SUBJECT: RENEWABLE ENERGY TECHNOLOGIES AT METRO GOLD LINE

ACTION: AUTHORIZE CEO TO NEGOTIATE AND EXECUTE A SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD) GRANT

RECOMMENDATION

A. Authorize the Chief Executive Officer (CEO) to negotiate and execute a contract agreement with Kinetic Traction Systems, Inc. (KTSi) to utilize South Coast Air Quality Management District (SCAQMD) grant from the Rule 1309.1 Mitigation Fund that will fund the design, manufacture, installation, testing, and monitoring of a one-megawatt (MW) wayside energy storage system (WESS) and a two-kilowatt (kW) photovoltaic system for the Metro Gold Line; and

B. Establish Project 500012 (Gold Line Renewable Energy Systems) and allow existing staff to support this project, commencing in FY12 until completion

ISSUE

Sustainability and energy efficiency is a central LACMTA focus and commitment, cutting across virtually all aspects of the agency’s mission, vision, values, and core business goals. We annually spend on average approximately $26 million to $29 million for electricity. About $20 million of this are for propulsion power. The remaining amount is for operation of bus and rail maintenance facilities, layovers, terminals, and headquarter buildings.

As the years progress, Metro has seen electricity costs rise due to periodic utility rate increases. Staff believes that in the volatile and costly energy market, embracing sustainability, energy efficiency, conservation, and installation of renewable energy sources is a primary pathway towards gaining control of, and reducing our energy usage and costs and gaining energy independence.

In our Board-adopted Renewable Energy Policy, Metro committed to a stretch goal of an additional 13% renewable energy use by 2020 above our current usage baseline of
20%. This will be achieved through the continued deployment of applicable, feasible, and practicable renewable energy sources at our sites.

Metro has already deployed over two-megawatts of electricity from renewable energy sources (i.e., photovoltaic sources) in the last five years; and has received federal funding in 2009 to install a wayside energy storage system pilot at Metro's Red Line McArthur Park Station. We are currently installing additional photovoltaics at our El Monte Station and at the Metro Orange Line Extension, and developing proof of concept protocols to harvest wind at our subway tunnels for energy. We will be releasing a procurement document later in the year to map out a comprehensive renewable energy program consistent with the plans outlined in our Energy Conservation and Management Plan.

Simultaneous with these efforts is the continuing emergence of funding opportunities to install pilot projects at our facilities such as those coming from federal, state, and other sources. These funding sources assist in the fulfillment of our renewable portfolio expansion using minimum Metro financial resources.

One such opportunity is the availability of funds through Kinetic Traction Systems Inc. to use South Coast Air Quality Management District Grant from the Rule 1309.1 Mitigation Fund. This grant allows for the design, manufacture, installation, testing, and monitoring of a one-MW wayside energy storage system for the LACMTA Gold Line; including the incorporation of a two-kW photovoltaic system on the modular power control center to power some of the WESS ancillary equipment. This grant was applied for by KTSi with no Metro involvement or endorsement, but with the intent of using the funds at a Metro site.

**DISCUSSION**

In May of 2011 the South Coast Air Quality Management District (SCAQMD) requested proposals (RFP #2011–21) for the deployment of in-basin renewable distributed electricity generation and storage. One of the AQMD priority initiatives in 2011 was to incentivize in-basin energy storage to support electric transportation technologies, such as Metro’s rail system.

Using publicly available information, KTSi applied for this grant with the intent of using the funds at Metro’s Avenue 61 Gold Line Station. The purpose of this project is to help SCAQMD accomplish its in-basin energy storage goal by installing one-MW of energy storage on the Metro rail system. An additional photovoltaic system will also be installed on the modular power control center to power some of the WESS ancillary equipment. When the project is completed, Metro is anticipated to realize an electricity demand reduction while demonstrating improved operational performance.

The total project cost is $3,130,974 with the SCAQMD funds totaling $2,473,469. The remaining funds are to be provided by KTSi.
This project is anticipated to be completed within a five year timeframe and allocates at least $800,000 of the grant to pay for Metro staff time. The final allocation amount to Metro will be determined at the conclusion of the negotiations of the contract agreement with Kinetic Traction Systems, Inc. If the pilot is successful, Metro will keep the WESS and solar panels at the end of the project.

By integrating the WESS with the rail traction power system, braking energy is captured as a train enters a station, converted and stored as kinetic energy, and later regenerated into clean, instant power to accelerate a train leaving a station. In addition, the flywheels provide voltage support to increase capacity in the system and improve the voltage regulation along the track. The result of this technology significantly reduces electrical power consumption, improves train performance, decreases resistor bank heating (wasted energy), and minimizes carbon emissions.

