CALTRAIN ELECTRIFICATION UPDATE

Joint Powers Board
November 4, 2021
PROJECT OVERVIEW
• Caltrain Electrification
• San Francisco to San Jose (Tamien Station)
• 51 miles
• Updated Project Cost: $2.31B
• Update Revenue Service: Sept. 2024
PROJECT ELEMENTS

Electric Trains
• 19 7-car train sets (133 cars)
  (Note: 96 cars funded by project; 37 cars funded by State TIRCP)

Electrification
• Overhead Contact System (OCS)
• Traction Power Facilities
• Signal System
PROJECT BENEFITS

- Improved Train Performance, Increased Service and Greater Capacity
- Improved Regional Air Quality and Reduced Greenhouse Gas Emissions
- Positive Economic Benefits for the Region
- Reduced Engine Noise Emanating from Trains
LONG-TERM SERVICE VISION

- Electrification sets foundation for future growth of system
- Meet projected regional growth in jobs and housing in the Bay Area
- Triple ridership, increase peak and off-peak service
- Carry equivalent of 5.5 lanes of US 101 highway traffic
2 SPEED CHECK (2SC) SIGNAL SYSTEM
• Manages train movements
  - Multiple signal locations
  - Managed by control center dispatch and train detection

• Components
  - Control points/Interlockings
  - Intermediate signal locations
  - Gate activation at crossings
• Current signal system (Constant Warning Time) will not work with electrified system

• New 2SC signal system to be installed
  - Approved by CPUC, FRA, UP

• Additional Crossing Optimization (Wireless) system
  - Part of PTC project
  - To be tested and implemented if proven and approved
• Track circuits (train detection)
• Updates to existing signal locations (156 locations)
• New signal equipment locations (58 locations)
• Insulated joints (isolate electrical current between track circuits)
• Impedance bonds (allows traction power return to go around insulated joints)
• Duct bank/Fiber (communication) installation
• 41 at-grade vehicular crossings (SF to SJ)
• Pedestrian crossings

<table>
<thead>
<tr>
<th>City</th>
<th>Number of Crossings</th>
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</thead>
<tbody>
<tr>
<td>San Francisco</td>
<td>2</td>
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<tr>
<td>South San Francisco</td>
<td>1</td>
</tr>
<tr>
<td>San Bruno</td>
<td>1</td>
</tr>
<tr>
<td>Millbrae</td>
<td>1</td>
</tr>
<tr>
<td>Burlingame</td>
<td>5</td>
</tr>
<tr>
<td>Burlingame/San Mateo (Peninsula Avenue)</td>
<td>1</td>
</tr>
<tr>
<td>San Mateo</td>
<td>9</td>
</tr>
<tr>
<td>Redwood City</td>
<td>6</td>
</tr>
<tr>
<td>Atherton</td>
<td>2</td>
</tr>
<tr>
<td>Menlo Park</td>
<td>4</td>
</tr>
<tr>
<td>Palo Alto</td>
<td>4</td>
</tr>
<tr>
<td>Mountain View</td>
<td>2</td>
</tr>
<tr>
<td>Sunnyvale</td>
<td>2</td>
</tr>
<tr>
<td>Santa Clara*</td>
<td>1</td>
</tr>
<tr>
<td>San Jose</td>
<td>2</td>
</tr>
</tbody>
</table>

*UPRR owned Reed Street Crossing in Santa Clara
• Today
  - Continuous train speed detection until gates are activated
  - If train speed changes after gates are activated, the system will not adjust to reduce gate down time

• New (2SC)
  - Future system detects speed at a track circuits and categorizes the speed into 1 of 2 speed categories (high or low speed trains)
  - Originated from Association of American Railroads (AAR)
  - Approved by UPRR, FRA, CPUC
2SC SIGNAL SYSTEM

- **Start Train Detection**
- **First Speed Check**
  - If high speed, gates go down
  - If low speed, gates remain up until Second Speed Check
- **Second Speed Check**
  - If low speed, gates go down
- **Island Circuit**
  - Detects train leaving crossing, gates go up
• Different train speed categories for the corridor
• Accommodates necessary slow speeds at terminals

