

Turning Vision into Reality

The Moment for Regional Rail is Now



TransitMatters is a 501(c)(3) nonprofit dedicated to improving transit in and around Boston by offering new perspectives, uniting transit advocates, and informing the public. We utilize a high level of critical analysis to advocate for plans and policies that promote convenient, effective, and equitable transportation for everyone.

Learn more & download other Regional Rail reports at: <http://regionalrail.net>

Executive Summary

In this report, TransitMatters calls on the Massachusetts legislature, Governor Maura Healey, the Massachusetts Department of Transportation, and the Massachusetts Bay Transportation Authority, to make tangible progress on transforming the current Commuter Rail network to a modern, efficient Regional Rail operating model, providing cleaner, more reliable frequent rail service all day, every day. This model, which provides frequent, affordable, and green rail transit, will improve the system's reliability, increase ridership, provide equitable access to the Commonwealth, significantly reduce rail equipment maintenance and life cycle costs for the MBTA, and meet our 2050 net-zero emissions goal. It also supports regional equity in the Commonwealth by enabling fast, frequent service to destinations such as the South Coast and Western Massachusetts.

The MBTA's state of good repair crisis has severely impacted Commuter Rail and by extension the Gateway Cities, growing suburbs, and inner core communities it serves. Nearly half of the Commuter Rail's locomotives will reach the end of their useful life by 2030. These diesel locomotives are expensive to maintain and produce black carbon emissions that contribute to greenhouse gas emissions and threaten public health. Additionally, while Commuter Rail ridership has recovered considerably from the COVID-19 pandemic, it remains about 30% below pre-crisis levels, speaking to a need to move beyond Commuter Rail's peak-oriented model to boost ridership and avoid a negative feedback loop imposed by possible service cuts. All the while, the region's congestion is increasing: the traffic analytics firm Inrix ranked Boston as the home of America's second worst rush hour traffic—and fourth in the world—in 2022.¹

Given these conditions, the Commonwealth faces a choice: either spend large sums of money to prop up an outdated, costly service paradigm delivered by perpetually unreliable and environmentally unsafe diesel equipment, or modernize the system and operate trains in a manner that performs at a high level for all residents of the Commonwealth.

Regional Rail will require significant capital investments, particularly in electrification and station upgrades. But these measures will substantially improve service delivery, the system's state of good repair, and accessibility, in a manner that looks towards the future while improving equipment reliability and reducing overall equipment life cycle costs. These improvements will only grow more expensive and complex with time. The Commonwealth cannot afford to wait for the reliability crisis to end to begin planning and making these investments.

In order to meet these worthy goals, TransitMatters provides recommendations regarding how to adopt recent best practices in the industry for the delivery of cost-effective, high-ridership transit projects, specifically:

- » Providing MassDOT and the MBTA with the dedicated, consistent funding necessary to improve and expand in-house project capacity to implement true Regional Rail as well as future crucial transit and intercity rail projects.
- » Implementing standardized design wherever possible.
- » Implementing transparent “best value” consultant bidding and cost estimate processes.
- » Where necessary, reform permitting to expedite environmentally beneficial transit projects.
- » Using best practice rolling stock, adhering to proven methods for the first phase of Regional Rail transformation while monitoring technological advances for future phases.

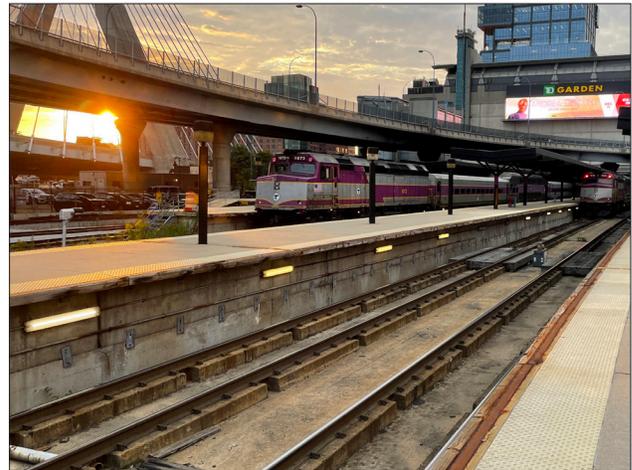
The Commonwealth is at a critical opportunity moment to transform Commuter Rail along these lines, given the convergence of multiple factors: a new gubernatorial administration committed to reducing carbon emissions and strengthening the economy equitably, the broad multifamily housing rezoning prompted by the MBTA Communities Act, and the availability of federal grant funding from the Infrastructure Investment and Jobs Act (IIJA). The Commonwealth must seize it.

¹ [Boston MA's Scorecard Report](#). Inrix.

Introduction

The MBTA's commuter rail system is failing the people it should serve. Riders from Gateway Cities like Haverhill and Fitchburg must pay high fares for trains that come hourly or worse. Environmental justice communities like Dorchester and Chelsea are exposed to dangerous black carbon emissions from diesel locomotives and are forced to contend with long bus trips because of commuter rail's expense, low frequency, and unreliability. White collar workers with flexible schedules drive instead thanks to commuter rail's infrequent schedules and poor reliability, adding to the region's traffic congestion while frustrating emissions reductions targets. This is despite spending nearly the same amount in operating subsidy as the rapid transit network, and attracting a fifth of the ridership - and serving a far less diverse population.

Making commuter rail useful for as many riders as possible, especially residents of low-income and environmental justice communities, requires substantial investment, but in the framework of a modern operating paradigm - one we call Regional Rail. Regional Rail would provide service every 10 minutes or better in the urban core, every 15 minutes or better inside Route 128, and every 30 minutes in the suburbs, all day, every day. This is based on the practice of similar systems in countries with high transit use. TransitMatters does not support heightened investment for investment sake; we insist on spending the money wisely and well, on modern systems that achieve our commonly shared environmental, economic growth and equity goals.



Credit: Ian Purcell for TransitMatters



Credit: Matt Robare for TransitMatters

Regional Rail has 5 transformative benefits:



Almost all commuter rail stops have poor accessibility. 32 are entirely inaccessible. High-level platforms provide step free access to all riders, including those with mobility constraints, parents with strollers, and riders with heavy equipment or suitcases.



Regional Rail improvements facilitate economic growth and provide a wider customer base for local businesses. Frequent, reliable rail can increase development near stations. Regional Rail provides a green, economical way to access our rich cultural resources and recreational amenities.



Modern electric trains create zero local emissions, reduce noise pollution, and increase reliability, making rail more attractive relative to car trips. Electrification can thus help reduce respiratory ailments in environmental justice communities, and is critical for meeting the Commonwealth's 2050 zero net emissions goals.

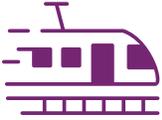


Regional Rail opens up new housing markets, and makes transit-oriented development more attractive. Workers who commute some or all days of the week can use the train for other longer trips, and walk or bike to local destinations. Frequent, reliable, and affordable rail service opens up new employment opportunities, particularly in Gateway Cities, which are well positioned to become employment centers in their own right.



Frequent, reliable, and affordable rail service opens up new employment opportunities. Regional Rail both reduces the “spatial-skills mismatch” that holds back employment, and provides access to vocational opportunities to boost workers’ skills. Regional Rail itself will provide up to 250,000 direct and indirect jobs during construction.

A highly functioning Regional Rail system includes five critical components:



Systemwide electrification and the purchase of high-performance electric trains.



High platforms, providing universal access and speeding up boarding for everyone.



Strategic Infrastructure investments to relieve bottlenecks.



Frequent service all day: every 30 minutes in the suburbs and every 15 minutes in denser neighborhoods.



Free transfers between regional trains, subways, and buses, and fare equalization with the subway in the subway's service area.

Recognizing the need for change, in Fall 2019, the Fiscal Management and Control Board (FMCB) voted to transform Commuter Rail into a modern Regional Rail system. Amidst the COVID-19 pandemic, the MBTA took an important step by providing more consistent, frequent all-day service on the commuter rail. This measure has already improved the rider experience, with 94% of trains meeting on-time goals.²

To her credit, Governor Maura Healey endorsed rail transformation during the 2022 campaign and pledged to make meaningful progress on this transition. Now, new leadership has the opportunity, and responsibility, to set things right. There will never be a more opportune moment to advance Regional Rail.

