Train Control Upgrade Project

SFMTA Citizen's Advisory Committee

October 3, 2024

Learning from past projects and improving contracting approach

Separate contracts

CONSULTANT

- Support staff with project delivery

SBE/DBE goal: 15%

☑ Contract approved August 2024

SUPPLIER

- Provides technology
- Helps design system
- Must ensure technology meets performance requirements
- Provides long-term maintenance support and knowledge transfer to SFMTA staff

SBE/DBE goal: 5%

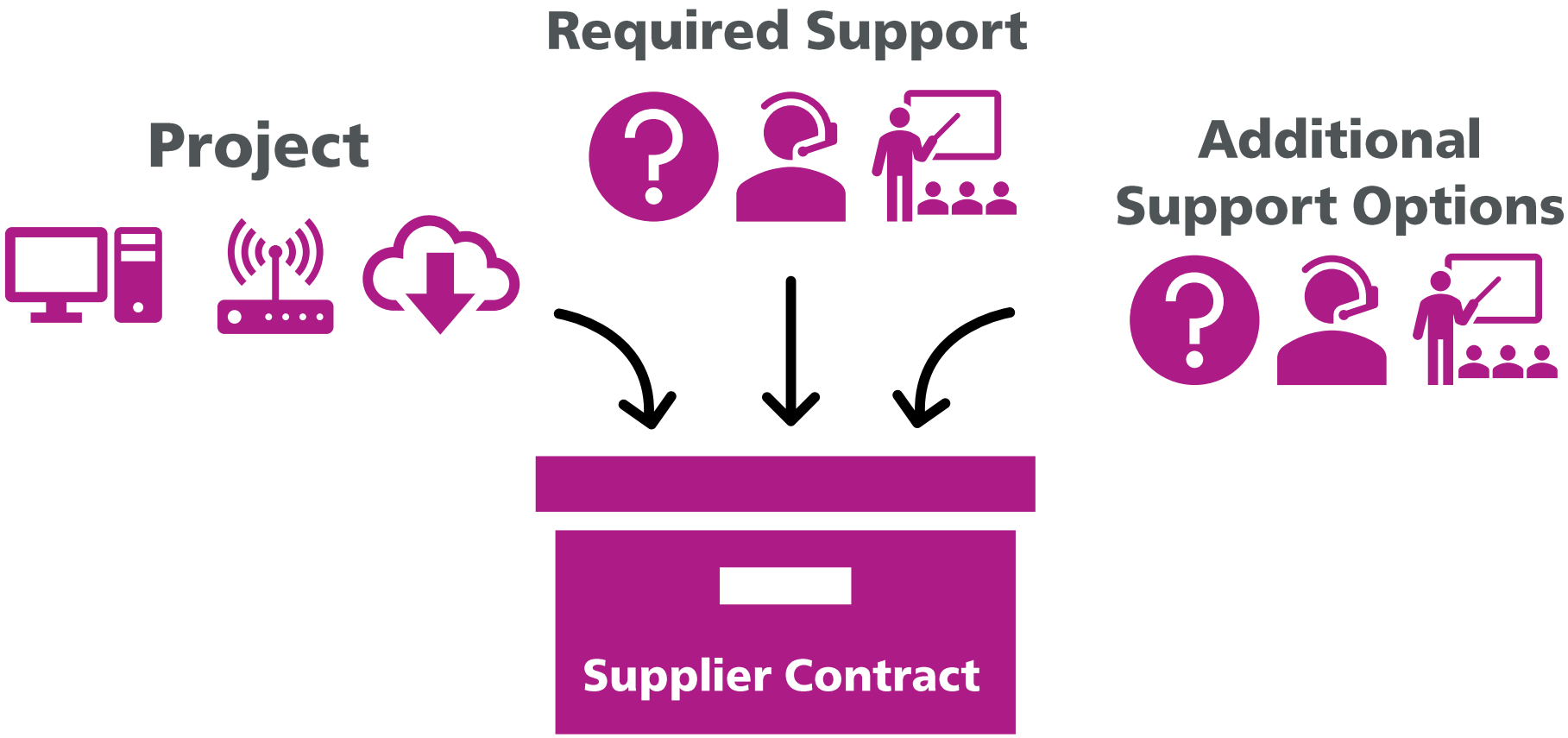
INSTALLERS

- Multiple installers shorten construction timeline

SBE/DBE goal: 100% (preliminary)

