METROLINK

metrolinktrains.com/meeting

ITEM ID: **2023-375-0**

TRANSMITTAL DATE: **December 1, 2023**

MEETING DATE: **December 8, 2023**

TO: **Board of Directors**

FROM: **Arnold Hackett, Chief Financial Officer**
Donald Filippi, Chief Operating Officer

SUBJECT: **Contract No. H1667-24 - Software and Maintenance for Simulation and Validation of the Positive Train Control (PTC) Braking Algorithm and Modeling of Next Generation Train Control Technologies - Recommendation for Award - Transportation Technology Center, Inc. d.b.a. MxV Rail**

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 execute a new master agreement with MxV Rail, to perform crucial validation activities such as:

- Simulation and validation of PTC locomotive computer braking algorithm for new PTC software releases (in lieu of field brake testing).
- 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 Rail, 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 train operations and residents near the testing sites. In addition, the Authority has received grant funding to perform a feasibility study and analysis of next generation train control applications to increase capacity and this Master Agreement is required to perform this validation.

Recommendation

It is recommended that the Board authorize the Chief Executive Officer to award Contract No. H1667-24 to Transportation Technology Center, Inc. d.b.a. MxV Rail under Master Agreement 23-MA-0002 for a base contract term of five years with annual renewal options at the discretion of the Authority and approve contract funding authorization in the amount not-to-exceed $3,000,000 for base contract term.

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) systems improvements as capital and rehabilitation projects are performed.

Background

In compliance with Federal legislation, including the Rail Safety Improvement Act of 2008 and the Surface Transportation Extension Act of 2015, the Authority designed and implemented a sophisticated PTC system. This advanced technology system is designed to prevent train collisions, derailments, and other critical safety incidents. PTC employs predictive enforcement measures to proactively engage train brakes and prevent the following scenarios:

- Potential train-to-train collisions.
- Train over-speed situations.
- Unauthorized entry into track work zones.
- Movement through misaligned switches.

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. The braking algorithm, which is constantly running on the PTC train, is crucial for the safe operation of the system. The braking algorithm 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; it relies on several train characteristics including but not limited to train length, tonnage, make up, speed and track grade. 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 contract had expired due to the fulfillment of the original statement of work. The new contract would build upon the original work and incorporate

additional statements of work beyond the initial scope. Contractor made all deliverable items before contract expired. At the moment there is no new added risks with the lapse, however without a new contract into the new year this puts new PTC onboard builds in jeopardy if any vulnerabilities are uncovered. It can also delay projects for any studies required.

The Authority performed field validation of the PTC braking algorithm by running test trains overall several months and territories that accounted for maximum authorized grades, speed and train consist. Due to the number of software releases being issued which required braking algorithm validation, it became an unsustainable practice to run field brake tests for each software release before deploying it in production given the cost, time, and resources it required to assemble, maintain, and run the test trains. To add, the Authority needed to run the field brake tests in the middle of the night to prevent interruption of revenue trains but that also resulted in the 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 Rail 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 Rail to generate the needed simulations for commuter/passenger braking algorithm at various train consists, grades and speeds. In October 2018, the Authority established Contract No. H1665-19 with MxV Rail 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. In August 2020, the Authority established Contract No. H1669-21 with MxV Rail 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 expired in September 2023.

In parallel to the braking algorithm validation efforts, MxV Rail 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 Rail 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. In February 2021, the Authority received $3,150,000 FRA grant to leverage PTC to increase capacity (matched with $3,150,000 for traditional infrastructure upgrades). The grant includes a feasibility study, plans and specifications for next generation train control technology along the Authority line, along with modelling and analysis of the outcomes compared against traditional infrastructure upgrades.

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 as well to validate emerging train control technologies involving the integration and evolution of PTC performance. At the Board meeting on September 22, 2023, the Board approved the request authorizing staff to commence negotiations with MxV Rail to establish a new sole source multi-year contract for the simulation and validation of the PTC braking algorithm and modeling of next generation train control technologies software and maintenance.

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. MxV Rail is the only entity that has developed and provides independent simulated validation of the PTC braking algorithm for freight, passenger, and commuter railroads. MxV Rail'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 Rail, 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. In accordance with authorization from the Board, staff conducted negotiations with MxV Rail to establish a Master Agreement for Simulation and Validation of the Positive Train Control (PTC) Braking Algorithm and Modeling of Next Generation Train Control Technologies. This agreement will enable staff to manage the scope and pricing incrementally through the Contract Task Order (CTO) process on an as-needed basis with fixed pricing established for key initial and recurring tasks under the agreement. A contract funding authority amount not-to-exceed $3,000,000 was established for a base term of five years and the agreement includes federal provisions for compliance with the largely FRA grant funding source.

Budget Impact

The amount for which contract authority is requested is included in the submitted FY25 Operating Budget ($135,209.00) 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). The project was approved in the FY22 Capital Program Budget. 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 Board approval, Contract No. H1677-24 Simulation and Validation of the Positive Train Control (PTC) Braking Algorithm and Modeling of Next Generation Train Control Technologies Master Agreement with MxV Rail will be executed, and staff will provide a Notice to Proceed.

Prepared by:	Melissa Cousart, Contract and Compliance Administrator Jairo Rodriguez, Senior Manager Train Control On-Board Systems
Approved by:	Arnold Hackett, Chief Financial Officer Don Filippi, Chief Operating Officer