PART III - STATEMENT OF WORK (SOW)

Energy Storage Demonstration Project - RFP FQ10044/FRV

1. Introduction and Background

In an effort to reduce operating costs and improve the quality of the traction power supplied within the Washington Metropolitan Area Transit Authority (WMATA) rail system, WMATA has taken the initiative to investigate whether more efficient methods of operation exist, which are technically feasible and cost effective. Because the costs associated with electrical energy consumption are increasing significantly, WMATA is investigating the possibility of recovering vehicle regenerative braking energy that is lost when the traction power supply system is not experiencing an electrical load, such as another accelerating train.

For more than 20 years, WMATA has enjoyed the benefits of transit car regenerative braking. The primary benefits are reduced energy consumption and reduced overall traction power costs. While the magnitude of these benefits were once considered acceptable, rising energy costs have driven WMATA to explore the possibility and feasibility of capturing and utilizing more of the energy wasted during brake regeneration.

Because of only limited success reported of Ultra Capacitor energy storage systems and extensive space requirements associated with flywheel energy storage systems, WMATA has decided to limit this project to the evaluation of battery energy storage systems. Several different battery technologies have recently been developed, and as of yet have not been completely evaluated in the areas of efficiency, maintainability, and return on investment (ROI). It is the intent of this project to ascertain the benefits and associated costs, while quantifying the energy savings (ROI) for a specific battery technology.

In WMATA's case, the ideal energy storage system will utilize battery storage technology, be small in size, have a large capacity for energy storage, charge rapidly, be relatively maintenance free, and have a high return on investment.

2. Scope of Work

WMATA, working in a partnership with the Federal Transportation Administration (FTA), intends to select one or two manufacturers of wayside installed battery energy storage equipment for a demonstration project at WMATA. The purpose of this project is to determine the effectiveness of the battery storage devices in capturing regenerative brake energy produced by WMATA's transit cars. Results of the study may be shared within the transit industry. It is probable that WMATA may utilize one or more consultants to evaluate the data collected as the

project progresses, and the results presented in the Contractor's final report. The selection of the successful Offeror(s) will be predicated upon the response to WMATA's RFP FQ10044/FRV.

Because of the limited equipment space and the aggressive schedule, WMATA is primarily interested in those manufacturers of battery storage systems that have already demonstrated success in the capture of regenerative braking energy which in the past was typically lost.

This study is divided into two steps, or phases:

First, the Offerors' response to the RFP must include a simulation mathematically comparing the existing electrical traction power energy consumption with that of the expected energy consumption, once the battery storage devices have been installed. WMATA will provide the necessary data to perform the simulation including train schedules, typical vehicle current draw, line voltage, etc. Please see Attachments A - E to the Statement of Work. Other technical proposal requirements are identified below in the Section 4 of the SOW, Technical Proposal Contents.

Second, the successful Offeror(s) will be required to loan, transport to WMATA, and install its battery storage equipment at the chosen wayside site, all at little or no cost to WMATA. Any of the Offeror's costs proposed to be paid by WMATA may detrimentally affect the Offeror's overall selection opportunity. WMATA will prepare the site for installation (pouring of concrete pads). Any existing WMATA monitoring equipment will be made available for the Contractor's use. Should this equipment be found to be insufficient, it will be the responsibility of the Contractor to provide and install any additional monitoring equipment.

Under no circumstances shall any malfunction of the installed battery storage equipment adversely affect the normal operation of the existing traction power equipment or transit operations. Should the battery storage equipment malfunction, the storage system must automatically isolate itself from the traction power system. American Standard high speed breakers shall be used to isolate the storage equipment from the operating traction power system. Isolation shall occur within three (3) cycles or 50 ms. This isolation shall be utilized solely or in conjunction with other methods to allow for safe maintenance of the battery storage equipment and traction power equipment.

Following notification by WMATA or a WMATA designated agent of a storage system failure, the Contractor must respond for remedy and repair within 72 hours of the notification.