Future RFQ followed by individual bids

TCUP is the first project to plan for future needs now

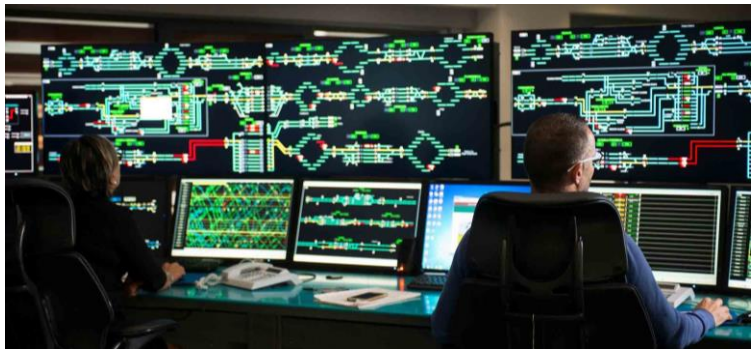


Supplier: Hitachi Rail GTS USA

Benefits:

- **Most advanced technology** in the industry
- In 16 countries and major systems like **London, Paris, Singapore, Hong Kong, New York, Vancouver, Toronto, BART**
- Only Hitachi offers **transponder-based train control** communication technology
- Can update existing onboard computers for **less vehicle integration cost and risk**
- Smaller, centrally located wayside equipment for **easier maintenance, less street clutter**
- SFMTA has experience with this supplier, structured contract to apply lessons learned

HITACHI
Inspire the Next



What we will ask the SFMTA Board of Directors to approve on October 15:

CBTC Supplier contract:

Contract No. SFMTA-2022-40 FTA with **Hitachi Rail GTS USA** for design, furnishment, system implementation, support and related services for a Communications-Based Train Control System (CBTC):

- Nine years of **design and procurement** (the span of the project) **not to exceed $212,093,633**
- Ten years of **required support services** after the project ends, **not to exceed $113,922,811**
- Two five-year **additional support service options, not to exceed $237,681,185**

Better outcomes from competitive, negotiated procurement

Contract wins for the project

Negotiated procurement process allowed for discussion with industry. Vendors understood project needs better. Lead to better proposals.

Annual software updates

- Keeps the new train control system up to date.

Long-term support included in contract

- Recognizes that a new train control system is a 30-year investment. Includes all spare parts.

Performance goals based on outcomes

- Builds performance into contract. Incentivizes supplier to build quality into the design up front and encourages supplier to make sure the new train control system works properly.

Knowledge transfer

- Creates a pathway to build in-house expertise for greater self-sufficiency.

Supplier Deliverables

Design: Hitachi will customize their baseline latest-generation train control technology to SFMTA's specifications

Construction: Hitachi delivers new train control components and monitors installation

Testing: Hitachi performs testing to ensure the system meets performance requirements

Long-term support: Hitachi provides maintenance support, training to SFMTA staff, and continues to monitor performance