• Corridor-wide
  - High Speed: 41 to 79 mph
  - Low Speed: 0 to 40 mph

• Diridon Terminus
  - High Speed: 21 to 35 mph
  - Low Speed: 0 to 20

• San Francisco Terminus
  - High Speed: 26 to 40 mph
  - Low Speed: 0 to 25 mph
GATE DOWN TIME

- Minimum required by FRA (safety)
- Gate down time vary at different crossings
- Factors that impact gate down time
  - Track curvature, civil speed restrictions
  - Proximity to terminals and station stops
  - Freight and tenant traffic
  - Train length
  - Speed restrictions
  - Extended crossing approach
• Segment 4 complete
  - Auzerais, W. Virginia
  - Data collection in progress

• Remaining segments
  - Winter 2022 – 2023

• City/County coordination
  - Projected gate down times
  - Actual gate down time following signal cutovers
• Scope and funding included in Positive Train Control (PTC) contract
• Added wireless technology allows signal system to react to train speed
• Proof of concept test anticipated January 2022
• Significant coordination with FRA/CPUC required
• Once crossing optimization is implemented, 2SC will be used for non-equipped trains or as back-up
CONSTRUCTION UPDATE
CONSTRUCTION SEGMENTS

Segment 1
San Francisco to Brisbane

Segment 2
South San Francisco to Atherton

Segment 3
Menlo Park to Santa Clara

Segment 4
Santa Clara to Tamien
• Overhead Contact System (OCS)
  - Foundations 92% complete (89% last month)
  - Poles 67% complete (66% last month)
  - Segment 4 Wire 78% complete (56% last month)

• Traction Power Facilities
  - Transformer installed at 10 of 10 facilities (9 last month)
  - Traction Power Substations 1 98% complete (96% last month)
  - Traction Power Substations 2 96% complete
  - Switching Station 1 94% complete (93% last month)

• Electric Trains (133 cars total)
  - 88 shipped (86 last month)
  - 73 in Salt Lake City manufacturing facility
  - Trainset 1 in Pueblo for on-track testing
# OCS FOUNDATIONS

<table>
<thead>
<tr>
<th>Segment</th>
<th>Foundations Required</th>
<th>Foundations Remaining</th>
<th>Installation Percent Complete</th>
<th>Completed Last Month</th>
<th>Anticipated Completion Date</th>
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</thead>
<tbody>
<tr>
<td>Segment 1</td>
<td>569</td>
<td>239</td>
<td>58%</td>
<td>101</td>
<td>12/30/2021</td>
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<tr>
<td>Segment 2</td>
<td>1,179</td>
<td>Complete</td>
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<tr>
<td>Segment 3</td>
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<td>Segment 4</td>
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<tr>
<td>CEMOF</td>
<td>85</td>
<td>Complete</td>
<td>100%</td>
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Data as of September 30, 2021
## OCS POLES

<table>
<thead>
<tr>
<th>Segment</th>
<th>Required</th>
<th>Remaining</th>
<th>Installation Percent Complete</th>
<th>Completed Last Month</th>
<th>Anticipated Completion Date</th>
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<tbody>
<tr>
<td>Segment 1</td>
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<td>442</td>
<td>0%</td>
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<tr>
<td>Segment 2</td>
<td>971</td>
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<td>61%</td>
<td>47</td>
<td>11/31/21</td>
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<tr>
<td>Segment 3</td>
<td>755</td>
<td>Complete</td>
<td>100%</td>
<td>Complete</td>
<td>Complete</td>
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<tr>
<td>Segment 4</td>
<td>304</td>
<td>12</td>
<td>96%</td>
<td>4</td>
<td>10/31/21</td>
</tr>
<tr>
<td>CEMOF</td>
<td>83</td>
<td>Complete</td>
<td>100%</td>
<td>1</td>
<td>Complete</td>
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Data as of September 30, 2021
### OCS WIRE

