MBTA Rail Vision

FEBRUARY 2020

FINAL REPORT EXECUTIVE SUMMARY

Acknowledgements

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Executive Summary

Greater Boston has experienced profound economic growth over the past few decades, manifesting in rapid employment and population increases and innovation and technological progress in several sectors. Yet, these dramatic changes have also strained the region's transportation system – road users face worsening congestion and our aging public transportation system is challenged to meet heightened demand. Housing, particularly in the inner core, is increasingly unaffordable as more people seek to live in areas with short commutes to the downtown job centers, exacerbating inequities faced by marginalized communities and the challenges caused by our wealth gap. And concern about climate change – both emissions reductions and resiliency – continues to be paramount.

Rail Vision is a study to evaluate how the Massachusetts Bay Transportation Authority (MBTA) can leverage its extensive Commuter Rail system to support both continued economic growth and the Commonwealth's equity and sustainability goals. The current Commuter Rail system stretches nearly 400 route miles, reaching over 80 communities in Eastern Massachusetts. Yet, service is focused on peak period commutes into and out of Boston, with frequency dropping significantly during the midday and evening. Rail Vision examines how the rail system can better serve the region's evolving mobility needs and change the role it plays in residents' transportation choices.

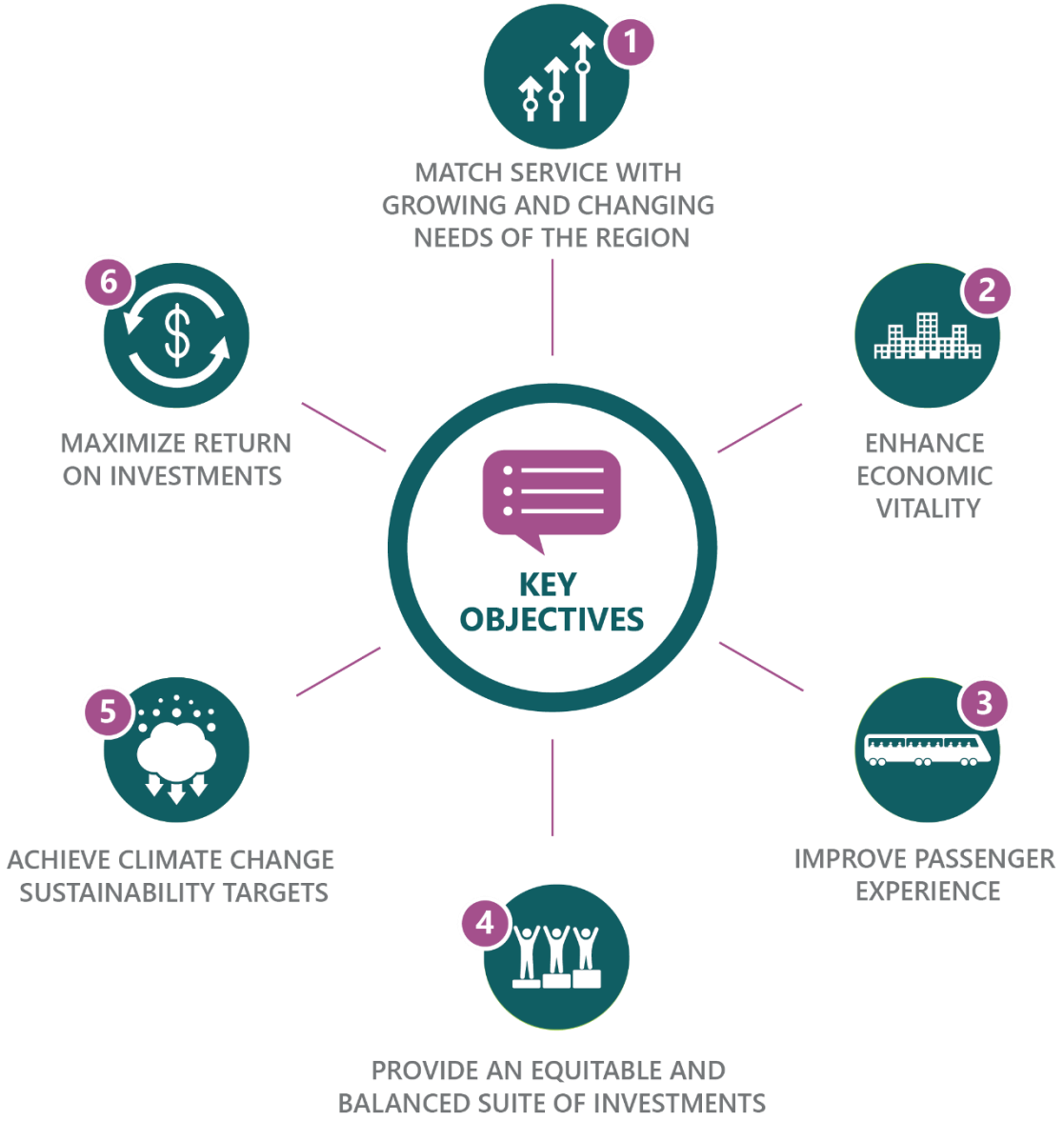
The study assesses different approaches to increase frequency, reduce travel time, and improve connectivity on the current network through changes to service design, infrastructure, and technology. It evaluates the performance of these changes to service against a set of metrics reflecting six objectives (Figure ES-1):

