U.S. Department
of Transportation

**Federal Railroad
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

APR 12 2013

Mr. John Cyrus
Vice President of Transportation
Portland & Western Railroad
200 Hawthorne Avenue SE, Suite C320
Salem, OR 97301

Re: FRA Type Approval (FRA-TA-2013-01) for the Enhanced Automatic Train Control (E-ATC) PTC System (Docket Number FRA-2010-0073)

Dear Mr. Cyrus:

The Federal Railroad Administration (FRA) has completed its review of your December 10, 2012, Enhanced Automatic Train Control (E-ATC) Positive Train Control Development Plan (PTCDP) Revision 1.1, submitted in fulfillment of the requirements of and in compliance with the Final Rule for Positive Train Control Systems, Title 49 Code of Federal Regulations (CFR) Section 236.1013.

FRA finds that the E-ATC system described within the PTCDP Revision 1.1, dated December 10, 2012, if built and implemented in accordance with the description, will satisfy the requirements for PTC systems as specified within 49 CFR Part 236, Subpart I–Positive Train Control Systems. Accordingly, FRA approves the E-ATC PTCDP Revision 1.1, dated December 10, 2012, with special conditions identified within the body of this letter as is provided for in 49 CFR § 236.1009(g)(1). FRA also is simultaneously issuing the enclosed Type Approval FRA-TA-2013-01 for E-ATC in accordance with 49 CFR §§ 236.1009(f) and (g), and § 236.1013(b).

FRA would like to take this opportunity to remind you that the E-ATC system must be developed and implemented as defined in the Type Approval issued for E-ATC. Any modifications of E-ATC beyond the provisions outlined in the Type Approval will require submittal of a Request for Amendment (RFA) for the modified PTC system, in accordance with 49 CFR §§ 236.1009(b) and 236.1013. FRA may reconsider the Type Approval upon revelation of factors outlined in § 236.1009(g). FRA review and approval is required of each RFA, and it must be fully justified to and approved by the Associate Administrator for Railroad Safety/Chief Safety Officer. An impact assessment statement that clearly identifies the potential impact of the change must also accompany RFAs to this Type Approval. Each railroad using this E-ATC Type Approval for the implementation of a PTC system is responsible for the assessment of potential impact of any amendments to this Type Approval on their operations, their PTC system implementation, making appropriate PTC system

modifications, and requesting Type Approval modifications to ensure system interoperability with other E-ATC PTC system implementation.

As special conditions of issuance of this E-ATC Type Approval, FRA requires you to submit not later than 60 days from the date of this letter:

1. A complete listing of all E-ATC-configurable items and variables along with their maximum and minimum values. Specific values assigned to these variables must then be identified in the PTC Safety Plan (PTCSP) for approval by FRA.

2. The Human Machine Interface information detailed in Section 7 within the E-ATC PTCDP for inclusion in the public record with the Type Approval.

3. A written affirmation that the railroads shall continue to work to develop a solution where the need for alternative protection associated with a malfunctioning highway-rail grade crossing active warning system is confirmed, and the applicable operational restriction needs to be lifted by the inherent function of the PTC system, instead of the user to confirm verbal authority to operate otherwise has been received from an authorized or designated employee at the crossing, as is required by regulatory language, prior to the December 31, 2015 deadline.

Failure to provide the above information may invalidate this Type Approval.

FRA will accept the concept of the No Code Proceed (NCP) functionality in the near term. However, in the long term (past 2015), the potential of a single-point failure related to the use of the NCP function will no longer be acceptable.

As is required by regulatory language, prior to the December 31, 2015, deadline, Portland & Western Railroad (PNWR) will develop and implement a solution where the protection associated with a work zone is confirmed, and the applicable operational restriction is lifted by the inherent function of the PTC system. Prior to the December 31, 2015, deadline, PNWR will adhere to the PTCDP approved plan to control train movements through work zones.

This Type Approval does not represent automatic approval of the use of the E-ATC system for all vital applications. A system is an organized, purposeful structure regarded as a whole and consisting of interrelated and interdependent elements (components, entities, factors). All claims of a vital implementation of the E-ATC system must be demonstrated to the satisfaction of FRA in the railroad's PTCSP submission. Use of E-ATC in vital applications by an individual railroad is not authorized unless certified by FRA for that specific railroad application.

All railroads electing to use this Type Approval are reminded of the requirements of 49 CFR §§ 236.1015(b) and (c) regarding the use of Type Approvals in support of a PTCSP.