Prior to the operation and evaluation of the new battery storage system, the Contractor shall establish a baseline of data by monitoring the existing equipment. This baseline shall not be less than one week of typical transit car operations. Following the successful monitoring period, the battery storage equipment will be activated and confirmed for proper operation before data is collected. Data shall be collected for no less than six months. During this test period, collected data will be shared with WMATA's consultant for the purpose of interim analysis and projection of energy storage efficiency.

For the first month of operation, weekly progress/issues meetings will take place at the selected WMATA facility. Once it has been determined by the WMATA Program Manager that no inherent program difficulties exist, progress meetings will be held on a monthly basis. It will be the Contractor's responsibility to provide written and electronic progress reports. To facilitate the ease of conducting these meetings, videoconferencing is an acceptable alternative to in-person meetings.

Following the test period, the Contractor shall prepare a final report of findings. This report shall include, but not limited to:

1) An executive summary of the study and the findings
2) A detailed report comparing the operation of the existing system with that of the battery storage system
3) An orderly compilation of data by category
4) Charts/graphs that depict differences in the operation – before and after installation
5) An estimated return on investment (ROI) of the cost of the storage equipment vs. the time to recover the cost of the equipment through the cost benefits. The ROI estimate must include all calculations.
6) Projected other benefits, such as increased traction power and vehicle reliability, and their cost benefits
7) Discussion of each sub-paragraph listed under Section 8 of the SOW, Success of the Project.

3. Safety Training

Prior to the installation of equipment, all on-site Contractor personnel will be required to take a one-day WMATA Safety Training course and pass a short safety test at the conclusion of the course. The safety instructions and test will be conducted in the English language. Any need for a translator will be the responsibility of the Contractor.

4. Technical Proposal Contents

In order for an Offeror's technical proposal to be considered "responsive" by WMATA, the items listed below must be included in the proposal. Failure to include any item may render the technical proposal "non-responsive" and thus ineligible for award. The technical proposal must be submitted in a separate volume apart from all other proposal requirements. (See RFP FQ10044 Solicitation Instruction #12 'Proposal Requirements').

(a) The technical proposal must contain information and documentation to demonstrate that the requirements specified in the Statement of Work for a wayside energy storage system are technically feasible and can be implemented in a timely and effective manner. Technical feasibility and timely implementation can be demonstrated through designs, drawings, test results, calculations, simulation analysis, reports from completed projects of a similar nature, and any other applicable documentation. The documents submitted must prove that the design and technologies utilized on this project are effective and reliable, and that the entire project can be completed within one year following issuance of WMATA's Notice to Proceed (NTP).

(b) The technical proposal must include a simulation of system operational loads and current draw for typical WMATA weekday and weekend transit car operations. This will be used by WMATA as a statistical baseline, and will be compared with actual measurements. The simulation will utilize operational data provided by WMATA including train schedules, system loads, and train performance characteristics. (Attachments A - E)

(c) The technical proposal must contain an estimate of electrical energy savings and the expected Return on Investment (ROI) after the first year and at 5-year intervals up to and including year 20 based upon the simulation results and WMATA current utility costs. All energy savings and ROI calculations must clearly show the factors, assumptions, mathematical formulas, and computations utilized. The ROI calculations should incorporate all pertinent factors including but not limited to energy costs, energy savings, power consumption, life cycle costs, labor and equipment costs, and maintenance costs.

(d) The technical proposal must include evidence that the Offeror has successfully administered similar projects at other transit agencies and has a proven track record in the field of battery energy storage systems. The Offeror must include examples of where the Offeror's battery storage equipment (or similar equipment) has been installed (no less than six months) and the expected/calculated energy cost savings. The Offeror must demonstrate that the project management and supervisory staff have prior experience with installing and managing similar projects at other transit agencies. A list of both on-site and off-site personnel, their qualifications, and their expected role in WMATA's project must be provided. Years of industry service by the Offeror, and the name and contact information of previous customers for transit battery storage systems must be included in the proposal.

(e) The technical proposal must contain a Master Program Plan to include:

1. A general overview of the schedule for the on-site test program including the initial meeting with WMATA, weekly progress meetings for the first 30 days (or as determined by the WMATA Program Manager), and monthly meetings thereafter.