Jumping five generations forward

Our History

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2004
G5: TAS platform

1974
Where it all started

1997
G4: Radio CBTC

2010
G6: Software defined radio

2015
Record order intakes year

New system: Generation 8

2018
G7

New wayside and onboard hardware

2023
Digital/cloud based G8

New positioning system, obstacle detection, predictive maintenance, AI

1986
G2: Driverless CBTC

1992
G3: New processor

SFMTA's current system: Generation 3

Modern Train Control Components

Train Control System - SelTrac™

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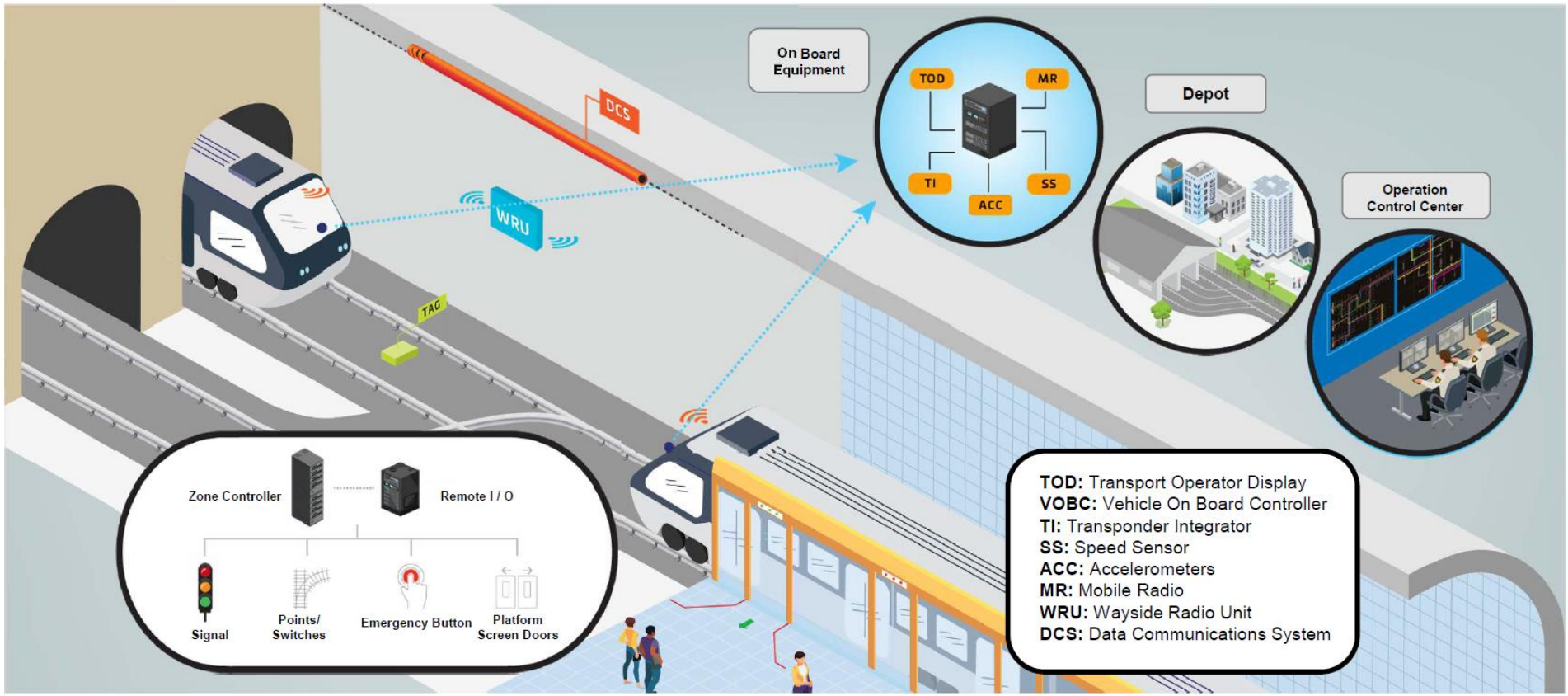
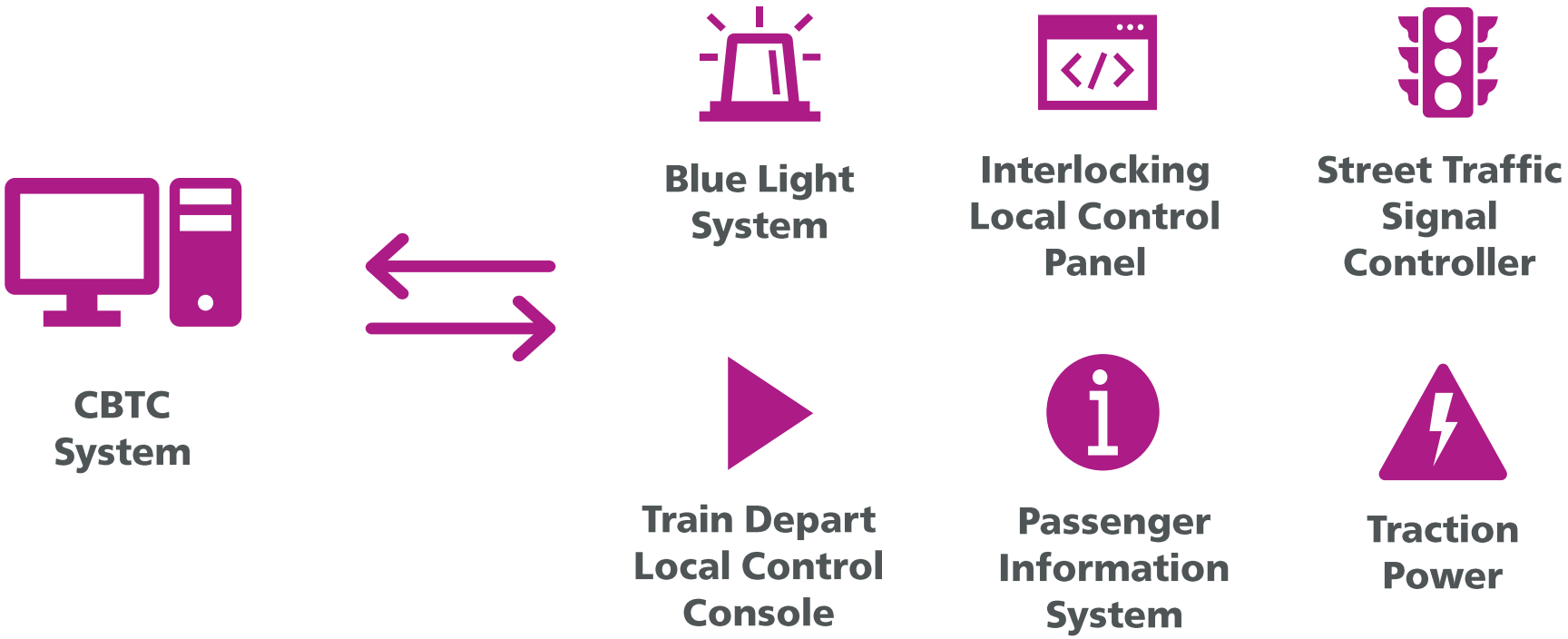