Should you have any questions regarding this letter or its conditions, please feel free to contact Mr. Robert Scieszinski, PTC Branch Chief (phone (360) 883-5811, email: Robert.Scieszinski@dot.gov).

Sincerely,

Robert C. Lauby
Deputy Associate Administrator
for Regulatory and Legislative Operations

Enclosure

U.S. Department
of Transportation

**Federal Railroad
Administration**

Type Approval Number: FRA-TA-2013-01

TYPE APPROVAL

This Type Approval is issued to attest that the following system meets the minimum regulatory performance requirements for Positive Train Control (PTC) systems required by Section 104 of the Rail Safety Improvement Act of 2008 (RSIA) and by 49 Code of Federal Regulations (CFR) Part 236, Subpart I.

System

Enhanced Automatic Train Control (E-ATC)

Type

E-ATC

This Type Approval is not valid if presented without the full attachment schedule composed of seven sections.

This Type Approval may expire 5 years from the date of issuance if at least one PTC system has not been issued a System Certification using the subject PTC system.

For Federal Railroad Administration,

At: 1200 New Jersey Ave, SE

Washington DC 20590

Robert C. Lauby

Deputy Associate Administrator for Regulatory and Legislative Operations

Robert C Lauby

Date of Issue: APR 12 2013

This Type Approval remains valid until the date 5 years from its issuance, unless canceled or revoked, subject to automatic and indefinite extension provided that at least one FRA PTC System Certification using the subject PTC system has been issued within that period and not revoked and the product remains satisfactory in service. This Type Approval will not be valid if the applicant makes any changes or modifications to the approved product, which have not been notified to, and agreed upon, by the Federal Railroad Administration.

This Type Approval consists of 8 pages

THE SCHEDULE OF APPROVAL

1. SYSTEM DESCRIPTION

1.1 Purpose

The Enhanced Automatic Train Control system (E-ATC) is a safety-critical, vital overlay system as defined in 49 CFR Part 236, Subpart I, Section 236.1015(e), used in conjunction with the existing method of operation (Traffic Control System) that interfaces to existing signal systems, wayside devices, and office train dispatching systems Computer-Aided Dispatch (CAD) via multiple communications links. E-ATC provides the means to fully enforce compliance with the four core functions required of PTC systems to include the movement authorities, speed restrictions, work zones, and switch positioning while retaining existing field signal system and CAD system functions as the primary means of maintaining train separation and protection.

1.2. Main System Components

The E-ATC system is made up of four unique segments: the Office Segment, the Wayside Segement, the Communication Segment, and the Locomotive Segment as further described in Enhanced Automatic Train Control system (E-ATC) Positive Train Control Development Plan (PTCDP) Revision 1.1 dated December 10, 2012, and the specifications in section 2.

1.2.1 Office Segment

The Office Segment is equipped with a Centralized Traffic Control (CTC) system. The CTC machine is the main component of the Office Segment. The CTC machine is used by the Dispatcher to control and/or monitor field equipment and trains using a Graphical User Interface (GUI). The GUI of the CTC machine provides a view of information regarding the status of field equipment, such as switches and train location.

The Dispatcher can select switches on the GUI to change the position of each switch. The CTC machine indicates to the Dispatcher any route that is in a pending state when the CTC machine is waiting for switches in that route to be properly aligned. When switches are not aligned and locked properly, the CTC machine will attempt to transmit commands to the switches to ensure that they align and lock in the proper position for the selected route. Once the switches are properly aligned and locked, the Dispatcher may set the signal to clear on the GUI, and the CTC machine will transmit a command to the Wayside Segment to set the wayside signal to clear. The Dispatcher can also select home signals to set them to Clear or Stop. If the Dispatcher selects a route by selecting two signals, the switches will automatically align and the signals will automatically clear once the vital wayside logic determines that it is safe to do so.

1.2.2 Wayside Segment

The Wayside Segment of the E-ATC System consists of a number of components and functions. The Wayside Segment consists of Control Points (CP) and automatic intermediate signals. The Wayside Segment governs routes over switches and sets traffic direction between CPs. The Wayside Segment provides for remote control (i.e., from the CTC machine at the Dispatch Center) during normal operations and local control (i.e., from an LCP) for emergency and

maintenance operations. Local Control Mode is only used for emergency and maintenance operations in rare instances when it is absolutely necessary to perform these tasks locally.