1. Match service with growth & changing needs of the region
2. Enhance economic vitality
3. Improve passenger experience
4. Provide an equitable and balanced suite of investments
5. Achieve climate change and sustainability targets
6. Maximize return on investments

Approach

Rail Vision was completed over the course of two years and included a robust analytical and outreach process. The analysis provides policymakers insight into the trade-offs associated with focusing on different service outcomes. Rather than work towards a distinct recommendation for change, the purpose of the analysis was the tease out the relative costs and benefits of service and infrastructure elements, as well as the constraints and opportunities inherent to our current system.

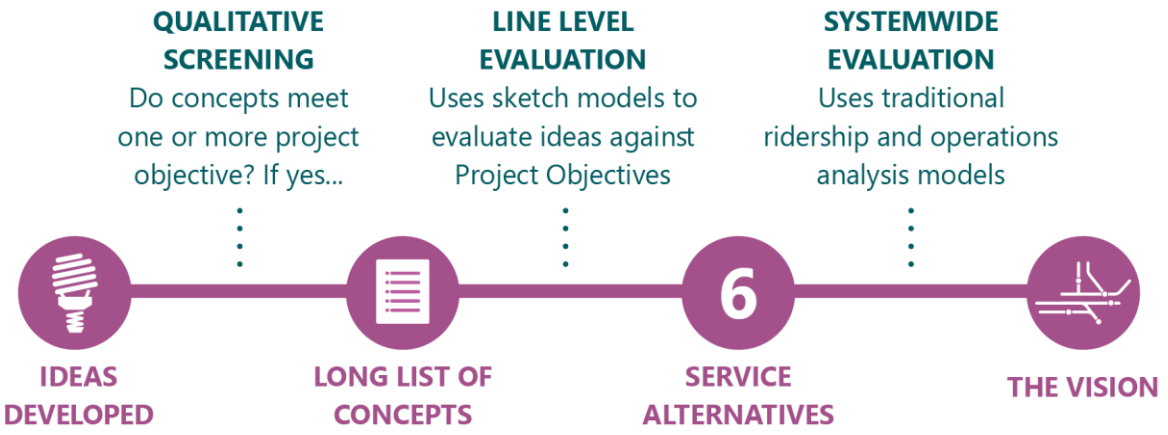
Figure ES-1 Study Objectives



The analysis included three steps (Figure ES-2):

1. **Qualitative Screening:** The team reviewed more than a dozen domestic and international peer rail systems to compile a long list of concepts potentially applicable to the MBTA network. The team then performed an analysis to narrow this set of ideas to feed into the line level evaluation.
2. **Line Level Evaluation:** The team tested how individual service concepts would perform on a line-by-line basis in relation to a number of criteria. This analysis used sketch-level tools to estimate ridership increases and identify any major infrastructure or operational challenges.
3. **Systemwide evaluation:** Based on the results of the line level evaluation and stakeholder input, the team developed six comprehensive systemwide alternatives featuring different approaches to scheduling (frequency and travel time at the station level), power and vehicles types (electrification and multiple units), infrastructure improvements (high-level platforms, terminal capacity, and additional services), and access (fares and parking capacity). The team evaluated the feasibility and impacts of the alternatives using rigorous modeling tools. The results identify the investments required to deliver each alternative, as well as the projected ridership response and benefits associated with the project objectives.