Unfortunately, progress on Regional Rail has otherwise stagnated, especially since the sunset of the FMCB, thanks largely to insufficient funding from the Legislature and insufficient oversight from the current Board, speaking to a lack of urgency. As *A Better City* noted in April 2022, the MBTA is “significantly behind their announced plans” on rail transformation, “specifically with the tasks on foundational planning studies, [electric multiple unit] procurement, and conceptual design advancement.”³ Meanwhile, traffic congestion has returned in full force, and the commuter rail’s reliability crisis is only growing more dire: nearly half of the MBTA’s locomotives will reach the end of their useful life by 2030.

LESS TIME WAITING

Higher frequency means getting people to their destinations faster



² The MBTA defines on-time performance as trains arriving within 5 minutes of scheduled arrival.

³ Caitlin Allen-Connelly and Tom Ryan, “[Keeping the MBTA on Track: Review of Prior Commitments.](#)” *A Better City*, April 2022.

Why Regional Rail

Greater Boston's transportation system is failing. The core MBTA rapid transit lines are in need of investments in safety, personnel, and infrastructure, and the commuter rail is slow, infrequent, and polluting. According to the 2019 Congestion in the Commonwealth report, many major corridors in Massachusetts saw increases of several thousand vehicles per day from 2012 to 2018 while most commuter rail lines saw ridership increase of a few hundred.⁴ Absent investments in better service, driving will remain many people's only option. But Regional Rail's high all-day frequency, faster trip times, and cheaper fares create such an alternative.

Putting all the emphasis on the transition to electric vehicles is misplaced and unlikely to achieve established carbon emission reduction goals. Short term carbon reductions are essential, and can more easily and equitably be realized by providing more people with more viable alternatives to driving. Electric vehicles also create their own substantial ecological problems: all of the infrastructure needed to support them, from roads to parking facilities to tires and batteries, is highly carbon intensive. Battery mining is environmentally harmful (as well as extremely hazardous), and tire wear still puts dangerous fine particulate matter in the atmosphere.

An equitable, sustainable, and smart approach to transportation sector decarbonization in Massachusetts would instead put significant effort and investment in highly reliable, frequent transit extending throughout the Commonwealth, of which Regional Rail is the centerpiece. As the last three years have proven, increased remote work has not measurably reduced traffic congestion or vehicle miles traveled. We continue to believe that Governor Baker's Commission on the Future of Transportation had it right when it declared that Massachusetts needs to move more people in fewer vehicles. Regional Rail creates a viable alternative to driving in three ways.

Absent investments in better service, driving will remain many people's only option. But Regional Rail's high all-day frequency, faster trip times, and cheaper fares create such an alternative.

First, electrification greatly reduces trip times, by enabling higher speeds even with additional stations. This entails both electrification of the rail lines and purchasing modern electric trains, called electric multiple units (EMUs). This is the same technology as used on the heavy rail subway; rather than unpowered cars being pulled by a locomotive, most or all cars in an EMU trainset have their own motor, achieving higher performance, just as a car with four-wheel drive outperforms one with two-wheel drive. EMUs drawing power from external sources, namely overhead wire or third rail, are standard the world over for running fast, frequent service. EMUs have all of the following benefits over both diesel locomotives and diesel multiple units (DMUs):⁵

- » Lower cost relative to diesel trains: a Dutch benchmarking report finds that the lifecycle costs of diesels are twice those of electric trains.
- » Emitting no local pollution while getting greener as the power source does
- » High reliability: the EMUs of the LIRR and Metro-North average about 10 times the mean distance between failures of those railroads' diesels.
- » Light weight, since the train does not need to carry its own power plant and can get its power from overhead wires.
- » Less noise pollution

⁴ ["Congestion in the Commonwealth Report to the Governor 2019,"](#) p. 89.

⁵ For further detail on the benefits of EMUs, see the TransitMatters report, ["Regional Rail Electrification: Costs, Challenges, Benefits,"](#) Fall 2021.

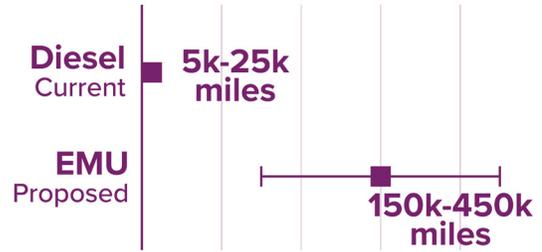
Level boarding, electrification, and EMUs will cut end to end trip times by as much as 50%

Combined with level boarding decreasing dwell time per station, electrification and EMU deployment will cut end-to-end trip times on all lines by 30-50%. This improvement, combined with increased, consistent all-day frequencies and the ability to add stations, will increase the competitiveness of rail.

Second, running frequent, reliable transit to inner and outer core destinations alike improves the viability of transit-oriented development, encouraging construction that concentrates around historic town centers, rather than continuing to sprawl. In contrast, a reliance on electric vehicles alone has the same destructive results of the autocratic, low-density development paradigm of the mid-20th century, paving over our communities for parking and forcing people to drive. The combination of the MBTA Communities Act expanding land zoned for multifamily construction and implementing Regional Rail can improve environmental sustainability, affordability, and economic competitiveness alike.

Third, the Regional Rail operating model makes more extensions of the rail network viable, increasing the range of destinations accessible by transit for many more residents of the Commonwealth and New England, and providing true regional equity. For instance, with diesel trains, the long-proposed Lowell Line extension to Southern New Hampshire was projected to take over an hour and a half, with only four daily round trips; under a Regional Rail operating model, trains would make the trip to Manchester in an hour, with 30-minute or better all-day frequencies.⁶ Similarly, full electrification and level boarding as well as track improvements on the Framingham/Worcester Line would guarantee a Boston-Springfield trip time of about 90 minutes, and justify hourly service.

Mean distance between failures



EMU trains offer significantly more reliability than the current fleet, suffering mechanical issues over an order of magnitude less often. That means far fewer delays for riders.

Commuter Rail Service Frequency (Midday Inbound Frequency)



The MBTA has increased average mid-day frequency on most lines compared to pre-pandemic schedules, but frequency still remains lower than what is needed to serve trips beyond traditional commutes.

⁶ See “[New Hampshire Capitol Corridor Rail and Transit Alternatives Analysis](#),” New Hampshire Department of Transportation, December 2014, p. 44, and “[Modernizing the Lowell Line: Rapid, Reliable Transit for Lowell, Nashua, and Manchester, NH](#),” TransitMatters, Winter 2023, p. 14.

TRAFFIC COMPARISON BETWEEN HIGHWAYS AND THEIR NEARBY RAIL LINES

Study Network Corridor	Average Daily Vehicles			Parallel Commuter Rail Line	Average Daily Ridership		
	2012	2018	Change		2012	2018	Change
Fellsway/McGrath Highway	32,092	30,951	-1,141	Haverhill and Lowell Lines	16,664	17,893	1,229
Interstate 90 (inside I-495)	132,304	147,853	15,549	Worcester Line	12,207	18,057	5,850
I-93 Northeast Corridor	177,776	189,716	11,940	Haverhill and Lowell Lines	16,664	17,893	1,229
I-93 Southeast Expressway	189,125	198,038	8,913	Middleborough/Lakeville, Kingston/Plymouth, and Greenbush Lines	14,120	19,034	4,914
I-95 Southeast Corridor	109,234	123,784	14,550	Newburyport Line	14,003	14,972	969
I-95 Northeast Corridor	121,657	131,926	10,269	Providence Line	20,416	24,647	4,231
MA Route 1A	56,677	60,846	4,169	Newburyport Line	14,003	14,972	969
MA Route 2	43,615	45,632	2,017	Fitchburg Line	7,507	8,885	1,378
MA Route 24	64,911	68,257	3,346	Middleborough/Lakeville Line	5,503	7,360	1,857
MA Route 3	132,053	133,238	1,185	Kingston/Plymouth Line	5,442	5,998	576
MA Route 3A	11,058	13,348	2,290	Greenbush Line	3,915	5,676	1,761
MA Route 9	49,008	51,675	2,667	Worcester Line	12,207	18,057	5,850
US Route 1	47,372	46,284	-1,088	Newburyport Line	14,003	14,972	969
US Route 3	94,163	112,793	18,630	Lowell Line	9,817	10,925	1,108

Source: "Congestion in the Commonwealth: Report to the Governor 2019," Massachusetts Department of Transportation, August 2019, p. 89.

