



April 26, 2013

To: Executive Board

Subject: **Approval of Sole Source Procurement: Nine (9) Electric Buses with Options**

Recommendation

Under the provisions of Foothill Transit's Procurement Policies and Procedures, it is recommended that the Executive Board approve a Sole Source Procurement with Proterra LLC for the purchase of nine (9) electric buses with options for eighteen (18) additional buses; and authorize the Executive Director to negotiate a contract containing appropriate terms and conditions with Proterra LLC.

General Background

In 2009, as part of Foothill Transit's organizational commitment to innovation and environmental stewardship, the agency committed over six million American Recovery and Reinvestment Act (ARRA) dollars to procure and deploy three electric buses and associated charging equipment. After issuing a Request for Interest, conducting a search and review of available suppliers, and finding only one bus manufacturer capable of producing vehicles meeting the stated needs of the project, on April 24, 2009 the Foothill Transit Executive Board approved a sole source contract award to Proterra, Inc. of Greenville, South Carolina (then Golden, Colorado) for the procurement of three buses and two sets of charging equipment. The contract included an option allowing Foothill Transit to procure an additional nine (9) buses from Proterra. In 2010, an in-route charging station was commissioned and three electric buses were deployed into heavy duty transit operations on Foothill Transit's Line 291.

In 2010, Foothill Transit was awarded a Transit Investment in Greenhouse Gas and Energy Reduction (TIGGER II) grant in the amount of \$10.17 million dollars for the purchase of nine additional electric buses and charging station enhancements. Foothill Transit intended to use the grant funds to exercise the option in the contract with Proterra, Inc.

In April 2012, Calyptus Consulting Group conducted an ARRA Procurement System Review on behalf of the Federal Transit Administration (FTA). This review focused on the Foothill Transit-Proterra procurement and resulting contract. At the completion of the review, the FTA recommended that Foothill Transit not exercise the option with Proterra.

The current service demands of Line 291, where the first three electric buses are in operation, mandate a peak demand of nine buses, and at least two spares. As such, Foothill Transit intends to procure nine or more all electric, zero emissions transit buses



using the TIGGER II funds. These electric buses will replace 40 foot compressed natural gas (CNG) buses that have reached or exceeded a useful life 12 years of 500,000 miles. The options will allow for expansion of Foothill Transit's electric bus program to other lines should that be deemed appropriate and feasible.

Existing Buses and Charging Infrastructure

In order to ensure the best and most effective use of public funds already invested it is imperative that the desired electric bus be able to utilize Foothill Transit's existing fast charge infrastructure located at the Pomona Transit Center (PTC) in Pomona, CA. This infrastructure was designed and constructed as part of the 2009 project to deploy the first three buses into service and supports full electrification of Line 291. The charging station's architectural and engineering cost was \$107,000 and the construction cost was \$590,000.

Foothill Transit identified the PTC as the best location for the in-route charging station for a number of reasons. The PTC is at the mid-point of Line 291, where most passengers on the northbound and southbound lines disembark to connect to other Foothill Transit or other local operator's bus lines. Since the existing buses have the capacity to travel approximately 30 miles per full battery charge, and Line 291 is 17.1 miles roundtrip, the PTC was the ideal operational location for installation of the charging equipment. Foothill Transit desires nine or more additional buses that can operate a minimum of 30 miles before recharging to fully accommodate the range requirements of this line.

The fixed infrastructure allows the bus to autonomously "dock" while the bus enters an existing and specially assigned bus bay to charge. This bay is specially assigned adjacent to the overhead charging infrastructure. The charging station features one central enclosure that houses two chargers, valued at \$1 million dollars each. Each charger feeds an overhead fixture that connects to a bus bar on the roof of the bus. The "charge arm" (part of the overhead fixture) lowers down as the bus aligns underneath it and slides into a bus bar located on top of the bus. Once a series of connections are met, the bus accepts a rapid charge. The current design is capable of simultaneously charging two buses, both northbound and southbound, and does not require any operator intervention. Passengers are able to board and alight the electric bus while it is charging. Maintaining this requirement is of the utmost importance to Foothill Transit so as not to disrupt the schedule or interrupt service to customers.

