ELECTROLINK

Modern Passenger Rail Service for Southern California

Californians For Electric Rail

September 2025

Californians for Electric Rail is a volunteer organization with members around the state, dedicated to connecting transit advocates and railfans with environmentalists, unions, good government advocates, and other supporters of environmentally-friendly, union-made, cost-effective rail.

We are committed to removing barriers to electrification via overhead catenary of California's railways through state legislative advocacy and engagement in decision-making within local transit agencies and regulatory boards.

This paper was produced in joint authorship by members of Californians for Electric Rail. Special thanks to Adriana Rizzo, Gabriel Riley, Andrew Graves, Brianna Egan, Mark Mollineaux with credit to Nolan Hicks.

Introduction

In April 2025, New York University's Transit Costs Project released a white paper entitled **Momentum** that demonstrates the benefits, costs and vision for a modernized regional and intercity rail network in greater New York City. Step by step, author Nolan Hicks shows how three straightforward improvements can dramatically increase speed, reliability and capacity of the existing rail network to unlock new mobility throughout the region.

It proposes an infrastructure modernization framework built around medium-sized interventions — level boarding, electrification, and coupled with fast-accelerating trainsets equipped with wide doors — that cuts trip times by as much as 25% and provide universal accessibility. It provides riders and the public with these tangible benefits while avoiding the high costs and many of risks typically associated with megaprojects, which come from needing substantial amounts of eminent domain, or significant tunneling. Delivering these benefits will require the region to strengthen and unify the ownership, planning, and management of its regional rail system.

Californians for Electric Rail believes the Momentum framework is exactly what California needs to implement the **2024 State Rail Plan** and achieve an integrated and modern regional and intercity rail network. To that end, this paper applies the Momentum framework to Southern California's existing regional and intercity rail network to create Electrolink.

We will look at the benefits, costs and reforms needed to deliver this ambitious program for Southern California. The benefits would be immense. This framework for rail

modernization would transform Southern California's existing publicly-owned commuter lines into a system with fast, comfortable, and frequent all-day regional and intercity rail service that is trip-time competitive with driving. Furthermore, the region could build upon this network with a re-aligned Pacific Surfliner route, joining together Los Angeles and San Diego with Electrolink's Northeast Corridor-caliber service. These two massive cities would be as easy to travel between as New York and Philadelphia. Electrified Caltrain in the San Francisco Bay Area shows what is possible. The improvements presented in this report will make higher speed rail possible, providing for regional connections to the backbone of future California high speed rail (HSR). Southern California's riders, local electeds, and state leaders need to recognize and fight for these benefits.

A new Caltrain EMU pulling into San Bruno Station.

The Momentum Framework

What is the Momentum Framework?

> *"The Momentum framework consists of a series of infrastructure designs focused on making the most out of existing rights-of-way by boosting speed and efficiency wherever possible, as detailed below. These improvements are most likely to be installed on existing rights-of-way already owned by the public or on underutilized freight routes that are sold back to taxpayers for expansion of passenger service. High-level platforms that sit at the same height as the trains' doors allow riders to step on and off, saving time at every station stop. Those efficiencies grow when railroads optimize passenger car designs with wider doors. Swapping diesel for electric power improves acceleration, saving time by getting trains up to speed more quickly. Those gains are increased by using high-performance designs with subway-style propulsion instead of locomotives. The benefits compound at every stop and add up over the course of a route. Real-world trip time improvements of 13%-29% are obtainable for both commuter and intercity services."*
>
> - Momentum, NYU Transit Costs Project

Each element of the Momentum Framework provides speed and connectivity benefits within the existing right-of-way that make regional and intercity rail more competitive with driving. In sprawling Southern California with many trips between 10-50 miles, it is imperative that rail service competes with the automobile. Simply running more service at the same speeds is insufficient to provide service benefits needed to grow ridership and induce modal shift.

In rail service planning, the best way to shorten trip times is not to raise top level speeds but to speed up the slowest parts of the route. This is because raising speeds at the top level requires straighter ROWs and more dedicated infrastructure. By contrast, increasing speeds at the low end can be a more surgical and cost-effective approach.

Level Boarding

Using this rubric, where are trips slowest? The answer is where trains are fully stopped at stations waiting for passengers to board. This period, known as dwell time, is of course necessary to serve passengers. But dwell time is not fixed and is much faster for subways than for regional and intercity rail in Southern California. The reason is that the platform height for subways is level with the train itself. This allows passengers to get on

and off trains quickly – even if they are in a wheelchair, pushing a stroller or carrying luggage. Regional rail stations in Southern California, by contrast, require passengers to step up from the platform to access the train. If a passenger requires assistance for a disability or other reason then lifts or manual assistance are required. This slows the boarding process considerably.

Level boarding at an Arrow train at the San Bernardino Station Metrolink station. Notice the platform height is level with the train floor.

The solution is to raise platform heights so there is no barrier for passengers boarding and alighting. This solution not only makes traveling more comfortable for people of different abilities or burdens but it also generates time savings for all passengers. The Pacific Surfliner uses 3 minutes of dwell time at non-Union Station locations. Level boarding can reduce that dwell time to 2 minutes. Regional rail services like the Antelope Valley Line have a dwell time of 2 minutes; level boarding can reduce that to 1 minute. While 1 minute of time savings may not seem like a lot, it adds up when multiplied across lines with 10+ stations. Just this one upgrade would cut 11 minutes off the current Surfliner's run-time between LA and San Diego.

Furthermore, the unreliability of low platform boarding necessitates a risk adjustment by rail schedulers called "padding" to ensure that the service can recover if there is a large queue or fall or other challenge with boarding. This padding is expressed as a percentage applied to the dwell time, for example 20%. Since level boarding provides more certainty to the boarding process, rail schedulers can reduce padding significantly – to around 7%. The saved dwell time and reduced padding from level boarding results in both wins for riders in trip speeds and reliability.

Electrification

Californians for Electric Rail has consistently articulated the benefits of rail electrification. Briefly: rail electrification via catenary wire allows trains to be lighter, accelerate faster, and hit higher top speeds. The acceleration benefits appear every time a train is pulling out of curves, away from stations, and traveling up inclines. Electric trains are much quicker than diesel, hydrogen, or battery trains because they are much lighter. Electrification is also a mature technology used throughout the world to deliver higher frequency service, which is not true for hydrogen or battery trains.
This acceleration benefit – where electric trains known as Electric Multiple Units (EMUs) can attain top track speed faster – is particularly important in the case of regional rail

where stations are closer together, usually 2-3 miles apart. The time accelerating out of each station is a penalty to trip times. By improving the efficiency of acceleration out of stations, EMUs can decrease trip times for people accessing jobs, education, and recreation. This allows rail to effectively compete with driving. This acceleration benefit also allows planners to add infill stations in gaps along routes, thereby creating more transit-served locations at a relatively low cost compared to building new fixed-rail routes. In addition to this benefit for riders, electrification brings benefits to surrounding communities by reducing pollution burden with zero-emissions technology. Coupled with clean energy sourcing and modal shift, electrification of Metrolink can yield significant environmental benefits across the Southern California region, especially with transportation being the largest source of greenhouse gas emissions in the state.

