Union Pacific continues to make strides implementing positive train control, closing 2016 with several key milestones:

- **More than a quarter of track segments are PTC-ready.** These 59 track segments, or subdivisions, are equipped with wayside devices (signals, switches and radios) and have defined GPS coordinates, which identify thousands of precise locations for systemwide PTC coordination. The PTC-ready segments cover a wide swath of UP's Western Region, from Southern California to Portland; from Portland to Pocatello, Idaho; and from Roseville, California, through Reno to Elko, Nevada.

- **Training efforts continue with more than 7,000 employees educated on PTC operations.** 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.

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Progress through 12/31/16	LOCOMOTIVES EQUIPPED	TRACK SEGMENTS	RADIO TOWERS INSTALLED	TRAINING COMPLETED	ROUTE MILES IN PTC OPERATION	PTC SAFETY PLAN	SPECTRUM
	64% 3,610 / 5,656	**26%** 59 / 231	**85%** 816 / 962	**18%** 7,057 / 40,269	**12%** 2,449 / 20,858	**+** SUBMITTED	**✓** AVAILABLE
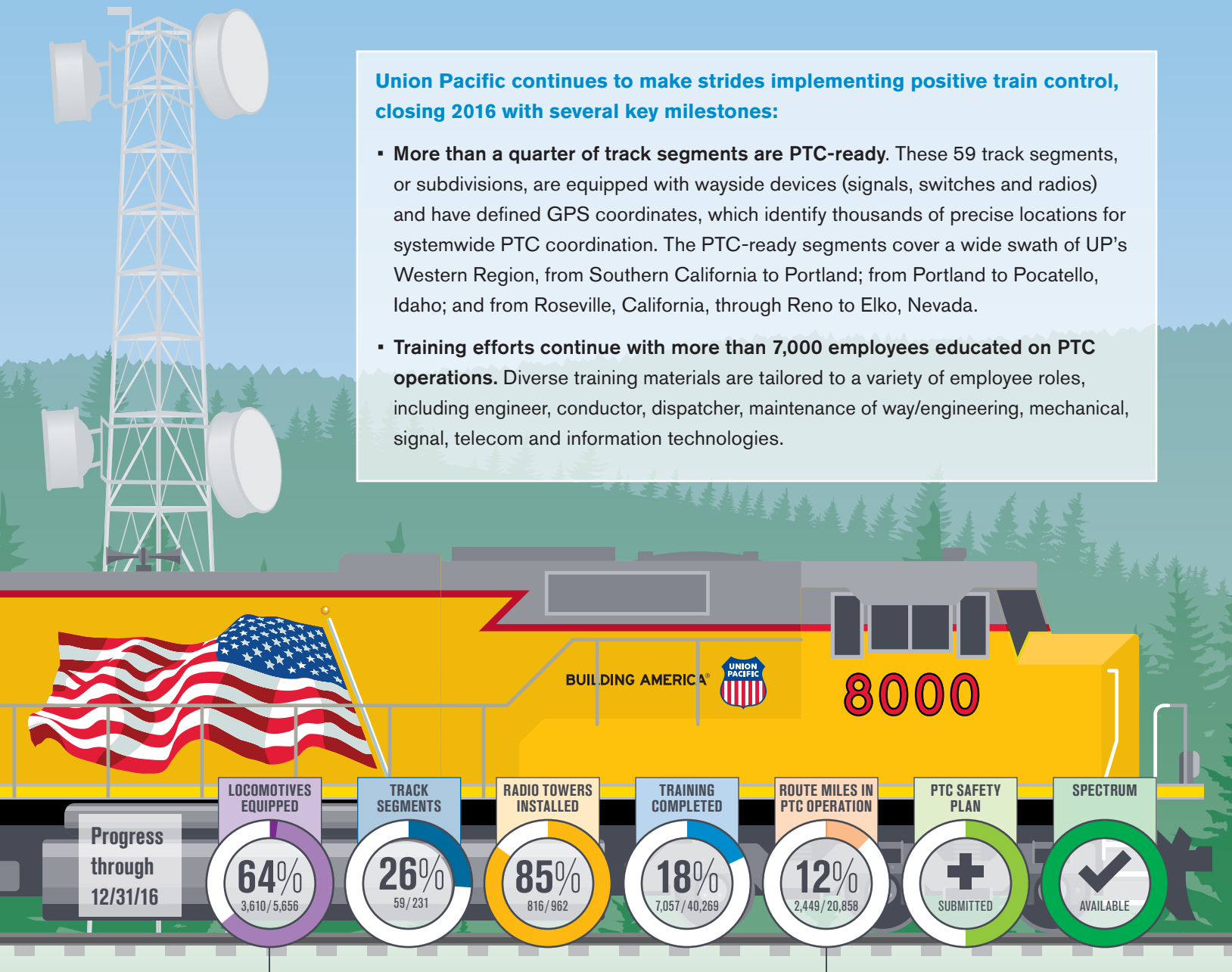
While the FRA notes only 111 (2%) UP locomotives are PTC equipped, more than 3,600 are fully PTC equipped with the exception of a single component: the PTC-compatible, crash-hardened memory ('black box'). We expect to make significant locomotive installation progress in 2017 as the supplier-related black box issue is resolved.

Union Pacific is running PTC operations on nearly 2,500 route miles in California, Oregon, Idaho, Nevada and Washington as part of revenue service demonstration (RSD), an ongoing and multifaceted test of the PTC system in a defined rail corridor. Upon FRA approving UP's safety plan, these miles will become officially PTC operable and our progress will increase significantly from the 0% noted by the FRA.

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.

FEBRUARY 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 Dec. 31, 2016, Union Pacific:

- Invested $2.3 billion in PTC. Union Pacific's current estimate for PTC's total cost is about $2.9 billion.

- Installed 93 percent, or 16,008 miles, of total route miles with PTC signal hardware.

- Partially installed PTC hardware on 93 percent of its 5,656 locomotives earmarked for the technology.

- Equipped 2,441 locomotives with PTC hardware and software for revenue service demonstration (a test of the PTC system in a defined rail corridor).

- Installed 93 percent of the wayside antennas needed to support PTC along the company's right of way.

SYSTEMWIDE PTC IMPLEMENTATION PROGRESS

Fifty-nine of UP's required 231 track segments were PTC ready as of Dec. 31, 2016, as shown in green. In the first quarter of 2017, Union Pacific crews will work eastward to prepare nearly a dozen more segments, shown in blue. The remainder of PTC-required segments will be addressed in the second quarter and beyond.

Legend:
- Implemented
- Implementation Plan for 1Q 2017
- Implementation Plan for 2Q 2017-4Q 2018
- PTC Not Required
- <5mgt Per Year
- Haulage or Trackage Rights