METROLINK

Executive Summary

FY2020 – FY2040

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INTRODUCTION

Metrolink, the regional rail service in Southern California, is operated by the Southern California Regional Rail Authority (SCRRA), a Joint Powers Authority with member agencies representing the counties of Los Angeles, Orange, Riverside, San Bernardino and Ventura. Metrolink strives to be a leader in the regional rail industry by providing safe, efficient, quality service to its customers and through the modernization of technology and business practices and the pursuit of sustainable solutions.

This Rail Fleet Management Plan (RFMP) update will be maintained as a live document which will be ever-changing with the life and growth of the fleet, including changes in technology, and contains Metrolink's strategy for achieving and maintaining its vehicle assets in a state of good repair, maintaining its status as an industry leader and, most importantly, providing its customers with an outstanding passenger experience on every ride with safe, clean, dependable and on-time operations.

SYSTEM OVERVIEW

Metrolink is the largest commuter rail operation in California based on route miles, and the eight largest in terms of ridership. Metrolink serves 62 stations in six counties on seven lines totaling 538 route miles of service. Of the seven lines, six terminate at Los Angeles Union Station (LAUS). LAUS is a stub-end, 13-track station with six low-level platforms that can accommodate trains up to sixteen cars long. The station is used for Metrolink and Amtrak trains. The station also includes stops for Metro's Red and Purple Line subways, the Gold Line light rail, Silver Line Bus Rapid Transit, numerous local bus routes, LAX Flyaway service and Amtrak Thruway Buses.

Over the FY14-FY18 period, Metrolink's network grew by 26 route miles with the initiation of service in the Perris Valley Corridor and San Bernardino – Downtown extension, Metrolink's first service expansion since 2002. In May 2018, the new Burbank Airport-North station on the Antelope Valley Line was opened, which expanded Metrolink's train-to-plane connectivity by providing additional access to the Burbank Airport from northern Los Angeles County and from Los Angeles Union Station.

FLEET OVERVIEW

The Metrolink fleet is comprised of bi-level passenger cars (built as either trailer cars or cab cars with an operator compartment at one end) and locomotives, the majority of which are newly delivered locomotives that use leading edge innovative clean technology. The equipment is arranged into sets of four, five, or six passenger cars and configured for push-pull operation, with a locomotive at one end and a cab car at the other.

As a key step in its drive to a zero emissions future, SCRRA was the first regional railroad in the United States to use diesel-electric locomotives with "Tier 4" clean engine technology.

The Metrolink fleet contains 59 locomotives including:

- 39 Electro-Motive Diesel/Progress Rail F-125
- 15 Motive Power, Inc. MP36PH-3C
- 5 Electro-Motive Diesel F59PHR locomotives rebuilt to FRA Tier 2 specifications

Tier 4 locomotives are compliant with the latest U.S. Environmental Protection Agency (EPA) emissions standards and reduce particulate matter and nitrogen oxide emissions by up to 85 percent compared to older passenger rail locomotives. SCRRA placed the first of its 40 new "F125" model Tier 4 locomotives into revenue service in 2017. In addition, SCRRA's new locomotives are also equipped with the latest rail safety features, such as Positive Train Control (PTC) and Crash Energy Management technology. The new locomotives have up to 46 percent more horsepower than older models, which will enable Metrolink to transport more people reliably and efficiently. The new locomotives also feature enhanced on-board engine diagnostics and are expected to reduce delays caused by mechanical issues on trains. SCRRA's order of 40 Tier 4 locomotives replace 37 older locomotives that otherwise would have required a midlife overhaul to maintain service reliability, and to increase the total in-service fleet by three locomotives to allow for service expansion.

Metrolink has one additional EMD F-125 locomotives ordered with expected delivery in June 2021. As the last remaining EMD F-125 is delivered, tested, and commissioned, the remaining EMD F-59PHR locomotives will be phased out of revenue service and stored as part of the contingency fleet.