Reliable, Cost-Effective Service Delivery

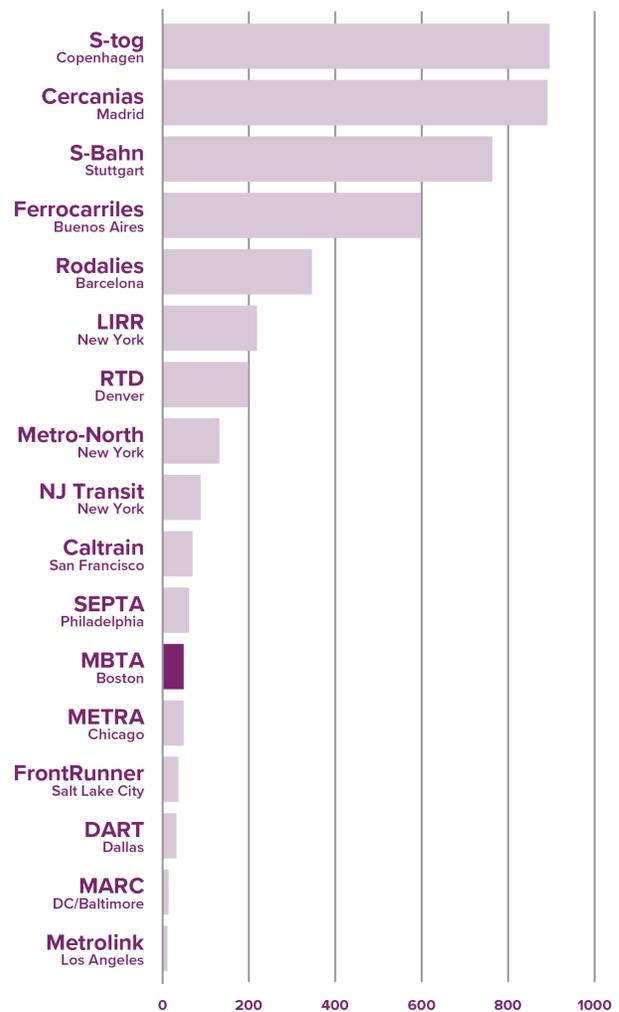
Regional Rail would reduce the per-trip operating cost through system-wide electrification and better utilization of staff and assets. EMUs trains are roughly 10 times as reliable as diesel locomotives, requiring less maintenance; their lifecycle costs, including acquisition and maintenance, are half the cost of diesels. Because operating costs are largely driven by the peak; increases in off-peak service incur little additional cost. High all-day frequency would mean the same number of conductors and engineers working the trains could make more trips per shift, reducing the cost per trip. Additionally, Regional Rail can enable service improvements on bus routes: Suburban bus routes that partially or wholly duplicate Regional Rail could be rerouted to new destinations.

Regional Rail will also improve the MBTA’s financial position. In 2019, the MBTA spent \$384 million on commuter rail operations and received \$239 million in fare revenues; on the Red, Orange, and Blue Lines, the corresponding figures were \$304 million spent on operations and \$224 million in fare revenue.⁷ While this looks like a similar situation, commuter rail did so while serving *one-fifth* the unlinked⁸ passenger ridership of these lines, with per-trip subsidies of \$0.50 on the subway and \$4.68 on commuter rail - and those recipients of that \$4.68 subsidy tend to have high incomes, since it takes a downtown 9-to-5 office job to be able to use the current trains and an income well above poverty to be able to afford them.

Investments in Regional Rail will maximize the value of each dollar spent and serve more riders more effectively. It will be a better use of taxpayer revenue than continuing the status quo of wasteful and inequitable 9-5-focused service.

Commuter Rail Ridership in 2022

(thousands of passengers per mile of track)



⁷ National Transit Database, *Transit Profiles: 2019, Top 50 Reporters*.

⁸ “Unlinked trips” refer to counts of riders per boarding of a transit vehicle; see “*Ridership Report*,” American Public Transit Association.

More Equitable Service

Contrary to the argument that all investment in commuter rail is thus inegalitarian, this situation is because commuter rail operating and pricing models have not kept pace with the changing demographics of Metro Boston, particularly as many people have been displaced from the urban core by high housing costs. The result is that while many diverse communities are served by commuter rail, the actual riders' incomes skew higher. Commuting can exceed 10% of a low income resident's annual income, while only making up less than two percent of a typical commuter rail rider's, according to research by MassINC.⁹

2/3rds of people who live near Lynn's commuter rail station are low income - yet thanks to low frequency and high fares, most cannot use commuter rail, instead taking long car or bus trips.

Percentage of Average Resident Income Spent on Commuting by Rail

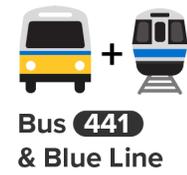


Calculations based on three round trip rides to Boston per week.

Source: US Census Bureau, American Commuter Survey, 5-Year Estimates (2017-2021)



Currently, the same trip from Central Square in Lynn to Downtown Boston can cost significantly different amounts based on how you travel.



Under the proposed fare system, traveling the same distance costs the same, regardless of mode used.

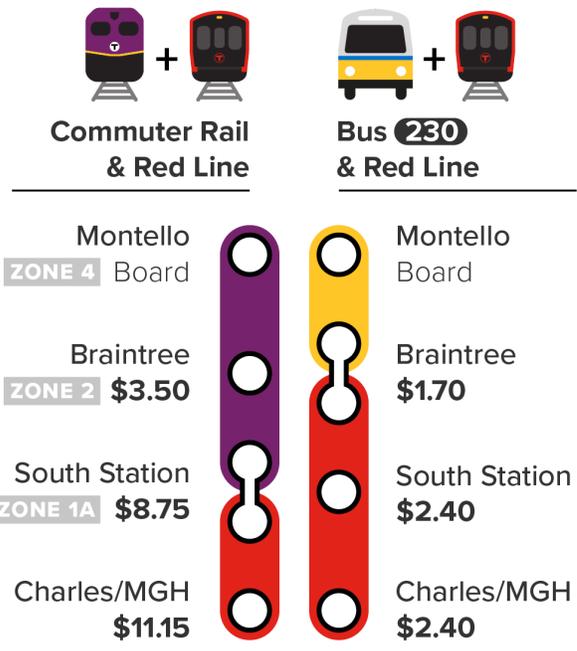
9 Elizabeth Haney, Tracy Corley, and Ben Forman, "Prioritizing Equitable Growth Through Fare Policy." Gateway Cities Innovation Institute, August 2019.

In Lynn, for instance, “two-thirds of station area residents are low-income and yet low-income riders account for just seven percent of those boarding at the Lynn commuter rail station,” the authors of the MassINC report wrote.¹⁰ As a result, overall commuter rail ridership from Lynn is low—with just 549 boardings, compared to about 2,480 daily bus rides between Lynn and the Blue Line terminus at Wonderland.¹¹

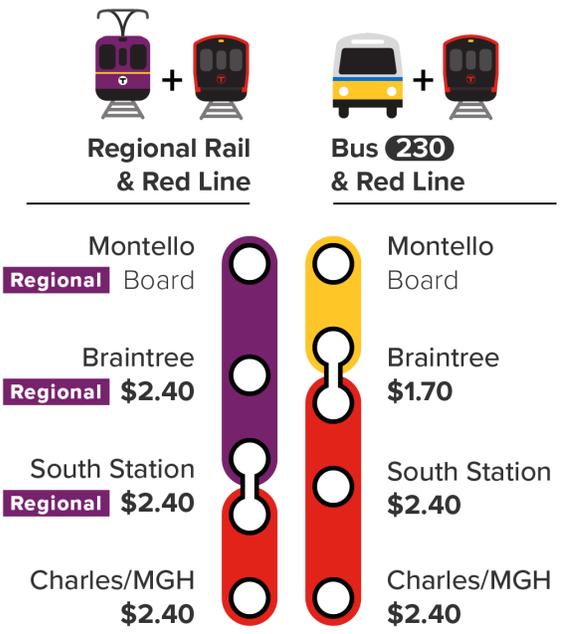
Increasing off-peak frequency and reducing fares would attract many riders who are excluded by the current system, many of whom commute midday. Infill stations, which are achievable with electrification without increasing end-to-end trip times, would likewise draw in a more diverse rider base.