The Wayside Segment automatically displays route information through wayside signals between CPs based on track codes received from adjacent automatic intermediate signals and CPs. Coded track circuits implemented between CPs provide train detection as well as convey aspect information between locations. DC track circuits provide train and broken rail detection within CP limits. In locations where DC track circuits are used, 100 Hz cab signal overlays are also provided.

The Wayside Segment automatically manages train separation by generating train speed commands between Control Points based on occupancy conditions associated with the train detection circuits. Cab codes (cab signals) corresponding to the occupancy conditions are transmitted into the rails for communication to the train. Signaling is comprised of 100 Hz cab signals and wayside signals.

The Wayside Segment of the E-ATC System is configured to communicate the maximum authorized speeds that reflect Permanent Speed Restrictions (PSRs). The Wayside Segment generates and transmits, via the rail, the applicable cab signal code rate, and the Onboard Segment detects the cab signal code and displays the corresponding speed on the cab's Engineer Display Unit (EDU). Any civil speed restriction different from available code rates will be enforced by selecting the next lower speed code. Each signal at CPs and cut sections are programmed to reflect the Maximum Authorized Speed for that location, according to the civil speeds listed in the Timetable.

The Office Segment is used to transmit zero speed and non-zero speed Temporary Speed Restrictions (TSRs) to the Wayside Segment. The Wayside Segment then communicates the TSR to the Onboard Segment via the corresponding cab signal code rate, and the Onboard Segment displays the corresponding speed on the cab's EDU. The process by which the Wayside Segment (i.e., equipment in the signal bungalow) transmits TSRs to the wayside signals is vital. The process by which the Wayside Segment generates cab signal code rates is also vital. Once a TSR is issued and implemented on the Wayside Segment, the TSR will stay latched in the wayside equipment until released by the Dispatcher.

1.2.3 Communications Segment

Communications between Control Points, dispatch office workstations, and system servers are networked using a secure connection over the Internet. The office is connected to the Internet via redundant Fractional T1 (FT1) circuits.

Communications equipment is provided at each Control Point which interfaces to a Frontier Communications DSL and to a Sprint 3G EV-DO cellular data subscriber service. A communications network router switches between the DSL and the 3G service in the event of a failure; the DSL line is the primary service. The communications router connects to a communications interface on the signals microprocessor.

The RailComm servers are connected to the Internet via a 100 Mbps connection and a DS3 circuit. The primary connection is the 100 Mbps connection provided by Frontier Communications, while the secondary connection is the DS3 circuit provided by TW Telecom.

The Communication Segment will be modified so that every cut section has a communication link to the nearest CP, which will allow communication between the servers and all cut sections.

1.2.4 Locomotive Segment

The same onboard UCII software is installed on both freight and commuter trains. The vehicle type is established via hardware, i.e., using wire harnesses with different pin-outs. The onboard software logic knows which set of speed commands to use based on the pin-outs detected.

A pair of receiver coils, mounted on the head end of the lead vehicle, detects coded cab signals that are transmitted through the rails by the signaling system. The 100 Hz carrier frequency is amplitude modulated (on / off) at one of 14 code rates that vary from 312.5 PPM to 74.3 PPM. Each train is equipped with GETS' Ultra Cab II (UCII), which decodes the received cab signal to display and enforce the maximum authorized speed associated with a particular block. Speed commands are presented via an onboard display unit as MPH speed authorizations. Whether a speed code is generated due to train separation, a PSR, or a TSR, the speed code will be transparent to the Onboard Segment, and thus transparent to the Locomotive Engineer. The Onboard Segment leaves the train in the control of the Locomotive Engineer if train speed is at or below the Over Speed Protection Point and the TTP is greater than zero seconds. Maximum speed authorities and time-to-penalty are displayed on the display panel. If the Locomotive Engineer exceeds the authorized speed or runs out the TTP, a mandatory full service stop is enforced by the equipment.

Overspeed is declared when the train's speed is above the limit associated with the detected signal. When an overspeed condition is determined but the speed is below the Overspeed Protection Point (OPP, 2 MPH above the speed limit) associated with the detected cab signal, an "Overspeed" message is displayed on the Engineer Display Unit (EDU) and an Audible Alarm is sounded. If train speed is not below the OPP, then the Onboard Segment invokes an irrevocable Penalty Brake Application by de-energizing the Electro Magnetic Valve (EMV) interface with the air brake system.