Overhead catenary on the newly electrified Caltrain Corridor.

The new schedule after Caltrain's electrification in 2024 shows this clearly. The local, 31 stop service schedule between San Francisco and San Jose in the diesel era was 100 minutes. After electrification, this schedule is now 75 minutes. With 25 minutes saved for riders, Caltrain has received a 41% increase in ridership from 2023 to 2024. The time savings and lower operating cost of electric service has also allowed Caltrain to re-invest in running more off-peak service, including 2 TPH on the weekends.

Through Running

The final element is through-running service at downtown stations. Many downtown stations in California are terminals – dead ends where trains stop service and then must maneuver to head back out for the next run. This turning process can take 20 minutes, which limits operational flexibility, increases complexity of service, and severely limits one seat ride service across regions. Terminal stations include Union Station Los Angeles, Santa Fe Depot San Diego, 4th and King San Francisco, and (to a lesser extent) Sacramento Valley Station.

By creating infrastructure and service patterns that run through these downtown stations, we can unlock more capacity as trains do not require complex turning movements and fewer platforms. That means more service can be added to meet demand. Through-running means faster trips as speeds approaching stations can be

increased with simplified operations and there is less dwell time at stations. Suddenly, the 20 minutes it takes to turn Pacific Surfliner trains at Union Station is reduced to 3-4 minutes.

Finally, through-running can open up larger potential service patterns, as trains can originate at one cardinal point and turn at another. This allows rail planners to create services that connect jobs, housing and other attractions to serve different travel demands and even create new travel demands. Through-running at Santa Fe Depot, the Coaster could not only connect Northern San Diego County to Downtown San Diego but also allow people in National City or Chula Vista to access jobs in Encinitas or Carlsbad.

Currently, LA Metro is developing a project to bring through-running to Union Station, called Link US. This project would construct a flyover above the 101 freeway that would link the south end of Union Station to points south like Fullerton, Anaheim, and San Diego. The project would transform the region by making it easy for trains to pass from the north to the south, speeding travel and increasing capacity. Despite its potential, LA Metro and beneficiary services like Metrolink and Pacific Surfliner have done little to publicize its benefits. Additionally, the agencies have yet to incorporate California HSR's newly economized design criteria into the project, meaning its costs can likely be reduced upon review. In short, Link US provides an excellent example of opportunities to transform Southern California by strengthening and integrating passenger rail planning and management.

Today's Network and Capacity Plans

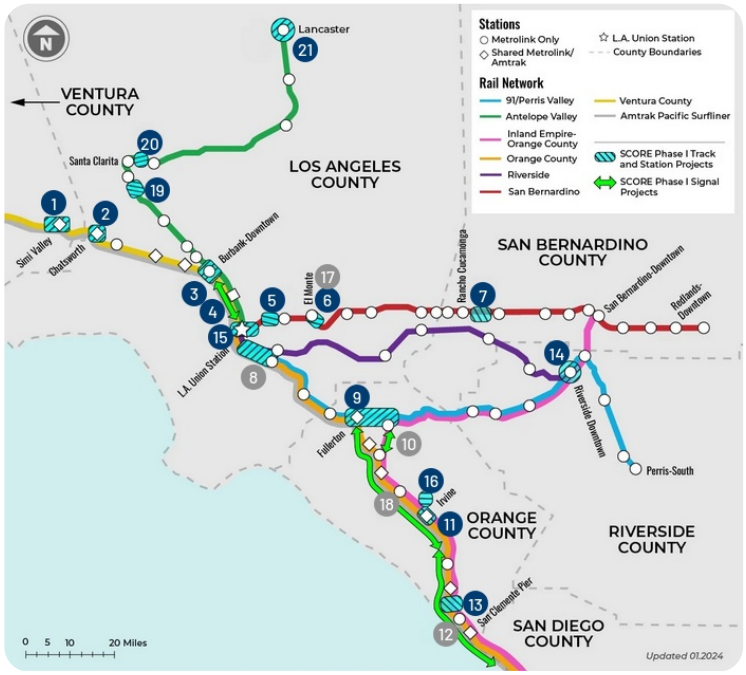
Currently, the Southern California rail network consists of regional services that are in the process of shifting from a commuter service with its focus on peak times and directions to a "regional rail" model that provides bidirectional, all-day schedules. Modern "regional rail" service is cheaper to operate due to predictable and consistent labor needs, more efficient use of equipment, and more rational maintenance schedules. Modern service patterns can also help rationalize fares by providing more flexible and lower cost fare products to meet non-commuter demand. This sets the stage for more frequency if capacity and demand allow. Generating that demand will require the improved trip-times delivered by the proposed modern infrastructure Electrolink framework — level boarding, electrification and through-running.

A good example is Caltrain's shift to a modern service pattern with electrification in September 2024 that includes at least 2 TPH every day from early morning to late at night and on weekends. As a consequence, Caltrain's service has recovered and surpassed its weekend FY 2019 ridership numbers. There is even more time savings to be found for Caltrain if it upgrades its stations to level boarding platforms, which

research shows would induce even more ridership.

Metrolink's 2024 schedule change represents a shift towards this modern regional rail service pattern. Trains now leave and arrive on much more regular and predictable schedules, although there are still gaps in weekend service on lines like Ventura County and Inland Empire - Orange County. Still this new schedule and its ability to provide transfers at key points like Union Station represents real progress for Southern California riders.

Additionally, Southern California also has intercity services like the Surfliner (San Luis Obispo to San Diego) and Amtrak long distance routes. The Surfliner has often been the highest ridership line outside the Northeast Corridor but struggles with coastal erosion and sea level rise at key points along its ROW. The Surfliner service is currently at ten (10) round trips per day, down from thirteen (13) round trips per day in 2019. While demand has returned for additional Surfliner service, the operating agency LOSSAN struggles to acquire equipment necessary for that service. Like Metrolink, the Surfliner has partially switched to consistent clock face departure times. South of Burbank all trains depart at consistent times; for example at Anaheim all Northbound trains depart at 10 minutes past the hour. North of Burbank the schedule is less precise, but departure times tend to group together within 15 minutes.



Improvements on Metrolink's SCORE program.

Electrolink's focus — based on NYU's Momentum research — is on unlocking more capacity and reducing trip times through raising average speeds. Currently, there are two plans for expanding capacity in Southern California: First is Metrolink's SCORE program, which was developed using service-led planning. Metrolink identified latent demand for additional service on its lines and identified that certain bottlenecks in the system had to be addressed through scheduling, signalling, double tracking, sidings and other improvements. For example, the **Antelope Valley Line (AVL)** could be boosted to 2 TPH from Vista Canyon and 1 TPH from Lancaster through double tracking in two locations, adding a siding, and building a layover yard in Lancaster.

The AVL Capacity Improvement Program is exactly the kind of targeted, incremental improvement envisioned by the State Rail Plan. Unfortunately, it has been delayed and costs have increased substantially for familiar reasons: 1) extractive demands from 3rd parties like utilities and Union Pacific; 2) lack of design/engineering capacity in house; 3) disinterest from infrastructure owner LA Metro; and 4) lack of programmatic construction funding. As discussed below, California will need significant reforms in governance, project delivery and programmatic construction funding to implement the various programs within the SCORE Plan.

