Narrative Application Form Individual FD/Construction Part II Statement of Work

High-Speed Intercity Passenger Rail (HSIPR) Program

Statement of Work

The quality and completeness of this document will be measured as a Project Readiness evaluation criterion, as outlined in Section 5.2.1 of the NOFA. The applicant must provide a sufficient level of detail regarding scope, schedule, and budget that demonstrates the project is ready to immediately advance to award. Tables have been provided as illustrative examples for capturing data however, applicants can delete or adjust the tables as necessary. This form must be listed in Section G.2 of the Narrative Application Form Part I.

(1) Background. Briefly describe the events that led to the development of this FD/Construction project and the issue the project will address. Also describe the transparent, inclusive planning process used to analyze the investment needs and service objectives of the full corridor on which the individual FD/Construction project is located.

Amtrak operates its eastbound and westbound Texas Eagle service across Union Pacific's highly congested Dallas Subdivision between Dallas and Fort Worth. Trinity Railway Express (TRE) is the commuter rail operation for the Dallas Area Rapid Transit (DART) and the Fort Worth Transportation Authority (the T) providing commuter service between Dallas and Fort Worth. The TRE carries approximately 9,000 passenger trips per day, removing an estimated 4500 motor vehicles from the road daily.

The TRE/Amtrak partnership was first supported by FRA in funding the Valley View Double Track Project which will add a second track between existing double-track on the Trinity Railway Express (TRE) Corridor at MP 629.50 to MP 630.9. The project is part of an overall long-range plan to double track the entire Corridor that would provide the ability to move Amtrak's Texas Eagle service from the UPRR mainline corridor to the TRE Corridor. Currently the Amtrak Texas Eagle uses the UPRR Corridor and requires multiple and time-consuming moves to traverse Fort Worth's Tower 55, the busiest at-grade railroad intersection in the United States. The Valley View Double Track Project will decrease the need for complex Amtrak turns in order to traverse Tower 55. Every movement of Amtrak across the TRE Corridor instead of the UPRR corridor enhances operating flexibility for the Class I Railroads at Tower 55 and consequently decreases locomotive idling time throughout the DFW area.

PTC is a federal mandate that was created as a result of the Rail Safety Improvement Act of 2008 (RSIA08). RSIA08 requires the installation and operation of PTC systems on all intercity and commuter lines by December 31, 2015. PTC provides another opportunity for TRE and Amtrak to partner for the benefit of both services and for the safety of all commuter and intercity passengers.

(2) Scope of Activities. Clearly describe the scope of the proposed FD/Construction project and identify the general objective and key deliverables.

(2a) General Objective. Provide a general description of the work to be accomplished through this grant, including project work effort, project location, and other parties involved. Describe the end-state of the project, how it will address the need identified in Background (above), and the outcomes that will be achieved as a result of the project.

PTC Functional Overview

The Positive Train Control (PTC) system will prevent train-to-train collisions, overspeed derailments, and casualties or injuries to roadway workers (e.g., maintenance-of-way workers, bridge workers, signal maintainers, etc.) operating within their limits of authority as a result of unauthorized incursion by a train. The PTC system will also prevent train movements through misaligned main line switches.

The locomotive or cab car onboard computer will utilize a GPS-based location determination system with dead reckoning provided by wheel tachometers and a track database to continuously determine the location of the train. The onboard computer will receive track authorities and speed restrictions generated from the back office and receive signal aspect and switch position information from wayside equipment. Based on all received information, the onboard computer will determine the train location, authority limits and speed limit of the locomotive, and ultimately provide vital speed enforcement and positive stop enforcement.

Interoperability will be ensured through use of the V-ETMS technology utilized by Amtrak and Class I freight railroads including UPRR.

TRE's PTC project will be fully compliant with 49 C.F.R. Part 236 inclusive of all subparts including FRA approved exclusions permitted under subpart I for terminals and limited operation territory. To achieve compliance with the Rail Safety Act and the PTC Regulations, TRE plans to utilize V-ETMS for compliance with PTC system (the PTC system) requirements that are not currently fully fulfilled by its existing signaling and train control systems. The strategy for the development of the required PTC system is to utilize the PTCDP for V-ETMS submitted to the FRA SharePoint site, if Type Approval is granted by the FRA.

