

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554**

<b>In the Matter of</b>	)	
	)	
<b>Request of PTC-220, LLC for Waivers of Certain 220 MHz Rules</b>	)	<b>WT Docket No. 08-256</b>
	)	
<b>Construction Progress Report</b>	)	

**To: Chief, Wireless Telecommunications Bureau**

**PTC-220, LLC  
CONSTRUCTION PROGRESS REPORT**

**I. INTRODUCTION**

PTC-220, LLC (“PTC-220”) submits this Construction Progress Report to satisfy the requirements of paragraph 16 of the Memorandum Opinion and Order (“*Waiver Order*”) adopted by the Federal Communications Commission (“FCC”) on June 25, 2009.<sup>1</sup> This Report details the progress made during the past six months in implementing the Systemwide Build-out Plan (the “Build-out Plan”) submitted by PTC-220 on November 1, 2010, in the above-referenced docket. The Build-out Plan explained how PTC-220’s 220 MHz licenses (“Licenses”) would be used in deploying a nationwide positive train control (“PTC”) system, as required by Federal statute. The construction of the Licenses will be undertaken in large part by each of PTC-220’s

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<sup>1</sup> *Request of PTC-220, LLC for Waivers of Certain 220 MHz Rules*, Memorandum Opinion and Order, 24 FCC Rcd 8537 (2009).

member railroads,<sup>2</sup> although PTC-220 will also coordinate construction activities by non-member railroads.

## II. SITE BUILD-OUT ACTIVITY

Since the November 2014 Report, PTC-220’s member railroads have continued to build new or prepare existing base station sites and install base station radios. As before, preparatory work at existing sites includes, among other things, coverage predictions, design and installation of antenna systems, upgrading of site power systems, site pre-wiring, and backhaul design. The table below indicates the progress to date for each PTC-220 member railroad, by State, for base station site preparation and base radio installations. Some of the installed radios are being actively used in various field testing programs, while others are currently powered off, awaiting final frequency coordination.

State	BNSF		CN		CP		CSX		KCS		NS		UP	
	Site Prep	Radio												
AL	4	4					41	27			39	39		
AR	7	5							9				28	22
AZ	20	20											11	4
CA	39	39											78	35
CO	19	15											10	3
FL							46	17			1	1		
GA							33	24			42	41		
IA	26	25			22	13							18	13
ID	5	5											21	19
IL	41	35	31	10	5	4	19	12			23	23	38	31
IN			6				52	29			14	14		

<sup>2</sup> PTC-220’s members are BNSF Railway (“BNSF”), Canadian National Railway (“CN”), Canadian Pacific Railway (“CP”), CSX Transportation (“CSX”), Kansas City Southern Railway (“KCS”), Norfolk Southern Railway (“NS”), and Union Pacific Railroad (“UP”).

State	BNSF		CN		CP		CSX		KCS		NS		UP	
	Site Prep	Radio	Site Prep	Radio	Site Prep	Radio	Site Prep	Radio	Site Prep	Radio	Site Prep	Radio	Site Prep	Radio
KS	36	35							3				29	15
KY			2	1			68	43			13	13		
LA	6	5	8	7			1	1	29		2	2	18	9
MA							14	10						
MD							25	9			2	2		
MI			10				22	0						
MN	33	28	6		5	1							1	
MO	40	31	12		6	5			7		8	8	22	17
MS	3	3	5	5			3	3	6		11	11		
MT	67	54												
NC							56	39			16	16		
ND	55	43			9									
NE	32	32											37	33
NJ							2	2						
NM	16	16											12	4
NV													27	1
NY					2	2	49	40						
OH							63	31			9	5		
OK	26	26							6				10	2
OR	1	1											34	6
PA					9		18	15			12	12		
SC							31	23			21	21		
SD	5	5												
TN	2	2	7	7			51	37			25	25	1	
TX	53	46							18				111	62
UT													18	2
WA	54	54											13	3
WI	3		24										4	
WV							99	55						
WY	1	1											23	14
VA							55	28			19	19		
<b>Total</b>	<b>594</b>	<b>530</b>	<b>111</b>	<b>30</b>	<b>58</b>	<b>25</b>	<b>748</b>	<b>445</b>	<b>78</b>		<b>257</b>	<b>252</b>	<b>564</b>	<b>295</b>

Totals	
Site Prep	Radio
2410	1577

In addition to the base station deployment programs, PTC-220 member railroads are also installing mobile radios in their locomotive fleets.