The above-described charging sequence occurs during predetermined "layovers," built into Foothill Transit's Line 291 schedule. A layover is "downtime" built into the schedule where the bus is not in operation, but is still in full revenue service. Layovers are found in all transit schedules and are strategically designed around traffic patterns and other trip planning considerations. The schedule for Line 291, and all other Foothill Transit



lines, is developed biannually by Foothill Transit based on the service demands, traffic patterns, and ridership levels of this specific line. Modifying the schedule to accommodate longer charging times will result in increased operating costs. A change would require new schedules, run cutting, operator bidding, and the creation of new "Bus Books" and other printed materials. Additionally, Foothill Transit may not be able to accommodate as many passengers if the schedule were changed to reflect longer charging times. This would affect at least two of Foothill Transit's Key Performance Indicators (KPIs), including ridership and farebox revenue statistics. These indicators measure the agency's success in delivering service.

Accordingly, new buses must be able to accept a high power fast charge sufficient to charge the batteries from a 10 percent to a 90 percent charge in under 10 minutes while the bus is at the PTC layover (the only site of the fixed charging infrastructure). The charging process must not disrupt the flow of traffic, boarding, alighting, or any other daily operational functions of this heavily visited transit center, where multiple bus bays are simultaneously utilized.

The existing system is able to accommodate lower impact grid connections while maintaining high charge rates. Essentially the system allows for the bus to charge directly "off the grid." As such, the power transfer must meet the existing grid connection requirements.

There are other existing fast charging methodologies, but they are either not feasible for Foothill Transit or would require a significant investment in new infrastructure technology and equipment. Wireless power transfer technology is a new technology that is still being tested. It would require infrastructure investment to install charging pads in the roadway which will add to the cost of this procurement. Another alternative for charging is "slow charging". A slow charging station is smaller and less costly than the fast charge station; however, one charging station is required for every two or three buses. They are usually installed at the "home" operations and maintenance facility for the bus fleet. The service schedule for the Foothill Transit electric buses requires them to be in service for 10-12 hours a day and charging with a slow charger takes three to four hours; so, buses are usually charged overnight. If Foothill Transit used slow charging for the additional nine or more buses, it would be forced to purchase an additional two shop chargers to have all nine buses fully charged during the off-peak hours and ready to begin service the next day. Foothill Transit's current battery powered buses are capable of operating 30-40 miles before charging is needed.

New Bus Requirements

To accommodate a “fast-charge,” the new buses must be designed with high voltage, high amperage capabilities and sufficient failsafe systems such as ground fault protection which would ensure passenger safety while boarding, disembarking, and/or remaining on the bus during the charging operation. In addition, battery charging at the layover must not impact service schedules or require special skills or assistance from the bus operator to complete the charge. The operator must be able to abort the charge operation and monitor the state of charge without leaving the operator seat so as not to impact daily operations on this line. Due to these requirements, “remote charging” at other locations on the route is not feasible. Remote charging (where the bus is “fueled” by a charging cable) would involve the operator leaving her seat while at a layover location.

The below listed minimum required capabilities and performance characteristics are intended to describe Foothill Transit’s needs relative to the procurement of additional electric buses and the reasoning behind each specification. These requirements are intended to indicate the type of transit bus and equipment desired by Foothill Transit and certain standards of bus performance which must be achieved.

- **Thirty-five to forty-two foot (35’ to 42’) foot Bus Length**
The 35-42 foot length constitutes a “full-size” heavy duty transit bus capable of meeting Foothill Transit’s existing service requirements, including passenger loads. Bus length determines the number of seats that the bus can accommodate and therefore the number of people.
- **Minimum 35 Passenger Seats**
Coaches on Line 291 transport five percent of Foothill Transit’s total ridership annually, or 750,000 people with only nine coaches in operation per day. To accommodate the heavy ridership demands of this line, Foothill Transit requires a minimum of 35 passenger seats.
- **Altoona Tested**
FTA’s Bus Testing Regulation (49 CFR Part 665) applies to buses acquired with FTA funding to provide public transportation service. Essentially this regulation states that Original Equipment Manufacturers (OEMs) who intend to build and sell more than five (5) buses in the United States and purchased with federal funds must have their bus “Altoona tested” before they can legally sell the sixth bus. As Foothill Transit intends to use FTA grant funds for this procurement, Altoona testing is a non-negotiable requirement.