This strategy mitigates development of a completely new system and permits TRE to implement the same system as is being proposed to the FRA by a majority of the Class I railroads.

Even though DART is implementing the complete PTC System as described in the PTC Implementation Plan available on the FRA website. For a complete description of the project scope, see TRE PTC Implementation Plan at http://www,fra.dot.gov/rrs/pages/fp_484.shtml, DART is requesting funding only for the portions that impact and benefit Amtrak as it migrates to the TRE Corridor. This portion includes the design, purchase, test, and implementation of the wayside interface units and related wayside infrastructure as well as 220 MHz communication spectrum and infrastructure on TRE's commuter rail line. As with the entire PTC project, it will be fully compliant with 49 C.F.R. Part 236 inclusive of all subparts including FRA approved exclusions permitted under subpart I for terminals and limited operation territory.

A link to thecomplete PTC implementation plan is provided because it is essential to meeting the criteria of the funded portion.

> **(2b) Description of Work.** Provide a detailed description of the work to be accomplished through this grant by task (e.g., FD and Construction) including a description of the geographical and physical boundaries of the project. Address the work in a logical sequence that would lead to the anticipated outcomes and the end state of the activities.

Corridor

The eastern terminus of the TRE line is Dallas Union Station on the west side of downtown Dallas at MP 644.3. The 34 mile line runs generally west, past the American Airlines Center and Southwestern Medical Center, through Irving, the DFW Airport, Hurst, and Richland Hills before ending with two stops in downtown Fort Worth (the Fort Worth Intermodal Transportation Center and the western terminus at T&P Station at MP 610.5).

Grant Activities

Design, purchase, test and implement PTC communication-based system including locomotive and cab car on-board systems, wayside interface units and related wayside infrastructure, 220 MHz communication spectrum and communications infrastructure, and PTC back-office systems on TRE's commuter rail line for the benefit of both TRE and Amtrak's Texas Eagle service. TRE's PTC project will be fully compliant with 49 C.F.R. Part 236 inclusive of all subparts including FRA approved exclusions permitted under subpart I for terminals and limited operation territory.

TRE's PTC system implementation will begin with a site survey of existing infrastructure including all critical track elements, fleet, signaling system, dispatch system and communications systems. TRE PTC system will then be designed to include, 220 MHz radio system, a track database, a secure back office system, interfaces to existing dispatch system and other TRE infrastructure and fleet and

to be interoperable with tenant railroads including Amtrak. PTC installation phase will include ordering and manufacturing of equipment, first article inspections, field installations, inspections, development of PTC safety plan, testing and final acceptance.

Below is a discussion of the TRE PTC segments that will be implemented for the benefit of Amtrak and TRE.

COMMUNICATIONS NETWORK

Existing Communications Network

TRE manages voice and data networks to support its daily operations. The communications infrastructure includes three 60 ft tall antenna towers to provide RF coverage for VHF voice and WIU radios along the TRE line. The base stations are located at Handley Edderville Rd, EMF facility, and West Perkins. These sites are connected to the Control Facility (CF) using four-wire analog leased lines. The CF hosts all database servers related to TRE operations. Also, a view client connection (dispatch terminal) is provided from the CF to the Union Station. In addition, TRE owns six strands of fiber optic cable along the TRE corridor.