### *Historic Review Process For Wayside Pole Construction*

In the November 2014 report, PTC-220 noted its appreciation for the FCC's efforts to streamline and expedite the historic review process for its wayside pole installations, which is required by Section 106 of the National Historic Preservation Act ("NHPA") and its implementing rules. In the last report, PTC-220 indicated that the railroads had only recently been able to take advantage of the newly established procedures, including the new expedited process for filing Environmental Assessments ("EA") in cases where such filings are required.<sup>3</sup> PTC-220 is pleased to report now that the new procedures are functioning well, and the prior backlog of submissions that needed to be filed has been eliminated.

### **III. TPCI ACTIVITIES**

As mentioned in previous filings, PTC-220 has engaged Transportation Technology Center, Inc. ("TTCI") for a number of technical support services related to PTC. Among these services is the radio frequency ("RF") network design of several congested urban areas, and management and coordination of PTC-220's spectrum holdings.

TTCI has continued with the development of full RF network designs for dense urban areas. The design for the Los Angeles area was reviewed to ensure compliance with regard to the inclusion of the incumbent analysis required by the FCC waiver order, released in early

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<sup>3</sup> 47 C.F.R. § 1.1307(a). If an EA is required, a railroad may not begin construction until the Commission issues a Finding of No Significant Impact ("FONSI"). 47 C.F.R. § 1.1308(d).

March 2015.<sup>4</sup> A frequency plan for all sites, including Wayside Interface Units (“WIUs”) and base stations, within the entire Los Angeles Major Trading Areas (“MTA”) was formally approved and Revenue Service Demonstrations in some territories started in late March 2015. The RF design for the Dallas/Fort Worth area is requiring more work than originally planned due to several incumbent interference issues, particularly in the downtown areas, and it is planned to be completed during the second quarter of 2015. The RF designs for the Chicago and Kansas City areas, funded by the FRA, are in the initial stages of base station frequency plan analysis, including resolution of incumbent interference, and are planned to be completed by mid-2015. The PTC-220-funded design of the New Orleans area started during the first quarter of 2015 and is also planned to be completed by mid-2015. The projects for the Minneapolis-St. Paul and Toledo areas are in the initial stages of data gathering and selection of propagation models.

Significant progress was made with regard to the RF network design for the Northeast Corridor (“NEC”): data from all the railroads, including non-PTC-220 railroad members, were acquired, prepared and uploaded to the project hosted server system; preliminary base station propagation analyses were developed to verify Interoperable Train Control and Electronic Train Management System (“ITC/I-ETMS”) coverage along passenger and commuter lines; and project boundaries were expanded to include Amtrak lines from Philadelphia to Harrisburg and Washington, DC. PTC-220 and the commuter and passenger lines discussed addressing issues relating to spectrum usage and train operations.<sup>5</sup> Discussions focused particularly on areas

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<sup>4</sup> PTC-220, LLC, *Request for Waiver to Facilitate Deployment of Positive Train Control Systems*, Memorandum Opinion and Order, WT Docket No. 13-59, WT Docket No. 13-59, DA 15-332 (WTB, Mar. 13, 2015) (“*Waiver Order*”).

<sup>5</sup> Commuter and passenger lines that participated in the discussions include Amtrak, New Jersey Transit, Metro-North Railroad, Long Island Rail Road, and the Southeastern Pennsylvania Transportation Authority.

where there are transitions between ITC/I-ETMS and Advanced Civil Speed Enforcement System (“ACSES”) controlled territories and also on routes where both systems will operate simultaneously to support trains equipped with either or both system configurations. The project is being adjusted, as decisions that affect the design are being made. The project is estimated to be completed by the end of 2015.