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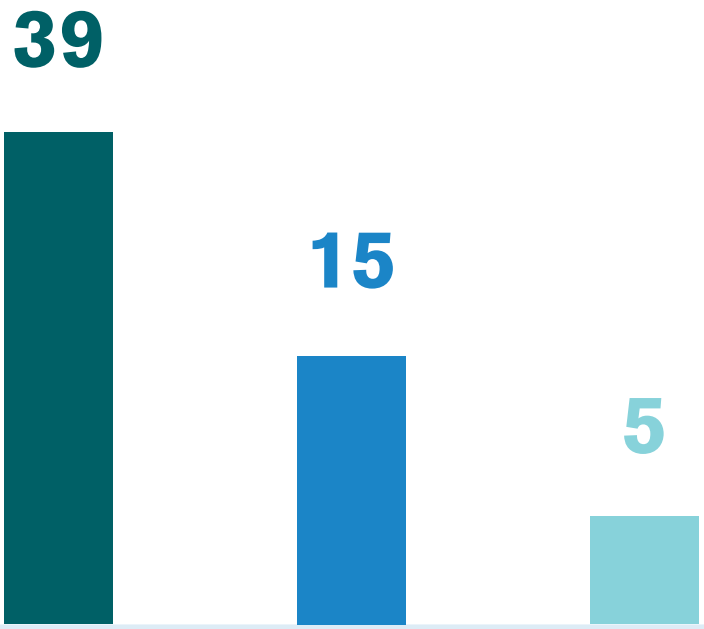


The state-of-the-art Tier 4 locomotives are the cleanest diesel locomotives in the nation, providing wide-ranging environmental benefits for the Southern California region.

Table 1 – Existing Locomotive Summary

BUILDER	MODEL	BUILT	ACTIVE / PENDING	CONTINGENCY	RETIRED	ROAD #
EMD	+ F40	1985			1	800
EMD	F59PH	1992 - 1993		1	14	853, 854, 857-860, 862-867, 869, 871, 872
EMD	F59PHR	2009	5	2		851, 852, 856, 861, 868, 870, 873
EMD	F59PHI	1995			8	874-881
EMD	F59PHI	1998			2	882-883
EMD	F59PHI	2001			4	884-887
MPI	MP36PH-3C	2008	15			888-902
EMD	F59PH	1988				18520, 18522, 18533
EMD	F125	2012 - 2016	40	3		903-942
TOTAL ACTIVE / PENDING & CONTINGENCY LOCOMOTIVES			**60**	**6**		

SCRRA weekday operations in 2020 required 40 daily cycles of equipment sets, requiring 40 locomotives, 40 cab cars, and 155 trailer cars. Service was temporarily reduced in March 2020 by 30 percent with the announcement of Safer-at-Home orders across Southern California. Since then, a passenger survey was distributed to gather customer feedback on changing travel needs and cleanliness requirements. Metrolink launched an online tool, "How Full is My Train?," to help customers gauge the ability to social distance on their train before boarding. Additionally, cleaning protocols were ramped up to curb the spread of COVID-19 onboard trains and included an increase in cleaning staff and nightly deep cleaning of all trains at minimum.

VEHICLE MAINTENANCE

SCRRA's rolling stock equipment and rehabilitation component upgrades are based on safety, condition, upfront replacement costs, maintenance costs, ongoing costs, on-time performance, return on investment, OEM recommendations and economies of scale for the individual programs.

Metrolink has started the process of moving towards a lifecycle maintenance (LCM) program to improve the reliability and safety of its fleets.

The Guardian cars and the F125 locomotives are currently being maintained within this program. Once the legacy vehicles have completed the one-time major overhauls,

it is planned they will also be shifted to an LCM maintenance program for the remainder of their service lives.

Metrolink's LCM covers all major reliability and safety critical systems that would be overhauled or replaced every certain number of years, specific to each system, to best match the needs of the system and the operational demands of Metrolink's service. The number of years between each iteration of an overhaul/replacement activity for a certain system is called the LCM cycle length.

Since it would not be possible to perform maintenance activities on all vehicles at the same time, the LCM activities need to be staggered, and may be performed over several years to complete on the whole fleet. The first cycle length requires performing some overhaul/replacements early, but once all activities have been performed on the staggered schedule, the remaining cycles will be naturally staggered without needing further adjustments. This allows for improved planning and preparation of maintenance activities and reduces the likelihood of multiple failures occurring within a short timeframe for the same system. Additionally, costs are stabilized, and long-term funding needs to support the fleet are normalized.