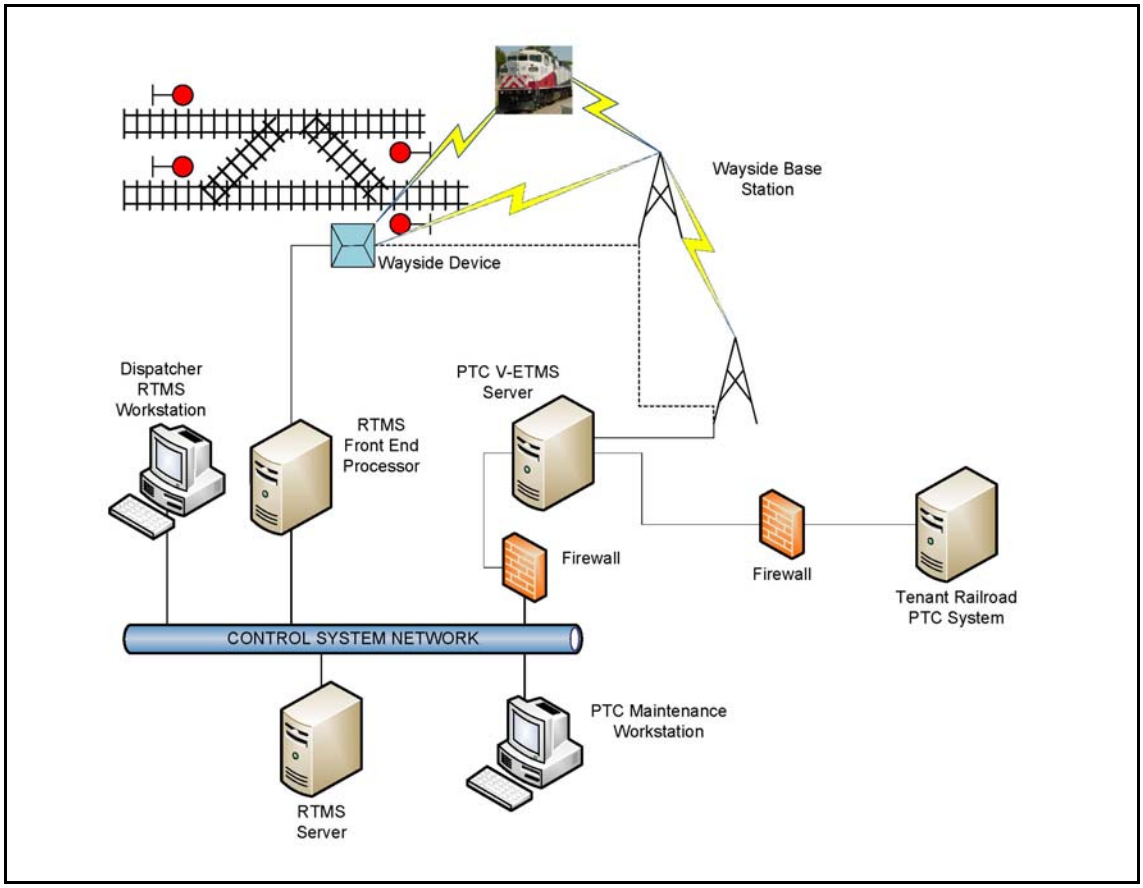
PTC Communications Network

TRE will implement I-ETMS communications based PTC system using existing communications infrastructure to the extent possible. New infrastructure will be constructed to accommodate PTC radio system specifications for redundancy and reliability requirements. WLAN or similar network will be deployed in yards and layover facilities to provide initialization locations for locomotive PTC data upload.

COMMUNICATION SEGMENT

The Communication Segment will provide a reliable conduit for PTC information exchange between the locomotive, wayside devices, and the CF. The system will be built in accordance with 49 C.F.R. § 236.1033 and other applicable standards. The design of the radio and ground networks will consider future capacity growth and availability of new technologies. System design considerations that will affect the deployment of the PTC Communications System will include the following parameters: number, location and the height of the radio towers, modulation techniques, RF coverage blanket, network reliability and availability, throughput rates, frequency spectrum distribution, antenna patterns, redundancy and resiliency requirements, RF interference and EM compatibility, data security, and data management.

TRE PTC Network Layout



Data Radio Communications System

General

The TRE PTC radio system will provide a reliable means of communications to implement and support the PTC operations. Mobile and stationary radio systems will be utilized to provide coverage for TRE's ROW as well as for yards and terminals. The existing communications infrastructure such as towers, antenna structures, data links, or servers will be reused to the extent possible. TRE's area of operation involves complex interaction with the two major freight railroads: UPRR and BNSF. These railroads have each developed a PTC-type system in the past nine years. In October 2008, these two railroads along with NS and CSX signed an agreement to work together to develop an Interoperability Standard for PTC. The standard and the following Interoperable Train Control (ITC) Standard will be the foundation that will allow the PTC communications infrastructure from one railroad to work with onboard PTC components from the other railroads. TRE is planning to build its network based on the ITC requirements.