Today, a hotel employee commuting from Haverhill to the Back Bay pays \$26.80 roundtrip. A low-income fare alone would only reduce the cost to \$13.40. A three-tiered fare model combined with a low-income discount and free subway transfer would let her get to work for \$7.20, or 27% of her current fare.

For this reason, fare reform is a key component of Regional Rail, and it’s one that can begin before more intensive capital projects. With commuter rail currently at 75% of pre-COVID ridership, there is ample excess capacity to grow ridership through cheaper, more equitable fares. We advocate a three-tiered system, with equal fares to the subway in the urban core and fares as a multiplier of the subway fare everywhere else. In the short term, a move to cheaper fares represents a commitment to mode shift and transit accessibility for all income levels - a regional and social equity win. In the long term, efficiencies from electrification and higher ridership mean an increase in ticket revenue.



Riders can travel from Montello station in Brockton to downtown Boston by bus or by rail, but the current fare system means travel by rail is over 4 times as expensive.

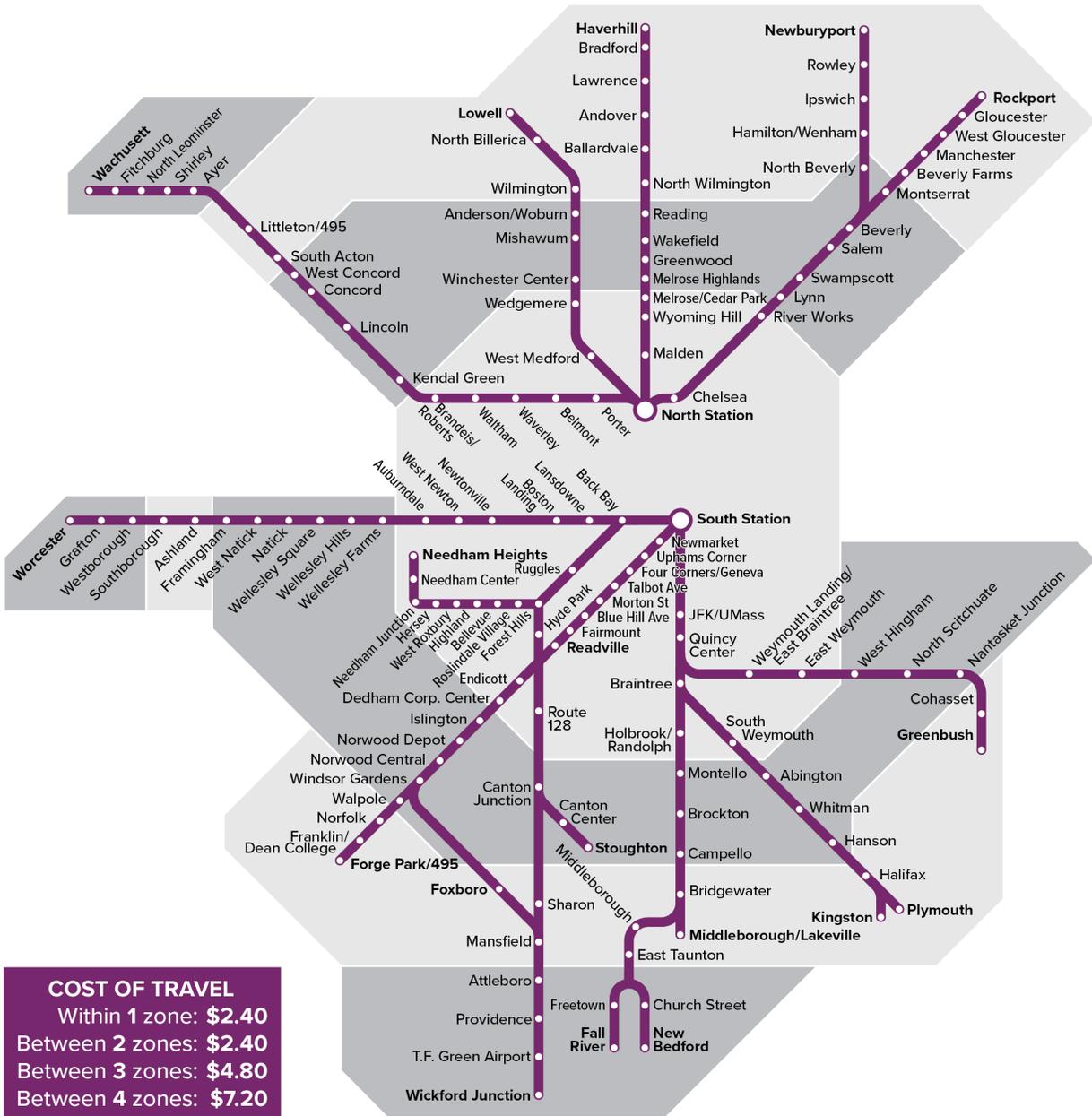


Under our proposed fare system, travel from Montello station to South Station is a more reasonable price, and the rider doesn’t need to pay more to transfer to the Red Line.

¹⁰ Ibid.

¹¹ [Bus Route Profiles](#), MBTA.

PROPOSED DIVISION OF EXISTING STATIONS INTO NEW FARE ZONES



Better Urban Mobility

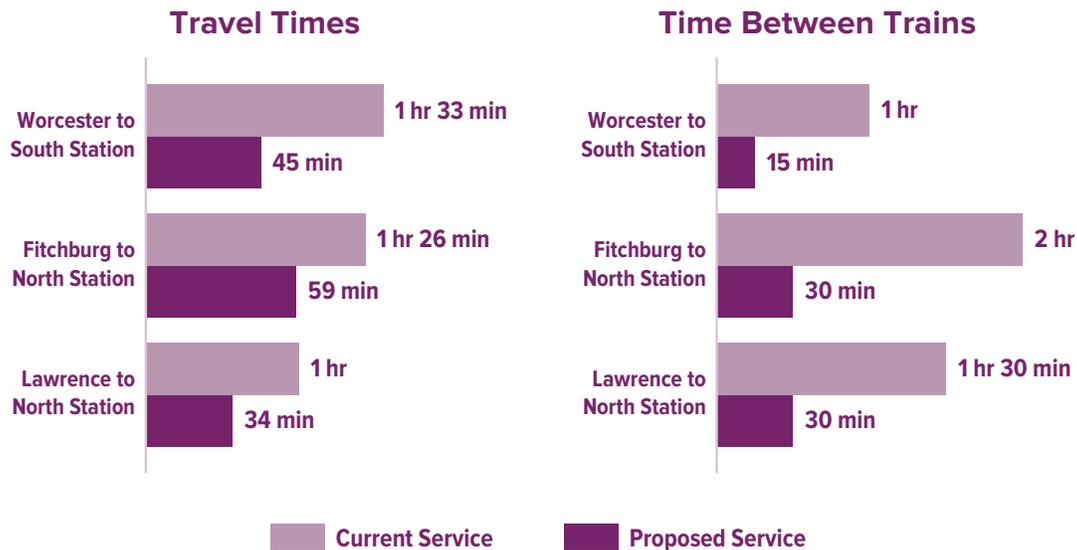
Commuter rail runs through much of the urban core—including the Fairmount Line in Dorchester and Mattapan, Allston and Brighton along the Framingham/Worcester Line (including the future Beacon Park redevelopment), and the inner Newburyport/Rockport and Fitchburg lines such as Lynn and Waltham—but service is too infrequent, and stations do not cover the entire area, for it to be useful for most people. Consequently, these densely populated communities endure long commutes because of distance from the subway and congested thoroughfares like the Alford Street and Tobin bridges.

A nursing assistant from Mattapan starts his shift at MGH at 3 pm. With trains running as frequently on the Fairmount Line as they do on the Red Line’s Ashmont branch, he could have a faster, more reliable trip than the Fairmount Line would provide today, transferring at South Station rather than Ashmont.

Regional Rail would both increase the reach of transit in the urban core and provide resilience for the rapid transit system.

