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E. A. Hullemeyer
Director Advanced Train Control Systems

Mr. Robert C. Lauby
Associate Administrator for
Railroad Safety / Chief Safety Officer
Federal Railroad Administration
1200 New Jersey Avenue, S.E., Mail Stop 25
Washington, DC 20590

March 31, 2016

RE: Norfolk Southern Railway Positive Train Control Progress Report (Docket FRA – 2010- 0060)

Dear Mr. Lauby:

With the attached document, Norfolk Southern Railway Company ("NSR") provides its progress report documenting progress toward achieving its planned PTC Implementation. This report is submitted in accordance with 49 U.S.C. 20157(c)(1) and utilizes the structure of Form FRA F 6180.166 ("Form") OMB Approval granted 3-16-16 for content.

Note that because this report covers calendar year 2015, a year for which annual goals were not covered by the revised PTCIP submitted by NSR as required by the PTC Enforcement and Implementation Act (the "Act"), there is not always a match between the NSR provided data requirements set forth in the Act and the "going forward" data requirements of FRA's Form. For example, NSR's revised PTCIP did not contain 2015 year-end goals for equipment installation, training, back office and dispatching locations, or route miles in testing, revenue service demonstration, or operation. Accordingly, many columns of data for the annual goals in this report have a response of "N/A."

Notwithstanding the foregoing, NSR has endeavored to provide in its 2015 report both the data elements now required by the Act as well as other meaningful information related to our progress.

Kindest Regards,

Eric Hullemeyer
Eric Hullemeyer
Director Advanced Train Control Systems

Norfolk Southern Railway
Annual PTC Progress Report
For Period 2015
(Docket FRA – 2010 - 0060)

2016

This document, as required by 49 U.S.C. § 20157(c)(1), is Norfolk Southern Railway's Annual Report of its progress report on the progress toward implementing the PTC system as defined in its PTCIP v. R1 of January 2016.

Submitted in fulfillment of 49 U.S.C. § 20157(c)(1)

The Annual Positive Train Control (PTC) Progress Report is due by March 31st of each year until full PTC system implementation is complete. The Annual PTC Progress Report must cover the railroad's implementation efforts and progress from the directly previous calendar year, and must be submitted electronically to the Federal Railroad Administration (FRA) via the FRA Secure Information Repository at https://sir.fra.dot.gov.

Version History

Date	Version	Description	Author
03/31/2016	1	This document, as required by 49 U.S.C. § 20157(c)(1), is Norfolk Southern Railway's Annual Report of its progress report on the progress toward implementing the PTC system as defined in its PTCIP v. R1 of January 2016.	Norfolk Southern Railway Company

Name of Railroad Subject to 49 U.S.C. § 20157(a): Norfolk Southern Railway Company

Railroad Code: NSR

Annual PTC Implementation Progress Report for: 2015

PTCIP Version Number of File with RFA (basis for goals stated): R1

Submission Date: 03/31/16

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1 Summary

Norfolk Southern Railway Company ("NSR") provides its progress report documenting progress toward achieving its planned PTC Implementation. This report is submitted in accordance with 49 U.S.C. 20157(c)(1) and utilizes the structure of Form FRA F 6180.166 ("Form") for content.

Note that because this report covers calendar year 2015, a year for which annual goals were not covered by the revised PTCIP submitted by NSR as required by the PTC Enforcement and Implementation Act (the "Act"), there is not always a match between the NSR provided data requirements set forth in the Act and the "going forward" data requirements of FRA's Form. For example, NSR's revised PTCIP did not contain 2015 year-end goals for equipment installation, training, back office and dispatching locations, or route miles in testing, revenue service demonstration, or operation. Accordingly, many columns of data for the annual goals in this report have a response of "N/A." Goals for 2016 where provided for in the PTCIP will be supplied in next year's annual report.

Notwithstanding the foregoing, NSR has endeavored to provide in its 2015 report both the data elements now required by the Act as well as other meaningful information related to our progress.

In 2015, NSR overcame a number of technical hurdles with the onboard, wayside and back office segments. This work effort laid the foundation for increased throughput of our installations and implementation:

- Equipped locomotives over a wider range of fleet type and with only one touch
- Completely installed more wayside locations to ready them to be cut-in
- Use of the FCC TCNS (Tower Construction Notification Service) which NSR used to submit a majority of its 220 radio sites for the necessary approvals
- Further integration of PTC with existing back office transportation systems
- NSR's technical progress in 2015 allowed PTC pilot territories to undergo extensive field testing in preparation for RSD in 2016.

Aggregated, the 2015 advances in each of the four segments of PTC (Communications, Onboard, Back Office and Locomotive) precipitated a final Implementation Plan which reflects the NSR PTC effort.

Table 1 - NS PTC Implementation Summary for CY 2015

Category	# Installed During CY 2015	PTCIP vR1 2015 Goal	Cumulative Quantity EOY 2015	PTCIP vR1 Total # Required for PTC Implementation
Locomotives Fully Equipped[1]	375	N/A	375	2,900
Installation/Track Segments Completed[2]	2	N/A	2	132
Radio Towers Fully Installed and Equipped	585	N/A	1,718	3,668[3]
Employees Trained	4,627	N/A	4,627	21,446
Route Miles in Testing or Revenue Service Demonstration[4]	229	N/A	229	1,208
Route Miles in PTC Operation	0	N/A	0	8,028

Norfolk Southern has worked in good faith to ensure the accuracy and completeness of the analysis and Plan for its PTC implementation. All metrics, dates and goals to deploy PTC to the rail network are based on NSR's estimates at the time of this filing.

[1] For the purposes of this report, "Fully Equipped" means a fully mission capable PTC equipped locomotive in which all onboard systems and equipment installations are complete, tested, and have all mission-essential subsystems installed and operating as designed. A fully mission capable PTC locomotive and similar vehicle has no faults that preclude its use, and the equipment is on-hand and able to operate as a lead locomotive vehicle with the onboard PTC system fully functional.

[2] For the purposes of this report, "Completed" means a fully mission capable PTC equipped track segment in which all wayside interface units, supporting signal systems (if applicable), communications equipment, switch point monitor systems, and other associated equipment installations are complete, tested, and have all mission-essential subsystems installed and operating as designed. A fully mission capable track segment has no faults that preclude its use, and the equipment is on-hand and fully functional and is capable of interacting with onboard and office subsystems. Hardware totals are reported separately.

[3] As mentioned in the PTCIP vR1, actual final numbers may vary slightly due to specific design, employment or organizational changes or interoperability factors affecting implementation.

[4] NSR has planned and requested RSD on districts totaling 1,208 miles. FRA conditionally approved this request October 28, 2015.

