METROLINK

metrolinktrains.com/meeting

ITEM ID:	**2023-302-0**
TRANSMITTAL DATE:	**September 1, 2023**
MEETING DATE:	**September 8, 2023**
TO:	**Contracts, Operations, Maintenance, and Safety Committee**
FROM:	**Donald Filippi, Chief Operating Officer**
SUBJECT:	**Approval to negotiate sole source multi-year contract with MxV for simulation and validation of the Positive Train Control (PTC) braking algorithm and modeling of Next Generation Train Control Technologies**

Issue

To ensure proper, efficient and accurate validation of the PTC braking algorithm and modeling of emerging train control technologies integrated with PTC, the Authority is seeking approval to commence negotiations to establish a new master agreement with a key PTC vendor, MxV, to perform crucial validation activities such as:

1. Simulation and validation of PTC locomotive computer braking algorithm for new PTC software releases (in lieu of field brake testing).
2. Validation, modeling, and analysis on future releases of next generation Interoperable Train Control technologies on the Authority's network such as Higher Reliability and Capacity Train Control (HRCTC), Quasi-Moving Block (QMB), and Full-Moving Block (FMB) to enhance capacity, reduce headways, reduce delays, and increase safety thorough enhancements of existing PTC/train control systems or development of new software/hardware for train control systems.

MxV, a subsidiary of the Association of American Railroads (AAR), is the only company that possesses the exclusive technology and software required for validating the PTC I-ETMS braking algorithm without the need for a physical train, using their Monte Carlo simulators. The Authority seeks to harness this capability to achieve cost savings on crew and fuel expenses, while also minimizing disruptions to residents near the testing sites.

The Authority has received grant funding to perform a feasibility study and analysis of next generation train control and this Master Agreement is required to perform this validation.

Recommendation

It is recommended that the Committee recommend the Board allow negotiations between the Authority and MxV to commence to establish a multi-year Master Agreement for the simulation and validation of the PTC braking algorithm and modeling of Next Generation Train Control Technologies.

Strategic Commitment

This report aligns with the Strategic Business Plan commitment of:

- **Safety is Foundational:** The Authority will stay on the leading edge by deploying new technologies and processes to enhance the safety and security of our riders, our fellow employees, and the communities we serve. This report ensures that the Authority supports Positive Train Control (PTC) system improvements as capital and rehabilitation projects are performed.

Background

In accordance with federal legislation (the Rail Safety Improvement Act of 2008 and the Surface Transportation Extension Act of 2015), the Authority has developed and deployed PTC, an advanced train collision/derailment technology avoidance system that uses safety-critical predictive enforcement to automatically engage the brakes and stop a train in advance of:

- Potential train to train collision,
- Train over-speed,
- Unauthorized entry into a track work zone, or
- Movement through a misaligned switch

Since June 2015, the Authority has successfully operated PTC “system-wide”, across its entire network of Authority-dispatched lines and its entire fleet of locomotives and cab cars as well as achieved interoperability in October 2018 with partner railroads (BNSF, UPRR, Amtrak, NCTD) so that Metrolink trains operating on foreign owned lines and foreign owned trains operating on Metrolink lines are also PTC protected.

Since the deployment of Positive Train Control (PTC), the braking algorithm has been a crucial and evolving component within the PTC locomotive computer software, (Interoperable - Electronic Train Management System) I-ETMS. The braking algorithm resides on the PTC train hardware and calculates the warning and braking curves that dictate when the PTC system will initiate visual and audible warnings for targets as well as calculate when PTC would apply penalty or emergency brake applications for targets. The braking algorithm is dependent on a multitude of factors including but not limited to train speed, grade, brakes applied, throttle notch, type of train (commuter, passenger, freights, etc.) and train consist. It is crucial that the braking algorithm is robust and consistent to ensure trains are reliably stopping short of targets but also not too conservative that PTC warns or applies train brakes out of standard train handling practices. The Authority performed field validation of the PTC braking algorithm by running test trains that accounted for maximum authorized grades, speed and

train consist. Due to the number of software releases being released which required braking algorithm validation, it became an unsustainable practice to run field brake tests for each release given the cost, time and resources it required to assemble, maintain and run the test trains. To add, Metrolink would need to run the field brake tests in the middle of the night to prevent interruption of revenue trains but that also resulted in disturbance of residents near the tracks by consistently sounding the horn during testing and engine idling between turnaround points. The railroad industry, in conjunction with FRA funding and support, partnered with MxV, (previously known as Transportation Technology Center Inc, TTC) a subsidiary of the Association of American Railroads (AAR), to develop a series of simulations that would be based on physical train braking characteristics from various train types in order to provide a reliable and efficient means of validating the PTC braking algorithm with several variables (grade, train consist, speed, etc.) without the need to run field test trains. The Authority collected years of field data from PTC test trains and was shared with MxV to generate the needed simulations for commuter/passenger braking algorithm at various train consists, grades and speeds.