Regional Rail would in effect make these corridors part of the rapid transit network. A fully realized Regional Rail system would provide subway-equivalent service along these corridors, with peak trains as frequent as every 5-7 minutes. In addition, infill stations would increase the reach of Regional Rail, as happened with Boston Landing and stations added to the Fairmount Line in the 2010s. Many riders who currently use buses that parallel commuter rail routes will have a faster trip, enabling the redeployment of buses and drivers to provide more bus service to places without rail access.¹² Lastly, Regional Rail would provide resilience for the core system, by providing additional options to the subway system. We have ample recent experience to know the importance of this resilience factor in providing access to people and supporting our Metro Boston economy.

Shorter Trips and Increased Frequency with Regional Rail



¹² For instance, Seattle’s recent bus network redesign reflected the extension of its light rail system. See: James Brasuell, “[Bus System Redesign Paired With New Light Rail Service Near Seattle](#).” Planetizen News, May 25, 2022.

Better Region Wide Connectivity

Likewise, Regional Rail brings the Gateway Cities closer to Boston and the region as a whole, with 30-minute or better bidirectional service all day. These cities have become leaders in housing production, revitalized their downtowns and have taken on new economic advantages. But poor rail frequency and reliability leave many residents without options beyond buying cars at great personal expense and forces those who want to do business in or visit these cities to drive there. Frequent rail service would make the Gateway Cities and their various developments and amenities, including the incredible growth in Worcester and Brockton, accessible without driving.

An entrepreneur who works with a startup incubator in Lowell lives within walking distance to Porter station in Cambridge. But low frequency combined with the long transfer time between the Fitchburg and Lowell lines at North Station keep him from using commuter rail. Trains every 30 minutes or better to Lowell all day, with frequent connections to the Fitchburg Line at North Station, would give him ample options to reach his workplace and connect with Gateway City-based businesses.

High bidirectional frequency would make more reverse commutes by transit possible. The US Census Bureau’s data show that 15.4 percent of all commuting trips in the region are reverse commutes. Several job concentrations, such as Woburn, are theoretically accessible to commuter rail, but relatively few of these trips are made by transit.¹³ Combined with stronger “last-mile” options, Regional Rail would make several such commutes viable by transit.

FASTER TRIPS

Dramatically better and more reliable trip times to/from Boston than driving



13 “Reverse Commute Areas Analysis.” Central Transportation Planning Staff, October 2019.

A Pro-Growth Paradigm

Growing rail ridership through better, more affordable service is an effective way to reduce vehicle miles traveled and limit the impact of traffic congestion. Good transit service is an amenity desired by many employers, especially the pharmaceutical and software industries that have driven economic growth in Massachusetts over the past several decades.

“The benefits of existing MBTA service are integral to Metropolitan Boston’s high-productivity, knowledge based economic structure ... In the MBTA system as a whole, the half-mile radii around rapid transit and commuter rail stations, representing just 5% of the region’s land area, hold 25% of its people and 37% of its jobs, and generate a disproportionate and growing share of its real property valuation.”

—Transportation Dividend Report by A Better City¹⁴

Regional Rail makes a wider variety of trips by transit possible in the region, benefitting universities, medical services, local businesses, and tourism. It would bring foot traffic, business, and the workforce back to Downtown Boston, a key priority of the Wu administration.¹⁵ Similarly, frequent, fast rail service to destinations such as Worcester, Lowell, Fitchburg, Lawrence, and Brockton will provide immense benefits to the Commonwealth’s secondary cities.



Better connectivity to Gateway Cities like Lowell, above, would provide opportunities for growth and development.

Photo Credit: Emw, [CC BY-SA 3.0](#), via Wikimedia Commons

But perhaps the biggest economic benefit of Regional Rail is that it would serve both existing and current residents of Metro Boston while limiting the impact of new people and development on communities. Investment in Regional Transit Authorities will further enable people to live and work affordably throughout Metro Boston. Our regional economy, and equitable, sustainable access to jobs and housing, depends on a rail network that provides frequent all day service.

With frequent weekend service, the hotel worker from Haverhill could bring her family to events and activities in Boston.

¹⁴ [Transportation Dividend Report](#), A Better City, February 2018

¹⁵ [“Revive and Reimagine: A Strategy to Revitalize Boston’s Downtown.”](#) City of Boston, October 2022.

How to do Regional Rail Right

Getting Regional Rail done while keeping costs manageable requires a willingness to imitate international best practices, and to not presume the high costs of North American projects are a given. This does not require major changes to formal governance—in fact, an excessive focus on leadership and formal structure is a distraction—but rather changes that empower the professional civil service and engineers and reduce political micromanagement, and attention to the practices proven to deliver affordable and effective transit projects.

Organization Before Electronics Before Concrete: A Crucial Guiding Philosophy for Capital Projects

Major American transit projects have suffered from high costs because of an overemphasis on overbuilding infrastructure, a lack of internal planning capacity resulting from excessive austerity, and inefficient and costly staffing practices. Countries which have built extensive, modern transit infrastructure, including Switzerland, Italy, Turkey, and Sweden, have emphasized some version of a philosophy which transit analysts call *organization before electronics before concrete*. In sum, the idea is that better frequency and reliability should first be delivered by a focus on operations, and investment in physical infrastructure should only be undertaken when absolutely necessary to deliver the desired service levels. Crucially, this is not an argument against transit expansion to serve new destinations; rather, in the context of Regional Rail, it means finding nimble ways to increase capacity on existing routes.

For instance, stub-end terminals in many countries have equal or greater peak throughput than South Station had prior to COVID-related peak service reductions, with

fewer tracks and platforms. Instead, they have upgraded capacity through updates to tracks and switches to enable faster speeds, as well as more efficient crew staging.^{16,17} Planning to increase South Station’s capacity must take this fact into account and draw upon the expertise of planners and consultants who have increased capacity in such environments, before the MBTA commits to a multi-billion dollar expansion of the station. The projected \$2.5 billion cost of expanding South Station would, if redirected, provide a significant contribution towards electrification and level boarding throughout the system.¹⁸

In the longer term, while a more expensive and complex project, the North-South Rail Link would provide a better way to boost capacity further. It would do so by enhancing region-wide connectivity, instead of taking up valuable downtown land for train storage.



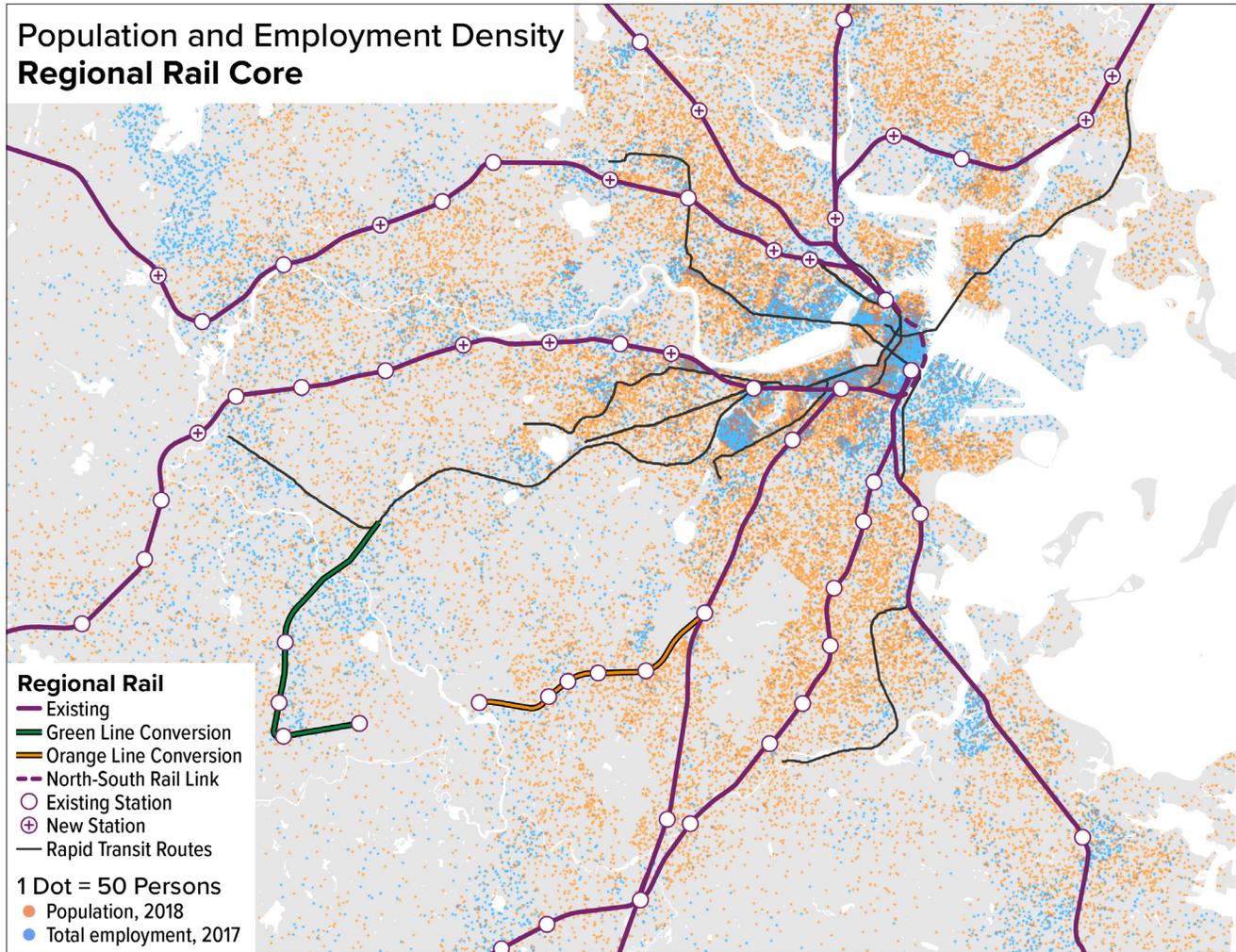
South Station, pictured above, can achieve higher passenger capacity via better operating principles and smart upgrades, making the expensive proposed expansion unnecessary.