The second capacity program is the **LOSSAN Optimization study**, which also uses service-led planning to identify a Surfliner timetable (1 TPH south of Union Station; .5 TPH to Goleta; .25 TPH to San Luis Obispo) and then identify the schedule, signaling and capacity improvements necessary to achieve it. Critically, the LOSSAN Optimization study integrates planning for regional rail services like COASTER and Metrolink so that improvements and outcomes can be shared between intercity and regional rail. One identified projects is Serra siding:

> *"The single-track sections between Laguna Niguel and CP SONGS impose a major constraint on the LOSSAN Rail Corridor's timetable structure. The Laguna Niguel – San Juan Capistrano siding project will partially relieve the bottleneck, however the 9.3-mile single-track section between Serra siding and CPSONGs will remain. Operations around a shortened bottleneck are detailed in the midterm concept.*
>
> *CP Serra and CP SONGs both have a minimum separation time of 2.5 minutes between trains, if the first train waits for the opposing train. To allow for 30-minute operating frequency, trains must operate through the section in 12.5 minutes. This zig-zag operation is unstable and should be restricted to one or two instances during peak times if necessary."*
>
> ~ LOSSAN Optimization Study

Unfortunately, the infrastructure owner — the Orange County Transportation Authority, OCTA — has struggled for nearly a decade to move forward on planning for this relatively simple infrastructure project due to objections by nearby property owners. The factors that have stalled the Antelope Valley Capacity Program have also put the brakes on LOSSAN upgrades. The tracks are owned by different counties, each of which have varying levels of interest in the line. There is a lack of project delivery staff at LOSSAN, and dearth of reliable and regular construction funding.

We mention these capacity projects first to demonstrate that capacity is necessary to achieve many of the service benefits of the Momentum framework and second to

illustrate the many challenges to plan implementation. We need a modern infrastructure framework. And we need a modern governance structure to plan, manage and deliver the upgrades.

Pre-conditions to implementing SCORE, LOSSAN Optimization or Electrolink are:

1. **Governance reform.**
2. **Project delivery in-house capacity.**
3. **Programmatic funding.**

First, Metrolink and LOSSAN — which have adopted modern schedules — struggle to deliver capacity improvements because the counties own the infrastructure. Many counties are at best disinterested in regional and intercity rail. Even Los Angeles, which has a political mandate for increased public transportation, does not prioritize these projects. The SCORE program was originally conceived to provide mobility for the 2028 Olympics — but it is still, in 2025, a decade away from implementation in the best case scenario. For capacity programs or Electrolink to succeed, either the operating agencies need to take point on delivery or another entity, such as Caltrans or a new regional rail authority, will need to become the lead agency for implementation.

Second, whichever agency takes over lead from the counties needs full-time in-house project delivery staff, including engineers, designers, and project managers. Modernization of regional and intercity rail is a generational project. It requires a robust public sector that is empowered to analyze, weigh tradeoffs and make decisions. The consultant-driven model of program management so familiar to California transit agencies has failed to constrain costs or deliver timely improvements to service. Moreover, consultants are often more expensive to the State of California and do not allow for the retention and development of knowledge and skill. This will have to change.

Third, such a program will require a unified ROW owner. The current county-based ROW ownership model creates a collective action problem where service gains cannot be accomplished unless all counties along the LOSSAN corridor prioritize investment in improving infrastructure. A unified ROW owner can coordinate priorities for investment, renewal and resilience in a way the fractured ownership of the past has not.

Fourth, programmatic construction funding for the elements of Electrolink and rail modernization will need to be established. The current funding model is project-driven rather than plan-driven. Agencies develop individual projects with the aim of attracting one-off discretionary grants from state programs like Transit and Intercity Rail Program (TIRCP) and Federal programs like Federal-State Rail Partnership. This encourages agencies to “lard up” projects without reference to service benefits to riders

while downplaying or misrepresenting costs, schedules and risks.
By contrast countries like Italy, Germany, Switzerland and Norway which have ambitious modernization programs have dedicated programmatic funding to achieve specific goals. For example, Italy created a level boarding funding program to implement level boarding at stations. These programs may be large or small but they are stable and allow lead agencies to plan, design and seek funding in a consistent and reliable way. That creates a pipeline of projects, attracts more contractors, and creates more price competition in competitive biddings. Dedicated programs for level boarding, electrification, and capacity projects like double tracking are necessary to achieve rail modernization in California.

A new EMU parked next to an old electric locomotive in Zürich Hauptbahnhof in Zürich, Switzerland.

Case Studies

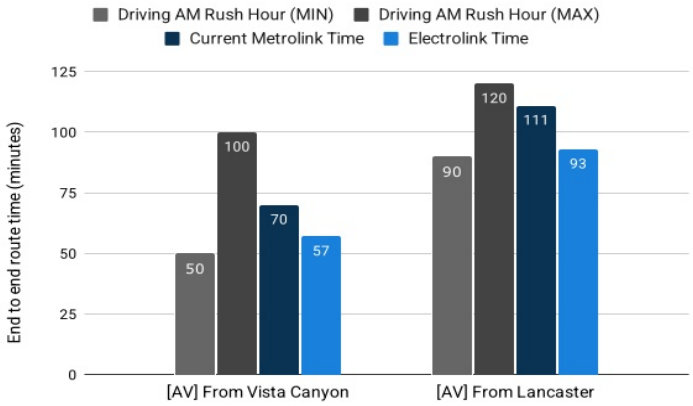
So how can the Electrolink Framework improve existing and new services in Southern California? This section will attempt to answer this question through five case studies.

Our time savings comes mainly from two sources: first, we shave off 1 minute on each stop except for the last to represent acceleration gains; second we cutt the boarding time, 2-3 minutes, in half to represent level boarding time savings.

Antelope Valley

The Antelope Valley Line runs between Lancaster and Los Angeles Union Station on a mix of double tracks south of Sylmar and single track and sidings to the north and northeast. The AVL serves San Fernando, Santa Clarita, and Antelope Valley residential areas connecting them to downtown Los Angeles and the core Los Angeles basin. With expanded bidirectional and off-peak service the AVL also has a growing share of people in core Los Angeles accessing jobs and recreation in more suburban areas.
The result of Electrolink improvements would be a trip time from Vista Canyon of 57m

down from 1hr10m. The trip time from Lancaster would be 1hr33m, down from 1h51m.



AV Line Electrolink time savings. From designated location to LA Union Station

The current weekday capacity of the AVL is close to 1 TPH at peak and ½ TPH off-peak from Vista Canyon south; ½ TPH from Lancaster. Service originating from Union Station is 1 TPH with the last train departing at 11:39pm. The AVL Capacity Improvement Program aims to double service to 2 TPH from Vista Canyon and 1 TPH from Lancaster.