<table>
<thead>
<tr>
<th>Segment</th>
<th>Installation Percent Complete</th>
<th>Completed Last Month (in feet)</th>
<th>Anticipated Installation Completion</th>
<th>Testing Percent Complete</th>
<th>Anticipated Testing Completion</th>
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<tbody>
<tr>
<td>Segment 1</td>
<td>0 %</td>
<td>0</td>
<td>06/23/22</td>
<td>0 %</td>
<td>07/20/22</td>
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<tr>
<td>Segment 2</td>
<td>20 %</td>
<td>0</td>
<td>12/15/2021</td>
<td>8 %</td>
<td>01/20/22</td>
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<tr>
<td>Segment 3</td>
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<td>0</td>
<td>05/03/2021</td>
<td>100 %</td>
<td>05/15/2021</td>
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<tr>
<td>Segment 4</td>
<td>78 %</td>
<td>46,911</td>
<td>11/15/21</td>
<td>0.0 %</td>
<td>11/21/21</td>
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Data as of September 30, 2021
<table>
<thead>
<tr>
<th>Segment</th>
<th>95% Design Percent Complete</th>
<th>Anticipated 95% Design Complete</th>
<th>Installation Percent Complete</th>
<th>Anticipated Installation Complete</th>
<th>Testing Percent Complete</th>
<th>Anticipated Testing Complete</th>
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</thead>
<tbody>
<tr>
<td>Segment 1</td>
<td>64%</td>
<td>03/31/2023</td>
<td>21%</td>
<td>08/31/2023</td>
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<td>09/23/2023</td>
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<tr>
<td>Segment 2</td>
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<td>07/17/2022</td>
<td>25%</td>
<td>08/01/2022</td>
<td>7%</td>
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<td>Segment 3</td>
<td>67%</td>
<td>12/11/2022</td>
<td>21%</td>
<td>02/28/2023</td>
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<td>04/24/2023</td>
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<td>Segment 4</td>
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<td>93%</td>
<td>10/31/2021</td>
<td>95%</td>
<td>11/15/2021</td>
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Data as of October 21, 2021
## Traction Power Facilities

<table>
<thead>
<tr>
<th>Facility</th>
<th>Sitework</th>
<th>Substation Building</th>
<th>Low / High Voltage Equipment</th>
<th>Transformer</th>
<th>Gantry</th>
<th>Total Completion</th>
<th>Anticipated Completion</th>
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<tbody>
<tr>
<td>TPS-1 (SSF)</td>
<td>95%</td>
<td>89%</td>
<td>98%</td>
<td>100%</td>
<td>99%</td>
<td>96%</td>
<td>1/30/2022</td>
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<tr>
<td>TPS-2 (San Jose)</td>
<td>95%</td>
<td>98%</td>
<td>100%</td>
<td>100%</td>
<td>98%</td>
<td>98%</td>
<td>10/15/2021</td>
</tr>
<tr>
<td>SWS-1 (RWC)</td>
<td>93%</td>
<td>89%</td>
<td>96%</td>
<td>100%</td>
<td>94%</td>
<td>94%</td>
<td>12/31/2021</td>
</tr>
<tr>
<td>PS-1 (SF)</td>
<td>65%</td>
<td>86%</td>
<td>96%</td>
<td>100%</td>
<td>91%</td>
<td>88%</td>
<td>1/19/2022</td>
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<tr>
<td>PS-2 (SF/Brisbane)</td>
<td>87%</td>
<td>80%</td>
<td>89%</td>
<td>100%</td>
<td>82%</td>
<td>88%</td>
<td>12/22/2021</td>
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<tr>
<td>PS-3 (Burlingame)</td>
<td>26%</td>
<td>68%</td>
<td>5%</td>
<td>47%</td>
<td>15%</td>
<td>32%</td>
<td>4/18/2022</td>
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<tr>
<td>PS-4 (San Mateo)</td>
<td>90%</td>
<td>82%</td>
<td>96%</td>
<td>100%</td>
<td>87%</td>
<td>91%</td>
<td>11/21/2021</td>
</tr>
<tr>
<td>PS-5 (Palo Alto)</td>
<td>77%</td>
<td>94%</td>
<td>96%</td>
<td>100%</td>
<td>94%</td>
<td>92%</td>
<td>1/7/2022</td>
</tr>
<tr>
<td>PS-6 (Sunnyvale)</td>
<td>93%</td>
<td>94%</td>
<td>91%</td>
<td>100%</td>
<td>92%</td>
<td>94%</td>
<td>10/15/2021</td>
</tr>
<tr>
<td>PS-7 (San Jose)</td>
<td>96%</td>
<td>99%</td>
<td>95%</td>
<td>100%</td>
<td>97%</td>
<td>97%</td>
<td>10/31/2021</td>
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### Wayside Power Cabinets