CBTC Automatic Train Supervision Interface

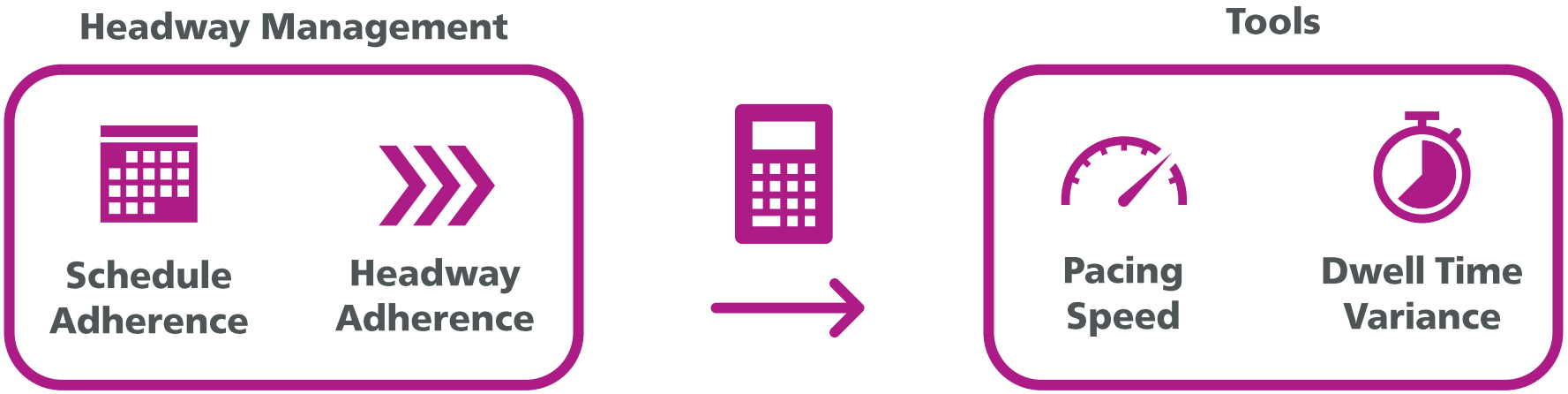


Automatic Train Supervision: Schedules Management

- CBTC will be able to receive, accept, and process timetable databases produced by CAD/AVL system
- CBTC can store at least a year's worth of schedules data
- CBTC can modify timetable databases before and during run time to account for changes during operations

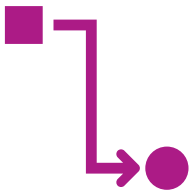
Automatic Train Supervision: Headway Management

- CBTC can optimize based on schedules or headway
- CBTC will calculate optimal pacing speed and dwell time to stay on schedule or headway
- CBTC can automatically take action to maintain schedules or headways, or suggest action to the operator on their display



Automatic Train Supervision: Route Setting

- CBTC offers automatic reroute functions to use in contingency situations
- CBTC automatically assigns vehicle routing based on preloaded schedules
- CBTC prioritizes trains at junctions based on different logic, below:



First In First Out

Schedule Order

Schedule Deviation

Enhanced automatic features in subway

CBTC will control train acceleration, deceleration, speed, station stops, and door opening in Automatic Train Operation (ATO) mode.

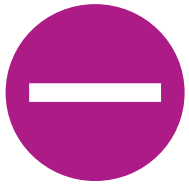
Operator will continue to provide oversight.

Automatic Speed Regulation

Automatic Door Control

Automatic Turnback

Platform Berthing



Station Bypass

Energy Optimization

New street mode features

- Include Automatic Train Supervision and safety functions
- System recommends actions to operator for safe, efficient operation
- “Driver assist” can be enabled to enhance safety

CBTC Safety functions will work citywide

- Train Location Determination
- Train Speed Determination
- Train Length Determination
- Safe Train Separation
- Speed Enforcement
- Overspeed Warning
- Interlocking Function
- Safe Braking
- Train Door Interlock / Step Control
- Rollback Protection
- End of Track Protection
- Parted Train Protection
- Intrusion Detection Interface
- Tunnel Ventilation Interface