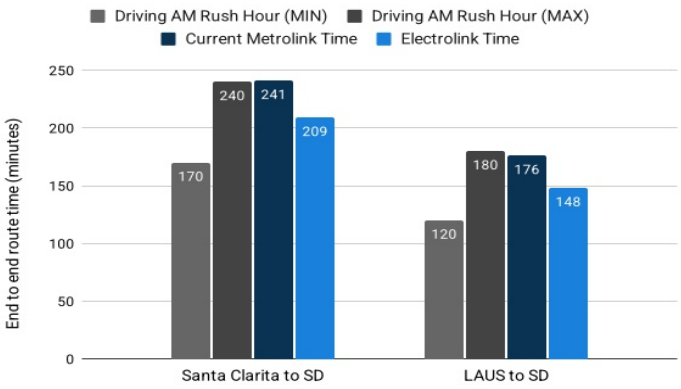
Run time is currently 1hr10m from Vista Canyon, and 2hr10m from Lancaster. The travel times from Santa Clarita Valley stations are the outer range for many daily commuters when factoring trip time from home and transfer at destination station. The lengthy trips from Palmdale and Lancaster would be considered intolerable commutes in most places but Los Angeles County's housing crisis has meant an increasing share of service workers are choosing to commute from these places. Providing a fast, comfortable, and affordable option other than driving for these communities is an important goal if Southern California hopes to reduce traffic and emissions.

In applying the Electrolink framework we assume electrification of the AVL to Vista Canyon. The route beyond Vista Canyon has significant constraints within the ROW to electrification and capacity improvements that would justify this level of service. Rolling stock would be dual mode Battery Electrical Multiple Units (BEMUs) that would draw power from catenary sections of the ROW from Union Station to Vista Canyon and at Lancaster Station and yard. Between these areas the BEMUs would draw power from batteries onboard.

However, it is worth noting that the High-Speed Rail Authority has proposed that **high-speed service to Palmdale could begin as soon as 2038** pending appropriate state investment. While extending electrification to Palmdale would require route changes beyond the scope of this or the SCORE program, it is worthy of further study as it would allow HSR to continue to Los Angeles in addition to further improvements to Metrolink beyond what's discussed here.

Platforms would be reconstructed to 22" at every station to allow for level boarding.

Santa Clarita/LA to San Diego - Surfliner



Time savings of the Electrolink framework applied to various service patterns.

The Pacific Surfliner currently runs between San Luis Obispo/Goleta and San Diego with a 16-minute turn in Los Angeles Union Station. Most service, however, runs between Los Angeles and San Diego. The service connects these distinct, large metros as well as job and amenity-rich suburbs like Orange County and Northern San Diego County. North of Los Angeles the Surfliner connects Southern California counties like Ventura, Santa Barbara, and San Luis Obispo to the rest of the region, including several large college student populations. In 2019, the Pacific Surfliner had 13 daily roundtrips; in 2025, 11 daily round trips. This amounts to a little less than ½ TPH.

Our proposed through running Santa Clarita to San Diego Pacific Surfliner.

The current run time between San Diego and Los Angeles Union Station is 2hr56m. San Diego to Santa Clarita is 4hr1m. San Diego to San Luis Obispo is 8hr38m.

Caltrans and LOSSAN have expressed interest in running additional service between Los Angeles and San Diego counties from Santa Clarita. Given that LA Metro owns the track between Santa Clarita and Union Station this makes adding this service relatively easier compared to adding more service on the Union Pacific's coastline.

In addition, the Link US project would extend through-running so that the Pacific Surfliner could eliminate its 16-minute turn at Union Station thus compounding the benefits of electrification and level boarding.

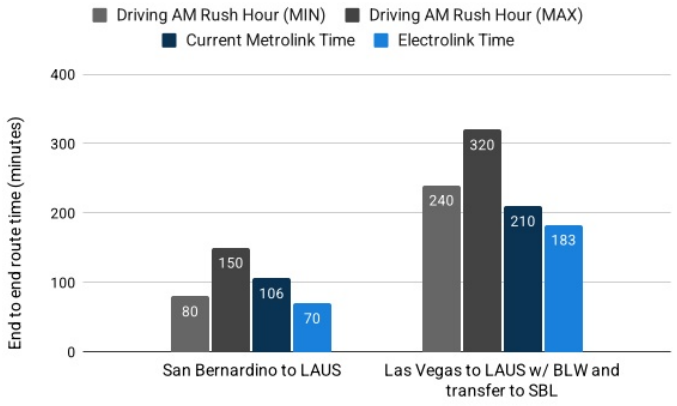
Finally, the LOSSAN Optimization Study envisions timetabling the Surfliner so that connecting services at Union Station and Burbank, among others, can offer easy transfers for riders. In addition, the Optimization study identifies infrastructure improvements to allow the Pacific Surfliner to run 1 TPH between Los Angeles County and San Diego County.

In applying the Electrolink framework, we would use the aforementioned electrification of the AVL south of Vista Canyon. In addition, the plan presumes the electrification of Burbank to Anaheim per the California High-Speed Rail Authority's adopted EIR for Burbank to LAUS and draft EIR for LAUS to Anaheim (crucially agreed to by BNSF and Union Pacific). Further, this plan would add on electrification from Anaheim to San Diego – relying on AB 2503 (Lee, 2024) to streamline CEQA review for rail electrification.

The result of these improvements would be a trip time from **Santa Clarita to San Diego of 3hr29m**, shaving off **32m**. The trip time from **Santa Clarita to Los Angeles Union Station would be 2hr28m**. Riders from **San Luis Obispo transferring at Los Angeles Union Station** from a diesel to electric train thanks to pulse scheduling would have a trip time of **8h5m (5h32min+2h:28m+5 min transfer)**.

San Bernardino Line

The San Bernardino Line (SBL) between San Bernardino and Los Angeles Union Station serves the San Gabriel Valley and Inland Empire and is the highest ridership service in Metrolink. Despite switching to a clock face schedule in recent years, the service is still commuter-oriented with 2 TPH during peak times/ direction but no service leaving San Bernardino headed west after 6:31pm and only 8 TPD on weekends. There is additional layered, shorter run service from Montclair to Los Angeles Union throughout the day. The service is oriented around conveying people to jobs centers in the Los Angeles core.



Time savings of the Electrolink framework applied to various service patterns.

The current run time between San Bernardino and Los Angeles Union Station is 1hr46m. The time from Rancho Cucamonga to Los Angeles is 1hr13m. For context, Brightline West high-speed rail proposes trip times from Las Vegas to Rancho Cucamonga of 2hr10m. With timed transfer, this means a total Las Vegas to Los Angeles Union Station run of 3hr30m.