In the area of spectrum management and coordination, TTCI’s 220 MHz Frequency Application Management System (“FAMS-220”) is in its second full year of operation. FAMS-220 holds and manages information about PTC frequency and time slot plans across the entire nation, and also automates the flow of this information from the RF planning tools to the databases. The TTCI Frequency Coordination Office staff continues to support the FAMS-220 system and develops software updates to manage the spectrum held by PTC. TTCI performs ULS searches and coordination functions as necessary regarding incumbents and waiver notifications. Additional tools are being developed to facilitate analyzing incumbent sites and licenses.

#### **IV. EQUIPMENT DEVELOPMENT**

The four PTC radio models, developed by Meteorcomm LLC and produced by two manufacturers, have been in production since 2012. These radios are effectively meeting the industry’s demands. The radio hardware designs are proving to be very stable, with no known problems. The software supports all basic PTC functionality, and new functions and features will be added through a program of scheduled software releases. For example, Meteorcomm implemented automatic gain control (“AGC”) in its radio products to reduce locomotive radio

blocking and therefore improve system reliability. In upcoming releases, Meteorcomm will be adding new functionality to ease the radio frequency planning requirements.

As previously reported, all PTC-220 radios have Part 90 certification and Meteorcomm has received Part 80 certification for these radios to accommodate users who might choose to operate on Automated Maritime Telecommunications System (“AMTS”) spectrum below 220 MHz. Meteorcomm is supporting North East Corridor stakeholders in the effort to develop an interoperable PTC communication system for the region.

## **V. FIELD TESTING**

As described below, most PTC-220 member railroads have ongoing field test programs designed to validate preliminary network designs and to assess the performance of over-the-air protocols under field conditions.

CSX. In preparation for a Revenue Service Demonstration (“RSD”) in the middle of this year, CSX has performed Field Qualification Testing (“FQT”) exercises, which required successful delivery of Wayside Status messages over various communications paths, including the 220 MHz network on the Wilmington subdivision. Additional FQT exercises are scheduled throughout the remainder of the year to prepare subdivisions for RSD. CSX has also completed the FRA-required Wayside Asset validation on several subdivisions in preparation for FQT and RSD exercises. Furthermore, CSX has completed radio coverage validation on several diverse subdivisions across its rail network, spanning multiple states.

CSX, with active participation from Norfolk Southern, has completed production network federation<sup>6</sup> in addition to numerous interoperability test activities. Network federation is a critical step in providing for PTC interoperability and CSX and BNSF hope to complete production network federation by the end of this year.

Norfolk Southern. Norfolk Southern continued FQT field testing early in the first quarter of 2015 and as a result of the successful FQT activities, is now prepared to begin more detailed testing referred to as User Acceptance Testing (“UAT”). This involves PTC-subject matter experts on board with crews operating revenue service trains as they begin to use the PTC system. Norfolk Southern believes that conducting UAT testing will allow it to begin formal FRA-sanctioned RSD sometime in the third quarter of this year.

Joint field radio planning efforts are underway between Norfolk Southern and CSX in numerous common areas. This involves frequency and slot planning activities as well as back office connections to support interoperable field testing activities.

BNSF. BNSF along with the three other roads in the LA Basin have implemented the ITCnet Planning Module (“IPM”) slot plan into production. All roads involved are gathering logs from their radios, reviewing that data, and sharing their findings with Meteorcomm. Many challenges remain in IPM slot planning, including the functionality of the slot plan in a dense urban area involving multiple railroads.

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<sup>6</sup> Federation is the establishment of back office messaging system links between railroad networks. In order for railroads to share the use of a base station and frequency in an area, the messaging systems of the railroads must be connected so that they are capable of routing messages between back offices and to specific base station radios.

Also during this reporting period, BNSF implemented a four second superframe in the LA Basin, thereby adjusting the cycle time used for sending WIU status message beacons/broadcasts from three to four seconds and significantly reducing the PTC base station backhaul load. BNSF is implementing similar changes in all subdivisions, coordinating with other roads along the way. At the end of the day, logs from the locomotive, base and wayside stations are collected and moved to the IPM parsing process, to validate IPM functionality. BNSF plans to implement IPM slot plan testing on additional subdivisions.