<table>
<thead>
<tr>
<th>Required</th>
<th>Installed</th>
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<tbody>
<tr>
<td>27</td>
<td>20</td>
</tr>
</tbody>
</table>

Data as of September 30, 2021
• Production
  - COVID-19-related global safety measures have slowed production
  - Salt Lake City assembly delayed
  - Trainsets 3 to 15 in various states of production
• Testing
  - Dynamic type testing on schedule in Pueblo on trainset 1
  - HVAC type testing trainset 2 ongoing
  - Routine testing trainsets 3 through 6 being performed in SLC
• Schedule
  - First trainset to Caltrain 1st Quarter 2022
  - Acceptance of 14 of 19 trainsets 2nd Quarter 2023
Revenue Service September 2024

Contract Baselines vs. Forecast

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<th></th>
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<tbody>
<tr>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
<td>Q2</td>
<td>Q3</td>
<td>Q4</td>
</tr>
</tbody>
</table>

- **Electrification - BBII OCS**: 10/09/17
- **Electrification - BBII TPF**: 12/01/17
- **Electrification - BBII Signal**: 09/06/16
- **Electrification - BBII Integrated Testing**: 7/01/22
- **Permanent Power (PG&E)**: 03/17/17
- **EMU (Stadler)**: 09/06/16
- **Revenue Service Date (RSD Period)**: Data Date

**Critical Path**

- OCS Foundation 02/03/22
- OC9 07/15/22
- TPF 06/10/22
- Signals 09/30/23
- Integrated Testing 12/31/23

**Contingency** (4 - 6 Months)

Data Date as of 09/30/2021

**RSD Period**: 01/01/24 - 03/31/24

**Critical Path**
As of August 31, 2021

December update subject to BBI negotiations and budget refresh

<table>
<thead>
<tr>
<th>Total Project Cost</th>
<th>$2.31B</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Previous Project Cost)</td>
<td>$(1.98B)</td>
</tr>
</tbody>
</table>

| Committed                                 | $1.85B  |
| Carryover Contingency (Previous Budget)   | $129.8M |
| Additional Known (Allocated)*             | $161.0M |
| Additional Reserve*                       | $172.0M |

*Note: Total $333M additional cost recommended by FTA
TOP RISKS

- Resolve BBII contract commercial issues
- BBII requests for change orders / claims
- Delays in parts supply chain affecting vehicle production schedule
- Continue to mitigate underground site conditions and assist BBII with redesign efforts
• **Priority funding opportunities**
  - State Budget (MTC Northern California)
  - Federal FY22 appropriations
  - Federal Infrastructure Bill

• **Other sources**
  - CTC Solutions for Congested Corridors Program (SCCP)
  - CTC Local Partnership Program (LPP)
  - CTC Trade Corridor Enhancement Program (TCEP)
  - Consolidated Rail Infrastructure and Safety Improvement (CRISI)
• Resolve BBII contract commercial issues (December)
• Project Assessment (transition from civil to system work)
• Keep construction moving forward (including 2SC work)
• Budget amendment request to JPB
• FTA / CAHSRA Project Recovery Plan
• FFGA update
• Funding advocacy
QUESTIONS