Credit: Lexcie, [CC BY-SA 3.0](#), via Wikimedia Commons

¹⁶ As one example, Barcelona’s Catalunya rail terminal has a peak frequency of 32 trains per hour across five platforms and three active throat tracks, with two additional tracks. (See Alon Levy, “[Quick Note: Catalunya Station](#).” *Pedestrian Observations*, February 12, 2023.) Other examples include the stub-end portions of Tokyo Station and Utrecht Centraal, the largest rail station in the Netherlands. Assuming a peak throughput of 4 trains per hour for most branches, 2 for each of the Old Colony branches given the lengthy single-track bottleneck, 8 trains per hour for the Framingham and Framingham/Worcester lines (half local, half express in the latter case), 4 Amtrak Northeast Corridor trains per hour, and 2 additional intercity departures per hour on the Framingham/Worcester Line, and conversion of the Needham Line to rapid transit, South Station would turn 40 trains per hour at peak across 13 platforms and six throat tracks.

¹⁷ For further analysis, see the [TransitMatters Regional Rail Proof of Concept](#) report.

¹⁸ This figure is based on the most recent cost estimate for South Station Expansion we are aware of, from the [2018 North-South Rail Link Feasibility Reassessment](#).



An attorney from Wellesley must often attend court at the McCormack and Moakley courthouses downtown, and occasionally the district court in Framingham. But hearing times vary, and commuter rail is too infrequent. Her spouse works for an investment firm with offices near Back Bay station and works 9-5, but has been delayed several times by train failures. So they both drive. Electrification and economical capacity increases would give them a reliable train every 15 minutes in both directions, all day.

A teacher from Dedham works in Melrose, and must be at school by 7 am, so he drives in Route 128 traffic every day. Classes end by 3 pm, but meetings and after-school activities can mean he leaves as late as 6 pm, often getting stuck in rush hour traffic. Similarly, the hotel worker from Haverhill must transfer to the Orange Line to reach Back Bay, often adding just enough time to prevent her from getting home in time to pick her son up from school. Frequent, reliable service combined with the North-South Rail Link would allow both to have a much faster and more convenient rail commute.

The Importance of Expanded In-House Capacity

In addition to an operations focus, the MBTA must improve capital delivery. For Regional Rail and other crucial projects, retaining and strengthening in-house capital delivery capacity, from procurement through project management and quality control, is essential to keep projects on schedule and costs low.

New York University's Transit Costs Project extensively studied transit construction and governance practices from countries such as Sweden, Italy, and Turkey which have successfully expanded urban and regional rail in a high-quality, low-cost manner.¹⁹ Learning from these successful examples will allow the MBTA to build Regional Rail and other major infrastructure expansion projects right.

The Transit Costs Project found that operators that build successful projects on budget have substantial in-house planning and design capacity at competitive salaries. Where outside consultants and contractors are needed, these agencies' in-house teams are sufficiently large to supervise them well and scrutinize cost estimates. In fact, private contractors prefer stronger oversight; the rail rolling stock manufacturer Stadler cites a lack of oversight as an explanation for why its EMU order for Caltrain cost so much more than similar products for the European market.²⁰ This problem among others is why Caltrain's electrification project has been so slow and expensive; the MBTA can do much better. Expanding in-house project-management capabilities would also allow the MBTA to properly maintain its infrastructure at reasonable costs over the long run.

The small in-house team at the MBTA is capable of executing small projects. The current pace of commuter rail high platform construction is within the capacity of its design review team of five to six people; adjusted for inflation, recent infill stations cost \$22-29 million, not much more than the €10 million seen in Berlin, where trains are shorter. It's only large projects, for

which the Commonwealth relies nearly entirely upon consulting firms, that get done at a large multiple of the international cost.

A remote worker who relies on a wheelchair lives near Concord station. She has a doctor in Waltham and friends in Fitchburg, both of which are on the same commuter rail line. But since Concord station is entirely low platform, she must use paratransit or get a ride to both places. Faster construction of high platforms would let her use a station close to her, and have more flexibility than paratransit provides.

Expanding in-house engineering capacity at the RATP Group in Paris allowed the company to design, procure, and manage multiple Métro line extensions (Lines 4, 11, 12, 14), the automation of Line 4, and the overhaul of major RER stations in the last eight years. But while Métro extensions of a few kilometers are within the RATP's in-house capacity, the 200-kilometer Grand Paris Express project is not, and this project has suffered from delays and higher costs than are typical for French projects.²¹ Expanding in-house capabilities will allow the MBTA to implement the necessary investments for Regional Rail while also undertaking rapid transit extensions such as the Red-Blue Connector.

Expanded in-house planning capacity and Regional Rail service standards make expansions of the rail network more tangible and more useful.

Cuts to internal planning have led to an erosion of institutional knowledge, and are correlated with higher costs. In other countries that built stronger civil service bureaucracies and then dismantled them due to austerity measures, such as Canada and the United Kingdom, costs escalated substantially within a generation; the Transit Costs Project report on Sweden warns that outsourcing is already creating problems there. Austerity practices may play well in the press, but they often fail to deliver

¹⁹ For example, Sweden recently opened a tunnel to increase regional rail capacity in Stockholm, similar in purpose and effect to the North-South Rail Link, and is building another such tunnel in Gothenburg, whose metro population is 1 million. The combination of low-cost construction and extensive transit-oriented development permitted Stockholm to reach 1.8 million rail trips per workday in 2019, in a region of 2.6 million.

²⁰ Baldric, Anthony, "High quality railway vehicles."

²¹ "Report of the Court of Auditors, Société du Grand Paris." December 2017.

outcomes that are cost-effective. It is important for the MBTA to hire competent project managers and retain them beyond the tenure of specific projects.

With that said, completion of Regional Rail Phase I on a quick timeline will require additional capacity that may not be attainable purely through in-house hiring. There may be room for public-private partnerships on aspects of Regional Rail, particularly platform and infill station construction; Boston Landing station was entirely privately funded by New Balance as part of its redevelopment project of the adjoining parcel. The track record of public-private partnerships in rail operations is mixed; there have been some high-profile underperforming projects, namely the Eurotunnel project and, arguably, Denver's RTD, but others, such as the Arlanda Express, have been more successful.²² But regardless of operating decisions, it's essential for the MBTA to have sufficient in-house staff to retain institutional knowledge, keep costs manageable, and deliver improvements.



Many stations like Ballardvale, pictured above, are in need of major renovation and upgrades to support better service. Using standardized station designs across the system would reduce expenses and get the projects done faster.