BNSF also spearheads the drive testing and model tuning efforts for PTC-220. Model tuning, a key component of the RF engineering process, uses the test drive data to adjust existing computer models so that the RF signal predictions will be as accurate as possible. In addition, tuned models are embedded with a signature feature which enhances model accuracy selection for an area, hence eliminating the risk of an RF engineer using an incompatible model. A significant portion of this process has been completed. To date, 16 models have been drive tested and tuned for PTC use, out of a total of approximately 37 models for which tuning will be needed. PTC drive testing and model tuning for 2015 commenced the week of April 27. The Pacific Northwest will be the “kickoff” region for 2015 with InfoVista, and Newfield Wireless will start data capture in the mid-west region, north of Iowa. All tuned models are attached with the Model Signature process, which enables mPlanet to select the most suitable model for an area from the available list of models. This process reduces user error in identifying the best model for the area.

Union Pacific. UP executed multiple drive test runs to validate the newly produced slot plan from IPM for MTA02 in the Los Angeles, Alhambra, Yuma, Santa Barbara, and Mojave subdivisions. UP also upgraded the radio software application to ITCR 2.0. During coverage

testing UP identified a base coverage issue for one site in the Santa Barbara subdivision. To fill that gap, UP tested the enhanced wayside relay function provided in ITCR 2.0 and the results have been promising. UP has built a dashboard that provides status of the communication links to the back office. UP is getting enough field data to begin comparing field measurements with the computer model predictions used for RF system design. Based on these results, UP is working with its computer model vendors to see if they can improve the accuracy of the models.

## **VI. SPECTRUM**

*Spectrum Needs Analysis.* Based on TTCI's spectrum needs analysis work, the emerging picture is that PTC-220's spectrum should be sufficient to support its PTC operations in most areas. Significant uncertainty remains, however, with regard to spectrum needs along the Northeast Corridor. The most immediate concern is for additional spectrum in the New York/Newark area, where PTC-220 has received recent requests from commuter railroads for additional PTC spectrum. As a result, PTC-220 is in discussions to acquire additional spectrum through the secondary market in New Jersey to help address this spectrum shortfall.

As indicated in the last report, PTC-220 had engaged in discussions with FCC staff regarding the potential feasibility of exchanging some of its non-contiguous licenses (*i.e.*, licenses composed of non-contiguous 5 kHz channels which cannot be used for PTC technologies) for other spectrum in the FCC's inventory which could be used in forming larger channel sizes that could support PTC. Ultimately, PTC-220 abandoned this proposal and surrendered its inventory of non-contiguous licenses. At the same time, PTC-220 submitted a letter of support for an application filed by New York's Metropolitan Transit Authority that would allow it to transfer its PTC operations to the 218 MHz band, thereby decreasing the

demand for and potential interference to spectrum at 220 MHz in the congested New York metropolitan area.

In its last report, PTC-220 noted that the situation along the Northeast Corridor is complicated by a new concern that PTC communications in the 220 MHz frequency band might be disturbed by electromagnetic (EM) emissions generated from the high-powered catenary systems that supply electrical power to the locomotives of passenger railroads. PTC-220 engaged Meteorcomm to evaluate the potential risk from these EM disturbances to PTC operations by performing onboard EM interference measurements along Northeast Corridor tracks. While the initial results from the preliminary studies have not identified interference concerns, additional work is needed to determine whether there could be a potential for harmful interference.

Waiver Grant. As previously reported, on February 1, 2013, PTC-220 filed requests for waivers of certain FCC rules which, *inter alia*, limit power and antenna height of transmitters in the 221-222 MHz band.<sup>7</sup> As outlined in the filing, the waivers are necessary to allow full and efficient use of PTC-220's licenses for PTC. PTC-220 is pleased to report that the FCC recently granted the requested waivers on March 13, 2015.<sup>8</sup> The first base stations to take advantage of the waiver grant have been deployed in the greater Los Angeles area. On April 13, 2015, Cornerstone SMR, Inc. and Comtran Associates, Inc. filed a petition for reconsideration of the waiver, and PTC-220 filed an opposition in response.

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<sup>7</sup> See Request of PTC-220, LLC for Waivers of Sections 90.729(b) and 90.723(f) of the Commission's Rules, WT Docket No. 13-59 (filed Feb. 1, 2013).

<sup>8</sup> *Waiver Order*, *supra* n. 4.

