Electrification - Infrastructure

• Progression of design:
  – Overhead Catenary System (OCS):
    • Complete design for Segment 2 Work Area 4
    • Continued design for other Segments 2 and 4
  – Signal System:
    • Continued submission and review of 65% signal design for Segments 2 and 4
    • Continued technical coordination with Union Pacific Railroad (UPRR) for system wide signal system design
    • Met with UPRR regarding proposed solution for Consistent Warning Time (CWT)
  – Traction Power System:
    • Completed review of 95% Traction Power Facilities design for Segment 4
    • Continued submission of 95% Traction Power Facilities design system wide
    • Completed Pacific Gas and Electric (PG&E) interconnection feasibility study for Segments 2 and 4 and reviewed preferred options with project team
  – Communication System:
    • Continued work on 65% system wide communication system design
Electrification - Infrastructure

Foundation Drilling Equipment
Electrification - Infrastructure

Loading Reinforcing Steel Cages
Electrification - Infrastructure

Final Equipment Setup To Move To Foundation Location
Electrification - Infrastructure

Foundation Work Train
Electrification - Infrastructure

Drilling of Foundations
Electrification - Infrastructure

Lowering Reinforcement Cage
Electrification - Infrastructure

Upper Foundation Framework and Anchor Bolt Setting
Electrification - Infrastructure

Final Alignment of Anchor Bolts
Electrification - Infrastructure

Concrete Placement with Pump
Electrification - Infrastructure

Close-up on Concrete Placement
Concrete for Guy Wire Foundation in Place
Electrification - Infrastructure

Finished Concrete for Top of Foundation
Electrification - Infrastructure

Foundation Concrete Quality Testing
Electrification - Infrastructure

Final Finishing of Exposed Concrete Foundations
Electrification - Infrastructure

Form Removal and Cleaning of Anchor Bolts
Electrification - Infrastructure

Restoration of Ballast and Area Around Foundation
Electrification - Infrastructure

- Supervisory Control and Data Acquisition (SCADA) Contract (ARINC Inc.)
  - Issued Noticed to Proceed and held kickoff meeting in October
  - Signal System

- Tunnel Modifications
  - 100% Plans and Specifications reviewed

- Centralized Equipment Maintenance and Operations Facility (CEMOF)
  - 60% Design underway

- PG&E
  - Progress on power quality studies with PG&E
  - Completed interconnection option study
  - Continued coordination for substation improvements

- Utility Relocation and Coordination
  - Relocation required at locations of overhead power and communication lines
  - Completed PG&E relocation in Segment 2 Work Area 5
EMUs

• Stadler
  – Preliminary Designs Reviews (PDRs) for all major systems conducted being finalized for Caltrain approval
  – Carshell extrusions in production
  – Aluminum carbody subassemblies being fabricated
  – Carshell structures being welded
  – Subassemblies being completed and staged for final assembly
  – Manufacturing and Final Assembly Facility beginning construction in Salt Lake City area
EMUs

Carshell Miscellaneous Extrusions
EMUs

Carshell Sidewall Extrusions
EMUs

Carcshell Miscellaneous Extrusions
EMUs

Representative Carshell Floor Structure in Welding Fixture
EMUs

Representative Carshell End Underframe
(oriented upside down)
EMUs

Carchsell Sub Assembly Lay-down Area with Representative Side Walls & Roofs
EMUs

Exterior Paint Test Samples
EMUs

Mockup of engineer’s console and seat within the cab
Schedule

MILESTONES

Caltrain strategic plan makes electrification a priority

Environmental Clearance

Award Contract

Groundbreaking

First Electric Train Arrives

Passenger Service with Electric Trains

1999

2015

2016

2017

2018

2019

2020

2021

2022

Electrification Infrastructure Construction

Final System Testing

Additional Capacity Improvements

*Please keep in mind that testing and construction will overlap as each Segment will be tested individually, prior to final system testing.

Note: Schedule Subject to Change
Risk Management

• Review Cost and Schedule Impacts of Risk Register

• Top Risk: Contractor may be unable to develop grade crossing modifications that meet operational requirements prior to scheduled sub-system testing of the grade crossings

• 277 risks; 90 active; 187 retired
## Budget & Expenditures (in millions)