2 Update on Spectrum Acquisition

Table 2 – PTC Spectrum Available CY 2015

Spectrum Area or Location (E.g., county)	Spectrum Acquired and Available for Use (Owned/Leased) During Calendar Year	Cumulative Amount of Spectrum Acquired and Available for Use (Owned/Leased) at End of Calendar Year	PTCIP Year End Goal for Spectrum Acquired and Available for Use	Total Spectrum Required for PTC Implementation, as Reported in PTCIP
Nationwide	2008	350 KHz	N/A	350 KHz
Chicago, IL	2013	150 KHz	N/A	150 KHz

The NSR PTCIP vR1 provided information to reflect that by 2015, the majority of the spectrum required had been purchased and is available for use for the entirety of the NSR implementation on its railroad. Since the spectrum is shared between other PTC220 owners, precise amounts of spectrum needed will vary depending on train density, terrain and other design criteria. Norfolk Southern believes we have adequate spectrum to support our PTC deployment.

In 2015, PTC-220 worked to acquire an additional 500 KHz in the Philadelphia and New Jersey areas for interference mitigation with commuter roads in the northeast where NSR is a tenant railroad.

Spectrum availability for PTC220, LLC members is determined by collaborative engineering activities using a shared Radio Frequency engineering software platform for predicting spectral availability and verifying its use on a non-interfering basis.

NSR is a member of PTC-220, owned equally by each of the seven Class I railroads including NSR. PTC-220 holds nationwide and regionally licensed FCC spectrum for PTC implementation in the 220-222 MHz spectrum band.

3 Quantity Update on Hardware Installation

3.1 Locomotive Status

Table 3 - Locomotive PTC Hardware CY 2015

Category / Installation Feature	# Installed During CY 2015	PTCIP vR1 2015 Goal	Cumulative # Installed EOY 2015	PTCIP vR1 Total # Required for PTC Implementation
Onboard Computer (TMC)	70	N/A	1,959	2,900
PTC Software	375	N/A	530	2,900
PTC Displays	140	N/A	2,029	5,800
Event Recorders	390	N/A	557	2,900
Locomotive Antennas	342	N/A	768	2,900
GPS Receivers	342	N/A	768	2,900
Locomotive PTC 220 Radios	342	N/A	768	2,900
Locomotive Cell Equipment	342	N/A	768	2,900

In 2015, the Mechanical Department utilized its locomotive shops at the following locations for installations:

- Shaffer's Crossing (Roanoke) Locomotive Shop
- Roanoke Locomotive Shop
- Chattanooga Locomotive Shop
- Conway Locomotive Shop
- Enola Locomotive Shop
- Bellevue Locomotive Shop
- Elkhart Locomotive Shop
- Juniata (Altoona) Locomotive Shop

We also brought the Birmingham Locomotive Shop onboard late in the fourth quarter.

NSR met several milestone goals for the year for locomotives:

- Maximize PTC mission-ready units for Field Qualification Testing and Revenue Service Demonstration scheduled for two districts by fully equipping over 350 partially equipped Dash 9 model units. Dash 9s account for 46% of the total PTC required fleet.

- Improve, enhance and standardize the locomotive modification procedures to provide clear and unambiguous instructions to field installers for the models comprising the majority of the NSR road fleet to reduce Departure Test failures caused by installation defects.
- Create PTC-ready locomotive modification procedures for 9 models including installation of PTC-ready Crashworthy Event Recorder
- Enhance internal system management applications to enable near real-time monitoring of PTC locomotive health status

3.2 Infrastructure/Back Office Status

Table 4 - Infrastructure/Back Office Status for CY 2015

Category / Installation Feature	Completed During CY 2015	PTCIP vR1 2015 Goal	Cumulative # Complete	PTCIP vR1 Total # Required for PTC Implementation
Dispatching Locations Installation	2	N/A	2	2
Back Office Locations Installation	N/A	N/A	2	2

Are the Back Office Location(s) fully operable?[5]	No
Are the Dispatching Location(s) fully operable?	Yes

Installation of PTC back office physical hardware is complete to support Revenue Service Demonstration and some amount of production rollout. NSR hardware resides in two locations: a primary data center for both back office servers and dispatch and a backup data center. This includes hardware to support testing, quality assurance, and production operations, although NSR may determine at a future date to increase its physical hardware as needed to support scaling of the system as we near full implementation. While the two locations will not change,

[5] For NSR to consider the systems "fully operable," both hardware and software will be fully mission capable and without the need for modification to address required functionality and full implementation as required by FRA system certification conditions.

the number of physical hardware servers will likely increase over time as implementation proceeds to support availability of the system.

NSR is implementing the I-ETMS Back Office Server (BOS) software on two sets of three redundant application servers: a primary server, backup server and standby server. These instances are being utilized for Revenue Service Demonstration. The Unified Train Control System (UTCS) is NSR's computerized dispatching system and provides train clearance, consist summary, authorities, and bulletins to the I-ETMS BOS system. UTCS is deployed on its own hardware platforms that support testing, quality assurance, and production operations. In 2015, NSR completed a required hardware refresh for its CAD system. UTCS and I-ETMS PTC BOS systems are connected via the PTC Message Router (PTCMR) system. PTCMR is also deployed on its own hardware platforms, and sends and receives information between the dispatch system and PTC BOS system.

3.3 Installation / Territory Status

NSR has fully completed installation of all required hardware, including all necessary communications backbone utilities for the two track segments where RSD was due to begin in 2016. The following bulleted points offer a summary of milestones achieved in 2015 regarding NSR's installation activity:

- Achieve goal of consistently installing 50 wayside towers per month by using dedicated teams to focus solely on tower installation
- During 2015 the industry worked to complete the analysis of the PTC radios that have failed in order to determine root cause. Conducted analysis based on the number of failure events to determine scope of concern. Teams worked with electronic component manufacturer and assemblers to correlate date codes, component lots and serial numbers to understand scope of failure events.
- NSR began 7 day/week wayside installation by increasing contractor numbers and maturing our processes to more fully utilize both NSR and contracted resources. Gains were made in more efficient use of track time, scheduling wayside in-servicing activities and using dedicated teams to accomplish key tasks aimed at preventing delay and non-productivity.

NSR has recognized some slight changes in totals from those reported in the PTCIP as mentioned might occur "due to specific design, employment or organizational changes or interoperability factors affecting implementation." While we do not feel the magnitude of these variances constitutes a requirement for an RFA, NSR will work with FRA PTC staff to determine the appropriate medium to capture the following updates.

- For Signal WIUs, the total installed was increased slightly to account for multiple track intermediate locations; for these types of locations, NSR has improved its methodology to account for multiple WIUs placed at a single location. However, the total required was decreased to more accurately account for the Exclusion or Removal of PTC Track Segments from PTC Baseline criteria.
- At the time of the PTCIP R1 filing, NSR's tracking database did not account for work completed at one unsignaled district for its 10 switch monitor WIUs; installations through 2015 has increased.
- For Wayside radios required, the total was increased slightly to account for multiple track intermediate locations as with the Signal WIUs.
- Base Station Towers & Poles and Radios installed through 2015 has technically decreased to no longer account for work completed early in installation on track that now meets Exclusion or Removal of PTC Track Segments from PTC Baseline criteria.
- As mentioned in the PTCIP vR1, the base station radios, towers & poles have increased slightly to account for specific design to mitigate Wayside radio interference.