2. Terms of the loan of an approximate 3MW battery energy storage system for the duration of the study. Offeror will determine the appropriate size. (WMATA has option to purchase.)

3. Plan and procedures for installation of equipment at WMATA (WMATA will perform the necessary site preparation.)

4. Test plan that explains how the demonstration project will be conducted and monitored.

5. Data collection plan that includes procedures for data collection, sampling rates, what data will be collected, how data will be used, and a list of monitoring equipment and wireless or Wi-Fi data reporting.

6. Reports and documents to be submitted during the course of the project. All reports must be submitted in the English language and be prepared on standard letter, 8 1/2" x 11", white paper. Electronic versions of all reports shall be prepared using Microsoft Office Word 2007.

7 . List of any supplier of parts/labor not directly working for the Contractor along with the part and labor to be provided.

8. Recovery plan in the event that the installed battery system stops functioning. The Offeror's installed equipment shall not adversely affect the WMATA traction power equipment, nor the electrical power utilities supplying electrical power to WMATA.

9. A safety plan to ensure worker safety and the safety of those performing job related tasks in the immediate area. The safety plan must include personal protective equipment (PPE) requirements. The access to all high voltage equipment shall be posted with warning signs. Each sign must be prepared with a white background, made of weather resistant material, and utilize highly visible red, or other Authority approved text lettering.

10. Because the probability is great that the battery energy storage system will be outdoors, the Offeror must protect the equipment by enclosing it in an appropriate weather resistant enclosure with adequate ventilation to ensure that all equipment is operating within the appropriate temperature range. The type of enclosure (NEMA or WMATA approved equal), dimensions, and materials must be identified in the Offeror's proposal.

11. MSDS data sheets for battery components, outdoor enclosure material, insulation,etc.

5. Equipment and Services to be Provided by the Contractor After Award

1) Submit revised Master Program Plan–written and electronic format. (Submit for approval 30 days after NTP) (If different from Master Program Plan submitted with proposal.)
2) Submit Master Program Schedule–written and electronic format. (Submit for approval 30 days after NTP) (Timeline for all project events including those identified below.)

3) Initiate implementation of Master Program Plan and Master Program Schedule	(Upon WMATA approvals)
4) Submit written weekly progress/issues reports. Once issues have been resolved, reports may be submitted each month.	(1st report 30 days after NTP)
5) Provide detailed electrical schematic diagrams of the energy storage system and its interconnection with the WMATA traction power grid.	(Submit for approval 60 days after NTP)
6) Provide detailed mechanical drawings showing the equipment size, necessary space for installation, fasteners, and protective enclosures.	(Submit for approval 60 days after NTP)
7) Transport battery energy storage equipment to WMATA test site. Contractor responsible for fees and licenses.	(90 days after NTP)
8) Install all project equipment, including any additional monitoring equipment. Contractor responsible for fees and licenses. The Contractor must interface with WMATA consultants in the installation of monitoring equipment. It is intended that collected data be transferred from the test site through Wi-Fi or other secure wireless means. The selected test area may have WMATA installed GPS type monitors at the time of the test. If this is the case, the Contractor may use the installed system during the test. If additional monitoring equipment is deemed necessary, it shall be the Contractor's responsibility to provide the equipment. (WMATA will make arrangements for any required state/county inspections.)	(120 days after NTP)
9) Perform baseline study. Once it has been determined that all monitoring and recording equipment is operating correctly, a baseline will be established by monitoring the daily train operations for a period of one week. This shall be done prior to the activation of the energy storage system. Any anomaly in train operation will be noted.	(One week after equipment installation)
10) Activate the battery energy storage system. Train operation will be monitored by WMATA's consultant and the Contractor. It is expected that during the first week, data will be downloaded daily to ensure that the equipment is functioning properly. After this initial period, weekly downloading of data shall be performed. Additional simulations may be prepared by the Contractor showing the expected energy savings, once the battery energy storage system is in operation.	(Upon completion of baseline study - #9 above)
11) Any required maintenance or repair of the battery energy storage system	(Repairs 72 hours after notice)
12) Submit final report.	(60 days after completion of collection of data)
13) Disassemble and remove all Contractor supplied equipment if Option to purchase is not exercised.	(Begin disassembly within 30 days of WMATA notification) (Complete removal within 60 days of WMATA notification)