With Brightline West's service to Las Vegas poised to connect to the Metrolink network at Rancho Cucamonga, the SBL is anticipated to be a critical link for 2 seat rides between Las Vegas and Southern California. The State Rail Plan identifies the SBL as having bidirectional 2 TPH regional rail service and 2 TPH from Rancho Cucamonga and 1 TPH

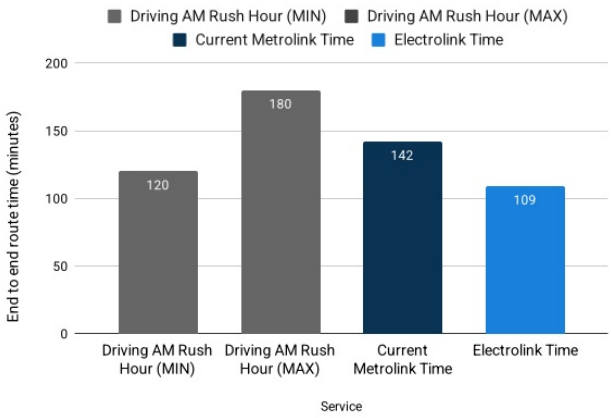
from San Bernardino of intercity rail service. Per the SCORE program, double tracking of the SBL from CP Lilac to CP Rialto is necessary to get to 2 TPH. Significant restructuring of the approach to Union Station of the SBL as it threads between I-10 is necessary for double tracking and electrification to get to 5 TPH. Electrification would reduce the need for significant double tracking by raising average track speed.

In applying the Momentum framework, we envision electrification from Union Station to San Bernardino as well as the necessary improvements to get to 5 TPH. The entire ROW is publically-owned and electrification can be possible with political support and funding.

The result of these improvements would be a trip time from **San Bernardino to Los Angeles Union Station of 1hr10m** shaving off **37m** and making rail times faster than driving. The time from **Rancho Cucamonga to Los Angeles would be 56m**. Trains from **Brightline West could run through and result in travel times from Las Vegas to Los Angeles of 3hr3m**.

Tripper Service

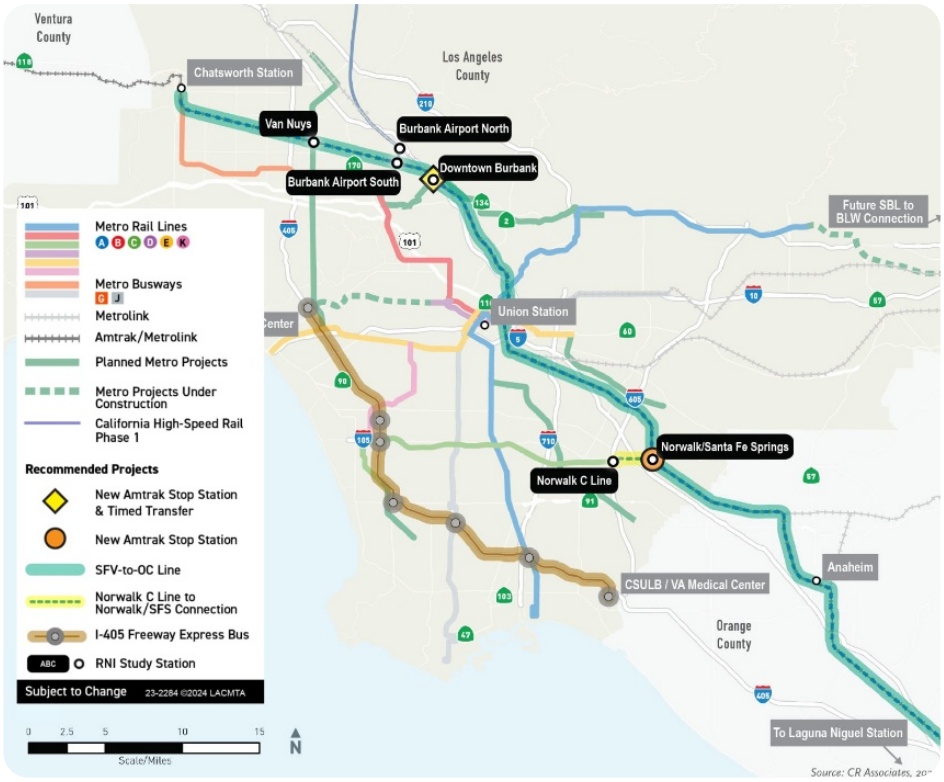
In 2024, Los Angeles Metro released a Rail Integration Study, which, among other things, showed the potential for an “S-Bahn” type service between Chatsworth and Laguna Niguel. Dubbed “Tripper” this service takes advantage of unused capacity in core Los Angeles and Orange counties along the mainline during midday. The service would provide hourly bidirectional, 18-hour service during weekdays.



Time savings of the Electrolink framework applied to various service patterns.

This service would serve demand not met by peak-oriented regional rail or intercity rail. This service would also form the backbone for pulse scheduling along transfer stations like Downtown Burbank, Union Station, Fullerton, and Santa Ana.

The Tripper service has yet to be implemented by Metrolink but it would take approximately 2hr19m to go from Chatsworth to Laguna Niguel under current infrastructure – including a 16 minute turn at Union Station. The trip from Chatsworth to Union Station is currently 45 minutes. The trip from Laguna Niguel to Union Station is 1hr18m. The Tripper would also clearly benefit from Link US’s future run through capacity at Union Station by eliminating the 16-minute turn.

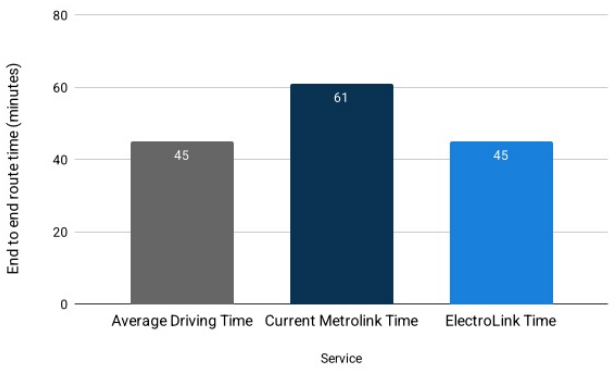


LA Metro Rail Integration Study 2024

In applying the Momentum framework we assume Chatsworth to Laguna Niguel would be fully electrified.

The result of these improvements would be a trip time from **Chatsworth to Laguna Niguel of 1hr49m**, saving **40m.**

COASTER Service



The COASTER Service runs between Oceanside in Northern San Diego County and a terminal station at the Santa Fe Depot in Downtown San Diego. There will be a special event service for the Convention Center just south of Santa Fe Depot starting in 2027. It serves the downtown jobs market as well as connecting people to jobs-rich areas in mid and northern county as well as communities serving Marine Corps Base Pendleton. At Oceanside, travelers can transfer to/from the regional rail SPRINTER service to Escondido, which is

timetabled at 2 TPH, with signaling and double tracking plans to get to 4 TPH in the near term. The clockface scheduled service is bidirectional with midday service of 1 TPH and peak commute hours layered on with additional service to 2 TPH. The weekend schedule alternates between 1 TPH and 2 TPH, which is challenging.

The current run time between Oceanside and Santa Fe Depot is 1hr1m. This puts the full length service just beyond the limit for most people for daily trips when considering origin and destination connecting trips.

SANDAG has an established plan and funding program for double tracking their Surf Line to accommodate more COASTER Service as well as Pacific Surfliners. Beyond double tracking, SANDAG must relocate the line inland at Del Mar to stop service interruptions and slow orders due to coastal erosion. This inland relocation would be paired with a tunnel at Miramar to straighten out a notoriously slow bend in the line. This tunnel, already in preliminary design stages, would take 6 minutes off the existing schedule.