With the delivery of 137 Guardian cars in 2010 and the ongoing delivery and commissioning of 40 F125 locomotives, Metrolink is well positioned to execute the LCM strategy for these vehicles. Newer generations of vehicles are equipped with microprocessor-controlled systems and require shorter/less inspection intervals (based on OEM recommendations) and generally will not continue to operate well without consistent, timely maintenance. Many agencies, including Metrolink, are now tasked with reorienting their maintenance programs to address the more demanding maintenance requirements, which are typically shorter than the mandatory FRA requirements for inspections that are often based on older technology and legacy equipment. Modern fleets can provide long-term service delivery benefits and customer comfort characteristics that today's customers expect.

IMPROVED PLANNING AND PREPARATION OF MAINTENANCE ACTIVITIES CAN PROVIDE LONG-TERM SERVICE DELIVERY BENEFITS AND CUSTOMER COMFORT CHARACTERISTICS THAT TODAY'S CUSTOMERS EXPECT

MAINTENANCE FACILITIES

Metrolink operates or rents space at a total of nine service and support facilities, divided into maintenance, layover, and storage facilities as follows:

Maintenance Facilities

- Central Maintenance Facility (CMF)
- Eastern Maintenance Facility (EMF)
- Orange County Maintenance Facility (OCMF) (Planned / Partially Funded)

