

Positive Train Control

Project Scope

The Alaska Railroad (ARRC) is pursuing a multi-phased program to design, develop and implement a fail-safe Positive Train Control (PTC) system that prevents human errors that may cause catastrophic results. The PTC system monitors and controls train movements, and provides improved information for decision-making. If warranted, PTC will stop a train if it exceeds safe speeds, moves into areas without authority, or detects potentially unsafe track conditions.

PTC integrates four major segments: office, locomotive, wayside equipment and communications. The PTC project replaces an older outdated Computer Aided Dispatch (CAD) system, and includes a locomotive on-board computer system, 220 megahertz (MHz) VHF packet data radio technology, Global Positioning System (GPS) locator technology, and upgrades to the back-haul fiber and microwave communications. Approaching locomotives interrogate wayside devices (including signals, switches, track integrity) for status.

In 2008, Congress mandated PTC for the nation's largest railroads and for railroads that carry passengers. Failure to meet the mandate would have essentially eliminated ARRC's passenger train operations. The federally-mandated deadline to

complete PTC was extended in 2015. Like other railroads, ARRC requested an implementation extension from Dec. 31, 2018, to Dec. 31, 2020. ARRC ultimately met the implementation deadline.

Benefits

PTC provides the regulatory-mandated safety functions that prevent:

- train collisions by enforcing authority limits;
- derailments from trains moving too fast in areas with speed restrictions, slow orders, over switches and through turnouts;
- trains entering established maintenance-of-way work zone limits without first receiving appropriate authority and verification; and
- movement of a train through a main line switch in the improper position.

Status

ARRC has implemented PTC in phases. The full PTC build-out, as mandated by federal law, was completed by the Dec. 31, 2020, deadline. The Alaska Railroad implemented the freight industry standard for PTC, called Interoperable - Electronic Train Management System (I-ETMS®) by Wabtec Railway Electronics (WRE).

Phase I (complete)

ARRC has implemented a newer CAD system to authorize train movements and deliver speed restrictions. The WRE Train Management and Dispatch System (TMDS) employs Centralized Traffic Control and dark-territory Track Warrant Control as the methods of operation at the Alaska Railroad.

Phase II (complete)

Office Segment: Wabtec further developed the office system to ensure authorized train movements are received and safe. This involves adding a Back



Wayside equipment at Curry is housed in shelters and powered by solar and solid oxide fuel cell technology.

PROJECT FACTS

Office Server to the Phase I TMDS. ARRC's nearly 600-mile route includes long stretches of remote, "dark" (non-signalized) territory that require electronic-only distribution of mandatory directives and that replace contingent authorities with dynamic authorities.

Locomotive Segment: Equip 54 power units (51 locomotives, 2 power cabs and 1 self-propelled railcar) with the I-ETMS® Train Management Computer, two computer displays, Meteorcomm LLC 220 packet radio, cellular modem and GPS equipment, and braking system modifications. All locomotives have been equipped with the PTC hardware, which will allow the system to stop a train if it detects an unsafe condition or situation. Onboard equipment installation was complete in 2015.

Along the Tracks Segment (Wayside): ARRC has installed wayside devices, switches and signals between Whittier and the Usibelli mine in Healy. ARRC is conducting field testing between Seward and Kashwitna. Through wayside controllers and interface units, and radios, the PTC system monitors wayside equipment status (switch position, for example) and communicates it to the train and dispatch office. Wayside infrastructure was completed in 2019.

Communications Segment: Communications systems and towers have been upgraded at existing sites and some new sites have been constructed to increase reliability and availability of data communications. The upgrades to existing facilities and new base-station / back-haul sites were completed as of the end of 2017.

Systems Integration: ARRC began operating revenue service demonstration in January 2019. The system has been continuously tested in the lab; and functional testing in the field began during first quarter of 2016. PTC has been fully integrated through functional tests in the signaled territory, followed by tests in other areas of the railroad.

The required PTC Safety Plan (PTCSP) was developed to prove that the system is fail-safe from end-to-end. ARRC submitted the PTCSP to the Federal Railroad Administration in spring 2020.

Costs & Funding

Beginning in 1997, ARRC has developed PTC using corporate revenues,

and federal and state grants. Since 2014, ARRC has relied more heavily on state and federal funding due to dramatic declines in business revenue. With the state facing its own budget woes in 2015, the railroad gained legislative approval to issue \$37 million in tax-exempt revenue bonds. In 2018 and 2019, ARRC received more than \$13 million in federal grants. Project implementation totaled about \$182 million.



Office segment control and monitoring is tested in the PTC Lab.



A new communication site is completed on Bald Mountain in 2016.

Positive Train Control System Overview