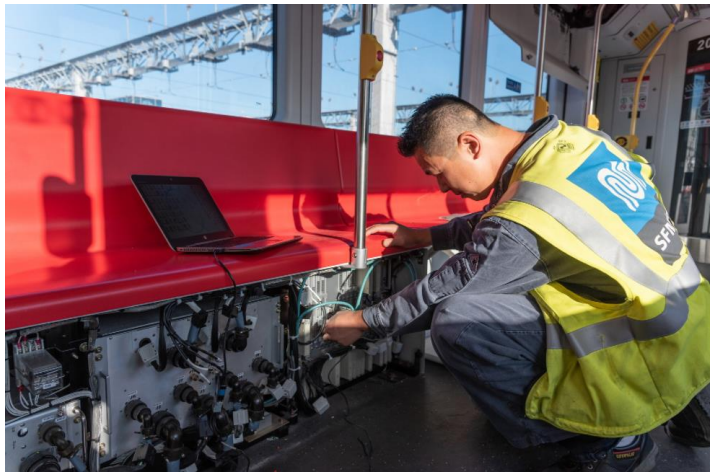
Long-term Support

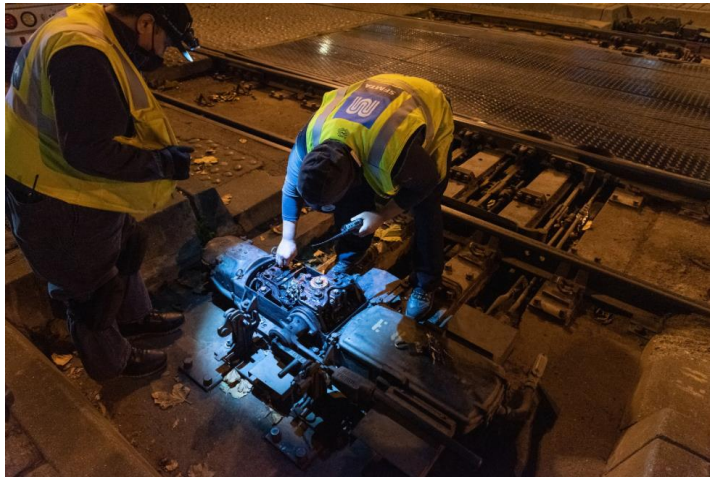
Design-Furnish-Support contract with up to 20 years of on-site technical support and performance-based requirements.

29-year contract		
Procurement: 9 years	**Base Support: 10 years**	**Two five-year support options**

- Train SFMTA staff to use and upkeep the system
- Help SFMTA staff troubleshooting issues
- Includes unlimited spare parts as needed to maintain the train control system
- Includes automatic annual software updates

Central Maintenance System Benefits





- Can monitor all CBTC subsystems in real time
- Integrates with EAMS to create database of LRU, software revision, and parts
- Customizable alarms quickly alert relevant personnel to different issues
- Detects potential fault conditions before the failure occurs
- Provides preventative maintenance reminders