- **New Bus/Original Manufacturer**
Foothill Transit requires that the supplier of the vehicle be a fully integrated bus manufacturer and that it supply a new, fully manufactured bus that utilizes electric bus technology. Foothill Transit does not seek to purchase technology placed into a repurposed bus.
- **In-Route Fast Charge Compatibility**
The electric bus and associated battery technology must be capable of accepting a rapid charge. Specifically, the battery must retain its energy reserve and charging profile from 10,000 to 25,000 charge discharge cycles and can be quick charged from a 10% to a 95% charge in three to ten minutes while the bus is at a layover. The batteries must have an IP rating of 65 or better, must incorporate a cooling system and must have the ability to be replaced in under two hours. Battery technologies that have a state of charge (SOC) memory are not acceptable. The battery must accept a full fast charge at any state from 5% to 95% SOC.
- **140 mile Range**
In order to meet the service profile of Line 291, the battery/drive system should be capable of powering a fully loaded bus for a minimum of 140 miles per day without returning to the shop to charge. This must be accomplished even under the worst environmental conditions.
- **Zero Emission**
To comply with the language proposed in the TIGGER II grant and in order to meet the California Air Resources Board (CARB) Zero Emissions Bus purchase rule, the electric bus must be a zero emission bus.
- **Advanced design**
In order to encourage increased ridership and attract discretionary riders by presenting a futuristic image, moving forward all revenue fleet bus purchases are desired to be of an "advanced design"--appearing progressive and modern, taking on the attributes of aerodynamic high speed rail vehicle styling.
- **ADA Compliant**
Foothill Transit requires electric buses that are available for use by the widest possible spectrum of passengers including children, adults, the elderly, and people with disabilities. The buses must be fully compliant with the Americans with Disabilities Act of 1990 (ADA).
- **Buy America Compliant**
The new buses must comply with the applicable Buy America requirements set forth in 49 U.S.C. 5323(j) and the applicable regulations in 49 C.F.R. Part 661, as



amended. Buy America requirements mandate that the electric bus be a minimum of 60 percent domestic component content and meet U.S. final assembly requirements.

- **Compatible with Existing Fleet**

In order to keep operating costs as low as possible, the desired buses should, where possible, promote standardization with the existing Foothill Transit fleet. The new buses shall incorporate a high level of subsystem integration coordinated with central diagnostic functions and "off the shelf," readily available components. Foothill Transit stresses fleet compatibility in all bus procurements. Compatibility increases familiarity amongst maintenance technicians and bus operators, reduces the need for additional training, and decreases the amount of necessary inventory.

- **Composite Body Structure**

Foothill Transit prefers to procure a vehicle with a composite body structure. A composite body is typically 20-40 percent lighter in weight and therefore satisfies the need for an electric bus to be lightweight to conserve energy and isolate the on board energy storage and flow of electric current. Composite bodies are also a more financially prudent option for transit agencies to employ as the body itself has an expected 30 year life and reduced repair costs compared to today's conventional and steel or aluminum body buses. In addition to the inherent safety improvements from the crash resistant composite body, it is desirable to have a bus body made of non-conductive material to ensure the safest environment for a fast charge electric vehicle.

The three electric buses that Foothill Transit currently has in revenue service meet all requirements listed above and the vehicles are currently consistently operating 100 percent of service (140 miles per bus per day). Uptime on these vehicles currently exceeds 90 percent.

Potential Sources of Supplying Buses

While battery powered buses are new to the US transit market, a number of manufacturers have recently indicated interested in supplying them. Of the four suppliers of standard transit buses for the US market; Gillig, NABI, New Flyer and Nova, only two have announced plans to pursue battery buses. The details of their efforts are detailed below. There are several specialty electric bus manufacturers who are pursuing the US battery-electric bus business.