*J Block Swap.* In July, PTC-220 and the Association of American Railroads (“AAR”) filed applications with the FCC seeking authority to exchange PTC-220’s 220 MHz J Block licenses for AAR’s nationwide 220 MHz license, which is currently used in rail yards for the remote control of locomotives (“RCL”). The proposed exchange will increase the amount of usable spectrum available for both PTC and RCL operations, while simultaneously reducing the risk of interference between the two services. After the swap, railroads will be able to use the J Block Licenses for specialized PTC applications (such as for “fill in” sites between existing base stations where signal coverage is weak), in areas where such operations will not interfere with RCL operations.

*Non-Member Spectrum Leases.* PTC-220 currently has active spectrum manager leases with several non-member railroads including CalTrain, MetroLink, North Country Transit District, and Sound Transit. In addition, testing leases have been signed with the Alaska Railroad, Amtrak, Metro North and the Massachusetts Bay Transportation Authority. PTC-220 is in active leasing negotiations with five other non-member railroads, with an additional nine railroads pending. Additionally, some short-line railroads may need a spectrum manager lease. The leases are an important threshold step, enabling future construction by these railroads on PTC-220’s licenses.

## **VII. INTERNATIONAL CROSS-BORDER SPECTRUM ARRANGEMENTS**

PTC-220’s member railroads have worked closely with the leadership and staff of the FCC’s International Bureau and the Wireless Telecommunications Bureau to coordinate the operation of PTC along the nation’s international borders. The current interim sharing arrangements governing use of the 220-222 MHz frequency band between the US and Canada

and the US and Mexico are 14 and 19 years old, respectively and, as currently written, do not appear to permit PTC operations near US international boundaries. The 1999 interim sharing arrangement with Canada, for example, imposes certain restrictions on 220-222 MHz operations within 120 kilometers of the US-Canada border, including 5 kilohertz channelizations with designated, service-specific US and Canadian uses; a maximum power flux density at any point at or beyond the border not to exceed -108 dBW/m<sup>2</sup>; a maximum EIRP limit in the 220-221 MHz band that ranges from 5 watts to 500 watts, depending on antenna height; and a maximum EIRP limit in the 221-222 MHz of 50 watts with a maximum height above average terrain of seven meters. The 1994 arrangement with Mexico imposes similarly impractical restrictions.

Due to very low levels of incumbency in the 220-222 MHz spectrum in both Canada and Mexico and anticipated changes in the use of the band similar to those the United States is experiencing, the current restrictions along the US international boundaries no longer appear to be necessary to protect existing or planned spectrum users in Canada and Mexico. Against this backdrop of limited incumbency and changing usage in the 220-222 MHz bands of the neighboring countries, the FCC's International Bureau raised the issue of reforming the existing Interim Arrangement with the Canadian regulator, Industry Canada, during a January 2013 meeting in Ottawa, Ontario. With the support of PTC-220 member railroads, the FCC's International Bureau successfully placed the need for new cross-border coordination on the agenda of the Radio Technical Liaison Committee ("RTL"), which provides a forum for direct exchange of information between the technical experts of both Canada and the US with the aim of promoting early coordination on spectrum allocations and achieving spectrum sharing arrangements necessary for the licensing of individual stations. Subsequent work sessions and correspondence between the FCC and Industry Canada led to an exchange of draft revisions that

appear to promise reform of the existing arrangement to accommodate technical changes and the new uses contemplated through the planned PTC deployment. The FCC submitted a draft Interim Letter Agreement to Industry Canada in February 2014. Talks progressed significantly between the FCC and Industry Canada over the past few months to finalize the agreement, but to date there is still no fully executed agreement in place.