Table 5 - Installation / Territory Status for CY 2015

District Geographic Information					Wayside Interface Unit			Switch Position Monitor			Communication Tower			Radios						Comms Backbone
Line ID	District	SUBDIV ID	From MP	To MP	# Signal WIU Installed 2015	# Signal WIU Installed Thru 2015	# Signal WIU Installs Required	# Switch Monitor WIU Installed 2015	# Switch Monitor WIU Installed Thru 2015	# Switch Monitor WIU Installs Required	# Comm Tower Installed 2015	# Comm Tower Installed Thru 2015	# Comm Tower Installs Required	# Wayside Radios Installed 2015	# Wayside Radios Installed Thru 2015	# Wayside Radios Installs Required	# Base Station Radios Installed 2015	# Base Station Radios Installed Thru 2015	# Base Station Radio Installs Required	Fiber, Copper, Ground Wiring, etc. Installed and Mission Capable
03	WASH/DANV/CHAR/GRVL (Charlotte)	7062	334.0	485.0	15	84	91	0	0	0	8	77	85	7	72	77	0	5	8	No
03	WASH/DANV/CHAR/GRVL (Danville)	7061	175.0	334.0	33	58	98	0	0	0	24	34	82	13	49	73	0	9	9	No
03	WASH/DANV/CHAR/GRVL (Greenville)	7063	485.0	630.9	0	78	79	0	0	0	27	56	70	27	63	63	0	6	7	No
03	WASH/DANV/CHAR/GRVL (Washington)	7060	8.0	175.0	20	59	95	0	0	0	19	25	85	16	61	75	2	8	10	No
03 KM	WASHINGTON	1010	0.0	1.2	0	0	2	0	0	0	0	0	2	0	0	2	0	0	0	No
03 B	WASHINGTON	1040	0.0	50.9	5	5	18	0	0	0	2	2	20	0	5	18	2	2	2	No
03 H	DANVILLE/ECBU	1081	0.0	110.5	33	48	52	0	0	0	12	12	59	12	47	51	0	0	8	No
03 R	COLUMBIA	1170	0.0	110.4	0	46	46	0	0	0	1	50	50	0	46	46	1	4	4	Yes
03 R	COLUMBIA	1171	112.0	190.5	0	0	1	0	0	34	0	3	39	0	0	36	0	3	4	No
03 S	ASHEVILLE	1182	0.0	25.6	0	5	14	0	0	0	0	1	16	0	5	14	0	1	2	No
03 W	COLUMBIA	1241	67.7	75.5	0	0	1	0	0	3	0	1	8	0	0	3	0	1	4	No
03AC	DANVILLE	1270	197.0	198.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	No
03SC	CHARLESTON	1440	9.5	128.0	0	2	2	0	34	34	0	43	43	0	36	36	0	7	7	Yes
04	NORCROSS	1471	630.9	635.2	1	3	3	0	0	0	0	0	3	0	3	3	0	0	0	No
04 A	ATLANTA NORTH	1520	226.7	235.1	0	5	5	0	0	0	3	4	4	3	4	4	0	0	0	No
04 G	MACON/VALDOSTA	1500	0.0	152.0	0	0	72	0	0	0	0	7	79	0	0	72	0	7	7	No

District Geographic Information					Wayside Interface Unit			Switch Position Monitor			Communication Tower			Radios						Comms Backbone
Line ID	District	SUBDIV ID	From MP	To MP	# Signal WIU Installed 2015	# Signal WIU Installed Thru 2015	# Signal WIU Installs Required	# Switch Monitor WIU Installed 2015	# Switch Monitor WIU Installed Thru 2015	# Switch Monitor WIU Installs Required	# Comm Tower Installed 2015	# Comm Tower Installed Thru 2015	# Comm Tower Installs Required	# Wayside Radios Installed 2015	# Wayside Radios Installed Thru 2015	# Wayside Radios Installs Required	# Base Station Radios Installed 2015	# Base Station Radios Installed Thru 2015	# Base Station Radio Installs Required	Fiber, Copper, Ground Wiring, etc. Installed and Mission Capable
04 G	MACON/VALDOSTA	1502	152.0	254.5	0	3	43	0	0	0	0	8	48	0	3	43	0	5	5	No
04 H	ATLANTA NORTH	1520	15.1	149.7	0	67	69	0	0	0	13	32	71	13	62	64	0	6	7	No
04 H	ATLANTA SOUTH	1521	149.7	239.2	34	45	46	0	0	0	0	11	47	0	42	43	0	4	4	No
04 H	BRUNSWICK	1521	239.2	242.1	1	1	1	0	0	0	0	0	1	0	1	1	0	0	0	No
04 D	AUGUSTA	1610	78.7	120.5	0	0	0	0	0	3	0	2	5	0	0	3	0	2	2	No
04 D	AUGUSTA	1610	125.0	129.0	0	0	0	0	0	3	0	0	3	0	0	3	0	0	0	No
04 H	ALBANY	7102	197.0	219.6	0	0	13	0	0	0	0	0	14	0	0	13	0	0	1	No
04 S	GRIFFIN	1682	288.2	294.5	4	4	4	0	0	0	2	2	4	2	4	4	0	0	0	No
04 S	SAVANNAH	1670	78.5	134.0	0	0	0	0	0	7	0	2	9	0	0	7	0	2	2	No
04 S	SAVANNAH	1670	137.0	190.4	0	0	11	0	0	10	0	3	24	0	0	21	0	3	3	No
04GH	ALBANY	N/A	0.0	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	No
07	CNO&TP (CNO&TP-First)	1830	2.5	116.0	5	52	56	0	0	0	22	30	55	22	47	49	0	6	6	No
07	CNO&TP (CNO&TP-Second)	1831	116.0	252.0	0	81	82	0	0	0	14	49	73	13	64	65	1	8	8	No
07	CNO&TP (CNO&TP-Third)	1832	254.0	334.0	0	38	45	0	0	0	0	37	51	0	37	44	0	2	7	No
07 A	CHATTANOOGA TERMINAL	1850	235.1	238.1	0	3	4	0	0	0	2	2	4	2	4	4	0	0	0	No
07 A	Knoxville	1841	0.0	125.0	0	56	56	0	0	0	0	59	59	0	54	54	0	5	5	No
07 A	Knoxville	1840	125.0	226.6	0	51	52	0	0	0	6	54	56	6	49	50	0	5	6	No