When the cab signal code rate transitions to a more restrictive code rate and the train speed exceeds the associated speed limit, Brake Profile Enforcement is in effect. The Onboard Segment calculates the time that the train may travel at its current speed before a Penalty Brake Application must be enforced in order to stop the train within a safe distance. This time is called the TTP and is displayed on the EDU. If the TTP falls below 8 seconds, an audible alarm is sounded. A Penalty Brake Application is invoked (by de-energizing the EMV) if the TTP reaches 0 seconds or no code is detected.

To permit operation when no code or an invalid code is being received, each cab is equipped with a No Code Proceed (NCP) pushbutton and counter. The NCP mode cannot be entered while the train is moving. The Onboard Segment sounds an audible alarm if the train speed reaches 10 MPH, and an irrevocable Penalty Brake is initiated if the train speed reaches 12 MPH. In the E-ATC System, this functionality will also be utilized for zero speed TSRs at work zones.

A sealed Cutout switch located in the cab allows the Onboard Segment to be cutout. In "Cutout" mode, the Onboard Segment de-energizes the EMV output (i.e., wiring of the "ATC Cutout" switch will energize the EMV when in this mode), and darkens all EDU indications. Cutout mode can only be authorized by the Dispatcher and will result in train operations being conducted in accordance with § 236.1029, PTC System Use and En Route Failures.

The Onboard Segment also includes an event logging function and reporting system. The Onboard Segment equipment stores event data in a Crash-Hardened Memory Module.

2. DOCUMENTS AND DRAWINGS

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document applies, including amendments.

2.1 Enhanced Automatic Train Control (E-ATC) Positive Train Control Development Plan (PTCDP) Revision 1.1 dated December 10, 2012

2.2 49 CFR Part 236, Subpart E, "Automatic Train Stop, Train Control and Cab Signal Systems"

2.3 49 CFR Part 236, Subpart H, "Standards for Processor-Based Signal and Train Control Systems"

2.4 49 CFR Part 236, Subpart I, "Positive Train Control Systems"

2.5 AREMA Communications and Signals Manual, 2011 Revision

2.6 GCOR – General Code of Operating Rules, dated April 7, 2010, Revision 6

2.7 GE Transportation Systems (GETS) System Description Document, dated January 31, 2008, Revision A07

2.8 GE Transportation Systems (GETS) Ultra Cab II Service Manual, dated March 19, 2008, Revision AB0

2.9 IEEE 1483-2000, IEEE Standard for Verification of Vital Functions in Processor- Based Systems Used in Rail Transit Control, dated March 30, 2000.

2.10 MIL-STD-882C, System Safety Program Requirements, dated 19 January 1993, with Notice 1, 19 January 1996

2.11 O'Connor, Patrick D.T., Practical Reliability Engineering, John Wiley and Sons Ltd Publishers, 4th Edition, 2002

2.12 RailComm Domain Operations Controller (DOC®) System User Manual, Unofficial Version, received November, 2011

2.13 Smith, David J., Dr., Reliability, Maintainability, and Risk: Practical Methods for Engineers Including Reliability-Centered Maintenance and Safety-Related Systems, Elsevier Butterworth Heinemann Publishers, 7th Edition, 2005

2.14 MIL-STD-781D, Reliability Testing for Engineering Development, Qualification, and Production, dated October 17, 1986

2.15 MIL-HDBK-781A, Reliability Test Methods, Plans, and Environments for Engineering Development, Qualification, and Production, dated April 1, 1996

2.16 MIL-HDBK-217F, Reliability Prediction of Electronic Equipment, dated 2 December 1991, with Notice 2, 28 February 1995

3. APPLICATION/LIMITATIONS/PROVISIONS

3.1 Application

Properly implemented, E-ATC as described in the PTCDP may be used to achieve PTC functionalities required by 49 CFR Part 236, Subpart I. Any deviations from this Type Approval without prior FRA approval invalidate this Type Approval for use as described in § 236.1015(c).

3.2. Limitations

3.2.1 This Type Approval does not authorize operation of E-ATC in revenue or revenue demonstration service without prior FRA approval.

3.2.2. This Type Approval does not authorize operation of E-ATC for testing on the general rail system without FRA prior approval.

3.2.3 Prior to the installation and use of E-ATC where a tenant railroad operates, formal written notification to the tenant railroad is required. The tenant railroad must acknowledge receipt of the notification and any conditions imposed. A completed copy of the notification and receipt is to be kept on file on the territory in question and available for inspection and duplication by the FRA during normal business hours. In the event of errors or malfunctions, the requirements of § 236.1023 shall apply.

