Communication Based Overlay Signal System

Project Status

Board of Directors
May 7, 2015

Background

- Issue Communications Based Overlay Signal System Design/Procure/Install Turn-key RFP - August 2010
- Awarded Prime Contact - October 2011
- Executed a Service Agreement with California High Speed Rail Authority (HSR11-04) for Federal Railroad Administration Funding – December 2011
- Issued Notice to Proceed (NTP) to Parson Transportation Group - January 27, 2012
- Executed Fiber Optic Option - April 26, 2012
- Exercised Option 1 (Phase 2) – April 30, 2013
- Exercised Option 2 (Phase 3) – August 1, 2013
- Exercised Option 2 (Phase 4) – December 4, 2014
CBOSS Project Requirement

Positive Train Control (Rail Safety Act 2008)
• Prevent Train to Train Collisions
• Prevent Overspeed Derailments
• Prevent incursions into established work zones
• Prevent movement through a misaligned switch

Additional Requirements:
• Enhanced Crossing Safety / Performance
• Improved Headways and Operational Flexibility
• Enforcement of Scheduled Station Stops
• Schedule Management
• Employee In Charge

CBOSS Project Solution Overview

• Interoperable - Incremental Train Control System (I-ITCS)
• Commuter Rail Solution
• Communications Based Train Control System Designed as an Overlay to The Existing Signal System
• Provides Enforcement of Signal Indications, Civil Speed Limits, Employee In Charge (EIC) and Temporary Speed Restrictions
• Provides Advanced Start of Public Crossings and Restricted Speed enforcement Over Hand Operated Switches
• Uses a Radio Frequency (RF) Data Link to Send Wayside Status Information to the Trains
Project Major Accomplishments

- Completed All Work in Phase 1
- Received FRA Conditional Type Approved for I-ITCS
- Fiber Optic Backhaul Installation Nearing Completion
- Completed Back Office Control Center Build Outs
- Completed Office Subsystem Installation
- Completed Installation of All Wayside Interface Units (WIUs)
- Completed Erection of 12/14 RF Base Stations
- On Board Installation is 55% Complete
- Completed Milepost Recalibration
- Continued community outreach for Installation and testing of Data Communication and Wayside Subsystems.

Project Key Milestones

<table>
<thead>
<tr>
<th>Project Key Milestones</th>
<th>Planned Baseline Finish</th>
<th>Actual/Forecast Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 JPE Issued Notice to Proceed to PTIG – Phase 1</td>
<td>Jan 2012</td>
<td>Jan 2012</td>
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<tr>
<td>2 Completion of Preliminary Design Review and Acceptance</td>
<td>Sept 2012</td>
<td>Nov 2012</td>
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<tr>
<td>3 Completion of Critical Design Review and Acceptance</td>
<td>Feb 2013</td>
<td>Jun 2013</td>
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<tr>
<td>4 Completion of Final Design Review and Acceptance</td>
<td>Jul 2013</td>
<td>Jun 2014</td>
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<tr>
<td>5 Complete Factory Integrated Systems/Subsystem Demo</td>
<td>Sept 2014</td>
<td>Apr 2015</td>
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<tr>
<td>6 Completion of Data Communication Subsystem (DCS) Installation and Verification</td>
<td>Sept 2014</td>
<td>Apr 2015</td>
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<tr>
<td>7 Completion of Field Subsystem Installation and Verification</td>
<td>Jan 2015</td>
<td>Mar 2015</td>
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<tr>
<td>8 Completion of Onboard Subsystem Installation and Verification</td>
<td>Jun 2015</td>
<td>Aug 2015</td>
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<tr>
<td>9 Complete build out of BCCF for CROSSTPC</td>
<td>Feb 2014</td>
<td>Sept 2014</td>
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<tr>
<td>10 Commence FRA Pilot Section Demonstration</td>
<td>Oct 2014</td>
<td>May 2015</td>
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<tr>
<td>12 Revenue Service Demonstration</td>
<td>Oct 2015</td>
<td>Dec 2015</td>
</tr>
<tr>
<td>13 Final System Acceptance</td>
<td>May 2016</td>
<td>Jun 2016</td>
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Project Total Installed Cost Update

<table>
<thead>
<tr>
<th>Description</th>
<th>Turn-Key Contractor Cost</th>
<th>Total Project Cost</th>
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</thead>
<tbody>
<tr>
<td>Project Planning and Procurement</td>
<td>0</td>
<td>$4.6MM</td>
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<tr>
<td>Phase 1 - Contract NTP – Critical Design</td>
<td>$16.3MM</td>
<td>$22.8MM</td>
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<tr>
<td>Phase 2 - Final Design and DCS Installation Including Fiber Backbone</td>
<td>$35.3MM</td>
<td>$53.7MM</td>
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<tr>
<td>Phase 3/4 - Field Installation, Testing and Commissioning through Acceptance &amp; Warranty</td>
<td>$87.6MM</td>
<td>$149.9MM</td>
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<tr>
<td>Total</td>
<td>$139.2MM</td>
<td>$231.0 MM</td>
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FRA Safety Certification Process

- **FRA Witness Testing**
  - Informal invitation for database validation of test segment has been sent to the FRA
  - FRA may choose to witness field testing for test segment (segment #3)
  - Caltrain to submit PTC Safety Plan including test results for segment #3.

- **FRA Revenue Service Demonstration (RSD):**
  - After successful FRA witness of segment 3 testing Caltrain submits an application for RSD
  - Caltrain follows with submittal of Segment #2 and Segment #1 test results
  - FRA Approves RSD Application
  - Caltrain begins PTC Revenue Service Demonstration
PTC CBOSS Activities from RSD to System Acceptance

- Major Activities- FRA Approved Revenue Service Demonstration (RSD) through System Acceptance:
  - FRA RSD Granted
  - Monthly reporting to FRA of CBOSS PTC operating results and statistics throughout RSD period.
  - RAMS Testing (RSD + 6 months)
  - Implement Long Term Maintenance and Support Agreement
  - Contract for JPB Owner’s Team
  - CBOSS PTC FRA Safety Certification - FRA reviews Caltrain Operating results and when satisfied that CBOSS PTC system is operating safely will approve PTCSP and grant Safety Certification for CBOSS PTC System (timeframe undefined by FRA)
  - CBOSS PTC System Acceptance

Challenges

- GE software release delays
- Interoperability - UPRR requires that JPB execute and Interoperability Agreement and pay all UPRR expenses associated with establishing and maintaining interoperability.
- FRA Revenue Service Demonstration application & beyond - learn as you go – no written FRA guidelines
- Long Term Maintenance and Support
CBOSS PTC - Owner’s Project Team

- Multi-disciplined/Cross Functional
  - Data and RF communications; wayside signal, control systems, on-board, rail system safety, system integration
- Effective and Cohesive unit
- Understanding PTC technology and continuity of project knowledge.
- Solid Rail Operations and System Engineering experience

Next Steps

- Commence Segment 3 Pilot Testing and FRA Witness Testing
- Complete All Wayside and Communication Subsystem Testing
- Submit RSD Application (including PTCSP)
- Complete On-Board Installation
- CBOSS PTC Initial Revenue Service by December 2015
Questions?

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Caltrain PTC