District Geographic Information					Wayside Interface Unit			Switch Position Monitor			Communication Tower			Radios						Comms Backbone
Line ID	District	SUBDIV ID	From MP	To MP	# Signal WIU Installed 2015	# Signal WIU Installed Thru 2015	# Signal WIU Installs Required	# Switch Monitor WIU Installed 2015	# Switch Monitor WIU Installed Thru 2015	# Switch Monitor WIU Installs Required	# Comm Tower Installed 2015	# Comm Tower Installed Thru 2015	# Comm Tower Installs Required	# Wayside Radios Installed 2015	# Wayside Radios Installed Thru 2015	# Wayside Radios Installs Required	# Base Station Radios Installed 2015	# Base Station Radios Installed Thru 2015	# Base Station Radio Installs Required	Fiber, Copper, Ground Wiring, etc. Installed and Mission Capable
07 W	LOUISVILLE	2001	268.3	268.9	0	0	2	0	0	0	0	0	2	0	0	2	0	0	0	No
07 W	LOUISVILLE	2001	274.9	357.7	8	8	41	0	0	0	0	3	44	0	16	41	0	3	3	No
07CJ	CINCINNATI LINE	2030	245.4	255.1	0	0	6	0	0	0	0	0	4	0	0	4	0	0	0	No
08	AGS	2380	0.0	295.4	0	135	141	0	0	0	5	147	149	0	128	132	5	17	17	No
08	EAST END	2170	650.0	798.4	0	57	66	0	0	0	3	61	73	0	57	66	3	6	7	No
08	WEST END	2171	798.4	798.8	0	3	3	0	0	0	0	0	3	0	3	3	0	0	0	No
08 A	MEMPHIS	2190	279.8	401.1	0	53	53	0	0	0	0	58	60	0	53	53	0	5	7	No
08 A	MEMPHIS	2200	402.3	545.0	0	61	61	0	0	0	0	68	68	0	61	61	0	7	7	No
08 A	NEW ORLEANS	2180	0.0	3.5	0	0	2	0	0	0	0	1	2	0	0	2	0	0	0	No
08 MB	3B SOUTH	2240	0	143.2	0	0	3	0	0	35	7	7	46	0	0	38	7	7	8	No
08 MB	3B SOUTH	2240	145.5	148	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	No
08 MF	MEMPHIS	2200	0.3	3.6	0	4	4	0	0	0	0	2	2	0	2	2	0	0	0	No
08 N	3B NORTH	2260	139.3	192.4	0	0	1	0	0	10	1	1	13	0	0	11	1	1	2	No
08 N	3B SOUTH	2260	192.4	206.6	0	0	0	0	0	2	1	1	3	0	0	2	1	1	1	No
08 NT	NEW ORLEANS	2280	2.5	8.1	0	3	5	0	0	0	1	5	5	0	3	5	0	0	0	No
08 R	3B NORTH	2260	0.0	35.0	0	0	0	0	10	10	0	0	11	0	10	10	0	0	1	No
08NA	WEST END	2440	1.7	3.7	0	4	4	0	0	0	0	4	4	0	4	4	0	0	0	No

District Geographic Information					Wayside Interface Unit			Switch Position Monitor			Communication Tower			Radios						Comms Backbone
Line ID	District	SUBDIV ID	From MP	To MP	# Signal WIU Installed 2015	# Signal WIU Installed Thru 2015	# Signal WIU Installs Required	# Switch Monitor WIU Installed 2015	# Switch Monitor WIU Installed Thru 2015	# Switch Monitor WIU Installs Required	# Comm Tower Installed 2015	# Comm Tower Installed Thru 2015	# Comm Tower Installs Required	# Wayside Radios Installed 2015	# Wayside Radios Installed Thru 2015	# Wayside Radios Installs Required	# Base Station Radios Installed 2015	# Base Station Radios Installed Thru 2015	# Base Station Radio Installs Required	Fiber, Copper, Ground Wiring, etc. Installed and Mission Capable
08NO	NO&NE	2460	0.4	195.9	9	85	92	0	0	0	0	90	100	0	83	89	0	11	11	No
55 B	BLUE RIDGE	7050	0.0	36.9	0	0	13	0	0	0	0	1	14	0	2	13	0	1	1	No
55 H	HAGERSTOWN	2540	0.6	59.1	0	6	30	0	0	0	1	5	35	0	6	30	1	1	5	No
55 N	BLUE RIDGE	7050	128.9	133.4	0	0	4	0	0	0	0	1	5	0	0	4	0	1	1	No
55 N	BLUE RIDGE	7050	214.5	257.4	0	4	22	0	0	0	0	0	21	0	4	19	0	0	2	No
55 N	BLUE RIDGE	7050	169.1	189.9	0	0	7	0	0	0	0	0	8	0	0	7	0	0	1	No
55 N	CHRISTIANSBURG	2581	257.4	297.6	7	29	29	0	0	0	11	12	24	10	22	22	1	1	2	No
55 N	CHRISTIANSBURG	2581	301.9	360.3	25	26	32	0	0	0	3	5	27	1	22	25	0	0	2	No
55 N	NORFOLK	7081	1.2	77.8	0	52	53	0	0	0	0	23	41	0	37	37	0	4	4	No
55 N	NORFOLK	7081	88.3	128.9	0	0	11	0	0	0	0	1	12	0	0	11	0	1	1	No
55 P	NORFOLK	7081	0.0	4.2	0	5	5	0	0	0	0	5	5	0	4	4	0	1	1	No
55 V	ALTAVISTA	2651	200.3	243.1	9	9	18	0	0	0	0	2	18	0	14	18	0	0	0	No
55BC	WINSTON-SALEM	2670	0.0	4.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	No
55HW	HAGERSTOWN SEC. (Lurgan)	4140	73.7	74.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	No
55LP	NORFOLK	7081	0.0	5.1	0	4	6	0	0	0	0	4	6	0	4	6	0	0	0	No
55NB	PULASKI	2801	297.6	408.4	4	4	48	0	0	0	5	6	54	0	4	48	5	6	6	No
55PH	BLUE RIDGE	7050	0.0	22.4	3	3	12	0	0	0	0	1	13	0	6	12	0	1	1	No

