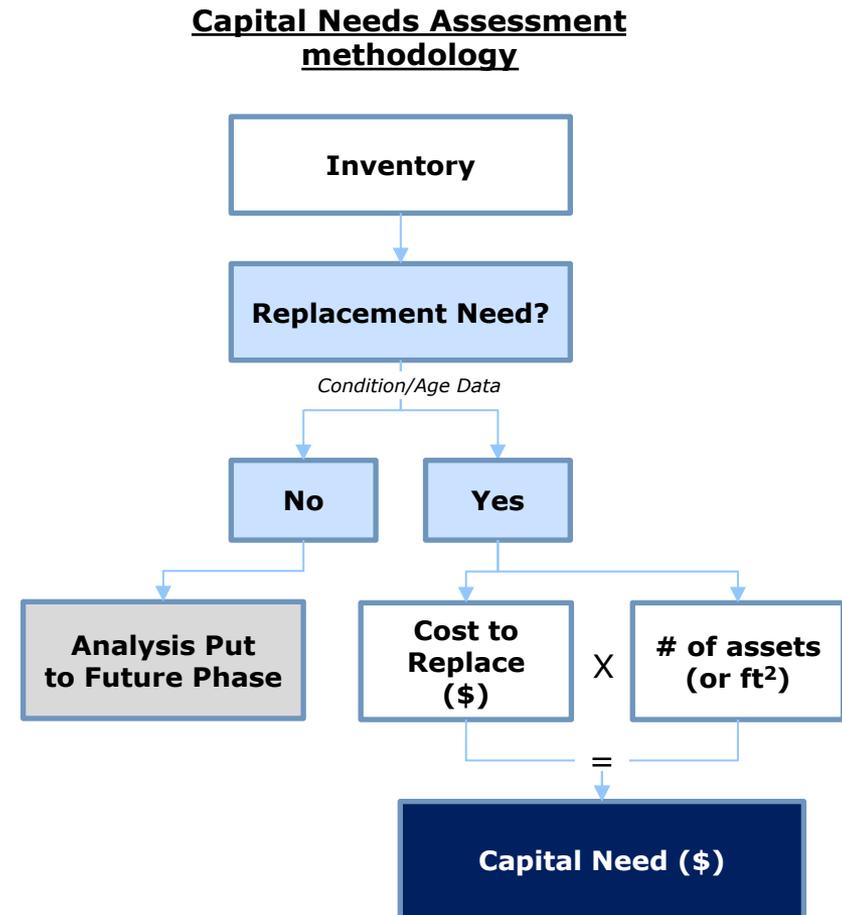
Capital Needs Assessment methodology

Inventory

Replacement Need?

Condition/Age Data

No   Yes

Analysis Put to Future Phase

Cost to Replace ($)   X   # of assets (or ft²)

=

Capital Need ($)

Capital Needs Assessment reflects different approaches to counts, conditions, and costs than prior analysis

COUNTS

- Updated inventory is a more complete representation of MBTA assets than prior analyses

  - Enhanced inventory for Track, Signals, and Power infrastructure and other areas

  - FTA allows 4 years to produce a complete inventory; MBTA has reported ~60% of assets to-date and plans to provide a complete inventory in Fall 2019

- In compliance FTA guidance, some assets are counted differently than prior analyses

  - Per FTA guidance, Stations and Facilities are reported at the location level

  - In prior analyses, Facility counts separated the building structure and all equipment within the building

- Where FTA guidance does not dictate level of reporting, some assets counted at a more granular level to support analysis and decision-making

  - For example, previous inventory showed one Red Line tunnel; new inventory reflects 30 entries for Red Line tunnel structures

  - Previous inventory reported each "signal system"; new inventory reflects 12 component parts and up to 42 sub-components for each signal

