

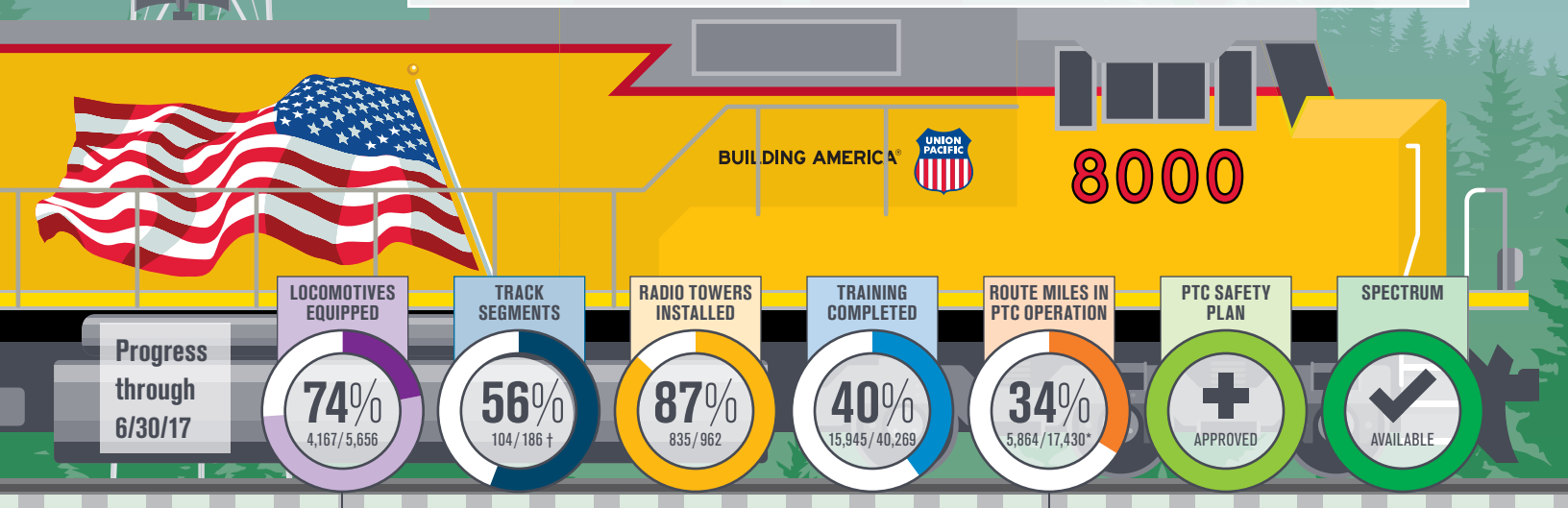
# UNION PACIFIC'S SECOND QUARTER 2017 Positive Train Control Update



## Union Pacific continues to make strides implementing positive train control. Accomplishments in the second quarter 2017 include:

- Preparing 27 additional track segments for PTC operations, bringing the total number of track segments to 104 (56% complete). These 27 track segments are equipped with wayside devices (signals, switches and radios) and have defined GPS coordinates, which identify thousands of precise locations for systemwide PTC coordination.
- Educating more than 3,400 additional employees on PTC operations, bringing the total number of employees trained to about 16,000 (40%). Diverse training materials are tailored to a variety of employee roles, including engineer, conductor, dispatcher, maintenance of way/engineering, mechanical, signal, telecom and information technologies.
- Increasing by 1,900 the number of route miles in PTC operation, bringing the total number of route miles in PTC operations to 5,864 (34%).

Union Pacific is testing the PTC system as we install the technology across our network and begin utilizing it in 200- to 300-mile sections. Occasionally trains may experience unintended stops, which are the result of a built-from-scratch technology in the hands of employees still becoming familiar with it. These unintended stops have an adverse impact on our system and, on occasion, the communities we serve when such a situation impacts vehicular traffic. We are consistently reducing unintended stop situations to eventually eliminate these occurrences.



While the FRA notes only 1,245 (22%) UP locomotives are PTC equipped, nearly 4,200 are fully PTC equipped with the exception of a single component: the PTC-compatible, crash-hardened memory (“black box”). We expect to make significant locomotive installation progress in the remainder of 2017 as the supplier-related black box issue is resolved.

With the FRA's conditional approval of our PTC safety plan, Union Pacific is running PTC operations on nearly 5,900 route miles in California, Oregon, Idaho, Nevada, Washington, Wyoming, Nebraska and Colorado.

*\*The FRA approved a previously submitted request for amendment related to PTC's scope, therefore decreasing required track segments and route miles from the numbers reported in the first quarter of 2017.*

### WHAT PTC DOES:

✓ Automatically stops a train before certain accidents caused by human error occur, including train-to-train collisions, derailments caused by excessive train speed, unauthorized train entry into work zones or movements through misaligned track switches.

### WHAT PTC DOES NOT DO:

✗ Will not prevent vehicle-train accidents at railroad crossings, stop trains when pedestrians are on the tracks, or prevent incidents due to track or equipment malfunctions.

## AUGUST 2017 SYSTEM UPDATE

Developing and implementing a PTC system is a multi-dimensional process requiring a cross-functional, systemwide approach. Union Pacific's PTC system consists of multiple technologies functioning together to constantly monitor and manage train movements. These involve integrating signal and telecom elements; GPS; wayside, base station and locomotive radios; antennas and satellites – all to predict whether the train crew should be alerted to take action or if the technology should take control to slow or stop the train.

Through June 30, 2017, Union Pacific:

- Installed 97 percent, or 16,782 miles, of required route miles with PTC signal hardware.
- Partially installed PTC hardware on 94 percent of its 5,656 locomotives earmarked for the technology.
- Equipped 3,193 locomotives with PTC hardware and software.
- Installed 98 percent of the wayside antennas needed to support PTC along the company's right of way.

Union Pacific plans to spend approximately \$300 million on PTC in 2017 toward the current total estimated \$2.9 billion cost.

### SYSTEMWIDE PTC IMPLEMENTATION PROGRESS

Nearly 5,900 PTC-required miles were in operational status as of June 30, 2017, as shown in green. In the third quarter 2017, Union Pacific crews will work eastward to prepare the additional track miles shown in blue. The remainder of PTC-required segments will be addressed in 2017's fourth quarter and into 2018.