District Geographic Information					Wayside Interface Unit			Switch Position Monitor			Communication Tower			Radios						Comms Backbone
Line ID	District	SUBDIV ID	From MP	To MP	# Signal WIU Installed 2015	# Signal WIU Installed Thru 2015	# Signal WIU Installs Required	# Switch Monitor WIU Installed 2015	# Switch Monitor WIU Installed Thru 2015	# Switch Monitor WIU Installs Required	# Comm Tower Installed 2015	# Comm Tower Installed Thru 2015	# Comm Tower Installs Required	# Wayside Radios Installed 2015	# Wayside Radios Installed Thru 2015	# Wayside Radios Installs Required	# Base Station Radios Installed 2015	# Base Station Radios Installed Thru 2015	# Base Station Radio Installs Required	Fiber, Copper, Ground Wiring, etc. Installed and Mission Capable
55VC	BLUE RIDGE	2881	0.0	1.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	No
62 N	KENOVA	7190	567.9	608.5	18	22	22	0	0	0	4	6	18	3	17	17	1	1	1	No
62 N	KENOVA	7190	470.0	484.3	4	4	7	0	0	0	0	0	5	0	3	5	0	0	0	No
62 N	POCAHONTAS DISTRICT	2960	360.3	470.0	38	40	77	0	0	0	29	35	76	21	41	70	3	3	6	No
62NA	KENOVA	7190	0.0	59.1	2	13	37	0	0	0	1	6	30	0	12	26	1	1	4	No
72 B	LAKE ERIE DISTRICT	3830	2.0	6.5	0	0	4	0	0	0	0	0	2	0	0	2	0	0	0	No
72AF	READING/HARRISBURG LINE	4620	5.4	13.0	0	0	10	0	0	0	0	0	8	0	0	8	0	0	0	No
72BR	BUFFALO LINE	3860	194.0	306.4	0	19	55	0	0	0	3	23	60	0	19	53	3	4	7	No
72EN	READING LINE	4620	88.6	93.0	1	1	2	0	0	0	1	1	2	1	1	2	0	0	0	No
72EP	PORT ROAD BR.	3980	33.7	76.1	1	5	6	0	0	0	3	7	8	3	5	6	0	2	2	No
72FK	DELMARVA SEC.	3520	0.4	6.3	3	3	3	0	0	0	2	2	4	2	3	3	0	0	1	No
72FR	POTTSVILLE BR.	4040	58.6	61.2	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	No
72GV	HARRISBURG LINE	4130	11.7	18.9	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	No
72HN	NORRISTOWN CONN.	4155	17.2	18.0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	No
72HP	HARRISBURG LINE	4130	5.2	112.9	5	5	74	0	0	0	0	1	59	0	4	52	0	1	7	No
72HW	HAGERSTOWN SEC.	4290	40.0	73.7	0	14	15	0	0	0	0	15	18	0	14	15	0	0	3	No
72LB	LEHIGH LINE (L&S)	7180	84.3	114.7	0	6	14	0	0	0	0	6	17	0	6	14	0	0	3	No

District Geographic Information					Wayside Interface Unit			Switch Position Monitor			Communication Tower			Radios						Comms Backbone
Line ID	District	SUBDIV ID	From MP	To MP	# Signal WIU Installed 2015	# Signal WIU Installed Thru 2015	# Signal WIU Installs Required	# Switch Monitor WIU Installed 2015	# Switch Monitor WIU Installed Thru 2015	# Switch Monitor WIU Installs Required	# Comm Tower Installed 2015	# Comm Tower Installed Thru 2015	# Comm Tower Installs Required	# Wayside Radios Installed 2015	# Wayside Radios Installed Thru 2015	# Wayside Radios Installs Required	# Base Station Radios Installed 2015	# Base Station Radios Installed Thru 2015	# Base Station Radio Installs Required	Fiber, Copper, Ground Wiring, etc. Installed and Mission Capable
72LE	LEHIGH LINE	7180	35.8	88.9	0	5	28	0	0	0	1	1	30	0	5	26	0	0	4	No
72LG	LURGAN BR.	4290	0.0	40.0	0	4	19	0	0	0	0	4	17	0	4	17	0	0	0	No
72MK	MORRISVILLE CONN. TRACK	4360	0.0	2.0	0	1	1	0	0	0	0	0	1	0	1	1	0	0	0	No
72MV	MORRISVILLE LINE	4360	30.3	46.0	0	1	4	0	0	0	0	1	5	0	1	4	0	0	1	No
72OO	PORT ROAD BR. CONN.	3980	72.8	73.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	No
72PD	PORT ROAD BR.	3980	0.3	39.7	0	4	20	0	0	0	1	8	22	1	4	18	0	4	4	No
72PT	PITTSBURGH LINE	5430	104.9	119.2	0	0	10	0	0	0	0	0	7	0	0	7	0	0	0	No
72RV	READING LINE	4620	7.5	36.3	0	0	21	0	0	0	0	0	16	0	0	14	0	0	2	No
72RY	ROYALTON BR.	4640	0.0	11.4	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	No
72SR	SOUTHERN TIER LINE	4670	368.3	424.2	0	7	23	0	0	0	0	6	25	0	6	21	0	0	4	No
72TK	READING LINE	4620	0.0	5.4	0	0	3	0	0	0	0	0	3	0	0	3	0	0	0	No
72TW	READING LINE	4620	8.1	9.4	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	No
72YI	REYBOLD I.T.	3650	0.0	3.5	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	No
74 B	LAKE ERIE DISTRICT	5040	6.5	172.0	0	6	69	0	0	0	5	11	74	0	6	69	5	5	5	No
74JP	PORT PERRY BR.	5200	0.0	2.9	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	No
74LC	CONEMAUGH LINE	5260	0.0	77.9	0	0	22	0	0	0	0	0	29	0	0	21	0	0	8	No
74ML	MON LINE	5320	0.0	40.2	0	0	13	0	0	0	0	1	11	0	0	9	0	1	2	No

District Geographic Information					Wayside Interface Unit			Switch Position Monitor			Communication Tower			Radios						Comms Backbone
Line ID	District	SUBDIV ID	From MP	To MP	# Signal WIU Installed 2015	# Signal WIU Installed Thru 2015	# Signal WIU Installs Required	# Switch Monitor WIU Installed 2015	# Switch Monitor WIU Installed Thru 2015	# Switch Monitor WIU Installs Required	# Comm Tower Installed 2015	# Comm Tower Installed Thru 2015	# Comm Tower Installs Required	# Wayside Radios Installed 2015	# Wayside Radios Installed Thru 2015	# Wayside Radios Installs Required	# Base Station Radios Installed 2015	# Base Station Radios Installed Thru 2015	# Base Station Radio Installs Required	Fiber, Copper, Ground Wiring, etc. Installed and Mission Capable
74PC	FORT WAYNE LINE	5420	0.0	110.2	0	0	56	0	0	0	0	1	46	0	0	35	0	1	11	No
74PT	PITTSBURGH LINE	5430	119.2	353.4	0	7	171	0	0	0	3	15	128	0	6	101	3	9	27	No
74RD	CLEVELAND LINE	5450	67.0	85.9	0	0	2	0	0	0	0	0	2	0	0	2	0	0	0	No
74SG	SANG HOLLOW EXTENSION	7150	277.3	290.6	0	0	1	0	0	0	0	0	2	0	0	1	0	0	1	No
74TJ	ISLAND CONN.	5400	0.0	1.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	No
74YG	YOUNGSTOWN LINE	5620	0.0	97.2	0	0	44	0	0	0	1	1	46	0	0	41	1	1	5	No
76 B	CHICAGO DISTRICT	5670	486.5	518.7	1	2	21	0	0	0	0	2	20	0	2	19	0	0	1	No
76 B	LAKE ERIE DISTRICT	5670	172.0	185.6	0	0	9	0	0	0	1	2	8	0	0	7	1	1	1	No
76 D	DETROIT	6360	4.5	116.0	7	7	52	0	0	0	6	6	53	6	7	49	0	0	4	No
76CD	CHICAGO LINE	5730	181.2	523.3	129	226	245	0	0	0	100	114	178	95	149	162	5	5	16	No
76DR	DETROIT LINE	5760	20.0	57.7	0	12	17	0	0	0	0	9	18	0	12	17	0	0	1	No
76GZ	CLOGGSVILLE LINE	5830	485.5	493.4	0	0	5	0	0	0	0	0	4	0	0	4	0	0	0	No
76RD	CLEVELAND LINE	6080	85.9	123.2	0	0	8	0	0	0	0	0	9	0	0	8	0	0	1	No
76UW	C.R. & I. I.T.	6150	0.0	5.3	0	0	6	0	0	0	0	1	6	0	0	5	0	0	1	No
92 B	CHICAGO	6346	367.8	486.5	5	5	54	0	0	0	5	8	55	4	5	52	1	2	3	No
92 B	CLEVELAND	6340	222.6	248.1	3	10	16	0	0	0	1	4	18	0	11	16	1	2	2	No
92 B	FOSTORIA	6341	248.1	367.8	11	54	59	0	0	0	51	55	60	46	53	55	4	5	5	No