Comparison of 2015 vs 2019 total asset inventory

Number of assets	2015	2019	*Change*
Vehicles			
Revenue vehicles	2,871	2,946	*75*
Non-Revenue vehicles	1,235	1,678	*443*
Stations and Parking			
Stations	266	267	*1*
Parking	125	125	*0*
Facilities	2,962	194	*(2,768)*
Bridges and Tunnels			
Bridges	448	459	*11*
Tunnels	7	147	*140*
Culverts	620	860	*240*
Track, Signals, and Power			
Track (in miles)	1,006	865	*(141)*
Signals	2,412	38,731	*36,319*
Power	~15,000	TBD	*TBD*

^ Some categories are easy to compare across years, but some portions of the inventory are fundamentally different (e.g. tunnels and signals)

Capital Needs Assessment reflects different approaches to counts, conditions, and costs than prior analysis

CONDITIONS

- Previous analyses used a mix of age, condition, and performance to determine if an asset was in/out of SGR and were not consistent within asset categories

- Updated inventory follows FTA guidance for reporting age vs condition ratings

  - Reported **age** for Revenue Vehicles, Non-Revenue Vehicles, Track, Signals, Power, Bridges, Tunnels, and Culverts

  - Reported **condition** for Stations and Facilities

- When condition ratings were available but not required, Capital Needs Assessment used this more precise measure to determine if an asset was in need of replacement

  - E.g. track, bridges, tunnels, and culverts are inspected, maintained, and replaced based on condition, not age

- When condition ratings were still in progress (e.g. transit stations), Capital Needs Assessment defaulted to asset age to determine if an asset was in need of replacement

FTA Condition Assessment Rating Scale

Rating	Condition	Description
5	Excellent	No visible defects, new or near new condition, may still be under warranty if applicable
4	Good	Good condition, but no longer new, may have some slightly defective or deteriorated component(s), but is overall functional
3	Adequate	Moderately deteriorated or defective components; but has not exceeded useful life
2	Marginal	Defective or deteriorated component(s) in need of replacement; exceeded useful life
1	Poor	Critically damaged component(s) or in need of immediate repair; well past useful life

^ Stations and facilities below a 3 on the 1-5 scale are considered out of a state of good repair/in need of replacement

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Capital Needs Assessment reflects different approaches to counts, conditions, and costs than prior analysis

COSTS

- Cost estimates are not required in FTA reporting, and therefore MBTA had discretion for how to calculate replacement values

- Assumptions reflect all-in costs for modernized assets based on recent MBTA projects
  - *All-in costs:* Includes project soft costs like planning, design, administration, field inspection, bus diversions, force account, and contingency
    - Previous analyses did not consistently or completely include soft costs

  - *Modernized assets:* Reflects cost of updated assets, not like-for-like replacement, and includes necessary modernization costs like ADA improvements and fire code upgrades
    - Previous analyses did not consistently or completely include modernization costs

  - *Recent projects:* Used active or recent MBTA project budgets as benchmarks, rather than industry estimates or accounting conventions
    - Previous analyses used inconsistent approaches to cost estimates – sometimes reflecting asset book value and sometimes reflecting project costs

2019 Capital Needs Assessment - Results

Initial Results: Overall, capital investment has led to better asset condition

The 2018 asset inventory provides evidence that significant capital investment since 2015 has led to fewer assets in need of replacement in 2019 vs. out of a state of good repair in 2015

- **Revenue vehicles:** 32% in 2019, vs. 73% in 2015 (-41%)

  - Over 1,000 bus, subway, Commuter Rail, and paratransit vehicles are in better condition than 2015; condition will continue to improve as new vehicles are commissioned in 2019 and beyond

- **Non-Revenue vehicles:** 23% in 2019, vs. 42% in 2015 (-20%)

  - Investment in winter resiliency equipment and other vehicles result in net decrease of 140 vehicles beyond useful life

- **Stations:** 42% in 2019, vs. 38% in 2015 (+3%)

  - Overall, a net increase of nine stations in need of replacement, some variance due to changes in assessment methodology

- **Parking:** 10% in 2019, vs. 82% in 2015 (-72%)

  - Significant investment in parking lots and garages led to a net decrease of 91 locations in poor condition

Comparison of 2015 vs 2019 asset inventory

Number of assets	2015	2019	Change
Vehicles			
Revenue vehicles	2,871	2,946	75
Non-Revenue vehicles	1,235	1,678	443
Stations and Parking			
Stations	266	267	1
Parking	125	125	0