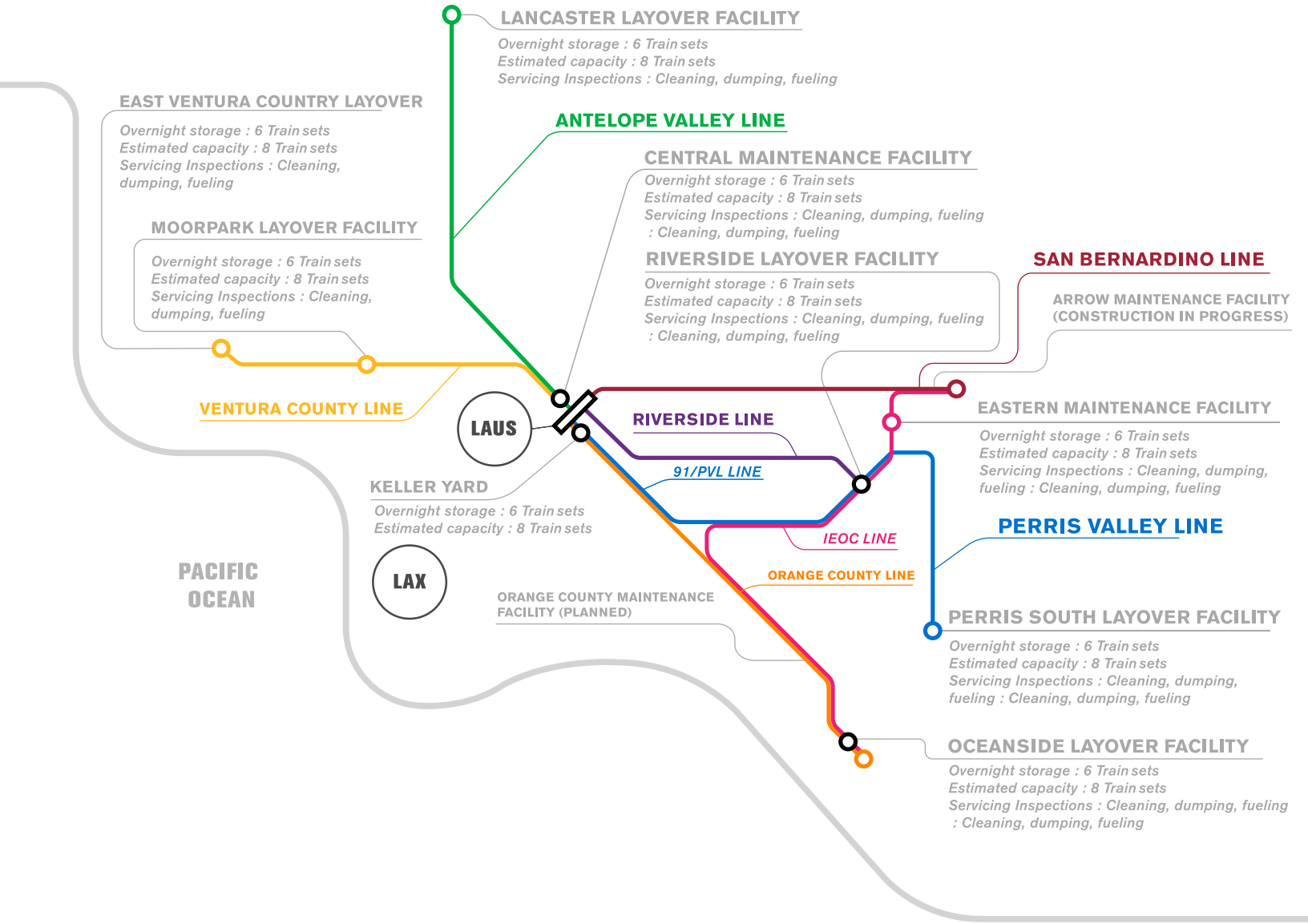
Layover Facilities

- Montalvo, East Ventura County (EVC)
- Lancaster (LCS)
- Moorpark (MPK)
- Riverside – Downtown (RVS):
  - Riverside – North layover facility
  - Riverside – South layover facility
- South Perris (SPS)
- Stuart Mesa Maintenance Facility, Oceanside (OSD) – operated by NCTD

Storage Facility

- Keller Yard

Figure 1 - Metrolink Facility Map



The CMF is Metrolink's primary location for rolling stock maintenance, fueling, materials management and also services as crew base. The facility is limited in space, not ideally suited for overnight storage, but requires storage for mid-day layovers. After the morning peak runs, most Metrolink trains arrive at the CMF for daily service and to be prepared for afternoon departures.

The CMF is also the only facility equipped to perform heavy repairs within the Metrolink system. Major maintenance and overhaul/rebuild work is identified in the Capital Plan and then work is prioritized and performed based on need and availability of funding under separate contracts.

The Eastern Maintenance Facility (EMF) is located in Colton, CA, southwest of San Bernardino. The EMF relocated train storage and servicing from the San Bernardino Santa Fe Depot station area, allowing improved efficiencies at CMF. The EMF is a maintenance facility with a train wash system, S&I yard, and an adjacent train storage yard. The facility transportation building is configured with space for administration, training, and office space. Train sets are serviced daily at the EMF, the S&I station is equipped with sand stations, water and sewage dump, and fuel and oil stations.

The EMF construction was split into three phases, but only two phases (Phase 1 and Phase 3) have been built to-date. Future construction referred to as “Phase 2” includes building two (2) additional S&I tracks as well as locomotive and car shops equipped with a drop table, overhead cranes and a wheel truing machine. Future changes in Metrolink’s maintenance requirements may result in shifting other maintenance roles to this facility. Phase 2 construction is currently not funded. Metrolink is currently in the processes of updating designs for the Phase 2 shop.

Similar to the CMF, the EMF is surrounded with residential and commercial properties. Initiatives to improve neighborhood relations relating to noise and vibrations are identical to CMF work and currently not funded.

In planning for the build-out of the EMF concerns of the community must be taken into consideration to minimize impacts to noise, vibration, air quality during construction and in expanded operations.