District Geographic Information					Wayside Interface Unit			Switch Position Monitor			Communication Tower			Radios						Comms Backbone
Line ID	District	SUBDIV ID	From MP	To MP	# Signal WIU Installed 2015	# Signal WIU Installed Thru 2015	# Signal WIU Installs Required	# Switch Monitor WIU Installed 2015	# Switch Monitor WIU Installed Thru 2015	# Switch Monitor WIU Installs Required	# Comm Tower Installed 2015	# Comm Tower Installed Thru 2015	# Comm Tower Installs Required	# Wayside Radios Installed 2015	# Wayside Radios Installed Thru 2015	# Wayside Radios Installs Required	# Base Station Radios Installed 2015	# Base Station Radios Installed Thru 2015	# Base Station Radio Installs Required	Fiber, Copper, Ground Wiring, etc. Installed and Mission Capable
92 D	HUNTINGTON	6360	116.0	204.5	31	31	40	0	0	0	24	26	43	23	37	39	1	3	4	No
92 N	COLUMBUS	6390	608.5	704.6	6	53	54	0	0	0	41	41	45	39	40	41	1	1	4	No
92 S	SANDUSKY	6400	1.0	111.4	39	49	49	0	0	0	32	39	45	32	40	40	0	5	5	No
92 T	TOLEDO	5681	24.6	53.1	0	0	2	0	0	0	0	0	3	0	0	2	0	0	1	No
92AM	WESTERN BRANCH	6470	132.1	137.6	1	1	3	0	0	0	0	0	2	0	1	2	0	0	0	No
92CF	NEW CASTLE	6442	16.5	185.8	16	19	70	0	0	0	5	33	77	0	32	71	5	5	6	No
92CJ	DAYTON	6470	134.4	245.4	0	1	55	0	0	0	1	6	50	0	1	46	1	2	4	No
92MP	MARION	6540	0.0	58.5	12	12	24	0	0	0	6	8	25	5	17	24	1	1	1	No
94 W	SOUTHERN EAST	6764	162.8	268.3	21	22	42	0	0	0	0	10	49	0	22	43	0	6	6	No
94 W	SOUTHERN WEST	6760	4.7	162.8	0	16	69	0	0	0	0	16	78	0	16	69	0	7	9	No
94 D	BROOKLYN	6792	376.5	480.4	1	1	39	0	0	0	1	4	42	1	4	37	0	3	5	No
94 D	LAFAYETTE	6792	204.5	376.5	72	75	79	0	0	0	62	68	76	62	66	69	0	6	7	No
94 S	KANSAS CITY	6820	213.0	274.8	1	12	28	0	0	0	2	10	29	2	12	27	0	2	2	No
94DH	SPRINGFIELD	6900	376.5	466.0	0	1	48	0	0	0	0	10	52	0	1	48	0	4	4	No

4 Employees Trained

Table 6 - Employees Trained in CY 2015

Employee Category	# Trained During CY 2015	PTCIP vR1 2015 Goal	Cumulative # Trained	PTCIP vR1 Total # Required
Employees who Install, Maintain, Repair, Modify, Inspect, and Test the PTC System[1]	577	N/A	577	2,925
Employees who Dispatch Train Operations[2]	20	N/A	20	370
Train and Engine (Operations) Employees[3]	53	N/A	53	12,451
Roadway Worker Employees[4]	3,800	N/A	3,800	4,025
Direct Supervisors of the Above Employees[5]	177	N/A	177	1,675

Categories of employees requiring training (49 C.F.R. § 236.1041):

(1) Persons whose duties include installing, maintaining, repairing, modifying, inspecting, and testing safety-critical elements of the railroad's PTC systems, including central office, wayside, or onboard subsystems;
(2) Persons who dispatch train operations (issue or communicate any mandatory directive that is executed or enforced, or is intended to be executed or enforced, by a train control system subject to this subpart);
(3) Persons who operate trains or serve as a train or engine crew member subject to instruction and testing under part 217 of 49 C.F.R., on a train operating in territory where a train control system subject to this subpart is in use;
(4) Roadway workers whose duties require them to know and understand how a train control system affects their safety and how to avoid interfering with its proper functioning; and
(5) The direct supervisors of persons listed above.

In 2015, NSR met several milestone goals for the year for PTC training:

- Developed a process utilizing employee data to specifically identify target populations for training
- Established an electronic reporting and record keeping process to track training completion and correlate the exam record with the employee file
- Created and developed all training material utilizing videos, presentations, simulator exercises, job aides
- Trained all employees required to support the first two Revenue Service Demonstration districts
- Developed strategy and plan for delivery of training for full implementation.

5 Progress on Implementation Schedule Milestones

NSR is complying with the implementation schedule it provided in its revised PTCIP.

Additionally, the following cross-referenced sections provide commentary on implementation milestones for calendar year 2015.

5.1 Locomotive Milestones

See Section 3.1 Locomotive Status for a discussion of program milestones for 2015.

5.2 Wayside and Communications Equipment Milestones

See Section 3.3 Installation / Territory Status for a discussion of program milestones for 2015.

5.3 Testing and Revenue Service Demonstration Milestones

See Section 11 Testing and Integration Efforts for a discussion of program milestones for 2015.

5.4 Training Milestones

See Section 4 Employees Trained for a discussion of program milestones for 2015.

5.5 Interoperability Milestones

See Section 9 Interoperability Progress and Other Formal Agreements for a discussion of program milestones for 2015.