Comparison of 2015 vs 2019 asset condition

% in need of replacement (2019) or out of SGR (2015)	2015	2019	Change
Vehicles			
Revenue vehicles	73%	32%	-41%
Non-Revenue vehicles	42%	23%	-20%
Stations and Parking			
Stations	38%	42%	+3%
Parking	82%	10%	-72%

Initial Results: When counts and conditions were reported differently, crosswalk is more challenging

For those categories where the counts and conditions were reported differently in 2015 and 2019, it is difficult to determine the change in overall condition.

- **Facilities**: Prior analyses counted equipment within facilities as separate assets. New analysis follows FTA guidance to report a building and all equipment as one facility with one condition score.

- **Bridges:** Counts are largely the same, but prior analyses used a combination of age/condition/performance to determine if bridges were in/out of SGR while new analysis uses more precise condition measure tied to bridge inspection and rating program

- **Tunnels:** Prior analyses counted 7 tunnels, with one tunnel per line (e.g. "Red Line Tunnel"), whereas the updated inventory includes sub-structures and components of tunnels for a total of 147 assets

- **Culverts:** Prior analysis counted fewer culverts and used a useful life of ~125 years to determine if culverts were in/out of SGR. New analysis includes more assets and uses condition to determine replacement need.

- **Track, signals, and power:** 2019 evaluations of the state of track, signals, and power remain underway. Additionally, discrepancies in the inventory data make these metrics hard to compare.

Comparison of 2015 vs 2019 asset inventory

Number of assets	2015	2019	*Change*
Facilities	2,962	194	*(2,768)*
Bridges and Tunnels			
Bridges	448	459	*11*
Tunnels	7	147	*140*
Culverts	620	860	*240*
Track, Signals, and Power			
Track (in miles)	1,006	865	*(141)*
Signals	2,412	38,731	*36,319*
Power	~15,000	TBD	*TBD*

Comparison of 2015 vs 2019 asset condition

% in need of replacement (2019) or out of SGR (2015)	2015	2019	*Change*
Facilities	83%	59%	*-24%*
Bridges and Tunnels			
Bridges	9%	11%	*+2%*
Tunnels	N/A	TBD	*TBD*
Culverts	0%	41%	*+41%*
Track, Signals, and Power			
Track (in miles)	N/A	TBD	*TBD*
Signals	N/A	TBD	*TBD*
Power	N/A	TBD	*TBD*

Initial Results: Different approaches to counts, condition, and costs results in an initial capital need estimate of ~$10B

**Capital Need Estimate
(in millions)**

Replacement Cost ($)