Overall Data Radio System Architecture

The data radio network will consist of the following components:

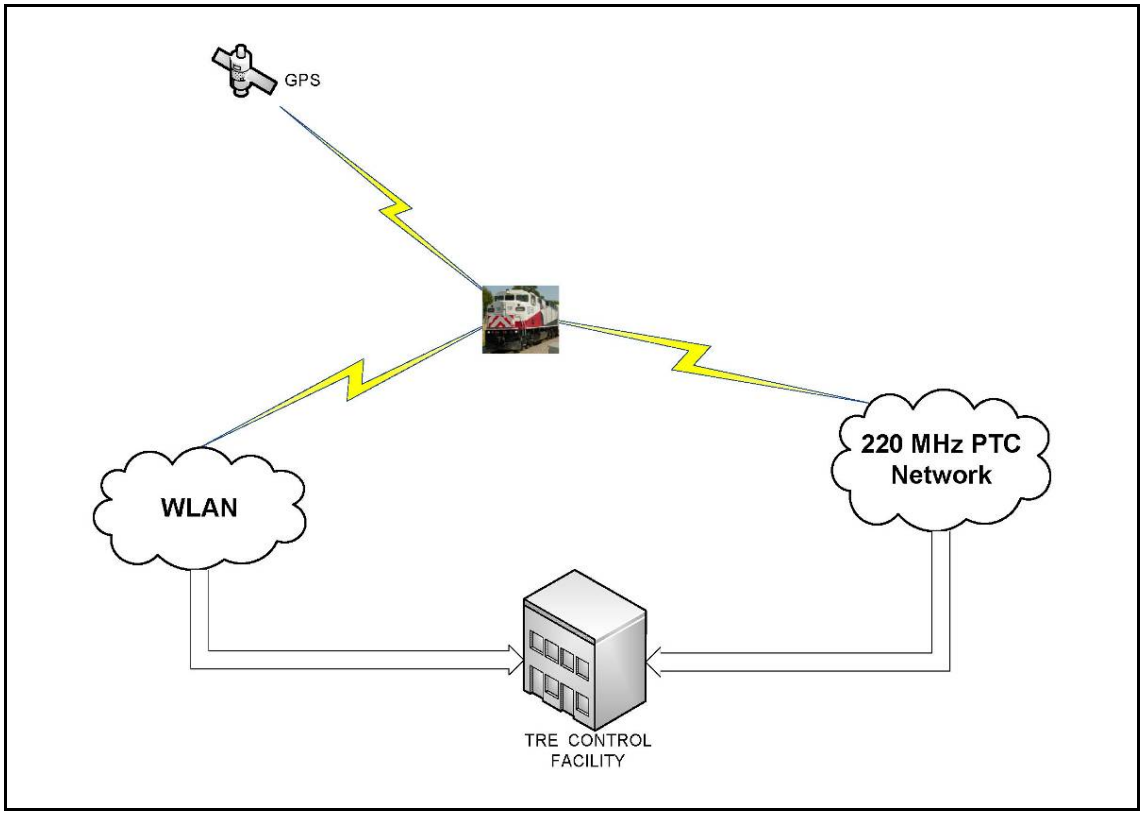
220 MHz Data Radio Network – for accurate and up to date movement authority information exchange.

High data throughput capable Wireless Local Area Network (WLAN) or compatible Cellular Modem – for stationary locomotives in the yards and terminals to upload relevant TRE track databases, train consist, work zones, speed restrictions, and other relevant information from the TRE CF.

Existing GPS nationwide network – for position and direction determination, as well as radio network synchronization if needed.

It is believed that the ITC Standards will specify the requirements for the use of the radio spectrum, base station and on-board equipment configurations.

Figure Error! No text of specified style in document.**-1 – PTC Data Radio Architecture**



220 MHz Network Architecture

The ITC committee of the Class 1 railroads is advising the other railroads that the interoperability radio standard for PTC will be based on the packet digital adaptive TDMA/CSMA, and that the 220 MHz spectrum channels will be configured in half-duplex pairs.

Cellular-based tower coverage scheme will be employed. Intentionally limited coverage for each cell will provide a pattern for frequency reuse and optimization.