In addition, service currently terminates at the Santa Fe Depot. This limits access to communities south of downtown such as Chula Vista and National City to regional jobs networks. It also creates capacity challenges as additional service is constrained by turning movements at Santa Fe Depot by both COASTER and Pacific Surfliner. There are pending plans by LOSSAN to construct a layover and maintenance facility south of Santa Fe Depot to:

1. **Allow run-through service of COASTER and Surfliner.**
2. **Serve the Convention Center with regular service as well as provide new infill stations in communities south of downtown.**

Despite ambitious plans to double track and raise speeds of the Surf Line to enable 2 TPH of Coast Service and 1 TPH of Pacific Surfliner, electrification is left off this corridor in the 2024 State Rail Plan. With plans to increase capacity to 3 TPH of regional and intercity rail and strong existing ridership, the Surf Line in San Diego would be a prime candidate for electrification in any other developed country. San Diego intends to spend billions relocating the line inland. Relative to the scale of these tunnels, interventions like electrification and level boarding are a small additional investment – but crucially improve trip speeds and unlock further capacity. Why not compound the gains of the tunnels with electrification and level boarding that provide fast and frequent service?

What is missing? It has been intimated that the Coastal Commission views overhead catenary wires harshly in their interpretation of the Coastal Act. Around the world including in France, Italy, and Portugal coastal areas feature electrified regional and intercity rail. Given the vast and discretionary powers of the Coastal Commission, the

Legislature should clarify that catenary itself is not in conflict with the Coastal Act so as to remove any uncertainty.

In applying the Electrolink framework we assume electrification of the corridor from Oceanside to National City. We also assume the construction of Del Mar and Miramar tunnels as well as layover and maintenance facility and infill stations south of Santa Fe Depot.

The result of these improvements would be a trip time from **Oceanside to Santa Fe Depot of 45m. From National City to CSU San Marcos via transfer to SPRINTER at Oceanside of 1hr23m**.

Costs

Clearly there are service benefits to the Momentum Framework – faster and more reliable trips and more accessible service. But what are the costs?

Projects elsewhere provide a guide for the likely costs of a modernization campaign. A program of electrification and level boarding across the Southern California network will require professional planners and engineers to create specific requirements to identify the quantities of civil, electronics and rolling stock improvements needed. Specific bridges may need to be raised or utility conflicts resolved depending on these requirements. This level of bottoms-up cost estimation requires a planning commitment from agencies like Metrolink, LOSSAN, and Caltrans.

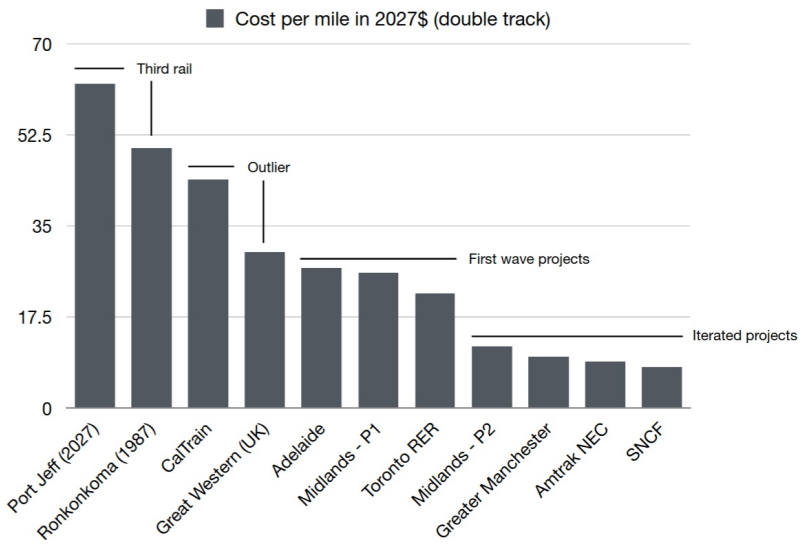
Caltrain's electrification program of 51 miles of double track completed in 2024 is the premier benchmark example most regional/intercity rail agencies and policymakers have used in considering electrification costs. At $8m per track mile these costs are high and have restrained many policymakers from further pursuing electrification.

But it would be a mistake to simply rely on the unit cost of Caltrain. Instead, the planners must consider what mistakes Caltrain made and how they can be avoided, mitigated, or new efficiencies incorporated.

Physically we can compare Caltrain's design requirements to that of other electrification projects. Momentum in analyzing Caltrain and Northend – Amtrak's electrification of New Haven to Boston identified that "Caltrain's system built 20% more electrical infrastructure for a system that will operate 32% fewer trains." The additional capacity here is future-proofing for California High-Speed Rail Authority's service for the Peninsula. This shows there are substantial economies to be found in designs and engineering through standards development and global benchmarking.

Furthermore, Momentum compared Caltrain to the UK's Network Rail design specifications for spacing of electrical substations. Network Rail, running a denser pattern of service at higher speeds (which draws more power), had "an average of eight miles between major electrical components, compared to the five-mile Caltrain average." This is one factor that led to higher costs.

Momentum found that Caltrain's pole spacing was 180' when Northend and Network Rail used 200' for pole spacing. This represents a 10% increase in poles, pole foundations, and associated life cycle costs.



Momentum, Transit Costs Project

In these cases, Caltrain's specifications included more scope than necessary to run their service. This raised the base costs of electrification. The Caltrain figure is also inflated by the costs of defective signaling system upgrades, delays from a CEQA lawsuit by the Town of Atherton, and delays related to the first Trump administration's withholding of awarded construction funding.

Finally, as we consider electrification costs we must remember that there was a "pioneer premium" for Caltrain. With the development of California High-Speed Rail Authority's Central Valley service and Brightline West's service into electrified mainline there will be a deeper bench of prime contractors, subcontractors, construction labor, engineers and managers with the experience of designing, building, and managing electrification assets.

This deeper pool of electrification capacity is an opportunity for California to develop a competitive industry with knowledge and know-how. As demonstrated in Scotland, Germany, Italy, India and other developed/developing countries, the more sustained investment in infrastructure creates more firms and specialization to make public and private investment go further. Greater efficiencies in electrification can occur *if* California can commit to a rolling program of electrification that provides steady work for the industry. That means costs can come down – but only if Southern California and California leaders commit to such a program.

Recommendations

Electrolink can deliver significant speed, reliability and accessibility benefits to riders across the Southern California region. This vision, however, requires operators, local and state electeds, and public buy-in. Simply adopting a programmatic plan like SCORE is not enough. Like SCORE, a Momentum framework for Southern California rail service must be preceded by reforms to the way intercity and regional rail is governed, owned, planned, funded, and delivered. Otherwise, just like SCORE, the Momentum framework will falter.

In this final section, we provide the following suggestions for reform that both strengthen regional and intercity rail overall and help set the stage for delivery of both SCORE and Momentum.