$12,500M

$10,142M

10,000 — Bridges, Tunnels, and Culverts
$1,470M

Facilities
$1,813M

7,500 — Track, Signals, and Power
$2,192M

5,000 — Vehicles
$2,193M

2,500 — Stations and Parking
$2,474M

0

Asset Replacement and Modernization
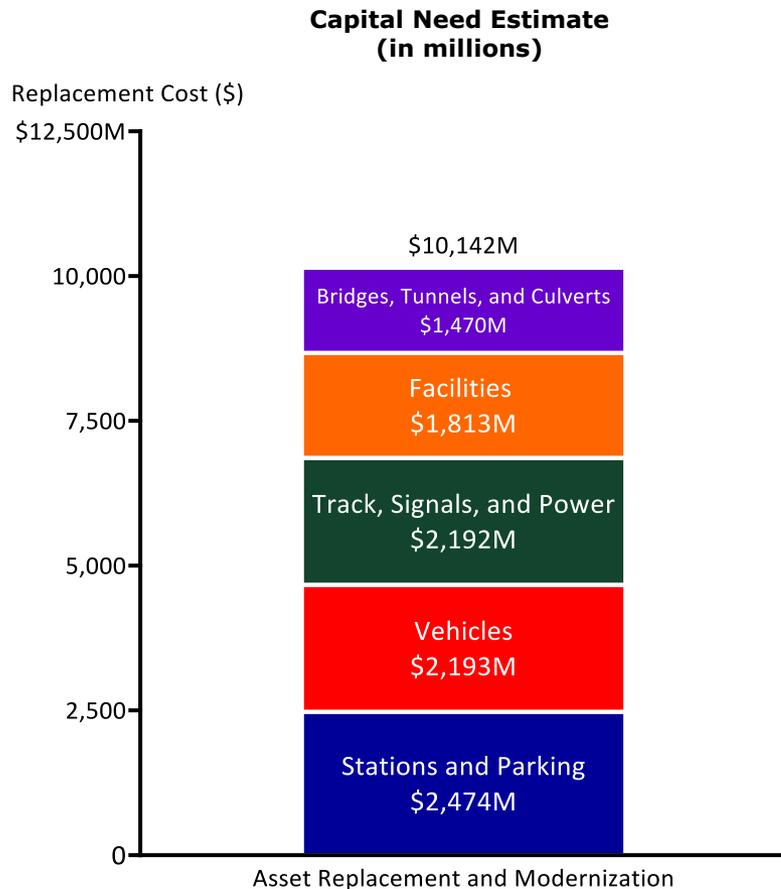
Today's capital need estimate is a dynamic value that will shift over time

- *Point-in-time estimate* reflecting the replacement costs for assets that are in need of replacement as of the required October 2018 NTD reporting

- Estimates for several asset categories include placeholders and *will be updated* as additional data is collected and analyzed:

    - **Transit:** ~60% of Power, Tunnels

    - **Commuter Rail:** Track, Signals, Power, Tunnels

- Stations condition assessments are underway and *may increase or decrease the capital need*

- Without the *substantial capital investment* since 2015, the capital need would be considerably higher

- Current capital investment will *significantly reduce capital need* once new assets are in service (e.g. new RL/OL vehicles = $836M reduction in replacement need)

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Without the substantial capital investment since 2015, the capital need would be considerably higher

**MBTA Capital Spending FY16-FY19
(in millions)**

Expansion   Reliability/Modernization
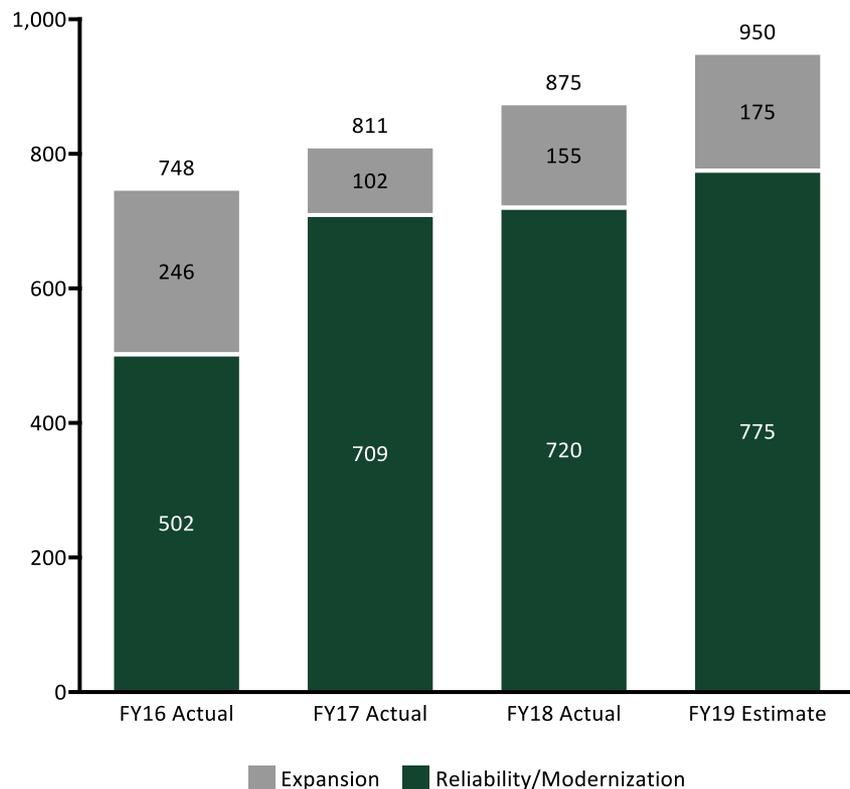
Impact of capital investment:

- Since the start of FY16 (7/1/15), the MBTA has invested over $3B in capital program, including **over $2.5B in reliability and modernization**

- Major projects completed in this time period with impacts on asset condition include buses, locomotives, coaches, paratransit vehicles, winter resiliency equipment, bridges, stations, parking, track, signals, and power infrastructure

- Substantial investment has also been made in projects that have ***not yet*** changed asset condition – such as the Red and Orange Line vehicles, signals, and infrastructure, and stations and parking projects at Wollaston, Braintree, and Quincy Adams

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Current capital investment will significantly reduce capital need once new assets are in service

Transit vehicles capital need reduced from $2.3B in 2015 to $1.7B today to $450M once current Red Line/Orange Line, bus, and paratransit procurements are completed

State of Assets - TODAY

Assets (today)
by Mode, Line

1,022	218	120	94	197	8	763	4

Bus: 75% / 25%
Red Line: 39% / 61%
Orange Line: 100%
Blue Line: 100%
Green Line: 56% / 44%
Red Line - MAT: 100%
Paratransit: 65% / 35%
Ferry: 100%

Capital Need - TODAY $1,740M

State of Assets – After CIP Investment

Assets (after CIP)
by Mode, Line

Bus: 100%
Red Line: 100%
Orange Line: 100%
Blue Line: 100%
Green Line: 61% / 39%
Red Line - MAT: 100%
Paratransit: 100%
Ferry: 100%

Assets Not in SGR
Assets in SGR

Capital Need - AFTER CIP $452M

Note: Red Line – Mattapan vehicles are not included in the capital need as the vehicle replacement type has not yet been selected and is part of the larger Mattapan HSL Transformation.

Alignment with CIP

MBTA investment framework: multiple priorities feed the capital program
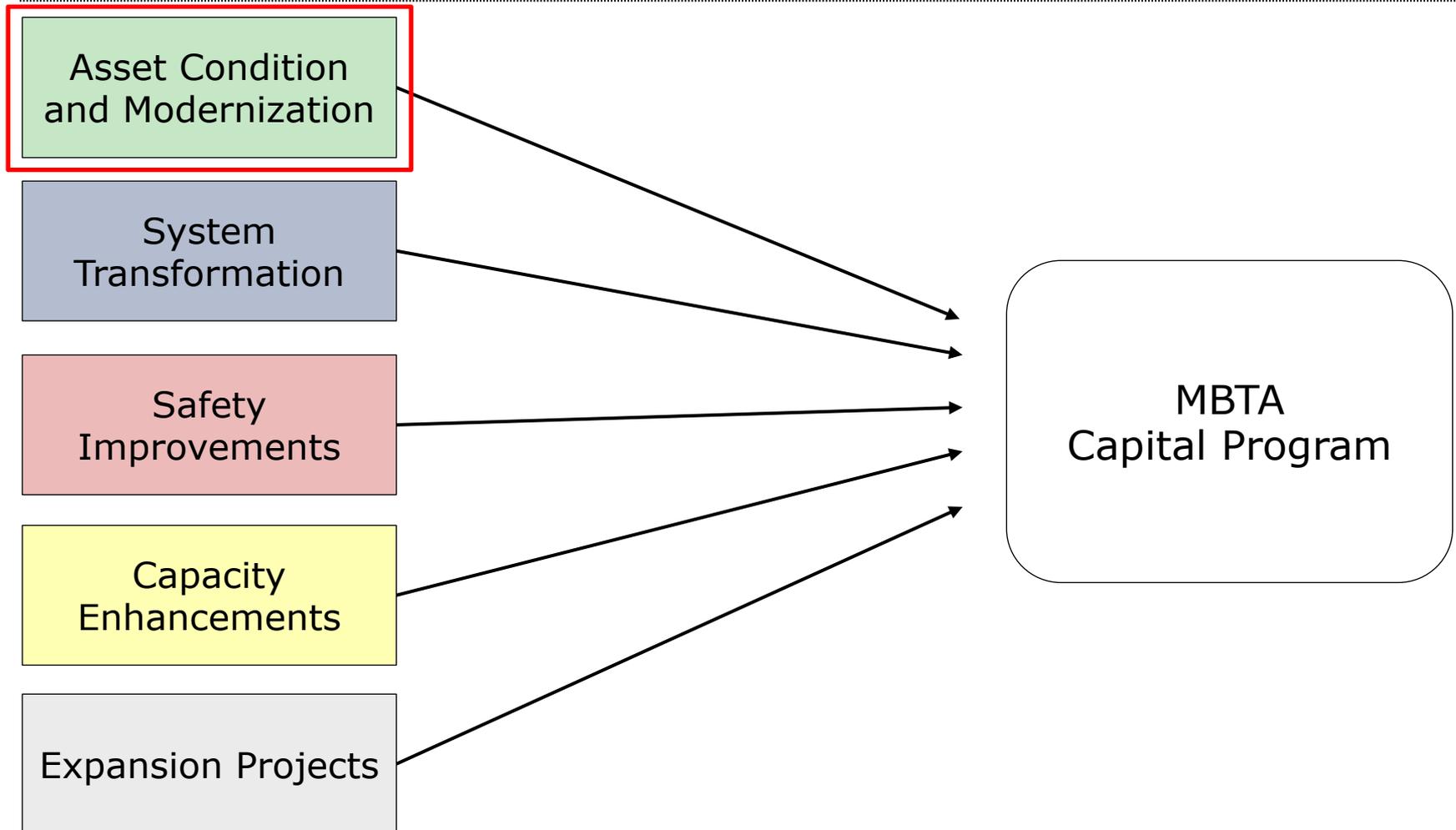
Initial Capital Needs Assessment estimate indicates our asset condition and modernization investment is on track