Wayside Communication Package

Wayside communications will utilize a network of wayside devices and radio base stations. The wayside communication package will provide a path to communicate movement authority to a locomotive(s) as well as receive position and other information from a locomotive back to the CF. The base stations will provide a common communication medium for the locomotives, wayside devices, and the CF. Diversity and redundancy schemes will be considered to achieve the reliability requirements.

The major components of the Wayside radio system will include:

Wayside Device:

220 MHz Stationary Data Radio

220 MHz Antenna system including antenna, cables, and associated connectors

Weatherproof Radio Equipment Enclosure

Power distribution unit

Communication Controller for ground communications with a base station (if applies)

Radio Base Station:

220 MHz stationary Data Radio

220 MHz antenna system including antenna, cables, and associated connectors

Weatherproof radio equipment enclosure

Power distribution unit

Communication Controller may include a microwave TX/RX module, fiber end point, or other ground communication means for interfacing with the CF

RF transmission components such as duplexers, combiners, and filters as needed

PTC WAYSIDE SUBSYSTEMS

The TRE PTC wayside subsystem consists of three major components:

Wayside Interface Unit (WIU)

Wayside Data Radio

Power Supply

Wayside Interface Unit

The Wayside Interface Unit (WIU) is a solid-state device that accepts hardwired inputs from the signaling system, main line switches, or hazard detectors. These inputs are directly related to the state of the interface device (wayside appliance) and are converted into serial data that is conveyed to the wayside data radio for transmission to the on-board system.

Wayside Data Radio

Using the information from the WIU, the radio will then transmit a coded signal to all trains in the area and to the nearest base station. These coded signals are determined by the inputs to the WIU relative to switch position and signal aspects.

Power Supply

The power supply for each WIU and wayside data radio includes an independent/dedicated set of batteries, charger and DC-to-DC filter with input power to the battery charger provided by the local utility or solar power cells, if the WIU or radio location is remote. Because of grounding requirements associated with the radio, this power supply arrangement is used only for the WIU and radio. It does not supply power for any other circuit or device within the location housing.

Functional Description

The PTC wayside components as described above will be installed at every signal location and interlocking that has any of the following wayside devices:

Automatic Signal

Absolute Home Signal

Powered or Manual Switch Machine not integrated into the signaling system

Circuits from wayside appliances are directly wired to specific input terminals on the WIU. Based on the state of the hardwired inputs and the site-specific location data, the WIU determines a code for transmission by the radio.

When a train or base station interrogates a wayside location a unique data stream is transmitted by the wayside component containing the location information and the wayside device type & status (Signal aspect and/or switch position). This transmitted data is combined with the onboard data to determine the allowable train speed. This same transmitted information is also received by the base station and retransmitted to the back office.

INTEROPERABILITY

This section provides a description of how TRE's PTC system will provide for interoperability as defined by 49 C.F.R. Part 236, Subpart I between TRE and the following tenant railroads including Amtrak in the future:

BNSF Railway (BNSF)

Union Pacific (UP)

Dallas Garland and Northeastern Railroad (DGNO)

Fort Worth and Western (FWWR)

RAILROAD AGREEMENT PROVISIONS RELEVANT TO INTEROPERABILITY

TRE has developed a pro forma document entitled, TRE Positive Train Control – Letter of Understanding for TRE Tenant Railroads operating on TRE lines.

The TRE Positive Train Control – Letter of Understanding includes provisions that require tenant railroads to equip each of its locomotives that are planned for operation on TRE-owned PTC-equipped rail lines with onboard PTC equipment that is functionally compatible with TRE's PTC System. Amtrak and TRE will execute a Letter of Understanding for PTC Interoperability.

TECHNOLOGY APPLICABLE TO INTEROPERABILITY

The TRE Positive Train Control (PTC) system will consist of an existing Centralized Traffic Control (CTC), which will be supplemented by the addition of a vital communication-based Wabtec-compatible PTC system. To facilitate interoperability with Amtrak and the Main Line freight railroads, the system proposed is the Vital Electronic Train Management System (I-ETMS). V-ETMS will be integrated with the existing CTC to gather and interpret information from the wayside signals.