<table>
<thead>
<tr>
<th></th>
<th>Budget</th>
<th>Current Budget*</th>
<th>Q2 Costs</th>
<th>Costs to Date</th>
<th>Estimate at Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Electrification</strong></td>
<td>$696.6</td>
<td>$696.7</td>
<td>$26.7</td>
<td>$183.9</td>
<td>$696.7</td>
</tr>
<tr>
<td><strong>SCADA</strong></td>
<td>$0.0</td>
<td>$3.4</td>
<td>$0.0</td>
<td>$0.0</td>
<td>$3.4</td>
</tr>
<tr>
<td><strong>EMU</strong></td>
<td>$550.9</td>
<td>$551.8</td>
<td>$17.1</td>
<td>$60.7</td>
<td>$551.8</td>
</tr>
<tr>
<td><strong>Separate Contract &amp; Support Costs</strong></td>
<td>$417.2</td>
<td>$417.2</td>
<td>$20.5</td>
<td>$143.9</td>
<td>$417.2</td>
</tr>
<tr>
<td><strong>Contingency</strong></td>
<td>$315.5</td>
<td>$311.1</td>
<td>$0.0</td>
<td>$0.0</td>
<td>$269.6</td>
</tr>
<tr>
<td><strong>Anticipated Changes</strong></td>
<td>$0.0</td>
<td>$0.0</td>
<td>$0.0</td>
<td>$0.0</td>
<td>$41.5</td>
</tr>
<tr>
<td><strong>PCEP Total</strong></td>
<td>$1,980.3</td>
<td>$1,980.3</td>
<td>$64.4</td>
<td>$388.5</td>
<td>$1,980.3</td>
</tr>
</tbody>
</table>

* Includes executed change orders and awarded contracts

** Refer to Contingency Drawdown Table on next slide for details

Note: Budget / Expenditures as of December 31, 2017
Contingency Drawdown

<table>
<thead>
<tr>
<th>Contracts</th>
<th>Amount</th>
<th>Contingency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning Contingency</td>
<td></td>
<td>$ 315,533,611</td>
</tr>
<tr>
<td>Drawdown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Executed Change Orders</td>
<td>$ 960,972</td>
<td></td>
</tr>
<tr>
<td>SCADA Contract</td>
<td>$ 3,446,917</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>$ 4,407,889</td>
<td></td>
</tr>
<tr>
<td>Remaining Contingency</td>
<td></td>
<td>$ 311,125,722</td>
</tr>
</tbody>
</table>

Note: As of December 31, 2017
# Anticipated Contingency Drawdown

<table>
<thead>
<tr>
<th>Contracts</th>
<th>Amount</th>
<th>Contingency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remaining Contingency</td>
<td></td>
<td>$ 311,125,722</td>
</tr>
<tr>
<td>Anticipated Contingency Drawdown</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negotiated Change Orders</td>
<td>$ 10,294,819</td>
<td></td>
</tr>
<tr>
<td>PG&amp;E Supplemental Agreement #4</td>
<td>$ 31,263,082</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$ 41,557,901</strong></td>
<td></td>
</tr>
<tr>
<td>Anticipated Remaining Contingency</td>
<td></td>
<td>$ 269,567,821</td>
</tr>
</tbody>
</table>

Note: As of December 31, 2017
Contingency Drawdown Curve

Contingency Hold Points (CHP)
CHP01 - Determination of Baseline Budget Rev 4
CHP02 - Entry into Engineering
CHP03 - PG&E Substation Design Acceptance
CHP04 - Finish Segment 4A All Disciplines
CHP05 - OCS Acceptance Testing Completion - Segment 1
CHP06 - Construction & Testing Completion - All Segments
CHP07 - EMU Conditional Acceptance of 14th Trainset
CHP08 - Pre-Revenue Testing Complete

Minimum Contingency Level
Actual Contingency Drawdown
Anticipated Contingency Drawdown
Infrastructure Outreach

• 3 Community Meetings re: Construction
  – (San Jose/Santa Clara, Redwood City/North Fair Oaks, Belmont/San Carlos)

• 15,670 Direct Mailers

• New Website: calmod.org
Electric Trains
## Procurement History

<table>
<thead>
<tr>
<th>Date</th>
<th>Key Milestones</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 2014</td>
<td>Request for Information (6 Car Builders participated)</td>
</tr>
<tr>
<td>August 2015</td>
<td>Request for Proposal Released <em>(Includes Board Decisions, Customized Vehicle)</em></td>
</tr>
<tr>
<td>July 2016</td>
<td>Stadler, Sole Proposer, Awarded Contract</td>
</tr>
<tr>
<td>September 2016</td>
<td>Limited Notice to Proceed</td>
</tr>
<tr>
<td>May 2017</td>
<td>Award Full Notice to Proceed Contract <em>(FFGA Requirement: “At least 10 percent increase in seated capacity”)</em></td>
</tr>
</tbody>
</table>
Capacity Decision (Summer 2015)

- JPB Discussion & Action
  - Tradeoffs between seats, standing space, bikes, restrooms (fixed space in the vehicle)
  - Dual Doors “not to preclude” future HSR options