The status of cross-border negotiations with Mexico is less clear. On June 10, 2013, the Mexican President, Enrique Peña Nieto, signed into law an amendment to the constitution that includes an overhaul of the telecommunication and broadcast industries and creates a new telecommunication regulatory body: the Federal Institute of Telecommunications (“IFETEL”). IFETEL replaces Mexico’s Federal Telecommunications Commission (“COFETEL”) and will have expanded licensing and anti-trust powers. During the transition from COFETEL to IFETEL, the FCC International Bureau had no Mexican counterpart with which to negotiate for an extended period of time. Now that IFETEL has commenced operations in earnest, revisions to the current US-Mexico protocol governing the 220 MHz spectrum along the southern border should be possible. The FCC reports that it has begun an informal correspondence with Mexico on revisions to the 220 MHz cross-border agreement. Negotiations are likely to require considerable time before a formal revision to the current arrangement between the two countries is executed. Thus, while PTC-220 member railroads will pursue all available means to support modifications to the cross-border arrangements between the United States and Mexico, PTC-220 member railroads may need to pursue alternative arrangements, such as applications for special temporary authority, to allow operations near the Mexican border.

## **VIII. NETWORK PLANNING TOOLS**

As described previously, field testing of the ITCnet Planning Module (“IPM”) time slot plans exposed issues that required modification to the planning method. Recent uses of the IPM tool by PTC-220 members have identified needed enhancements to support the iterative nature of deployments. Meteorcomm LLC continues to work with InfoVista to improve the number of sites processed within a single slot plan. The goal is to be able to process large MTAs in a single slot planning cycle. The IPM tool is installed on a hosted server to allow wider testing. Railroads are sharing project data on the server for base station frequency planning and usage authorizations.

The Mentum Planet RF prediction tool with the IPM module is being offered to both PTC-220 members and non-members in a hosted environment supported by InfoVista (which acquired Mentum in 2012) under contract to PTC-220. Lessees of PTC-220 spectrum are provided access to the tools pursuant to a provision in the lease. The hosted environment makes possible the coordination of independent but geographically adjacent network design projects so that each design takes into account all adjacent projects. For this reason, it is important that all projects be implemented in a consistent way. PTC-220 has developed standards for the building of projects, and is working with InfoVista to provide classroom training as well as WebEx sessions on specific topics. To date, 64 engineers have completed the training to be certified to use the PTC-220 hosted environment. Relatedly, PTC-220, in conjunction with InfoVista, has commenced a revamped Planet for PTC Certification Class. This class has been revamped to include the latest software and standards being used on the PTC-220 Hosted Server. This class is required for all engineers that will be accessing the Hosted Server for PTC RF planning and will have an exam at the end that must be passed to gain access.

As previously noted, PTC-220 also contracted with InfoVista to develop a Cross Border Tool (“CBT”). The underlying height and clutter files used by the Mentum Planet RF prediction tool are divided into 51 MTAs covering the United States. Because railroad subdivisions and districts cross MTA borders all across the country, the CBT will help RF engineers by automatically syncing the data in the border area along two MTAs. PTC-220 continues the process of implementing this tool across all of the projects on the Hosted Server.

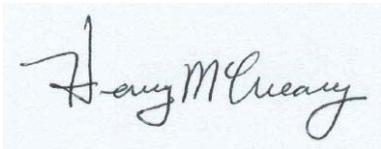
Finally, PTC-220 member railroads have worked with RadioSoft to develop and test an online tool to predict out-of-band emissions. Once transmitter and receiver data is entered, the software will examine terrain path(s) between the transmitter and receive antennas, apply a path loss and adjacent channel formula, then determine how much energy is present at the receive antenna.

## **IX. CONCLUSION**

The last six months have seen important progress on two fronts. First, using the new expedited Section 106 review procedures, PTC-220 members have been able to submit wayside sites awaiting review, which has cleared the way for the construction of thousands of PTC wayside sites. Second, the FCC in March granted PTC-220’s pending waiver request and the construction of waiver-enabled base station sites has already begun. PTC-220 is still awaiting a revised US-Canada agreement governing the 220 MHz band, however, which will allow construction of base station sites near the Canadian border.

Despite progress on radio deployments, other delays related to some of the non-RF components required for the launch of fully operational PTC service have made it unrealistic to expect nationwide PTC service by the end of the year. In recognition of this, legislation has

been introduced in Congress that would extend the December 31, 2015 date for full PTC service deployment until at least 2020. Despite this possible extension, however, PTC-220 members are nevertheless moving forward with construction of the radio network component of PTC as expeditiously as possible and expect to see a significant increase in installed and operational PTC radios by year-end.



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