METROLINK STRIVES TO MAINTAIN ITS STATUS AS A LEADER IN THE REGIONAL RAIL INDUSTRY BY PROVIDING SAFE, EFFICIENT, CLEAN, QUALITY SERVICE THROUGH THE MODERNIZATION OF TECHNOLOGY AND BUSINESS PRACTICES WHILE PURSUING SUSTAINABLE SOLUTIONS

PLANNING FOR THE FUTURE

To inform fleet planning and recommendations, an assessment of various vehicle technologies was undertaken to identify and recommend feasible alternative propulsion technologies in order to reduce greenhouse gases and criteria pollutants while improving upon train performance. This assessment included a cost benefit analysis of eight different fleet technology scenarios to compare the costs and benefits associated with each technology type. The results of this analysis will facilitate the development of an in-depth Pilot Implementation Plan to provide real-world testing of different equipment with the aim of identifying the preferred rolling stock, technology, supporting infrastructure, and timeline for when equipment procurements and maintenance updates need to occur.

The framework for the cost benefit analysis is based on the existing LHC fleet and will explore and compare the costs and benefits from deploying alternative fleet types such as single level multiple unit trains. A rail multiple unit is an ever more popular arrangement worldwide and within the U.S. such as in at Caltrain and North County Transit District in San Diego. The use of single level multiple unit trains in the cost benefit analysis has two potential benefits that require further exploration: firstly limiting the length of the semi-permanent coupled trainsets reduces the impact of converting traditional individual locomotive or coach maintenance facilities to multiple unit facilities; and secondly, it allows a standardized fleet the flexibility to efficiently service both high and low demand routes.

To provide a true comparison of the technology impacts, the scenarios described below assume the current fleet will be replaced at the end of its service life such that capital costs relating to quantities of vehicles needing to be procured is a like-for-like representation:

01 Locomotive Hauled Coach / Diesel

02 Locomotive Hauled Coach / Diesel-Battery Hybrid

03 Locomotive Hauled Coach / Battery Only

04 Locomotive Hauled Coach / Hydrogen Fuel Cell (HFC)-Battery Hybrid

05 Multiple Unit / Diesel

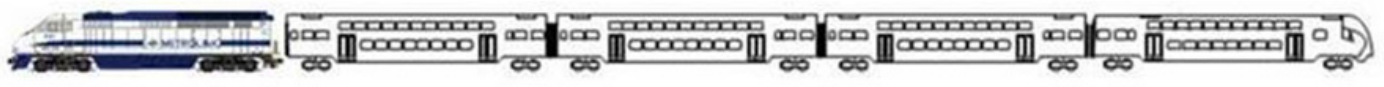
06 Multiple Unit / Diesel-Battery

07 Multiple Unit / HFC-Battery Hybrid

Each scenario assumed a homogenized fleet of the consist type and propulsion technology listed, unless the range or performance of the technology may drive a train length limit, e.g. shorter train length on the Antelope Valley Line due to steep grades. For cost benefit analysis, a homogenized fleet was assumed in order to properly evaluate the performance of the technologies. It is understood that Metrolink may procure a mixed fleet and therefore further evaluation is recommended to assess mixed fleet scenarios to determine the appropriate combination of vehicle types and technologies to meet Metrolink's goals for their planned operations.

Figure 3 - Trainset Configurations Evaluation

The locomotive hauled coach scenarios was comprised of a consist of 1 locomotive, 3 to 5 trailer coaches and 1 cab car. This is consistent with the consist evaluated within Metrolink's Locomotive Modernization Study such that data from that study are applied to the analysis.



The multiple unit scenarios will comprise a standardized consist of a 4 pasenger-car, 1 power car, articulated unit of a type consistent with SBCTA's ZEMU project such that the data from that project are applied to the analysis.

The high-level technology assessment and cost benefit analysis conducted indicate the following:

- Battery and hydrogen-battery hybrid propulsion technologies are technologically feasible zero emission solutions for Metrolink. However, these technologies have range deficiencies relative to Metrolink's current fleet that cause additional fleet quantity requirements and operational complexities that may not make them viable in the short term.

- Significant fueling, charging and facilities infrastructure would be required to support either technology.

- Hydrogen-battery hybrid propulsion is estimated to be the most economical zero emission alternative, however this is estimated to increase Metrolink's fleet related costs by approximately 40% relative to diesel-based fleets at the current cost of technology, with costs reducing relative to diesel over time and estimated to reach parity in the early to mid-2030's.