<table>
<thead>
<tr>
<th>Board Decision</th>
<th>Outreach</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:1 Ratio Seats to Bikes (staff originally proposed 9:1)</td>
<td>- Special Board Workshop</td>
</tr>
<tr>
<td>1 Restroom per train (staff originally proposed 0 restrooms)</td>
<td>- 20 public meetings</td>
</tr>
<tr>
<td>Dual doors “not to preclude” future HSR boarding decisions. Customized vehicle. Seats in front of the doors.</td>
<td>- Over 10,000 comments from the different venues</td>
</tr>
<tr>
<td></td>
<td>- Multiple Surveys</td>
</tr>
<tr>
<td></td>
<td>- Top 10 Station Outreach AM/PM</td>
</tr>
<tr>
<td></td>
<td>- Traditional / Social Media</td>
</tr>
</tbody>
</table>
Stadler Design (2017)

- Layout largely fixed to meet bike / seat ratio, FFGA seat requirements, ADA Restroom, dual doors, etc.
Capacity

The CalMod program lays the foundation for continued capacity growth on the corridor. Unlike diesel trains, electric trains can maintain performance while expanding the number of train cars.

Figures and percentages subject to changes as EMU design elements and new service schedules are finalized.
Capacity Continued

CURRENT DIESEL FLEET
(Mix Of Bombardier and Gallery Cars | 5- and 6-car Train Sets)

Average Per Train

<table>
<thead>
<tr>
<th></th>
<th>Standing</th>
<th>Seats</th>
<th>Bikes</th>
</tr>
</thead>
<tbody>
<tr>
<td>People</td>
<td>637.0</td>
<td>741.0</td>
<td>73.6</td>
</tr>
</tbody>
</table>

Trains Per Peak Hour In Each Direction

5

Average Per Peak Hour, Per Peak Direction

<table>
<thead>
<tr>
<th></th>
<th>Standing</th>
<th>Seats</th>
<th>Bikes</th>
</tr>
</thead>
<tbody>
<tr>
<td>People</td>
<td>3,185</td>
<td>3,705</td>
<td>368</td>
</tr>
</tbody>
</table>

2022 ELECTRIFICATION
(Mix of 7-car Diesel Train Sets and 6-car Electric Train Sets)

Average Per Train

<table>
<thead>
<tr>
<th></th>
<th>Standing</th>
<th>Seats</th>
<th>Bikes</th>
</tr>
</thead>
<tbody>
<tr>
<td>People</td>
<td>821.3</td>
<td>681.3</td>
<td>72.0</td>
</tr>
</tbody>
</table>

Trains Per Peak Hour In Each Direction

6

Average Per Peak Hour, Per Peak Direction

<table>
<thead>
<tr>
<th></th>
<th>Standing</th>
<th>Seats</th>
<th>Bikes</th>
</tr>
</thead>
<tbody>
<tr>
<td>People</td>
<td>4,928</td>
<td>4,088</td>
<td>432*</td>
</tr>
</tbody>
</table>

The CalMod program lays the foundation for continued capacity growth on the corridor. Unlike diesel trains, electric trains can maintain performance while expanding the number of train cars.

Figures and percentages subject to changes as EMU design elements and new service schedules are finalized. *Electric trains will meet a 1:8 bike to seat ratio.
### Design Refinements (2017/2018)

<table>
<thead>
<tr>
<th>Topic</th>
<th>Outreach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exterior Train Design (Red and White)</td>
<td>- Surveys</td>
</tr>
<tr>
<td></td>
<td>- 10 Station and Outreach Meetings</td>
</tr>
<tr>
<td></td>
<td>- Restroom Mockup and walkthrough for ADA Community</td>
</tr>
<tr>
<td></td>
<td>- 56 Meetings</td>
</tr>
<tr>
<td></td>
<td>- Sample Seats &amp; Bike Storage at Project Office</td>
</tr>
<tr>
<td>Interior Seats Color (Grey, red stripe)</td>
<td>- Social / Traditional Media</td>
</tr>
<tr>
<td></td>
<td>- Calmodtrains.org website</td>
</tr>
<tr>
<td>Restroom ADA (Incorporated many changes: button, handle location etc.)</td>
<td></td>
</tr>
<tr>
<td>Bike Storage Options (Stacking option selected to maximize capacity)</td>
<td></td>
</tr>
<tr>
<td>Interior Wheelchair Lift (to be used when HSR on the corridor with common platforms)</td>
<td></td>
</tr>
<tr>
<td>Upper Doors (to be used when HSR on the corridor with common platforms)</td>
<td></td>
</tr>
</tbody>
</table>
Design Refinements Continued
Bike Security

• Bike Security Review (Onboard and Wayside)
  - What could we be doing better now, potential options and best practices with new electric trains
  - Response to concerns raised by bike community

• Collaboration with Key Stakeholders
  - Bicycle Advisory Committee
  - SF Bicycle Coalition and Silicon Valley Bicycle Coalition
  - Broader Bike Community
  - Internal Taskforce (Ops, Planning, Marketing, Transit Police)
Electric Train Amenities

- Plentiful Power Sources
- Better Location & Destination Info
- Quieter, Smoother Rides
- Increased Frequency & Reduced Travel Time
Questions