6 Program Challenges and Risks

In 2015, NSR experienced the following challenges/risks to maintaining its schedule for implementation of PTC:

6.1 Update to the Summary of Remaining Technical, Programmatic, Operational or Other Challenges

6.1.1 Challenges to Wayside Implementation

6.1.1.1 Radio Hardware Failures

- In November 2015, railroad technical staff identified several incidents of premature failure with some of the PTC radios. The impact of the failure causes the radio to stop transmitting. The cause was not fully known in 2015, but was suspected to be due to deficiencies in the manufacturing process, component failure or a combination of the two. The issue affects the base station and locomotive radios. To date, the problem has been observed in the wayside radios but the component placement is such that there is minimal risk to this particular type of PTC radio. Coordinating a return of the affected radio equipment without impacting installation schedules will be a challenge. The 2016 plan, if needed, is to begin an opportunistic return of radio equipment that is readily accessible and still in original shipping boxes. Once that is completed, we will begin equipment swaps and return which will likely take 12-18 months to refurbish the entire fleet of locomotive and base radios.

6.1.1.2 Wayside Software and Hardware Immaturity

- Early versions of the wayside message server provided poor performance in 2015 and required extensive diagnosis to determine the root cause of the problem and the versions affected.
- Software issue found in 2015 related to PTC signal equipment executive software that causes the WIU to become non-responsive, defaulting to an off-line state and requiring a manual reset.

6.1.1.3 Interoperability Complexity

- We faced scheduling challenges with multiple railroads on many projects. Scheduling presents issues, time to test and method of outages. We use absolute outages while some roads use signal suspensions and continue to

move trains during cut-ins, our operating rules make this a cumbersome process working in the fashion with other roads.

6.1.1.4 Tower Approval Process

- Even though we have been successful at getting more approvals, it is very seldom that you get 100% of the approvals for a given line segment. This requires return visits, delays track data V&V testing and increases costs.
- Some tribes have become less willing to bundle sites for approval while others have undergone a change in leadership which has caused delays.

6.1.2 Challenges to Testing, Demonstration, Certification and Progressive Implementation

- The initial entry to RSD was delayed due to software defects identified from the first through the fourth quarters of 2015. Additional time was required to define and prioritize these defects, to identify and test mitigation where necessary and to re-test subsequent software fixes. These challenges correspond to the challenges presented in the PTCIP in sections 5.4.4.1 PTC Software Immaturity – PTC Does Not Perform as Intended and 5.4.4.3 Final Defect Free Product.

6.2 Schedule Risk Updates

6.2.1 Wayside

- Software issue found in 2015 related to PTC signal equipment executive software that causes the WIU to become non-responsive, defaulting to an off-line state and requiring a manual reset. Due to the large number of locations already placed in service, this will require use of already constrained labor, trips back to locations, and track time or outages to install and test the new executive software.
- The Brotherhood of Railway Signalmen NS PTC labor contract expires June 2016. Negotiations are ongoing to extend the agreement to match new federal deadline. This could have a detrimental impact to our plan if negotiations fail.
- Some Native American tribes have become less willing to bundle tower sites for approval while others have undergone a change in leadership which will continue to cause delays for segment readiness for RSD or implementation and could affect the sequence in which NSR can deploy a district.

6.2.2 Testing & Implementation

- Hardware and Software immaturity - to date two significant hardware recalls (PTC radios discussed under Wayside challenges and a TMC flash drive issue) have occurred which will impact schedule as removal and replacement of faulty hardware consumes constrained resources.
- Significant vendor support is required for both hardware and software to meet the schedule. The ability of key vendors to support PTC in production across the Industry is unproven.
- Complex areas of implementation, such as Chicago, critical to ultimately validate system design and architecture remain to be tested. There is no industry or PTC program history upon which to rely or base estimates for the ability to adhere to the estimated schedule.

7 Progress on Revenue Service Demonstration (RSD) or Implementation

Table 7 - Progress on Revenue Service Demonstration (RSD) or Implementation

District Name	District From - To	Route Miles	Status at EOY 2015	RSD Estimated Start
Charleston	Charleston - Columbia	118.5	• Testing Complete	01/16
Columbia	Charlotte Jct. - Augusta (Charlotte-Columbia)	110.4	• Testing In Progress	03/16
Memphis	Tuscumbia - Memphis	142.7	• Testing In Progress	05/16
Memphis	Tuscumbia - Sheffield	3.3	• Testing In Progress	05/16
Memphis	Stevenson - Norala	121.3	• Testing In Progress	06/16
West End	Sheffield - Parrish	2.0	• Testing In Progress	06/16
AGS	Chattanooga - Meridian	295.4	• Testing In Progress	07/16
Knoxville	Bristol-Knoxville	125.0	• Testing In Progress	08/16
Knoxville	Knoxville-Ooltewah	101.6	• Testing In Progress	09/16

In 2015, NSR had initiated 0 route miles in RSD and implemented 0 miles with PTC.

NSR submitted its Request to Conduct Revenue Service Demonstration v1.0 on September 15, 2015 to take us through 2016 as we await certification of the system. FRA conditionally approved the RSD request on October 28, 2015.

In Table 7 - Progress on Revenue Service Demonstration (RSD) or Implementation, NSR notes status as of end of year 2015 as Installing, Testing (Track Data Verification & Validation or Field Qualification Testing or RSD) or Operational/Complete for these territories. NSR started RSD on the Charleston District in January 2016 and will begin RSD on the Columbia District in March 2016. Actual start dates for additional districts to enter RSD will be determined by software readiness.

8 Update for Intercity or Commuter Passenger Transportation

N/A - This section is not applicable to Norfolk Southern Railway Company.

9 Interoperability Progress and Other Formal Agreements

9.1 NSR as Host Interoperability Milestones

The following bulleted points offer a summary of milestones achieved in 2015 regarding NSR's activity as a host railroad. NSR is working to have finalized agreements by the end of second quarter 2016 and will report to FRA on its status, including estimated tenant locomotive fleet in a 2016 quarterly report.

- In March 2015, NSR representatives attended and presented to shortline and commuter road attendees at the AAR/ASLRRA/APTA Conference in Chicago, IL.
- In April, formed a PTC tenant interoperability task force of Short Line Marketing, Transportation, Law, Operating Rules, Advanced Train Control and Joint Facilities department representatives. The task force formed to review the regulatory requirements of 49 C.F.R. 236 Subpart I and its 2014 amendments to develop a methodology for tenant PTC equipping for operation on NSR PTC districts.
- In June, participated in and presented to the NS Short Line Caucus members, representing a dozen short line roads on NS, on the status of NS implementation, challenges and plans for tenant interoperability task force team
- Throughout the summer and fall of 2015, refined an inventory of tenant operations and location specific characteristics, including those found in 49 C.F.R. 236.1011(a)(5).
- In December 2015 as required by 49 C.F.R. § 236.1011(a)(6)(iv)(A), NSR made a formal written request to each Class II or III tenant railroad operating on PTC-required track
    - To notify the railroad of its requirement to equip for PTC, alter operations or in limited circumstances, operate unequipped under § 236.1029
    - To provide the NSR terms and conditions for interoperability
    - To request the tenant identify rolling stock to be PTC-system equipped
    - To request the date their rolling stock will be equipped with a PTC system
    - To provide NSR contacts for commercial, technical and regulatory compliance related matters and to request the same from each tenant.