Category	Description	Examples	Share of FY19-23 CIP (appx)
Asset condition and modernization	Projects and investments that replace existing capital assets with modern-day equivalents or rehabilitate assets to a like-new condition	• Bus procurement • Bridge rehabilitation • Station reconstruction	$4.0B / 50%
System transformation	Projects that introduce new features, amenities, or capabilities to make the MBTA more accessible, resilient, efficient, or customer-friendly	• Elevator installation • Digital signage • Resiliency retrofits	$1.2B / 15%
Safety Improvements	Projects and investments that improve safety and security for MBTA employees and customers	• Positive Train Control installation • OHSA improvements	$1.2B / 15%
Capacity Enhancements	Investments that increase the throughput of the existing network by providing more or larger vehicles or increasing frequencies	• Expanded Red and Orange Line vehicle fleets	$300M / 5%
Expansion Projects	Investments that expand the network by introducing new service, creating new connections, or converting service to a new mode	• Green Line Extension • South Coast Rail	$1.3B / 15%
Total			**$8.0B / 100%**

Capital Needs Assessment drives asset-focused investment decisions

The assessment is already helping us answer the following questions...

1. What are the MBTA's needs across asset categories?

- Where are the most critical needs?

- How does asset condition compare across categories?

2. How does our Capital Investment Plan address the identified needs?

- Where are there gaps between our estimated need and our programmed capital spend?

3. Where and how should we make adjustments to the capital program?

- Identify assets for further planning or project development

- Reallocate resources across investment programs

- Reprioritize projects within programs

EXAMPLE: Capital Needs Assessment indicates investment in transit power assets should increase in order to more quickly address our current needs

State of Assets – TODAY (40%)