- Battery propulsion is the next most economical zero emission alternative. This is estimated to increase Metrolink's fleet related costs by approximately 60% relative to diesel-based fleets at the current cost of technology, with costs reducing relative to diesel over time. Significant advancements in capability and longevity are needed to reach cost parity with diesel. Significant risk lies in the implementation of needed charging infrastructure that should be studied further before investments are made.

- In the short- to medium-term, diesel-battery hybrid propulsion is expected to be an economical means to further reduce emissions beyond Tier 4 levels.

FUTURE FLEET REQUIREMENTS

In planning for future needs of Metrolink's regional rail fleet, several reports have been conducted related to the facilities and rolling stock – including the Strategic Business Plan (SBP), Climate Action Plan, SCORE, CMF & EMF Build-out Study, Locomotive Fleet Modernization Study, and MP36 Overhaul Investment Strategy. Future expansion of fleet and facilities is largely defined by the SCORE Program, the first phase of which is funded by $2 billion in grants with construction and a service phase-in expected to extend through 2028. To understand operational needs, the size of fleet, and nature of facilities modifications needed, a Cost Benefit and Operations Analysis (CBOA)
was prepared. The CBOA helps SCRRA and its member agencies understand the levels of systemwide regional rail service enabled by the funded (and future unfunded) projects and the costs, benefits, and cost-effectiveness associated with those service increases. However, the CBOA (as shown in Figure 4) does not commit SCRRA or its member agencies to run a predetermined level of service when that capacity is created.

Figure 4 - SCORE Cost-Benefit & Operations Analysis Service and Ridership Statistics

COST-BENEFIT & OPERATIONS ANALYSIS: SYSTEMWIDE SERVICE & RIDERSHIP STATISTICS BY MILESTONE

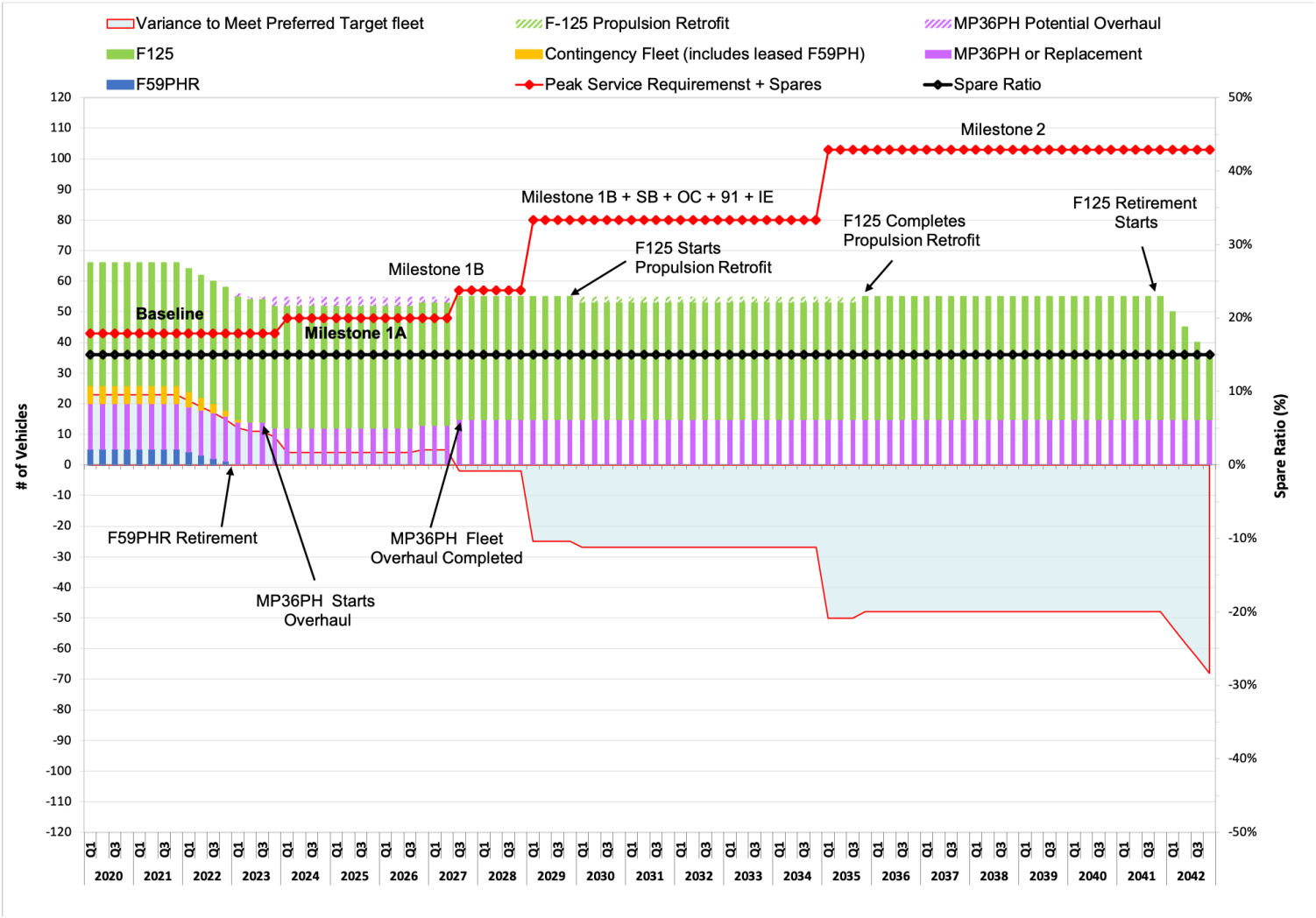
MILESTONE	POTENTIAL TIME FRAME	WEEKDAY REVENUE TRAINS	ANNUALIZED WEEKDAY REVENUE TRAIN MILES	WEEKDAY TRAINSETS	WEEKDAY CREWS*	WEEKDAY RIDERSHIP
2019 Baseline (Observed)	-	167	2,489,540	40	50	41,750
Milestone 1A (Partial SCORE Phase 1)	2024 - 2026	206 (23%)	3,204,151 (29%)	44 (10%)	75 (50%)	53,550 (30%)
Milestone 1B (Full SCORE Phase 1)	2027/2028	224 (34%)	3,795,038 (52%)	50 (25%)	90 (79%)	73,030 (75%)
Milestone 2 (30-minute Service)	454 (172%)	9,575,414 (285%)	9,575,414 (285%)	92 (130%)	229 (258%)	109,200 (166%)

