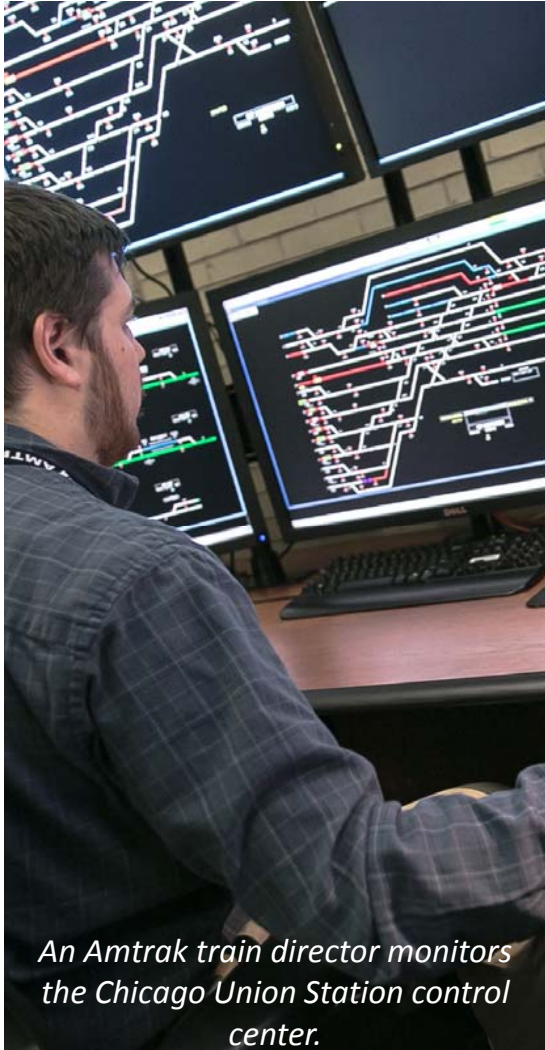# AMTRAK:

COAST TO COAST IMPLEMENTATION OF PTC

June 12, 2018

PTC Overview – What Does PTC Do?

An Amtrak train director monitors the Chicago Union Station control center.

PTC systems that meet the standards set by FRA regulations are required to reliably and functionally prevent:

- ✓ Train-to-train collisions;

- ✓ Over speed derailments;

- ✓ Incursion into an established work zone; and

- ✓ Movement through a main line switch in the improper position.

- ✓ Other functions are applicable within the requirements as specific conditions warrant.

PTC Overview – Amtrak and PTC

For Amtrak's purposes, there are 2 approaches for the use of PTC

- ✓ PTC technologies that we own/operate and have installed on our infrastructure (Host)
- ✓ PTC technologies that have been chosen by other carriers for their infrastructure that Amtrak's locomotives and cab cars must operate and communicate with (Tenant)

Amtrak's PTC = ACSES, ITCS

- ✓ Approved by FRA, provide all elements of PTC
- ✓ In use on the NEC (ACSES) and Michigan Line (ITCS)

Freight carriers' and some other commuter RRs' PTC = IETMS

- ✓ Class I freight carriers and many commuter systems outside the NEC use the Interoperable Electronic Train Management System (I-ETMS)
- ✓ I-ETMS provides all the elements required for PTC

An Amtrak technician resetting a PTC transponder in Pennsylvania along the Northeast Corridor.

3 different PTC systems on Amtrak's Network

Advanced Civil Speed Enforcement System (ACSES)

- ✓ In service on the NEC since 2000
- ✓ Used by multiple northeast commuter agencies
- ✓ Vital overlay used to support 150 MPH operation
- ✓ Transponder based train positioning
- ✓ Almost all of Amtrak's NEC main spine was implemented by December 2015

Incremental Train Control System (ITCS)

- ✓ Vital overlay used in Michigan to support 110 MPH operation
- ✓ GPS based train positioning
- ✓ Current version in service since 2011

Interoperable Electronic Train Management System (I-ETMS)

- ✓ Non-vital overlay used by all Class I freight carriers and many commuter agencies outside the northeast that supports 90MPH operation
- ✓ GPS based train positioning
- ✓ Freight train braking algorithm based on actual consist
- ✓ Back Office Servers (BOS) must be "Federated"

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Interoperability by the Numbers

	Tenants on Amtrak	Amtrak as Tenant
ACSES	10	3
ITCS	1	0
I-ETMS	3	20

An Amtrak technician resetting a PTC transponder in Pennsylvania along the Northeast Corridor.

Locomotives for 3 different systems

Amtrak PTC Fleet

Active Fleet Quantity	PTC Equipped Fleets	I-ETMS (PTC) Equipped	I-ETMS (PTC) Commissioned	ACSES (PTC) Equipped	ACSES (PTC) Commissioned	ITCS (PTC) Equipped	ITCS (PTC) Commissioned
21	F59 Locomotives	21	14				
18	P32-8 Locomotives	18	8			2	2
18	P32 Dual Mode Locomotives	18	12	18	18		
8	8 Surfliner Cab Car	8	8				
19	NPCU (Formerly F40)	18	8	3	3		
190	P42 Locomotives	190	143	38	38	31	15
13	P40 Locomotives	13	13				
4	GENSET Locomotives	4	1				
68	ACS-64 Locomotives			68	68		
16	9600 Series Cab Cars			16	16		
40	Acela Power Cars			40	40		
31	Work Engines			31	31		
446		**290**	**207**	**214**	**214**	**33**	**17**