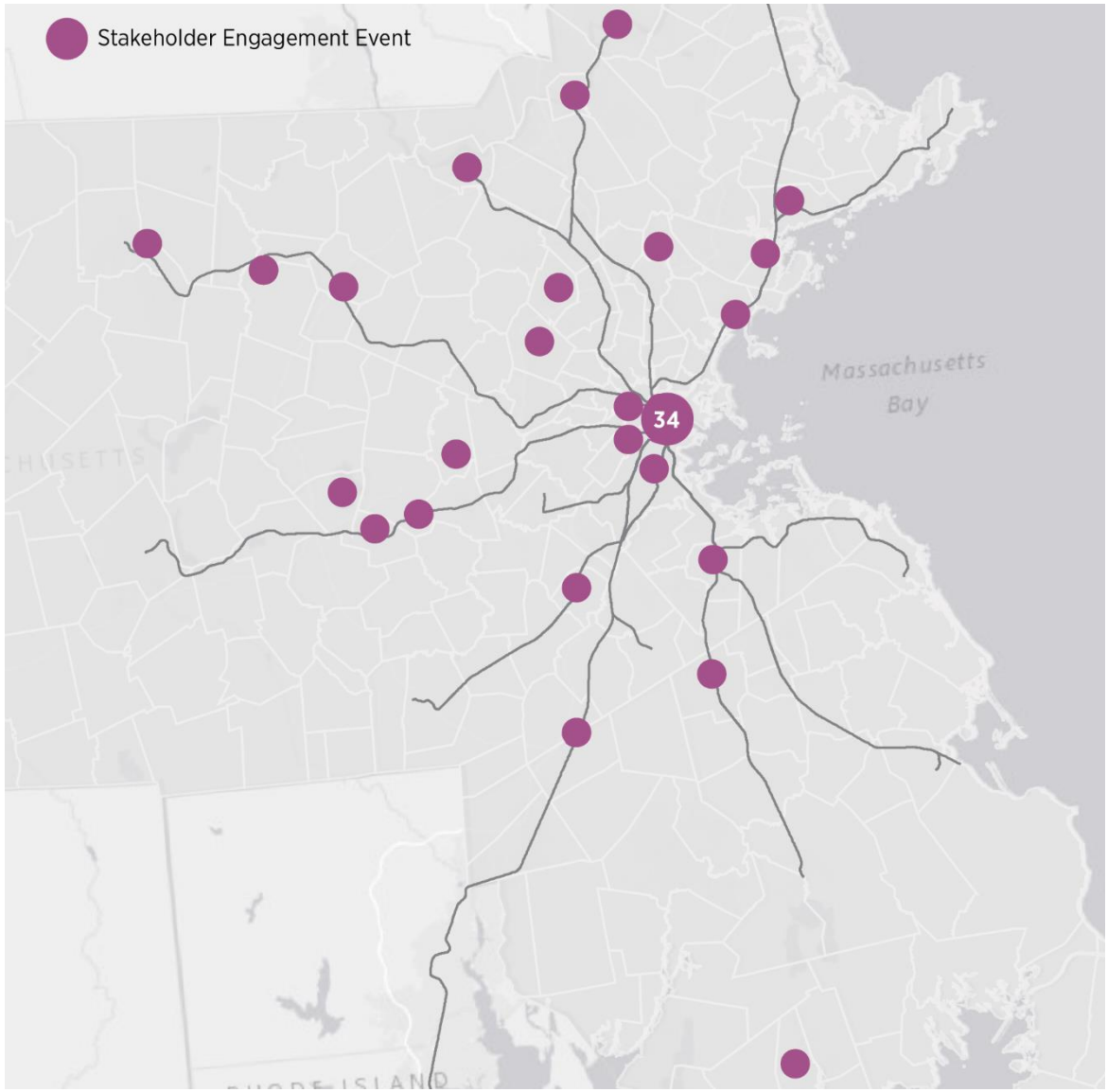
Figure ES-2 Rail Vision Evaluation Approach