Governance Reforms

Metrolink and Surfliner services currently suffer from a fractured Joint Powers Authority (JPA) governance that relies on the goodwill of a diverse set of counties to appropriate annual funding for service including rolling stock, operations and capital. This isn't just **Californians for Electric Rail's opinion**. The California Senate Subcommittee on LOSSAN Rail Resilience has heard consistent evidence from experts that the current governance structure fails to deliver service improvements and corridor resilience. The demands of the 21st century have outpaced the ability of counties to work effectively in a loose confederation to provide a competitive service.

In a region with no serious plans for growth or static travel demand this would make running a railroad difficult. In Southern California struggling with massive regional travel demands, expanding growth patterns, sea level rise, and ambitious service goals necessitating large capital project delivery plans, it makes it nearly impossible. Given competing demands for local transit or road projects or general health and safety of county residents, counties will necessarily deprioritize regional and intercity rail service planning and investment.

Without a strong governance model, Southern California operators rely on a lean internal organization and consultants to manage their service. The result has been very slow progress on improving service through low-hanging fruit such as clock face scheduling, on-board amenities like Wi-Fi, flexible fare products, and more difficult tasks like transit integration and capacity improvements via SCORE.

It should not be a surprise that regions with strong regional and intercity rail ridership

and programs do not use the current Southern California governance model.

- **In Europe,** intercity and regional rail service is managed by a national railway or subnational/regional government with local governments supporting through service planning and the purchasing of additional service above baseline levels through local contributions.
- **In Massachusetts,** regional rail is governed at the state level by a nine-person board consisting of the mayor of Boston, a small city representative, and seven Governor appointed slots, including environmental justice and labor representatives.
- **In New York,** Metro North and the Long Island Rail Road regional rail systems are governed by the state-run Metropolitan Transportation Authority and its 23-person board, over whom the governor directly appoints the plurality and approves the other members recommended by the New York City mayor and suburban counties.
- **In New Jersey,** regional rail service is part of the statewide transit authority, NJ Transit, which is governed by a thirteen-person board appointed by the governor. This includes eight members of the public and three state officials with voting rights, as well as two non-voting members from labor organizations.

Even in California, regional rail and intercity rail programs that have successfully delivered service improvements have stronger governance: Capitol Corridor's board is a JPA but includes BART board members – who are directly elected running specifically on transit issues – as well as support from BART administrative staff. Caltrain's board is a JPA but it also has unified ownership of the lines – rather than fractured, county-level ownership like Southern California – and has a dedicated sales tax to support operations.

Southern California service needs a stronger governance model in order to deliver service capacity and modernization improvements like SCORE and Electrolink. There is a range of options: 1) state-level entity directly administering service and unified ROW with service planning input from counties ; 2) a regional board appointed by the governor with state-funded staff and unified ROW; or 3) the existing JPA with a dedicated operations funding mechanism for service and unified ROW ownership.

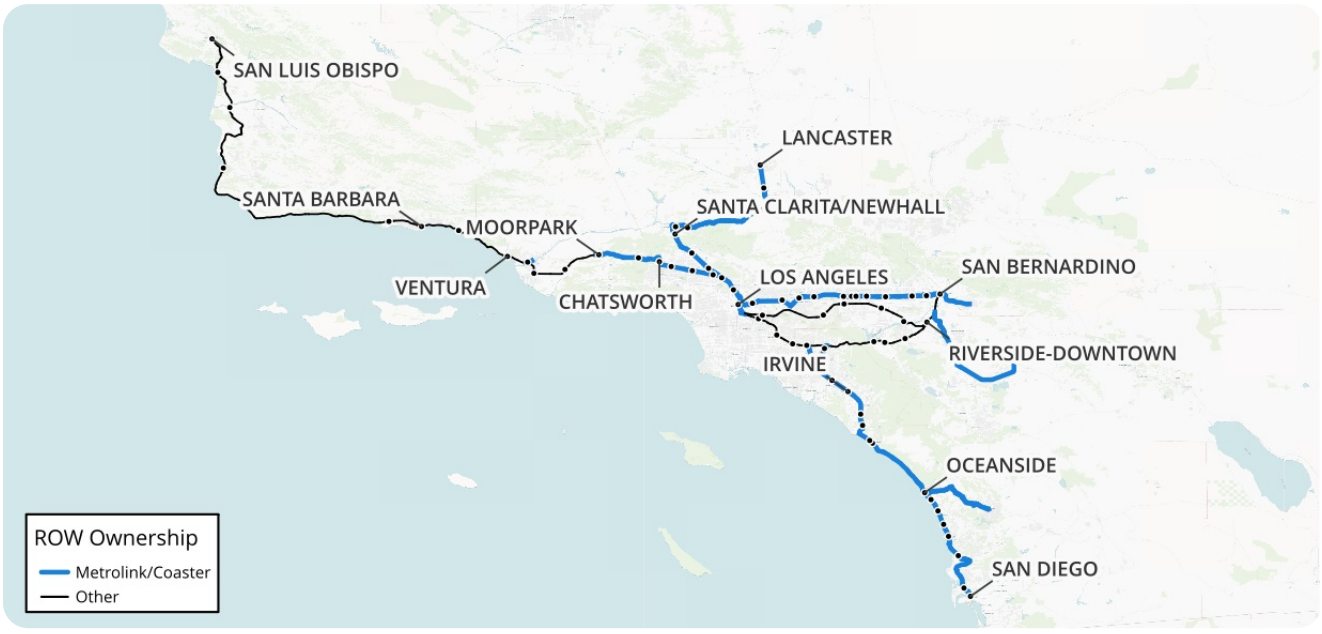
There are trade-offs with each option. The local electeds who govern these services currently, however, will need to honestly assess whether they intend to or are capable of delivering the service currently planned much less Momentum – via the current hyperlocal governance model.

Unified ROW Ownership

Southern California rail service operators have a distinct advantage over other regional and intercity services in California: in many cases they own the underlying ROW. This allows operators the ability to own their own destiny through signaling upgrades, capacity increases, and even electrification. The same cannot be said for services like Capitol Corridor and ACE in Northern California, which rely on the goodwill of freight railroads.

Unfortunately, the value of this public ROW ownership is restrained by the diffuse ownership by the constituent counties of the various service operators. This turns into a collective action problem. While some counties like San Diego have ambitious double tracking and tunneling programs, others — like Orange — struggle to complete basic siding improvements. If San Diego County completes the capacity projects outlined in the 2022 LOSSAN Optimization Study, but Orange County does not, then we still cannot achieve the 1 train per hour Surfliner service goal. Under this set up, the rate of service improvement will only proceed at the pace of the least motivated county. That's a dynamic rife for stagnation and failure, as the least ambitious county determines the future of transportation for the Southern California region.

Take a lesson from Caltrain. Caltrain's JPA organization has unified ROW ownership for ROW that runs through three different counties: Santa Clara, San Mateo, and San Francisco. It is hard to imagine how Caltrain could have completed its modernization program of positive train control and electrification in 2024 if decisions on ROW had



A map of Southern California Regional and Commuter Rail. Blue lines are under public ownership.

been left to the sole discretion of its constitutive counties. While the Caltrain counties and the cities continue to have a voice on decisions affecting their citizens and interests, they are not expected to lead planning and delivery of ROW improvements. LOSSAN and Metrolink should embrace this model of unified ROW ownership as a pre-condition to delivering capacity plans and Electrolink modernization for regional and intercity rail.