As mentioned above, as a result of the revised PTCIP analysis, NSR sent written notification to tenant roads in December 2015. At the time of this filing, those agreements were still under discussion with many roads. Accordingly, no table of tenant locomotive equipping will be provided for 2015.

9.2 NSR as Tenant Interoperability Milestones

NSR operates as a tenant road on the following PTC host railroads:

- Amtrak (ATK)
- Belt Railway Company of Chicago (BRC)
- BNSF Railway (BNSF)
- Canadian National Railway (CN)
- Canadian Pacific Railway (CP)
- Consolidated Rail Corporation (CR)
- CSX Transportation (CSX)
- Kansas City Southern Railway (KCS)
- Kansas City Terminal Railway (KCT)
- Metro North Commuter RR Co (MNCW)
- New Jersey Transit Rail Operations (NJTR)
- Southeastern Pennsylvania Transportation Authority (SEPTA)
- Terminal Railroad Association of St. Louis (TRRA)
- Union Pacific Railroad Co. (UPRR)

The following bulleted points offer a summary of milestones achieved in 2015 regarding NSR's activity as a tenant railroad on foreign line hosts.

- The Class Is worked through the ITC organization and the I-ETMS Application team to continue to refine and prioritize the "I-ETMS Roadmap" for enhancements and changes
- Worked to gain consensus with other Class I I-ETMS users to prioritize vendor defect resolution that would support NSR Revenue Service Demonstration goals
- Worked with the industry and FCC to eliminate radio interference issues in the 220 MHz, 218 MHz and 217MHz frequencies
- Participated in testing at TTCI to confirm the interoperable RF architecture
- Engaged through the industry with TTCI to coordinate and provide slot-planning for the Northeast implementation
- Worked with vendors to establish a hosted back office I-ETMS environment which can interface remotely to host CAD systems

- Developed improved I-ETMS cab signal behavior with vendor to interface to hosts' wayside systems without the need for redesign
- Identified appropriate systems integrators to assist hosts
- Began 220 MHZ base station analysis to identify gaps in coverage
- NS and CSX established an Interoperability Test Team which met regularly
- Established testing communications federation network connection, installed production circuits and established production federation connection between NSR and CSX with CSX in 1st Quarter
- Established federation test circuits between NSR and BNSF and UPRR
- Engaged host roads to reach commercial and technical agreements to facilitate interoperability on host roads
    - Michigan DOT/Amtrak agreement achieved in 2015
    - AMTRAK agreement in progress to finalize by mid-2016
    - NJTR agreement in progress to finalize by the end of 2016
    - SEPTA agreement in progress to finalize by the end of 2016

10 Estimated PTC Safety Plan Submission Date

NSR plans to submit its final PTC Safety Plan in June 2016, following the completion of RSD on several districts. A draft plan was submitted in December 2014. FRA responded in August of 2015 with feedback of 625 comments.

11 Testing and Integration Efforts

The following section provides milestones and progress updates related to the NS testing and integration effort for 2015.

11.1 Lab Testing

- Maintained two lab testing environments: Lab Integration End-to-End (LIEE) and Field Qualification Testing (FQT)
- Accomplished LIEE testing activities using manual and automated processes
  - Expanded automated regression suite to include 44 new test cases
  - Received seven releases of onboard software, seven releases of BOS software, eight releases of CAD software, four releases of ITC messaging and three releases of radio communication software, resulting in 22 combinations of release test cycles
  - Executed 342 LIEE test cases in 1,875 iterations
  - Tested 678 total requirements in lab environment
- Performed requirements tracing to ensure all changes were captured and test cases were modified or added as needed
  - Updated 166 modified component requirements
  - Added 27 new requirements
  - Modified 595 test cases for the total NS test suite
  - Created 292 new test cases

11.2 Field Testing

- Conducted 29 User Acceptance Test (UAT) trips with I-ETMS onboard a revenue service locomotive connected to the FQT environment for the BOS and CAD segments
  - Assessed I-ETMS performance in actual operational scenarios
  - Evaluated GPS-related functionality on a field locomotive (a train movement simulator is used in the lab)
  - Provided a hands-on and guided training opportunity for train crews operating UAT units

11.3 Revenue Service Demonstration (RSD) Readiness

- Employed data mining techniques to pinpoint test scenarios based on actual field operations on districts slated for RSD

  - Developed additional test cases based on historical data as well as current operations
  - Improved regression test data to more closely reflect actual operations
- Focused vendor development efforts on RSD
  - Prioritized vendor defects and change requests based on need for RSD
  - Reviewed status and priority of defects and change requests regularly with each vendor
- Identified and completed extensive RSD readiness tasks, including a review of all system configuration settings

12 Updated Information that FRA Can Use to Maintain Its Geographic Information System Database

As noted previously, PTC is not operational in revenue service on any NSR districts as of the end of calendar year 2015. NSR will be in Revenue Service Demonstration during 2016 for the districts listed in Section 7 of this report. After the NSR PTC Safety Plan and NSR implementation are approved by FRA to allow for operation in revenue service, NSR will update its timetables to reflect this change and notify FRA in future updates of operational PTC district limits.

In the meantime, in Table 5 of this document and in the PTCIP vR1, Appendix B: NSR PTC Implementation Schedule, Sequence and Hardware Totals, NSR provided the FRA geographical data related to where PTC is required with the following data columns:

- Line ID
- District name (subdivision name)
- Start (from) milepost and end (to) milepost

Appendix B represents only the NSR requirement for PTC, so no specific PTC attribute is provided. Appendix B table provides the following information:

- Year PTC implementation will be achieved
- Implementation phase, by half year designation
- Sequence of implementation
- Line ID
- District name (subdivision name)
- From-to station names for the district
- Start (from) milepost and end (to) milepost
- Number of miles
- WIU Installation schedule, by year
- Number of Wayside Interface Units for legacy signal systems
- Number of Wayside Interface Units for switch position monitoring
- Number of wayside towers or poles
- Number of wayside radios
- Number of base station towers or poles
- Number of base station radios

Appendix C NSR Track Segment Characteristics provides FRA with additional information for entire NSR network. In Appendix C, a PTC attribute is provided in the “Status” column. The table provides the following:

- The line segment ID
- District name
- From-to station names for the district
- PTC implementation status
    - Baseline – non-mainline
    - Baseline- 0 TIH
    - Baseline- planned
    - DeMinimis- categorical
    - DeMinimis categorical planned
    - Foreign railroad- leased
    - Line sale, mainline- not-PTC
    - Non-mainline
    - Non-mainline- auxiliary track
    - Non-mainline- Rule 93 yard limits, restricted speed
    - PTC
- Start (from) milepost and end (to) milepost
- Number of miles
- Mainline or non-mainline status
- Additional information required by Subpart I.