Roadmap to Notice to Proceed

MTA Board: Aug 6

Board of Supervisors: Sep 17

NTP (Consultant): Nov

Consultant Contract

Supplier Contract

MTA Board: Oct 15

Board of Supervisors: Nov

NTP (Supplier): Jan

Roadmap from Notice to Proceed to initial installation

Supplier NTP: January 2025

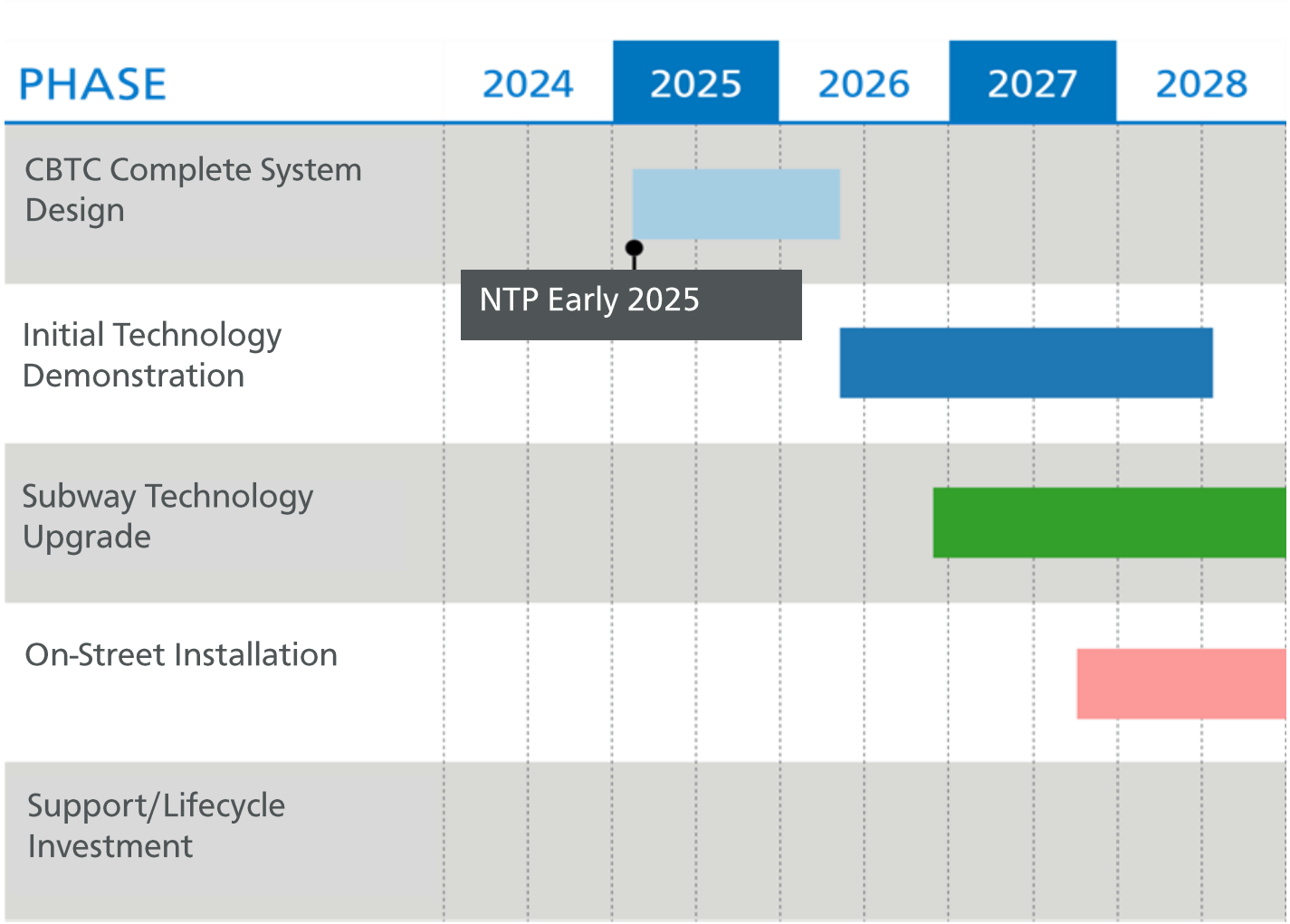
Deliver design: Spring 2026

Begin initial installation: 2027

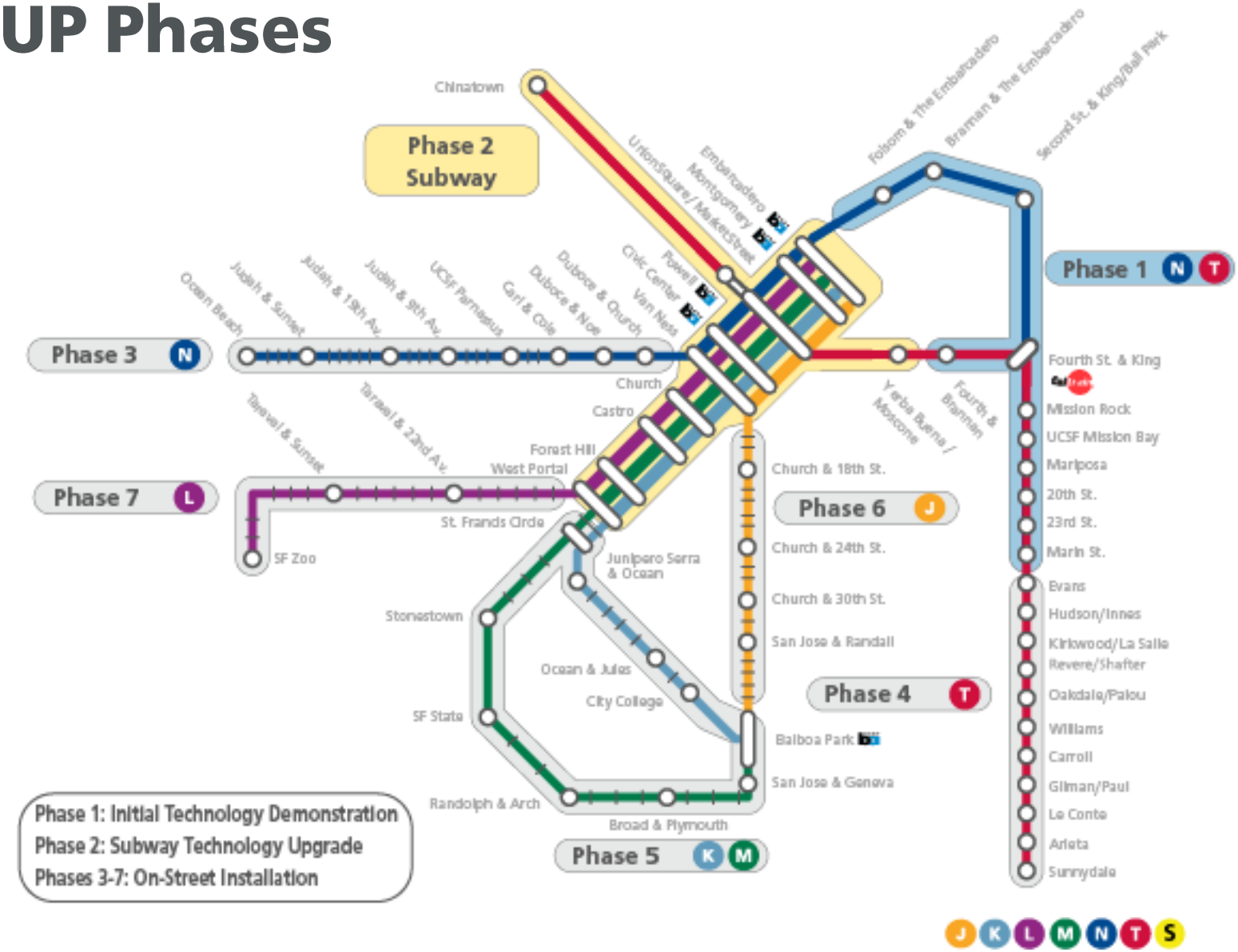
Testing: 2028

Complete initial installation: Late 2028

Train Control Upgrade Project Timeline



TCUP Phases


Chinatown
Phase 2
Subway
UnionSquare/MarketStreet
Embarcadero
Montgomery
Powell
Civic Center
Van Ness
Folsom & The Embarcadero
Brannan & The Embarcadero
Second St. & King/Ball Park
Phase 1 N T
Fourth St. & King
Mission Rock
UCSF Mission Bay
Mariposa
20th St.
23rd St.
Marin St.
Evans
Hudson/Innes
Kirkwood/La Salle
Revere/Shafter
Oakdale/Palou
Williams
Carroll
Gilman/Paul
Le Conte
Arleta
Sunnydale
Phase 3 N
Ocean Beach
Judah & Sunset
Judah & 19th Av.
Judah & 9th Av.
UCSF Parnassus
Carl & Cole
Duboce & Noe
Duboce & Church
Church
Castro
Forest Hill
West Portal
Taraval & Sunset
Taraval & 22nd Av.
Phase 7 L
St. Francis Circle
SF Zoo
Yerba Buena / Moscone
Fourth & Brannan
Church & 18th St.
Phase 6 J
Church & 24th St.
Church & 30th St.
San Jose & Randall
Junipero Serra & Ocean
Stonestown
Ocean & Jules
City College
SF State
Phase 4 T
Balboa Park
San Jose & Geneva
Randolph & Arch
Broad & Plymouth
Phase 5 K M
Phase 1: Initial Technology Demonstration
Phase 2: Subway Technology Upgrade
Phases 3-7: On-Street Installation
J K L M N T S

Transparent, Full Scope Investment

TCUP is the first project to plan for and build in support costs up front using maximum possible cost to invest in reliability.

Train Control Supplier Contract – Not-to-Exceed Amounts	
Total Procurement including Options (TCUP Capital Budget)	**$212,093,633**

**This project cost is already funded in the TCUP $700M funding plan, through capital funds than cannot be used to fund Muni service.*