Number of Assets
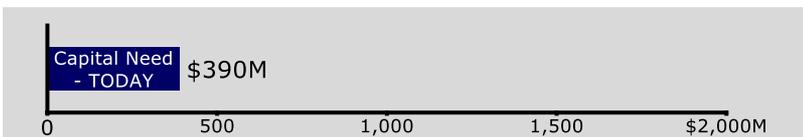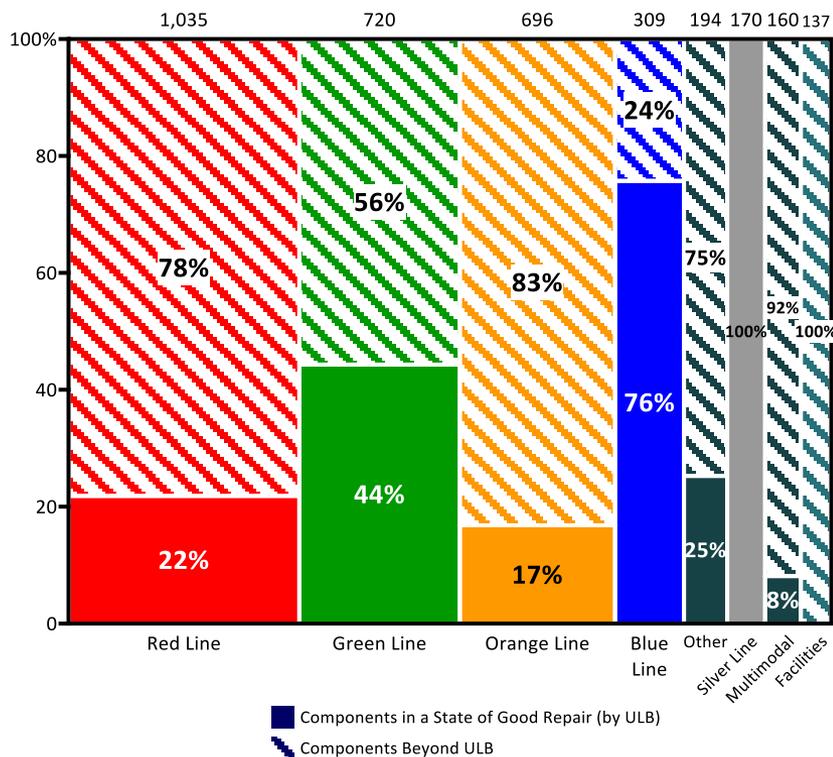
- Capital Needs Assessment showed that capital needs for power infrastructure far exceeded current investment programmed in the CIP

- In response, the draft FY20-24 CIP proposes to *increase* funding for power infrastructure through projects including:

  - **Systemwide Power Study** to develop a 15 year action plan to ensure state of good repair, modernize/improve resiliency of the system and provide future expansion and capability within the overall system

  - Additional funds for the **Power Systems Resiliency Program** to replace priority duct banks and power cables and install back-up generators at key locations

  - Additional funds for the **Power Systems Capital Maintenance** program to facilitate and execute replacement of critical power infrastructure

  - Ongoing support for targeted replacements of **Traction Power Substations** on the Red and Orange Lines, as well as **Systemwide Transformer** upgrades

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Alignment with Long-Term Capital Plan

Capital Needs Assessment informs funding needs for the Long-Term Capital Plan

- The capital needs estimate of ~$10B reflects how much the MBTA would need spend if it chose to fully replace all assets currently in need of replacement with modernized assets (e.g. ADA compliant, fire code compliant).

- While it is the most straightforward methodology for cost analysis, we acknowledge that full asset replacement is not the only option and sometimes not the preferred option for investments

  - Based on other priorities, sometimes we choose to invest more (e.g. Green Line fleet) and sometimes we choose to invest less (e.g. locomotive overhaul)

- The $10B estimate **does not** reflect a list of projects, but rather provides general direction for how much the MBTA should plan to invest to achieve asset condition and modernization goals

- This analysis is therefore the baseline for the long-term capital plan, which will be built out with specific projects addressing asset condition and modernization, transformation, safety, capacity, and expansion using the PSAC prioritization criteria and Focus40 as a roadmap for next priorities

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Long-Term Capital Plan will address capital needs for asset condition and modernization, transformation, safety, capacity, and expansion