NOTES: PERCENTAGES IN TABLE REFLECT COMPARISON TO 2019 BASELINE.
*** A CREW INCLUDES ONE (1) ENGINEER AND ONE (1) CONDUCTOR.**

Future service capacity increases or new service expansions will require additional rolling stock (locomotives or RMUs, cab cars, coaches, and associated spares & special equipment) and maintenance facility needs and/or improvements. Additionally, the contingency fleet will need to be retained in a useable state to prevent any significant deterioration from being out of use for periods of time. This may include the need to overhaul and maintain such things as safety critical systems/components as a minimum on a regular schedule with the in-service revenue vehicles for use in any service increases or expansions.

A potential timeline of future fleet needs is illustrated in Figure 5. For this scenario, a target spare ratio of 15% was maintained throughout the life of this RFMP and the assumption that the F59 will be retired within the next couple of years, starting in 2023 and completion by mid-2027. The F125s would only need a major overhaul (engine) due to the LCM program and would not need to be sent to an outside contractor. Metrolink would need to decide by that point whether to overhaul the engine or replace the propulsion package with zero/near-zero emission technologies which is estimated to take a couple of months per vehicle since other system components would be addressed and maintained through LCM. Testing would take about a year (first two units) for the outside contractor to implement efficiencies that would accelerate the overhaul/replacement of propulsion system. For the purpose of this graph, the work is estimated to start in 2030 and would be completed in 2035 based on the assumption that there would be a propulsion retrofit.

Figure 5 - Potential Future Fleet Requirements (15% Target Spare Ratio)



The 2020 RFMP is intended to chart a course for future service and investment decisions. The Plan will be revised as necessary to reflect, new service conditions, new technologies, evolving regulatory requirements, future Board direction, funding constraints, and policy changes.