3.2.4 All claims of a vital implementation of E-ATC must be demonstrated to the satisfaction of FRA in the applicable railroad's PTCSP submission. This Type Approval does not represent automatic approval of the E-ATC system for vital applications. A system is an organized, purposeful structure regarded as a whole and consisting of interrelated and interdependent elements (components, entities, factors, members, parts etc.) that influence one another (directly or indirectly) to achieve a set of functional goals.

3.2.5 Until roadway workers are utilizing an Employee in Charge (EIC) terminal which allows the EIC to control access of the train into and through the work zone, the railroad will develop and adhere to a FRA approved plan to control train movements into and through work zones.

3.2.6 Upon implementation of the E-ATC System, in addition to verbal communication, a zero speed TSR will be implemented by the Dispatcher for work zones. Prior to the train entering the work zone, a Positive Stop will be enforced by the OBC due to this zero speed TSR.

3.2.7 Upon receipt of a credible report of a warning system malfunction involving an activation failure, a zero speed TSR will be sent to the corresponding wayside signal locations closest to the malfunctioning highway grade crossing, which will force the train to stop prior to entering the crossing. The train will remain stopped at the signal location until flagging protection is provided at the malfunctioning crossing, at which time the dispatcher will replace the zero speed TSR with an appropriate speed TSR, allowing the train to proceed through the malfunctioning highway grade crossing.

3.2.8 The NCP mode will not be allowed at malfunctioning highway grade crossings unless, after the train has stopped and adequate flagging protection is in place, an appropriate non-zero speed TSR cannot be transmitted to the corresponding wayside location.

3.2.9 The NCP mode cannot be entered while the train is moving.

3.2.10 The maximum authorized speed allowed during No Code Proceed (NCP) operations shall be limited to restricted speed or less.

3.2.11 Difference between the NCP counter and authorized uses of the NCP function shall be investigated and reported to FRA.

3.3 Provisions

3.3.1 The Communication Segment shall include redundant and diverse paths between the wayside and office segments.

3.3.2 Every cut section shall have a communication link to the nearest CP, which will allow communication between the servers and all cut sections.

3.3.3 Two actions shall be required by the Dispatcher to apply or release any TSR as per the E-ATC PTCDP section 10.2.1.

3.3.4 FRA expects changes to the Operations and Maintenance manual and other supporting documents that adversely affect Safety and Reliability to the system will require an RFA submission. FRA does not expect RFA submissions for benign changes that do not adversely affect safety or reliability of the system.

4. TYPE APPROVAL VALIDITY

4.1 This Type Approval will remain valid if any component implementations are upgraded to a newer version as long as the manufacturer or railroad presenting this Type Approval notifies and receives FRA's agreement that no change is introduced to the intended functionality and/or applicability of the named components. FRA will require proof that newer versions of E-ATC component design underwent a full safety engineering analysis, full regression testing if applicable, and meets all software safety criteria, and did not in any way compromised safety.

4.2 Any significant modification to E-ATC hardware and/or software components listed in Section 1.2 of this document that changes the intended functionality and/or applicability of E-ATC will require a new type approval.

4.3 Any deviations from the documents and drawings listed in Section 2 and the supplementary conditions listed in Section 3 of this document that introduces changes in E-ATC system principle of operation or applicability will require a new type approval.

5. PRODUCTION SURVEY REQUIREMENTS

5.1 E-ATC is to be manufactured and installed in accordance with the approved type described in this Type Approval. Conformance testing of the installed system must be done to assure that the system faithfully implements the specifications and meets the interoperability requirements. The documentation of conformance testing of E-ATC hardware/software must follow a standard format that includes the description of the product, condition to claim conformance, core profile, extension profile (if applicable), implementation defined features, alternative features (if applicable), reference implementation used, and conformance test suite used. All testing must comply with the requirements of § 236.1035.

5.2 FRA reserves the right to attend and modify tests, conduct examinations of installation work, or perform relevant audits.

6. SYSTEM CERTIFICATION PROCESS FOR THE USERS OF THIS TYPE APPROVAL

This Type Approval does not constitute System Certification for revenue operation. In order to obtain System Certification for the system designed and build using E-ATC architecture under this Type Approval, the applicant referencing this Type Approval must fulfill all the requirements of § 236. 1015.

7. DISCLAIMER

The United States Government and its employees, makes no warranty, expressed or implied, including the warranties of merchantability and fitness for a particular purpose, assumes no legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, and do not represent that the use of this Type Approval would not infringe upon privately owned rights. Reference herein to any specific commercial products, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government, and shall not be used for advertising or product endorsement purposes.

End of Document