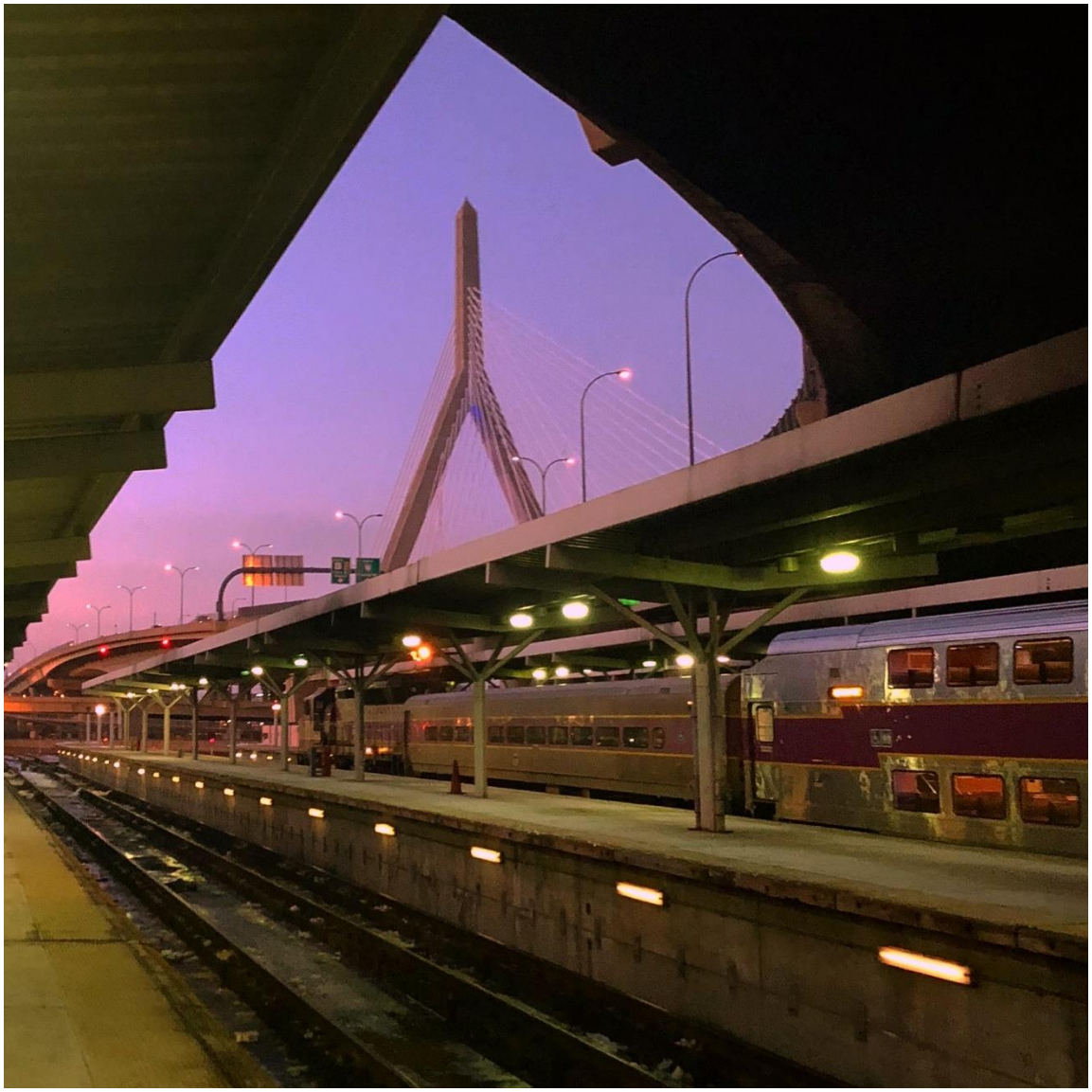


Rail Vision aimed to successfully involve stakeholders representing the range of interests across the region, including current and potential future riders. Key stakeholders were invited to serve on the Rail Vision Advisory Committee, which met seven times over the course of the study and provided informed advice to MBTA leadership and the project team. The members represented diverse perspectives from across the MBTA service area. Members included elected officials, the business community, advocacy groups, and local agencies. In addition, the team gathered input from the public through several mechanisms, including a survey aimed at learning about why people do not currently use the system, two open house public meetings, and briefings at the local level (**Figure ES-3**).