Proterra has already commenced commercial production of fast charge, battery-electric buses. In addition to the three buses currently in successful revenue operation at Foothill Transit, Proterra has delivered three buses to VIA Metropolitan Transit Authority



in San Antonio, Texas; three to Star Metro in Tallahassee, Florida; and two to San Joaquin Regional Transportation District in Stockton, California. Currently under production are four buses for Regional Transportation Commission in Reno, Nevada and five buses for Clemson Transit in Seneca, South Carolina. Proterra also has a contract with the Worcester, Massachusetts Regional Transportation Authority for six buses and production is scheduled to commence in March 2013. The Proterra bus is the only battery-electric bus to have completed the FTA Altoona Test Program.

eBus is an electric bus provider headquartered in Downey, CA. As explained herein, eBus re-powers existing or used transit vehicles by installing their specially designed battery equipment. They have produced five 22-foot battery-electric powered trolleys for LINK Transit in Wenatchee, WA. These vehicles are recharged in 30 minutes. eBus recently developed a prototype 22-foot traditional transit bus for Utah State University which they intend to test in campus service. They have indicated an interest to build a 40-foot battery-electric bus, but have yet to produce a prototype. eBus does not currently produce an electric bus that has completed the FTA Altoona Test Program.

DesignLine is a bus builder from New Zealand that moved its headquarters to the US in 2008 when it decided to build buses for the US hybrid bus market. The bus they currently produce is not a true Zero Emission battery powered bus, but is an extended range hybrid-electric bus capable of operating as a pure electric bus for short periods of time. This bus cannot be fast charged. DesignLine has indicated an interest in building an all-electric-battery bus for the US transit market, but have not produced a prototype. DesignLine does not currently produce an electric bus that has completed the FTA Altoona Test Program.

BYD is a vertically integrated Chinese electric bus manufacturer that has indicated an interest in building a battery-electric bus for the US market. They produced their first all-electric bus in 2010. They have since delivered over 200 battery-electric buses for the Chinese market. BYD has a Chinese built demonstrator bus that has been used in test service in several American cities. It was recently used by Hertz to transport customers at LAX airport. BYD has yet to build a prototype for the US transit market. BYD was recently the successful proposer to provide electric buses to Long Beach Transit. BYD does not produce an electric bus that has completed the FTA Altoona Test Program.

Complete Coach Works (CCW) remanufactures retired diesel buses into electric buses by replacing the conventional propulsion system with an electric motor and Chinese-manufacturer batteries. Their product is called Zero Emission Propulsion System (ZEPS). The ZEPS bus can travel 100 miles on a single charge but does not possess fast charge capabilities; it must be slow charged during the evening. CCW has delivered one demonstration bus to Ben Franklin Transit in Richland, Washington. CCW has not announced any plans to deliver additional buses. Because this bus does not have the capacity to fast-charge in-route and its range capabilities fall short of the



required 140 mile duty cycle (160 miles including deadhead), it is not suitable for operations on Foothill Transit Line 291. CCW does not produce an electric bus that has completed the FTA Altoona Test Program.

New Flyer is partnering with Mitsubishi Heavy Industries to develop and test a battery powered electric bus. Their program calls for the construction of four rapid-charge battery-electric buses for Winnipeg Transit and two for the Chicago Transit Authority. Delivery is scheduled for late in 2013. The performance of these buses will be documented over a four year period. New Flyer is hoping that the initial tests will be successful which will allow them to begin seeking orders for production buses within a year or two. New Flyer does not currently produce an electric bus that has completed the FTA Altoona Test Program.

Nova Bus is partnering with the Province of Quebec and several local suppliers to design and build a prototype battery-electric bus by 2015. Nova has not indicated when they expect to begin building production buses. Nova Bus does not currently produce an electric bus that has completed the FTA Altoona Test Program.

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The chart below details the competitive landscape for the electric transit bus market.