Total Initial Support (FY32-44 Operating Budget)	**$113,922,811**

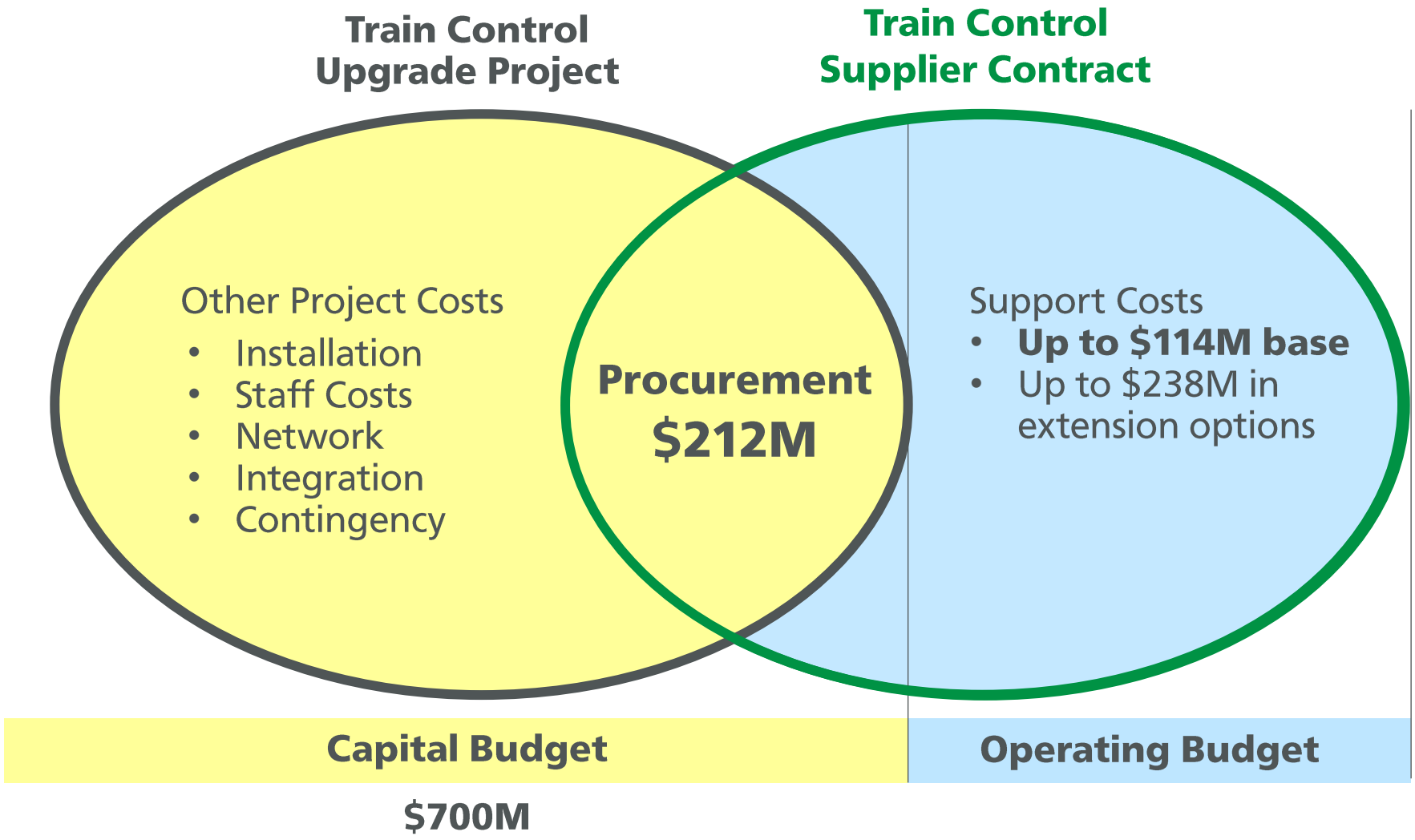
**We know we will need continual support and some of this cost absorbs what we already pay in support for the current system.*

Total Support Options (FY45-54 Operating Budget)	**$237,681,185**

**Structuring as options give SFMTA flexibility to revisit support based on needs in ten years.*

TOTAL Not-To-Exceed Amount	**$563,697,629**

Allocation of Contract Costs

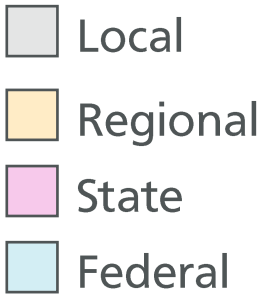


TCUP Capital Budget

Item	Budget
Train Control Supplier Contract (This Contract)	$212M
Consultant Contract (Approved Aug 2024)	$30M
Installation Contracts	$99M
Project Management and Engineering	$102M
Network Infrastructure and Systems Integration	$64M
Testing, Training and Operational Support	$53M
Contingency	$140M
Total Train Control Capital Budget	**$700M**

Project Funding Plan

Total Project Budget	$700,000,000
2021 Revenue Bond	$24,500,000
Prop B (General Fund)	$30,000,000
TSF Developer Fee	$12,000,000
Prop L	$16,000,000
GO Bond	$30,000,000
AB 664	$1,500,000
TIRCP Grant	$130,000,000
SB 1 (State of Good Repair)	$25,000,000
FTA (Transit Capital Priorities)	$375,000,000
Funding Need	$56,000,000



Questions?

Contract Price Breakdown

Procurement	Price
Base Procurement	$151,514,437
Procurement Options	$44,761,719
Escalation (Procurement)	$15,817,476
Total Procurement (TCUP Capital Budget)	**$212,093,633**

Initial Support	Price
Support (First 10 years + Phase In)	$56,676,617
Escalation (Initial Support)	$57,246,194
Total Initial Support (FY32-44 Operating Budget)	**$113,922,811**

Optional Support	Price
Support Options (10 additional years)	$62,498,541
Escalation (Optional Support)	$175,182,644
Total Optional Support (FY45-54 Operating Budget)	**$237,681,185**