On October 2018, the Authority established Contract No. H1665-19 with MxV to perform simulation and validation of three PTC braking algorithm software versions with Authority specific vehicles models, grades and speeds for a total not-to exceed amount of $53,000.On August 2020, the Authority established Contract No. H1669-21 with MxV for a 3-year contract that would allow the Authority to execute braking algorithm simulations as determined by the Authority and included various modules to allow the Authority to execute simulations modules based on the need dictated by the Authority; this contract is set to expire on September 2023 and the Authority needs continued support to validate the PTC braking algorithm in a timely manner for the Authority to upgrade and deploy PTC software in an efficient and safe manner.

In parallel to the braking algorithm validation efforts, MxV has been the nation-wide railroad entity that manages the development of railroad train control/PTC emerging technologies, standards development and industry coordination with freight and commuter/passenger railroads. MxV has worked with the railroad industry to obtain priorities, perform needed studies, simulations and validation of emerging train control technologies that allow the industry to further develop or partner with vendors to develop such technologies and integrate with interoperable train control systems. On February 2021, the Authority received $6,300,000 FRA grant to leverage PTC to increase capacity. The grant will help advance traditional infrastructure upgrades and initiate a feasibility study of the HRCTC along the Metrolink line. This master agreement with MxV would be leveraged to support for studies involving the integration and evolution of PTC performance, as well as software additions aimed at enhancing ridership performance and increasing the throughput of SCRRA trains over the existing infrastructure.

Discussion

To ensure the proficiency and safety of the Authority's PTC system, it is essential to have a reliable, efficient, and sustainable means to validate the PTC braking algorithm when software versions are released by the vendor. Establishing a new master agreement with the same entity that performs current algorithm validation for the Authority as well as the other major railroads utilizing PTC would ensure seamless coverage across contracts as well as ensure that no development or setup costs would be needed for the continued validation support. Previously, SCRRA had to conduct field brake testing on a 14-piece train set under various

conditions, a process involving multiple days of testing and coordination with different SCRRA departments. MxV is the only entity that has developed and provides independent simulated validation of the I-ETMS braking algorithm for freight, passenger, and commuter railroads.

The Agency spent extensive resources during the implementation of PTC to collect field PTC brake testing data and set up of simulation scenarios that are specific to the Agency's subdivisions and equipment that are currently used on an on-going basis for I-ETMS validation braking algorithm validation. While field testing covers worst-case scenarios, MxV's simulation offers the advantage of statistically evaluating algorithm performance across a wide range of conditions, eliminating the need for costly and time-consuming field testing and evaluating the braking algorithm at a fraction of the cost. As part of this initiative, the Authority seeks to establish a new multi-year Master Agreement with MxV, enabling the execution of a comprehensive contract supporting task orders encompassing software release validation, modeling and analysis, feasibility studies, and implementation plans for next-gen train control technologies within this domain. The ultimate goal of this collaboration is to streamline validation procedures, enhance PTC reliability, and optimize daily operations, thereby ensuring a more efficient and effective implementation of Positive Train Control.

Budget Impact

The amounts request for this contract are included in the Adopted Operating Budget for FY2023-2024 ($135,209.00) to perform annual PTC braking algorithm simulations and FRA awarded CRSI grant (69A36521402620CRSCA) titled, "Leveraging PTC to Increase Capacity" ($2,350,000.00) to perform new modeling and assessments of next generation train control technologies including Higher Reliability and Capacity Train Control (HRCTC) and Quasi-moving block (QMB). Funding for subsequent years will be requested through the annual budget or an equivalent process. There is no financial commitment with respect to subsequent years and work will be authorized only if funding is approved.

Next Steps

Upon approval of this request, the Authority will commence negotiations with MxV on a sole source multi-year master agreement. Once both parties are in agreement, the Authority will request board approval for contract award.

Prepared by:	Jairo Rodriguez, Senior Manager Train Control On-Board systems
Approved by:	Don Filippi, Chief Operating Officer