Throughout the process, the project team provided MBTA leadership and the Fiscal and Management Control Board (FMCB) with regular updates on the approach, results, and stakeholder input. At the completion of the effort, in November 2019, the FMCB held a conversation with the Rail Vision Advisory Committee to directly discuss the outcomes and subsequently provided their final conclusion on the results of the study and direction for next steps.

Figure ES-3 Locations of Stakeholder Events, including Advisory Committee and Public Meetings and Stakeholder and Community Briefings





Key Takeaways

The systemwide evaluation reveals the benefits and costs associated with transformative changes to the Commuter Rail system. However, performing the technical analysis required the team, with input from leadership and the Advisory Committee, to define a clear scope for the study and develop a set of assumptions about operations and infrastructure needs. Many of these assumptions relate directly to federal regulations for heavy rail operations, as it would be too risky to build a scenario dependent on changing these rules. Other assumptions were more exploratory; the analysis assumed unlimited (unconstrained) parking availability at stations receiving significant frequency increases across the Alternatives to assess ridership demand without station access constraints. However, in implementation, this type of assumption would need to be reassessed, given the challenges and costs associated with building more parking. The Rail Vision study thoroughly documents this set of parameters to ensure complete understanding of the results and takeaways.

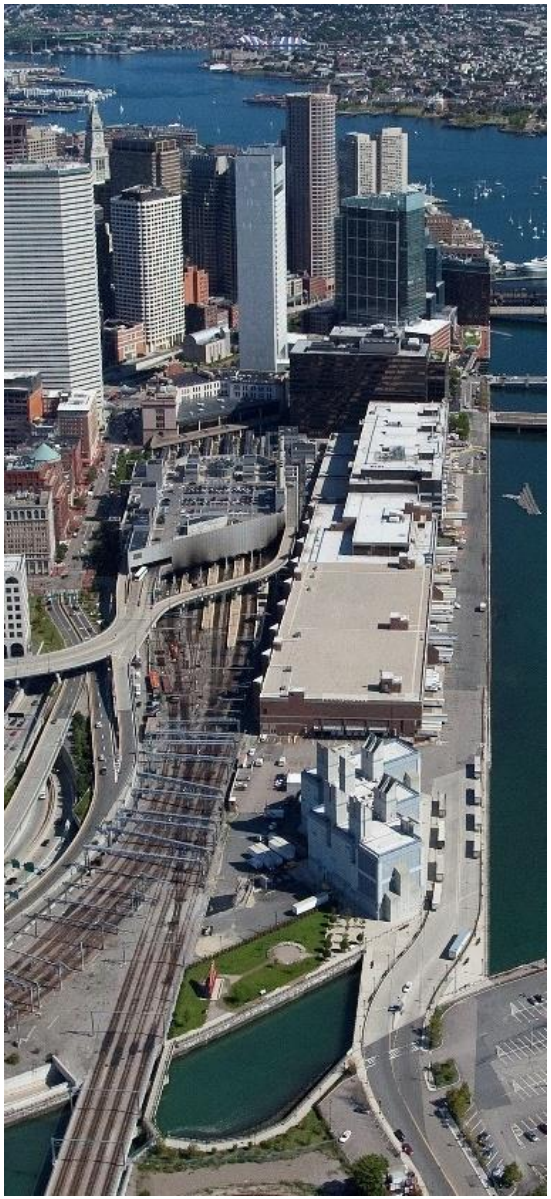
The results associated with the six project objectives support several key takeaways on system-level performance. While the objectives all reflect specific regional goals, the process did not assign weights or comparative values to each. Assessing the performance of the alternatives across the objectives as a whole can inform a regional conversation about how the Commonwealth should value each objective, as well as how investments in Commuter Rail fit into larger efforts to meet the associated goals. The results of the rigorous technical analysis performed for the systemwide evaluation, summarized in Table ES-1, found:

