Class I Freight Railroads PTC Implementation Status

Jeff Young

Union Pacific Railroad

ASSOCIATION OF
AMERICAN RAILROADS

Freight Rail Works

Agenda

- Scope of Class I Implementation

- Component Availability

- Back Office System Software Development

- Verification and Validation

- Training

- Operating Rules

- PTC Implementation Risks

ASSOCIATION OF
AMERICAN RAILROADS
Freight Rail Works

Scope

- This presentation reflects the implementation status of the US Class 1 freight railroads and the Alaska Railroad, which are deploying the Interoperable Electronic Train Management System® (I-ETMS) and associated technologies

Implementation Scope
(Based on approved PTCIPs and totals through 12/31/2012)

Item	Total	Completed to Date
Locomotives to be equipped with PTC onboard equipment	18,117	5,906 (partial) 166 (complete)
Wayside locations to be equipped with PTC Wayside Interface Units (WIU)	37,512	8,504
220MHz Radios - Base	4,234	396
220MHz Radios – Wayside	33,684	2,210
220MHz Radios – Locomotive	18,117	169
PTC Critical Features to be Surveyed and Processed into Track Database	473,529	--
Investment	--	$2.69B

ASSOCIATION OF AMERICAN RAILROADS

Freight Rail Works

Component Availability

- ## Locomotive

  - Vendor supply chain issues and capacity have improved and available hardware (but not software) components are generally being delivered on time;

  - Software delivery dates for the onboard PTC software component slipped several times over the course of 2012, but are now expected in 2Q 2013

  - Production of the 220MHz locomotive radio began production in 2012; and

  - Hardware design changes necessary to support the messaging system on some railroads were completed and delivered.

- ## Wayside

  - Product availability from several suppliers has improved, although it remains a concern; extensive lab and field testing will be required

Back Office Systems
Software Development

- Development of PTC back office systems for many roads will take considerable time
    - Design complexity
    - Required interfaces to existing and disparate railroad systems
    - Availability of supplier resources
    - Scalability of the solution

- Development schedules have slipped with the final version(s) likely not available before 2014

- Software highly immature
    - Very little testing completed to date

- Unavailability of the final production version of the BOS is one of the critical factors seen as preventing the railroads from installing PTC on the entire nationwide network by the current 2015 implementation date

ASSOCIATION OF
AMERICAN RAILROADS

Freight Rail Works

Verification and Validation

- ◆ V&V is combination of supplier and railroad efforts and responsibilities
  - ◆ Railroads and/or their consultants and contractors are effectively the system integrator
- ◆ Suppliers
  - ◆ Unit or "Segment" testing of subsystems
- ◆ Railroads
  - ◆ Unit or "Segment" Testing
  - ◆ Interface testing, i.e. "Nearest Neighbor" testing
  - ◆ End-to-End testing, i.e. exercise of all interfaces
  - ◆ Field Integration Testing
  - ◆ Field Qualification Testing
    - ◆ Formal, FRA-reviewable activity

ASSOCIATION OF
AMERICAN RAILROADS

Freight Rail Works

Training

- Scope
  - Estimated to include over 75% of industry employees
    - Train and Engine Service Employees – 68,000
    - Signal Employees – 7,200
    - Train Dispatchers – 2,500
    - Roadway Workers, Mechanical Employees, Supervisors – thousands more
- Methods and Approaches
  - Classroom Training
  - Simulators
  - Computer-Based Training
  - Certification Programs
  - Phasing to accommodate rollout schedules

ASSOCIATION OF AMERICAN RAILROADS

Freight Rail Works

Operating Rules

- The number of operating rules introduced or revised for PTC is very limited due to the <u>overlay</u> nature of I-ETMS
    - All existing railroad operations and rules are maintained, but overlaid by PTC functions
    - Very few, if any, existing operating rules are preempted by PTC

- Operation of the PTC system in the context of existing operating rules will be addressed in Special Instructions, General Orders, Train Handling Rules, and the like
    - Points of emphasis in training

- The few new operating rules that will be created fall primarily in the following categories
    - Initialization and Operation of PTC onboard apparatus in PTC territory
    - Handling enroute failures of PTC equipment
    - Reporting of and recovery from PTC enforcement brake applications

PTC Implementation Risks

Categories	Risks	Level
PTC System	Develop Industry Interoperable PTC Standards	
PTC System	Reliability of PTC Components	
Loco	Development of Locomotive PTC Hardware	
Loco	Development of Locomotive PTC Software	
Comm	Develop New Radio to Provide Secure Messaging	
Comm	Spectrum Needs	
Wayside	Wayside Interface Unit Deployment	
BOS	Design/Development of Back Office System	
Testing	Testing of all Components for Proper Integration	
Regulatory	PTC Regulatory Approval	
PTC Mandate	Meeting the 12/31/2015 Mandate	

ASSOCIATION OF
AMERICAN RAILROADS
Freight Rail Works