As of 5/24

State PTC Fleets

Active Fleet Quantity	State Owned PTC Equipped Fleets	State Owner	I-ETMS (PTC) Equipped	I-ETMS (PTC) Commissioned	ITCS (PTC) Equipped	ITCS (PTC) Commissioned
15	F59 Locomotives	California	15	2		
22	Charger SC-44 Locomotives	California	6	0		
14	California Cab Cars	California	14	1		
8	Surfliner Cab Cars	California	8	4		
2	P32-8 Locomotives	California	2	0		
28	Charger SC-44 Locomotives	Midwest	28	0	28	0
3	NPCU	Oregon	3	3		
8	Charger SC-44 Locomotives	Washington / Oregon	8	0		
2	Talgo Series 8 Cab Cars	Oregon	2	0		
8	F59PH Locomotives	North Carolina	0	0		
5	Cab Control Units	North Carolina	0	0		
115			**86**	**10**	**28**	**0**

As of 5/24

Steps to Interoperability

Federation of BOS systems (I-ETMS Only)

- ✓ Federated Test Systems
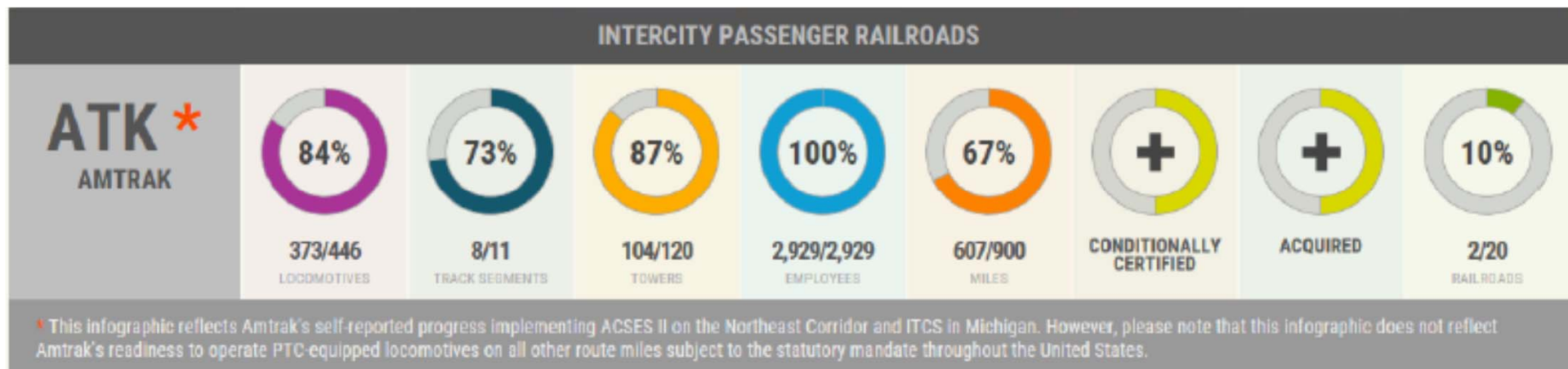- ✓ Federated Production System
- ✓ Key Server Testing

Interoperability Testing

- ✓ Full Lab testing (I-ETMS Only)
- ✓ Field Testing
    - ✓ Functional Testing – multiple classes of equipment
    - ✓ End to End Testing

Revenue Service

- ✓ Only after host RR achieves certification unless FRA permission is received for joint Revenue Service Demonstration (RSD) testing

FRA Status Report

INTERCITY PASSENGER RAILROADS

ATK* AMTRAK							
84% 373/446 LOCOMOTIVES	73% 8/11 TRACK SEGMENTS	87% 104/120 TOWERS	100% 2,929/2,929 EMPLOYEES	67% 607/900 MILES	+ CONDITIONALLY CERTIFIED	+ ACQUIRED	10% 2/20 RAILROADS

*This infographic reflects Amtrak's self-reported progress implementing ACSES II on the Northeast Corridor and ITCS in Michigan. However, please note that this infographic does not reflect Amtrak's readiness to operate PTC-equipped locomotives on all other route miles subject to the statutory mandate throughout the United States.

PTC Implementation Status

Effective 6/11/18

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Legend:
- PTC completed by 12/31/18
- PTC not completed by 12/31/18 or Unknown
- PTC not required
- Railroad is likely to qualify for an alternative schedule
- PTC in Service

CREATED BY AMTRAK POLICE

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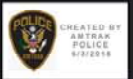
PTC Regulation – What Happens on 12/31/2018?

Track Segments will fall into one of five (5) categories:

1. Track is equipped for PTC operation and FRA has certified the Railroad Safety Plan.

2. Track is equipped for PTC operation. Trains are operating in Revenue Service Demonstration (RSD) mode with PTC protection waiting for FRA Safety Certification.

3. Track is not equipped for PTC operation but the railroad has met the criteria to apply for an "Alternative Schedule" (Extension). Amtrak will perform a risk analysis for tracks in this category.

4. Track is not equipped for PTC operation and the railroad has failed to meet the criteria to apply for an "Alternative Schedule" (Extension). **It will be against Federal Regulations to operate service.**

5. Track qualifies for a Main Track Exclusion Addendum (MTEA). PTC is not required by regulation. Amtrak will perform a risk analysis for tracks in this category.

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Challenges

Boundary Locations between systems

- ✓ ACSES/ACSES
- ✓ ACSES-I-ETMS
- ✓ ITCS-I-ETMS

Reliability

Limited Resources

- ✓ Vendors
- ✓ Knowledgeable Railroad Staff

Regulatory Timeframes

- ✓ 12/31/18 Deadline
- ✓ FRA review workload in Fall 2018

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