Project Delivery Staff

Service improvements on the scale of LOSSAN Optimization ($16.5bn), SCORE ($10bn) and Electrolink ($6-7bn) are large, generational programs. Even once complete, they will require a significant body of engineers and project managers to maintain and renew assets. The historic path for Southern California rail service is that such programs will be managed by consultants with a skinny state staff overseeing program management consultants. Every piece of literature on this topic and past performance of LOSSAN Optimization and SCORE indicates that the overreliance on consultants is a poor decision.

The **NYU Transit Costs Project**, **Eno Center for Transportation**, **SPUR**, **the California State Auditor** and **UC Berkeley's Center for Law, Energy and the Environment** all have documented how public sector capacity is key to delivering the infrastructure necessary to unlock new and improved service. The public sector must be in a position to understand risks and properly allocate risks between themselves, designers, contractors, and 3rd parties. That requires a cohort of public sector engineers, procurement staff, and project managers to develop and retain institutional knowledge. Further, this public sector needs to be empowered to make decisions and oftentimes say no to demands that inflate costs and schedules without clear public benefits.

Consultants, by contrast, are temperamentally inclined to say "maybe" or "we'll study it for you" and legally not allowed to make final decisions for public entities. In practice however, many public agencies – lacking fundamental knowledge – defer to consultants for nearly every decision thereby conceding public control of projects to private actors. The results are consistently inflated base scopes and schedules followed by change orders and delayed delivery of service.

It's not reasonable to expect every operator to retain the full array of project delivery discipline in-house, but they need to be able to access this expertise when necessary to ensure project delivery and wise expenditure of tax dollars. Low and medium cost rail countries have solved this problem by housing their public sector capacity in national or subnational engineering departments or publicly-owned private firms. California already has a department with lots of in-house engineering and project management staff that

help counties deliver infrastructure Caltrans. Its mission should be expanded and clarified to include assisting and facilitating the development of the statewide rail network.

In order to realize the State Rail Plan, LOSSAN Optimization, SCORE, and Momentum California should invest in developing state capacity for rail projects that can be lent out to regional and intercity service operators.

Programmatic State Funding

Californians for Electric Rail's prior white paper "**Against Patchwork Funding: How Multi-Year Investment Frameworks Can Deliver Rail Service Faster and Cheaper**" discusses at length how the current slate of discretionary, competitive grant programs is ill-suited for rail program delivery. These grab bags of partial award funding with no guarantees of project award drive out project timelines and increase costs through escalation. Furthermore, the practice of partial awards incentivizes operators to apply for funding at the very beginning of design, when much of the project's scope and schedule are undefined. This opens the door to ballooning the size and costs of projects. As costs inevitably rise sharply as scope is finalized, operators must apply for even more grants to cover growing funding gaps creating a feedback loop.
This system is broken. By latest estimates, less than 20% of Transit and Intercity Rail Program funded projects have been completed since the program started nearly ten years ago despite $10bn invested.

Developed countries with much stronger rail ridership and service do not fund capital projects via one-off grants. They instead rely on multi-year investment frameworks. These frameworks prioritize project funding based on 1) finalizing design; 2) cost-benefit ratios; and 3) national or subnational service plan compliance. Projects that have strong cost-benefit ratios will be fully funded for construction. Projects that allow scope to be inflated or provide little in terms of service are re-worked to optimize costs and benefits or are deprioritized. This funding program design aligns to provide certainty for full funding, cost minimization and benefit maximization. It's also not a foreign concept: New York's MTA

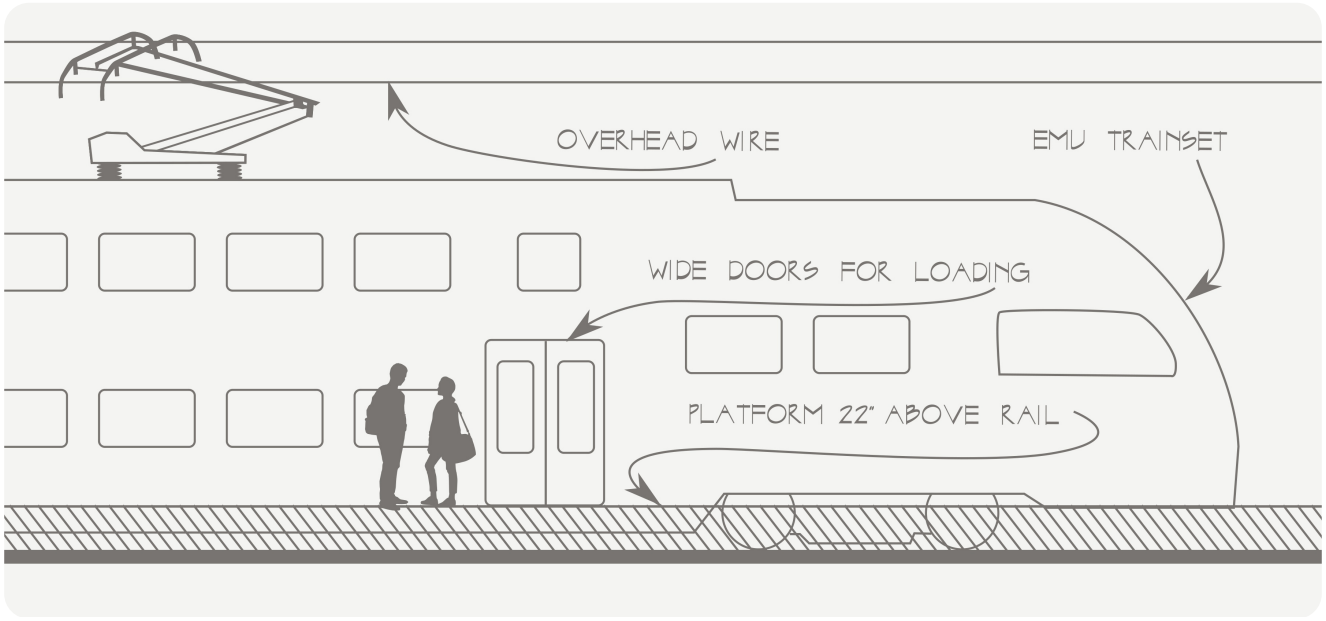
Californians For Electric Rail: Against Patchwork Funding

uses a 5-year capital budget to create a pipeline of projects.

In order to deliver rail expansion and modernization, California needs to shift to a more rational and effective capital funding program. With Cap and Trade renewal, the ten-year anniversary of SB 1 grant programs, and a potential road user charge all coming soon, now is the chance for California to adopt best practices for capital funding programs for regional and intercity rail.

Conclusion

Level boarding, through running and electrification of regional and intercity rail service in Southern California on the Metrolink and LOSSAN corridors have the potential to deliver massive gains for riders and bring the region closer economically. These benefits can only be realized, however, if the public and policymakers in Southern California 1) demand them; and 2) are willing to support necessary institutional reforms required to deliver them.



A dragram applying principles discussed in this paper. Featuring level boarding, an Electric Multiple Unit (EMU) and overhead electrification.