6. Equipment and Services to be Provided by WMATA After Award

1) Provide Contractor with 9'x12' office area near test site.	(30 days after NTP)
2) Provide "as built" electrical diagrams of the associated traction power substation.	(30 days after NTP)
3) Provide safety training classes for all Contractor on-site personnel.	(90 days after NTP)

4) Prepare the selected test site as necessary, including pouring of concrete pads.	(90 days after NTP)
Currently, the selected test site will be south of the West Falls Church Station, located on the Orange Line. The storage equipment will be installed at the traction power substation located within the West Falls Church Service and Inspection Facility compound. As an alternative, the equipment may be installed at a test site located on the Red Line, north of Brookland Passenger Station.	
5) Provide technical oversight during the installation and data collection phase.	(On-going)
6) Allow for the Contractor use of any/all traction power monitoring equipment installed at the selected test site.	(On-going)
2) Restore the test site after removal of equipment if the Option to purchase is not exercised.	(30 days after equipment removal)

7. Test Completion

Within 60 days of the conclusion of the testing, WMATA will notify the Contractor whether the Authority wishes to exercise the option to purchase the installed test equipment with a two (2) year warranty at the line item value on the Price Schedule Sheet. If the Authority decides not to exercise the equipment purchase option, the Contractor must begin disassembly within 30 days of notification, and have all equipment removed from the Authority's property within 60 days of notification by the Authority.

8. Success of the Project

Success of the project will be measured by how well the Authority's concerns are addressed in the following areas:

a. Does adding the battery system support WMATA's ridership growth and increased number of cars in service? Will it help to sustain the line voltage on marginal sections of track thus assuring consistent train performance and a reduction of the risk of trains bunching, particularly after the introduction of additional 8-car trains?

b. Does the battery system provide a receptive load in braking – does it help to level out the energy consumption, allowing more of it to be used by the auxiliary equipment on the trains? Is the system compatible with the existing cars? Does it help in reducing harmful electrical transients? Is it compatible with the wayside fault detection system currently used?

c. Savings in energy will be the most significant factor. By doing baseline testing to characterize the system, WMATA will be able to measure the net energy savings and determine where in the demand cycle it occurs. From this, the projected annual return will be calculated, and the payback period can be determined using the installed cost of

the equipment. The forecasted cost of energy will be a factor in these calculations, as well as, any offsetting life-cycle and maintenance costs.

d. The impact on peak voltage drop will be measured and compared against the baseline. WMATA will be selecting areas where voltage is likely to be a problem. If the battery substation shows the expected reduction in peak demand, the savings could be equated to the cost of providing additional traction power feeder cables or of reducing the resistance of the third rail. The cost of these options will be assessed for feasibility and calculated for the analyses.

e. WMATA will be choosing locations where there is space for a battery substation installation. Available space is a constraint that will be evaluated for each location where any extension of the battery substation is considered.

f. A clear view needs to be established regarding the potential cost sharing partnerships with local utilities.

9. Standards and Regulations

The Contractor must be familiar and comply with appropriate local, state, and federal laws, regulations, and NEC associated with the installation and operation of the battery storage equipment. These standards include, but are not limited to AAR, ANSI, AMSE, ASTM, FRA, IEEE. Should the Contractor propose other or foreign standards as an alternative, the Contractor shall submit to the Authority documentation demonstrating that the proposed standards meet or exceed those identified in this specification. In the event that there are two (2) or more regulations covering the same item, the Contractor must adhere to the most restrictive regulation.

Enclosures used for outdoor equipment protection must be of the NEMA type or Authority approved equivalent. All enclosures must be fully insulated against electrical shock, and be properly vented to safeguard against the accumulation of gases.

10. Schedule

The complete program must be completed within one (1) calendar year following the Authority's NTP.