Credit: Nick Boppel, [CC BY-SA 4.0](#), via Wikimedia Commons

The Importance of Standardization

Regional Rail requires an aggressive rollout of high platforms: most stations are only partially accessible, and just under 20 percent are completely inaccessible; furthermore, some, such as South Attleboro and Beverly Depot, are in severe disrepair. Thus, it's critical to implement a standard design for high-level platforms wherever possible. We acknowledge that there will be circumstances where the design will need to be modified based on local conditions, but standardization generally is important for delivering cost-effective projects.

Of the \$20-25 million it cost to raise the platforms of an existing two-platform station or build a new one in the late 2010s, between \$2 and \$7 million were spent on design. No standardized designs have ever been provided. A lack of standardization contributes to American transit's high costs, including recently the first phase of New York's Second Avenue Subway. GLX also suffered from this problem: every local neighborhood group in Somerville demanded a signature station that would be large and unique, driving up costs. Standardized stations need not be spartan or lacking in functionality; consistent design standards for recent projects in Denmark, Finland, and Italy have built functional and attractive stations.

The Commonwealth should use the standards currently in use for South Coast Rail Phase I if possible, or develop new ones if not. Moreover, the budget for Regional Rail must be exclusively focused on Regional Rail items; unrelated projects must be funded from outside the MBTA.

22 [“Successful Public Private Partnerships in rail? Yes, we can!” Global Railway Review, May 15, 2009.](#)

Overall Project Reform

Good project management requires, at a minimum, the following measures:

- » The MBTA must develop its own experienced professional planning department.
- » The MBTA must develop a stronger project management workforce and strengthen quality control/quality assurance efforts.
- » Costs must be itemized and public, for the sake of both transparency and anchoring expectations in case of changes.
- » The MBTA's in-house staff should be capable of technically scoring each proposal, so that the winning bidder should be the one with the best value and not lowest bid; 50-80% of the weight of the bid must be by technical merit, not price.

The legislature can also assist by implementing permitting reform. This includes reforming the Massachusetts Environmental Policy Act to streamline environmentally beneficial projects like transit expansion, but it can also save Regional Rail a lot of time and money with a waiver from its requirements.

“It can take a decade to permit and build offshore wind, clean transportation, and major electric transmission. This is as unacceptable as it is unnecessary. While permitting is not the only source of delay, it is virtually impossible to build out essential infrastructure and clean energy under the current approach to federal, state, and local project review and approvals.”
—Sen. Chris Murphy (D-CT) and Conservation Law Foundation president Brad Campbell²³

This vision for Regional Rail builds infrastructure to not only meet Boston's needs today but decades in the future. This approach creates the highest returns on investments, something that is extremely pressing given MBTA's current financial status. Bespoke designs and

insufficient project oversight with United States transit projects means design costs add up to 30% of the total cost.²⁴ Under good standards for megaprojects, the design costs usually add about 7-8% on top of the hard costs, but not more than 10%. To meet these conditions, it is critical to concentrate efforts, and thus budgets, on investments that can provide a high return in the long run such as implementing Phase I of the Regional Rail Transformation Plan.

A Salem State University student from Lynn would greatly benefit from a Regional Rail station in South Salem, providing a faster trip than driving or buses, which can take anywhere from 20 minutes to an hour depending on traffic. Streamlined project delivery enables several new stations, which increase transit access.

Getting Regional Rail done requires advancing a realistic budget and timeframe and proceeding with a sense of urgency. Learning from successful transit projects, sufficient in-house staffing, and a cohesive vision can avoid unnecessary delays and cost overruns.



Constructing overhead wires for electrification is a complex but critical project. Improved planning capacity would help it complete on time and within budget.

Credit: MTA Capital Construction Mega Projects, [CC BY 2.0](https://www.flickr.com/photos/mta/1481111111/), via Wikimedia Commons

²³ Chris Murphy and Brad Cambell, [“To better address the climate crisis, the US must reform its permitting process.”](https://www.bostonglobe.com/story/2022/11/21/better-address-climate-crisis-us-must-reform-permitting-process/) *The Boston Globe*, November 21, 2022.

²⁴ This figure is averaged across a large number of rail projects accessible via <https://www.transit.dot.gov/capital-cost-database>

The Need for EMUs

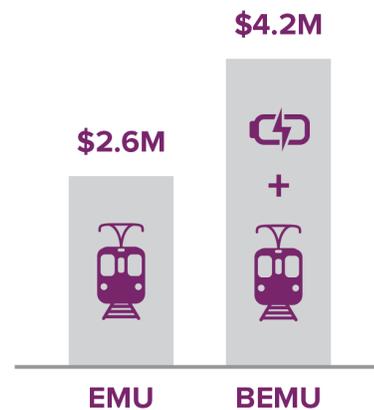
Nearly all modern Regional Rail systems use EMUs with external power. The EMU market is well-developed and competitive, with many European and Asian vendors producing standardized trains for different markets' needs; the typical cost for a standard-speed EMU is about \$2.5 million per American-size EMU car. However, recent planning by the MBTA's Office of Rail Transformation has assumed the use of battery electric multiple units (BEMUs) charging off overhead wire for large portions of the routes and running on battery elsewhere, in a method called discontinuous electrification. While the range and performance capability of BEMUs have improved, they remain untested and uneconomical for high-frequency service.

BEMUs currently cost roughly twice as much as EMUs to acquire, and still require some of the fixed costs of electrification to install; with discontinuous electrification, substations will still be required, which account for half the cost of electrification, though a somewhat lower number may be needed.²⁵ For this reason, metro areas equivalent to Boston with high-frequency service use EMUs exclusively; even mid-sized cities worldwide are continuing to use overhead wire. In this decade, India, China, and South Korea are all about to reach 100% electrification, leapfrogging Europe with its 60-80% electrified systems. No agency besides the MBTA is planning to deploy BEMUs on high frequency lines.^{26,27}



An electric multiple unit (EMU) train, pictured above in Germany, more closely resembles a subway train than the MBTA's current commuter rail fleet with large locomotives.
Credit: Garth Frantzen for TransitMatters

Cost Comparison Between Conventional EMU and BEMU



Calculations based on cost for 26-meter vehicle

²⁵ Alon Levy, "[In-Motion Charging is Not for Trains.](#)" *Pedestrian Observations*, July 13, 2022.

²⁶ For further analysis regarding BEMUs and the MBTA's discontinuous electrification proposal, see the joint A Better City/TransitMatters report "[Reimagining Regional Mobility: Productive, Equitable, and Decarbonized Regional Mobility.](#)" February 2023, as well as the TransitMatters "[Regional Rail Electrification](#)" report, Fall 2021.

²⁷ There is one recent example we are aware of where discontinuous electrification may be operated at moderately-frequent headways: Merseyrail, the operator of Liverpool's regional rail system, ordered seven new BEMUs with plans to deploy them in the future on non-electrified lines; most Merseyrail lines operate every 15 minutes, but it is not clear how frequently the battery-operated portions will run. See: "[Merseyrail's new EMUs enter service.](#)" *International Railway Journal*, January 25, 2023.

For a successful transition to a reliable, frequent Regional Rail system, it's crucial to use best-practice equipment. The first phase of Rail Transformation is the wrong time to be the testing ground for speculative technologies like battery trains.

While operators in Europe and Japan are using BEMUs on a growing number of lines, they are doing so entirely on lower-ridership, low-frequency lines (running at most half-hourly, in some cases as little as 3-4 daily trips), where the costs of the train fleet are much smaller than those of infrastructure. The trains are also typically short trains, no longer than three or four US-size railcars; whereas pre-COVID, the MBTA regularly ran full eight-car bilevel trains at peak.

It is possible that as BEMUs and discontinuous electrification methods are more extensively tested in revenue service, they will prove useful and more economical than full overhead catenary electrification for later phases of the Regional Rail transition, particularly where demand and thus frequencies are lower. We encourage the MBTA to continue to monitor developments. But the MBTA is not in the position to provide the testing ground for a technology that has never been deployed for this application.