Long Term Capital Plan (FY17-32)
(dollars in millions)
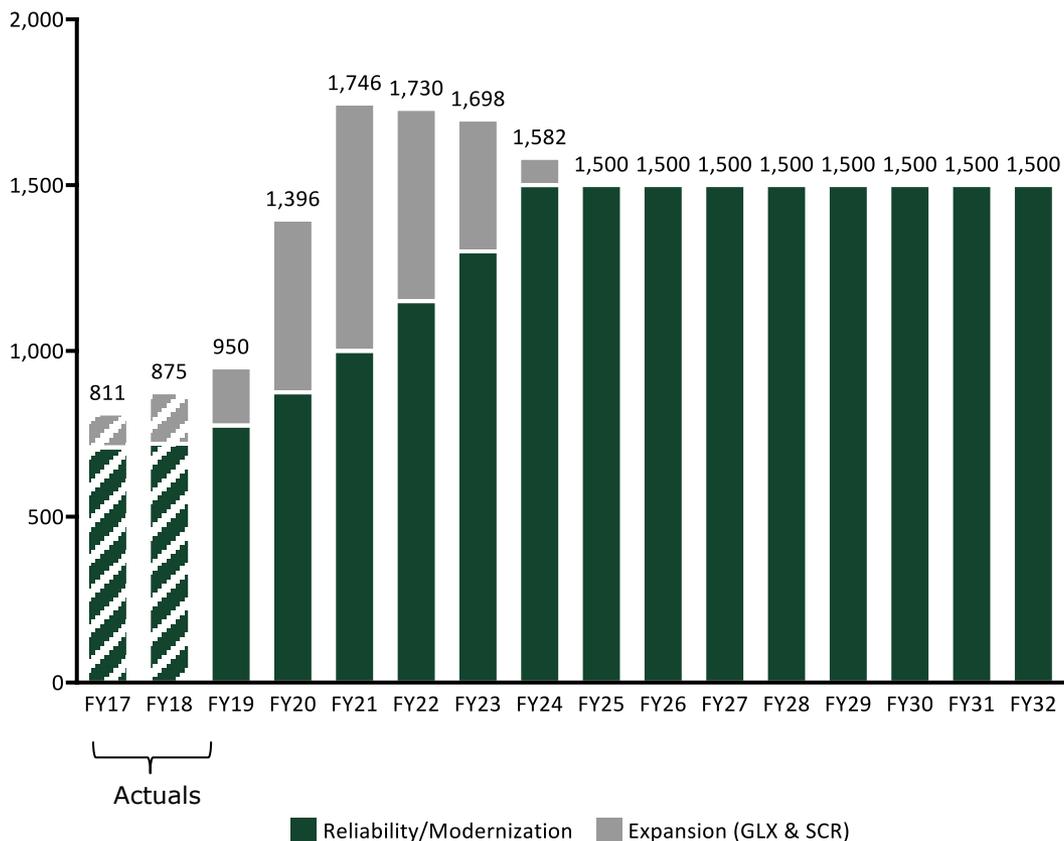
Constraints:

✓ Address current asset condition and modernization needs by 2032 - assumes $10B capital needs estimate as baseline

✓ Include additive transformation, safety, and capacity investments

✓ Account for cost escalation/asset depreciation

✓ Reflect more realistic ramp-up of spending, consistent with MBTA project delivery capacity

✓ Be affordable within existing resources

■ Reliability/Modernization ■ Expansion (GLX & SCR)

Next Steps for Understanding, Prioritizing, and Delivering Capital Needs

1. Complete Capital Needs Assessment

   - Update asset replacement estimate as new inventory and condition data becomes available

   - Build out non-asset replacement categories to reflect costs of additional strategic priorities

   - Use results to inform capital planning and prioritization decisions

2. Execute current five-year Capital Investment Plan

   - Delivering current CIP will significantly reduce today's asset replacement needs once new assets are in service

   - **Example:** Revenue Vehicles capital need will be reduced from $1.7B to $450M after CIP investment

3. Build 15-year capital program to invest ~$20B in non-expansion priorities

   - Develop long-term capital plan to address asset replacement, modernization, capacity, safety, and expansion needs

   - Build project management capacity to double output from $720M in non-expansion investment in FY18 to $1.5B by FY24

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