- *Frequency drives ridership* (particularly in the inner core and for minority and low-income communities), *lower fares* result in additional ridership, and most trips still occur in the *peak period/direction* even with all-day bi-directional service;
- *Generating ridership results in auto diversions*, which reduces vehicle miles traveled, vehicle hours traveled, and emissions, but does not outweigh the emissions associated with running frequent all-day diesel-powered service;
- *Electrification enables faster travel times and reduces emissions*, but has a relatively limited impact on ridership;
- *Service increases in the inner core generate more walk-up service* than in the outer parts of the region, where the construction of additional parking may be required to see ridership gains; and
- *Improvements present a range of costs and benefits*. Alternative 1 (Higher Frequency Commuter Rail) provides benefits for a fraction of the cost of other alternatives. Alternative 5 (Urban Rail (Electric)) shows that urban rail could provide many of the full transformation benefits at a portion of the cost. Alternative 6 (Full Transformation) provides the most benefit at the highest cost.

Among stakeholders and through public engagement efforts, the project brought into focus a deep interest in transforming the system consistent with the project objectives. The Advisory Committee expressed support for enhancements to frequency, reliability, and travel time to increase ridership and improve passenger experience, but also concerns about the need to resolve challenges associated with station access (parking, first/last mile), fares, and other barriers to the system. The input received largely complements the quantitative findings and provides context for the potential prioritization of projects for implementation.

Table ES-1 Comparison of Results for Systemwide Alternatives

	Alternative 1: Higher Frequency Commuter Rail	**Alternative 2:** Regional Rail to Key Stations (Diesel)	**Alternative 3:** Regional Rail to Key Stations (Electric)	**Alternative 4:** Urban Rail (Diesel)	**Alternative 5:** Urban Rail (Electric)	**Alternative 5:** Urban Rail (Electric) with Modified Fares	**Alternative 6:** Full Transformation
2040 Ridership (compared to No-Build)	+**19,000** daily CR boardings **(+13%)** *+5,300 drive access* *+13,700 walk access* +**9,200** new linked transit trips in system	+**36,200** daily CR boardings **(+24%)** *+10,200 drive access* *+26,000 walk access* +**21,200** new linked transit trips in system	+**52,900** daily CR boardings **(+35%)** *+19,400 drive access* *+33,500 walk access* +**35,800** new linked transit trips in system	+**80,400** daily CR boardings **(+53%)** *+12,600 drive access* *+67,800 walk access* +**47,500** new transit trips in system	+**81,600** daily CR boardings **(+54%)** *+10,300 drive access* *+71,300 walk access* +**47,500** new transit trips in system	+**99,000** daily CR boardings **(+66%)** *+20,000 drive access* *+79,000 walk access* +**59,100** new transit trips in system	+**225,900** daily CR boardings **(+150%)** *+94,400 drive access* *+131,500 walk access* +**122,400** new transit trips in system
Assumptions: *-Fare Structure*	*-Current fares*	*-Current fares*	*-Current fares*	*-Current fares*	*-Current fares*	***-Urban rail fares***	***-Urban rail fares and distance-based fares***
-Parking	*-Parking constrained*	***-Parking unconstrained at most key stations***	***-Parking unconstrained at most key stations***	***-Parking unconstrained at urban rail termini***	***-Parking unconstrained at urban rail termini***	***-Parking unconstrained at urban rail termini***	***-Parking unconstrained at all stations (excluding rapid transit & limited parking stations)***
Fleet Needs	Diesel Locomotives Bi-Level Cab Cars/Coaches	Locomotives Bi-Level Cab Cars/Coaches	Bi-level EMUs	Diesel Locomotives Bi-Level Cab Cars/Coaches Single-Level DMUs	Locomotives Bi-Level Cab Cars/Coaches Bi-Level EMUs	Locomotives Bi-Level Cab Cars/Coaches Bi-Level EMUs	Bi-Level EMUs
Preliminary Capital Costs (2020$/ 2030$)	**$1.7B** (2020$)/ **$2.3B** (2030$)	**$4.5B** (2020$)/ **$6.3B** (2030$)	**$17.9B** (2020$)/ **$25.2B** (2030$)	**$8.9B** (2020$)/ **$12.6B** (2030$)	**$10.6B** (2020$)/ **$14.9B** (2030$)	**$10.6B** (2020$)/ **$14.9B** (2030$)	**$28.9B** (2020$)/ **$40.7B** (2030$)
Incremental MBTA Systemwide Revenues (2020$)	**$29M**/Year	**$52M**/Year	**$52M**/Year	**$58M**/Year	**$48M**/Year	**$15M**/Year	**$80M**/Year
Incremental MBTA Commuter Rail O&M Costs (2020$)	**$130M**/Year	**$379M**/Year	**$439M**/Year	**$333M**/year	**$304M**/year	**$304M**/year	**$643M**/year