Bus Manufacturer	New/Original Bus Manufacturer	Composite Body	Altoona Tested	Buy America Compliant	Buses In Revenue Service	On-Route Fast Charging Available	Available for Uninterrupted Full Day Service (18 hrs., 140 miles)
Proterra	Yes	Yes	Yes	Yes	Yes	Yes, <10 minutes	Yes, can operate full day
BYD	Yes	No	No	Vertically integrated Chinese manufacturer. No existing U.S. manufacturing	No	No, 3-6 hours	No, must return during day to shop to charge
Nova Bus	Yes	No	No	Not expected for electric bus, Canadian consortium	No	No, 4 hours	No, must return during day to shop to charge
New Flyer	Yes	No	No	Not expected for electric bus	No	No, >1 hour	No, must return during day to shop to charge
DesignLine	Yes	No	No	Unknown	No	No, 6-8 hours	No, must return during day to shop to charge
CCW	No	No	No	Unknown, Electric system content largely foreign	No	No, 4-6 hours	No, must return during day to shop to charge
eBus	No	No	No	Unknown but possible	No, 22 trolley Only	Borderline, 30 minutes	No, cannot charge within normal layover

**No information available for a 35-50 foot electric transit bus from manufacturer eBus.*

Sole Source Justification

After a careful review of the potential suppliers of a bus that meets Foothill Transit's requirements, full and open competition simply is not feasible. A careful study of the

products offered by the sources identified above and individually addressed in the above chart support the conclusion that only one manufacturer can produce a vehicle at this time that meets Foothill Transit's needs and requirements. If Foothill Transit were to conduct a competitive procurement, the above information clearly supports the conclusion that no manufacturer other than Proterra has a commercial product currently available that meets Foothill Transit's operating and design requirements, which is fully compliant with all Federal requirements, and which can be delivered within Foothill Transit's time constraints.

Under Foothill Transit's Procurement Policies and Procedures, a sole-source procurement is justified because the evidence supports a finding that the buses are available only from a single source since the manufacturer of the bus offers a unique or innovative concept or capability that is not available from another source. The bus offered is a unique, innovative concept, the details of which are confidential, patented or copyrighted, and is available to Foothill Transit only from one source and is not available to Foothill Transit from another source.

Documented throughout this report is a detailed discussion of Foothill Transit's requirements that the buses to be procured under this procurement must be capable of being integrated with Foothill Transit's existing in-route charging system without any requirement for the addition of new infrastructure or re-design of the existing infrastructure. In addition, the new buses must be capable of meeting all of Foothill Transit's requirements for fast-charge while on route. Buses potentially available from manufacturer's other than Proterra simply cannot meet either of Foothill Transit's critical performance requirements.

Proterra is currently the only electric bus manufacturer that can fully integrate with Foothill Transit's existing infrastructure, fully designed and installed by, and proprietary to Proterra. Proterra is currently the only manufacturer whose design meets the mileage requirement of uninterrupted service as a result of their on-route fast charge capability.

Foothill Transit seeks to fully integrate fast-charge technology buses on to Line 291. While Foothill Transit recognizes that some manufacturers have demonstration models of some type of fast-charge buses, Proterra is the sole existing manufacturer of fast-charge buses at this time, whose bus has fully completed of the so-called Altoona testing requirements and is the only entity with full-scale production underway.

Complete electrification of Line 291 buses as soon as possible is necessary to assist Foothill Transit in determining whether the use of fast-charge buses as an option on other routes in the future. While it is possible that other manufacturers could have an Altoona-tested bus in the future, currently there are no electric buses being tested at Altoona; and the length of the test process (approximately six months in duration) for



any bus tested in the future would significantly delay Foothill Transit's procurement and deployment requirements.

Proterra is the only manufacturer that is building battery powered buses in North America on a production scale. All other potential suppliers of electric buses are still developing and testing prototype buses, none of which have been Altoona tested. Proterra is currently delivering buses within approximately six months of contract award. The other suppliers are at least one year and as much as three years away from building battery buses on a production scale.

Budget Impact

The cost of nine additional electric buses is estimated at \$10,478,600, based on the most recent sale of electric buses in the U.S. transit industry. This estimate includes the purchase of nine (9) electric buses, and includes all known project costs, including sales tax. Funding for this project was approved by the Foothill Transit Executive Board in the FY 2013 business plan.

Sincerely,

Roland M. Cordero
Director of Maintenance and Vehicle Technology

Doran J. Barnes
Executive Director