Moreover, the Phase I rail lines demand high frequency service and the benefits that overhead electrification has proven it can provide. The Fairmount and inner Newburyport/Rockport lines have some of the highest residential densities (and longest transit trips) in Metro Boston. The Providence Line is mostly electrified and is the MBTA's busiest commuter rail line.²⁸ Overhead catenary on the Stoughton and Framingham/Worcester lines is a downpayment on future services, namely South Coast Rail Phase II, future East-West Rail, and restored Amtrak Inland Route service. The outer branches of the Newburyport/Rockport Line have lower ridership potential and are thus theoretically attractive for discontinuous electrification. But the extent of catenary



Battery-electric multiple unit (BEMU) trains, pictured above, are generally used on low-capacity, infrequent routes, not large systems like the MBTA's network.

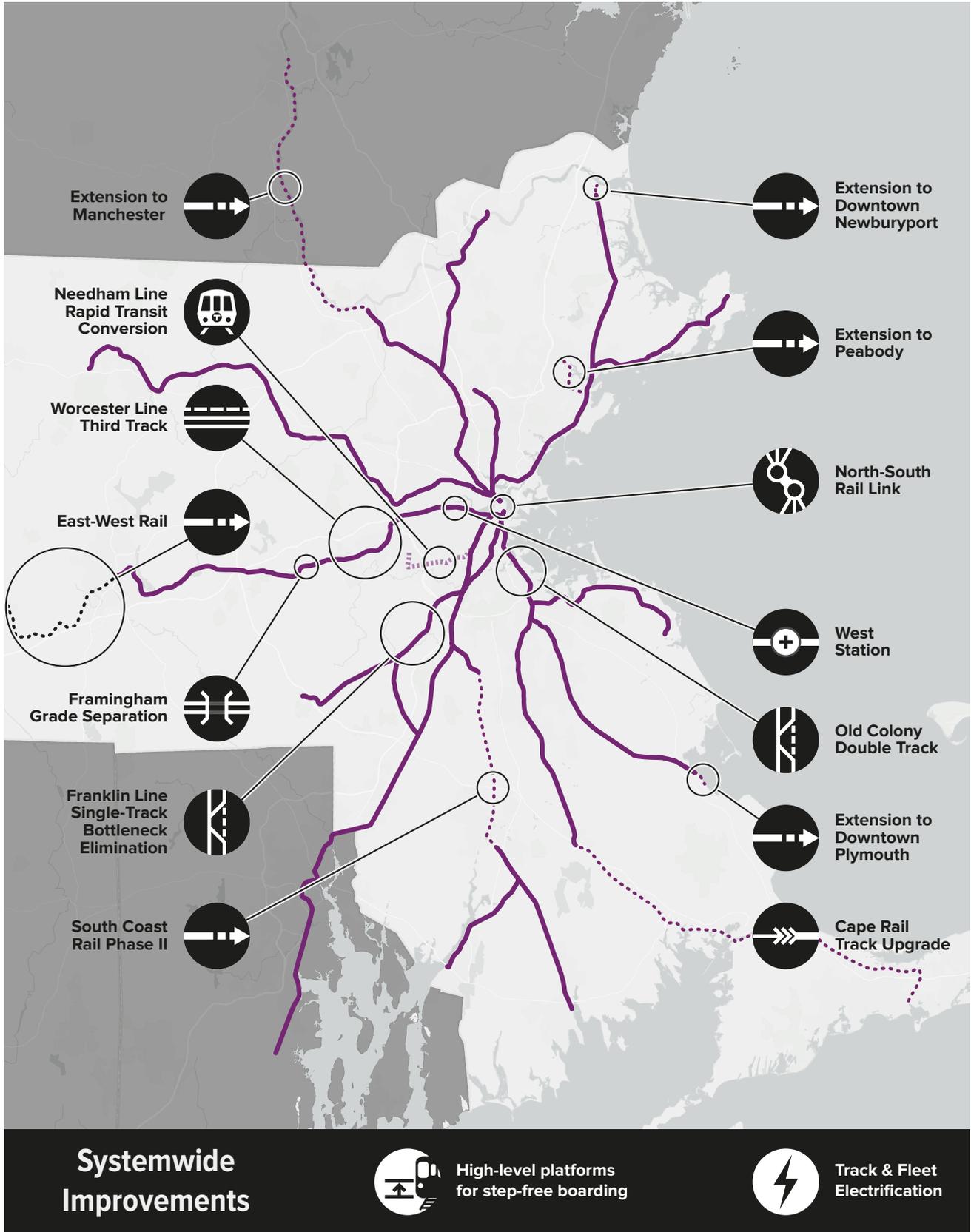
Credit: Spsmiler, CC0, via Wikimedia Commons

needed for charging under the MBTA's assumptions is such that simply wiring the lines in their entirety and achieving economies of scale in procurement is more advantageous than needing to purchase unique, more expensive trains for just part of Phase I.

Overhead electrification has proven itself over the last century in metro regions across a variety of political alignments, geographies, and sizes. In the future, a Metro Boston with an extant Regional Rail network will have the expertise to experiment with technology, timetables, and infrastructure and could even define best practices itself, but for the first phase of Regional Rail, adherence to the proven method is crucial.

²⁸ Providence Line trains continuing to Wickford Junction do use an unelectrified track for about nine miles between Providence Station and just south of T.F. Green Airport station, and the Wickford Junction platform siding is unelectrified. However, there is an underway project to electrify T.F. Green Airport station.

MAP TO KEY PROJECTS NEEDED ACROSS THE SYSTEM TO ACHIEVE REGIONAL RAIL



Getting on Track Now

Regional Rail will drastically improve mobility in Metro Boston, encouraging mode shift, reducing carbon emissions from transportation, growing ridership, advancing regional and social equity, and reducing the high fixed costs of the MBTA. While expanded bus service is also crucial, it cannot solely meet the region's mobility needs. Buses and rail work best when they work together as part of a cohesive, equitable, and integrated system. Expanding the core rapid transit system is likewise an important long-term goal, but Regional Rail leverages the assets we already have to provide frequent service in the near term.

The MBTA can start by improving service to existing commuter rail, while it staffs up with experienced, technically competent planners, designers, engineers and project managers. They can cut their teeth by designing and building high level platforms for all stations and completing the Providence/Stoughton and Fairmount Line electrification, then they can acquire EMUs and begin running them. The MBTA also needs a dedicated, reliable source of planning and operating funds, so it can pay people competitive salaries. Building a confident, empowered, informed in-house staff will be crucial to the success of Regional Rail and to future transit expansion projects.

In order to provide region-wide mobility benefits in the immediate term, it's crucial that Phase I include "no-regrets" projects to provide 30-minute or better headways system-wide, in keeping with the *organization before electronics before concrete* philosophy. Equally important is the rollout of accessible platforms at key stations, such as Back Bay and Porter Square, and those flagged as urgent priorities by the Program for Accessible Transit Infrastructure.

The legislature, MBTA, MassDOT, and executive branch must commit to a comprehensive plan to get Phase I done quickly, in a manner that gives deference to the best practices outlined herein. Concurrently, planning for future phases of Regional Rail must begin – and the sooner in-house capacity is expanded, the more can be done.

While following the mantra of *organization before electronics before concrete* reduces the amount of physical infrastructure needed, Regional Rail will include intensive capital projects that cannot be avoided, and will pay dividends, including conversion of the Needham Line to rapid transit and grade separation in Waltham and Framingham. Moreover, Regional Rail enhances the utility of projects such as the North-South Rail Link, the second phase of South Coast Rail, East-West Rail, and rail to New Hampshire's Capitol Corridor and Cape Cod – and these projects become more tangible with a more equipped planning division.

There is no other alternative that helps the Commonwealth meet its climate goals, address congestion, connect Gateway Cities, and provide regional and social equity in the delivery of quality public transportation services while improving the system's state of repair.

Regional Rail is an opportunity to transform Metro Boston's transit network from one which barely manages to run trains and buses to the world-class system the region needs. There is no other alternative that helps the Commonwealth meet its climate goals, address congestion, connect Gateway Cities, and provide regional and social equity in the delivery of quality public transportation services while improving the system's state of repair. Fulfilling this vision requires a real sense of urgency and a commitment to action. We cannot afford three more years of hand wringing and delay. These challenges will not wait for the MBTA to address every other issue facing the T, nor will they wait for the federal government to swoop in. The time to build this transformative system will never be better; it's time to act on it.

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