Conclusion

Based on the results of the evaluation and feedback from key stakeholders, the MBTA's FMCB instructed the MBTA to "transform the current commuter rail line into a significantly more productive, equitable, and decarbonized enterprise."

The FMCB voted on four resolutions related to the Commuter Rail system:

- Endorsed electrification, higher frequency service, accessibility improvements, and lower fares;
- Identified priority lines and elements of Phase 1 of the transformation effort;
- Proposed the establishment of a Commuter Rail Transformation Office, with the single mission of advancing the Rail Vision; and,
- Advocated for new contract mechanisms and new labor practices, and a formal request of the Legislature to enact the reform proposals in Governor Baker's transportation bond bill.

The Rail Vision analysis provides initial insight into the potential investments needed to achieve the future system the FMCB resolutions describe. However, implementing such a transformation would require a complete change in thinking about the system.

This process begins by clearly defining the desired outcome for a Rail Transformation, and scoping and prioritizing the delivery plan from Phase 1 forward. Developing a robust financing plan and securing adequate funding is critical to any transformation effort. It will likely require a high degree of private participation in both funding and delivery, given the magnitude of the potential program.

Beyond funding, moving forward a vision requires a thorough understanding of all the dependencies, constraints, and challenges associated with delivering a major infrastructure program. These include phasing improvements while operating the system, integrating the vision with the larger transportation efforts, identifying needs associated with housing and maintaining an expanded fleet, exploring new technologies in a cost-effective manner, and identifying creative solutions to physical constraints in our dense urban environment. Such a transformation brings inherent risks as the program would be delivered over more than a decade, in the midst of regional and national economic, demographic, and environmental changes. New technology and regulations, as well as other external factors, could affect the course of the project or reduce the effectiveness of previous decisions. Successful implementation requires the drive to transform the system to achieve a desired outcome, resources to deliver it, and a robust plan to manage risk and challenges.

To begin the transformation, immediate next steps include more thorough assessment of:

- **Desired outcome and business case for change:** While the FMCB resolutions provide a foundation, the stakeholders in the Commonwealth must come together around a clear set of goals of a rail transformation program. The desired outcome should specify both the end state as defined by user experience - including service availability, access, fares, and ease of use - as well as consider how the system will balance the costs and potential revenue implications associated with changes to these factors. Quantifying the key benefits associated with the defined set of outcomes would support the case for investment.
- **Electrification:** A thorough understanding of the infrastructure/power, technological, and environmental requirements associated with providing electrified service.
- **Operations, including non-revenue moves:** Analysis of how additional service frequency may affect track capacity for needed movements for trains when they are not in service, as this evaluation was outside the scope of the study.
- **Fleet:** Defined vehicle specs and a transition plan to consider how to phase in new fleet, particularly as certain technologies have different infrastructure requirements (e.g. electric locomotives or electric multiple units).
- **Layover and maintenance facilities:** The requirements and locations for new train layover storage, service, inspection, and maintenance capacity, as this evaluation was also outside the scope of the study.
- **System Access:** A cost-effective strategy to enhance access to stations so that the system can realize the ridership gains associated with service improvements, including a comprehensive approach to parking, bicycle and pedestrian improvements, and other first/last mile solutions. Access also includes fares, and a more thorough discussion of the policy underpinning how the MBTA sets fares for a new service would be important to fulling defining the transformation.

As these efforts come underway, the MBTA can work in parallel to program foundational investments required to advance a rail transformation in the long term, and improve service reliability and performance in the near-term – including investments in fleet, high-level boarding platforms, and addressing critical constraints along the tracks. These investments will unlock incremental improvements that will improve the customer experience and attract new riders to the system.