The TRE PTC system will make use of a 220 MHz frequency spectrum for communication to the wayside and the back office and GPS technology for train location

The Communications Segment will act as a reliable conduit for PTC information exchange between the locomotive, wayside devices, and the Control Center. The system will be built in accordance with 49 C.F.R. § 236.1033 and other applicable standards.

TRE plans to have a joint use agreement with regional Class I railroads for a PTC radio system that will provide reliable means of communications to implement and support the PTC operations. Mobile and stationary radio systems will be utilized to provide coverage for TRE's ROW as well as for yards and terminals. The existing communications infrastructure such as towers, antenna structures, data links, or servers will be reused to the extent possible. The Interoperable Train Control (ITC) Standard will be the foundation that will allow the PTC communications infrastructure from one railroad to be fully compatible with, and work with onboard PTC components from the other railroads.

Success Criteria

The metrics used to determine the success of the deployment include the following:

- Implementation of design, procurement, and construction program elements according to the schedule.
- Reliable performance of all PTC functions.
- Achievement of RAMS goals.
- Completion of PTC implementation prior to December 31, 2015.
- Completion of all employee operational and maintenance training in a timeframe consistent with the commissioning program.
- Accurate documentation of the PTC system.

The success of the PTC implementation will be evaluated in terms of improvement in the safety and service performance. Moreover, the safety of the passengers and track workers is of the utmost importance as a critical success factor while assuring the efficient handling of TRE and Amtrak traffic.

(2c) Deliverables. Describe the work products of the project to be completed to FD, or constructed in accordance with the FD that were provided to FRA during the application process or will be completed as a part of this grant. In the table provided, list the deliverables, both interim and final, that are the outcomes of the project tasks.

	Deliverable	Task
1	PTC equipped locomotive and cab cars	Installation of PTC on-board systems
2	PTC communications systems and infrastructure	Purchase and Installation of 220 MHz system and other communications and infrastructure
3	PTC equipped corridor	Installation of Wayside Interface Units
4	PTC back office system	Installation of back office system

(3) Project Schedule. In the table below, estimate the approximate duration for completing each task in months. For total project duration, reference Section C.4 in the Narrative Application Form Part I.

	Task	Duration		
		Start Month	to	End Month
1	Installation of PTC on-board systems	2/2014	to	10/2014
2	Purchase & Installation of 220 MHz syteme	4/2011	to	2/2015
3	Installation of Wayside Units	2/2010	to	2/2015
4	Installation back office systems	4/2014	to	6/2014
	Total project duration	40 months		

(4) Project Cost Estimate/Budget. Provide a high-level cost summary of FD/Construction work in this section, using the FD/Construction Application Package Instructions, the HSIPR Individual Project Budget and Schedule form, and the Narrative Application Form Part I as references. The figures in this section of the Statement of Work should match exactly with the funding amounts requested in the SF-424 form, the HSIPR Individual Project Budget and Schedule form, and Section C of the Narrative Application Form Part I. If there is any discrepancy between the Federal funding amounts requested in this section, the SF-424 form, the HSIPR Individual Project Budget and Schedule form, or Section C of the Narrative Application Form Part I, the lesser amount will be considered as the Federal funding request. Round to the nearest whole dollar when estimating costs.

The total estimated cost of the proposed FD/Construction project is provided below, for which the FRA grant will contribute no more than the Federal funding request amount indicated. Any additional expense required beyond that provided in this grant to complete the proposed FD/Construction project shall be borne by the Grantee.

FD/Construction Project Overall Cost Summary		
#	Task	Cost in FY11 Dollars
1	Installation of PTC on-board system	$ 3,902,304
2	Purchase 220 MHz System	$ 776,527
3	Installation Wayside Units	$17,041,572
4	Installation back office systems	$17,343,684
	Contingencies	$6,490,427
	Total FD/Construction project cost	$ 45,554514

Federal/Non-Federal Funding			
		Cost in FY11 Dollars	Percentage of Total Activities Cost
	Federal funding request	$24,846,172	54.5%
	Non-Federal match amount	$ 24,846,172	45.5 %
	Total FD/Construction project cost	$ 00,000	100 %