Cost-Benefit

There are multiple components of a cost-benefits analysis of applying this WESS to the Metro light rail system. The current Gold Line traction power substations are conventional transformer and rectifier systems that pull AC voltage from the utility grid and convert it to DC traction power. At the proposed Avenue 61 location, the existing traction power substations are over two miles apart. The KTSi WESS is a DC energy storage system that connects directly to the existing DC network to capture available braking energy, correct low voltage occurrences, and satisfy peak power demands supporting train electrical loads. This eliminates the need for the high voltage AC utility line connection, transformer, rectifier, and AC switchgear along with utility permitting, installation, and connection costs.

A Turner Engineering study conducted in 2008-2009 for Metro documented the capital cost advantage of the WESS versus a conventional traction power substation as a 46% capital cost savings. KTSi also found that their WESS design for the Long Island Rail Road was over 60% capital cost savings versus the conventional traction power substation alternative.

The study by Turner Engineering also indicated substantial energy cost savings on the Gold Line could be achieved by installing a WESS. The study estimated a $43,000 per year cost savings based on an electricity unit rate of $0.064/kilowatt-hour. This estimate was based on a number of factors including the relative low voltage in that area, poor receptivity, headway schedules, grade, and train operating profiles. However, using Metro's 2011 electrical billing data from all utilities, the average electricity unit rate is $0.128/kilowatt hour. Using the same Turner Engineering data but at the more realistic electricity unit rate, our average projected savings using this technology at this one location could be as much as $86,000 per year.

The additional potential benefits of the WESS as installed on the Gold Line can potentially include:
- Elimination of slowdowns and stop/start by correcting low voltage occurrences, increasing system reliability through greater power capacity; and
- Redundancy in power source for adjacent substation outage or emergencies.

A typical system of this nature is anticipated to result in a 7 to 10 year payback period and has an expected life of more than 20 years. This project is anticipated to realize an accelerated payback period of about 1 to 2 years.

System Impacts

Staff has reviewed the conceptual design of the proposed project and will be actively involved in the final design to eliminate system impacts. Analysis during design will include modeling and system analysis to measure specific reduction in voltage fluctuation of the system and reduction in wasted energy from train braking. The agreement will also include a comprehensive discussion of KTSi turnover of the WESS after pilot conclusion; as well as the maintenance and other provisions to ensure integrity of Gold Line operations prior to, during, and the conclusion of this pilot effort.

Comparison to the FTA-funded WESS Project

There are a small but growing number of companies providing energy storage systems for electrified rail applications. The technologies include flywheels, ultracapacitors, and battery based systems. Flywheels are mechanical kinetic energy storage devices and not based on complex electro-chemical processes. The flywheels identified for use in this pilot have the benefit of 20-year lifecycles and the ability to complete over 1,000 charge-discharge cycles per day without performance deterioration. For these reasons, Metro staff selected flywheel energy storage technology for the Red Line McArthur Park Station.

The WESS for this SCAQMD project is also intended to demonstrate the suitability of this energy storage technology in a light rail application compared to the heavy rail application on the Red Line FTA project. In addition, the fundamental purpose of this application is voltage support in contrast to energy recovery and savings in the FTA project. Through this project we will be able to validate the benefits of energy storage on our transit systems in general; and specifically the advantages of using flywheels as a WESS.

Once the SCAQMD project is completed, and if successful, Metro will have flywheel WESS installations on both heavy rail and light rail systems that are optimized for energy savings and voltage support, respectively.

DETERMINATION OF SAFETY IMPACT

There is no impact on safety as a result of this contract award.
**FINANCIAL IMPACT**

The cost accumulated in project 500012 will be fully reimbursed by the executed contract with KTSi. This will be a no cost project with Metro. The grant also seeks no financial match from Metro.

No Life of Project Budget will be required as all incurred costs will be reimbursed by the SCAQMD through KTSi. Costs to be incurred in FY12 will initially come from a re-allocation of funds from an underrun in project 300012 to Project 500012. Thereafter, the project will be funded through KTSi reimbursements.

A minimum of $800,000 of the SCAQMD Grant from Rule 1309.1 Mitigation fund is allocated for Metro charges. Final amount will be determined prior to the execution of the agreement for this project with Kinetic Traction Systems, Inc., up to a projected maximum of $1,600,000.

Since this is a multi-year project, the Executive Director, Transit Project Delivery will be responsible for budgeting in future years and ensuring cost recoveries from KTSi.

**Impact to Budget**

A. Source of funds: South Coast Air Quality Management District Grant from Rule 1309.1 Mitigation Fund.

These funds are not eligible for Metro Bus and Rail Capital and Operating expenses. This activity will not impact ongoing operating costs because the cost for operating and maintaining the WESS and the solar panels will be offset by the minimum $800,000 of the grant that is allocated for Metro personnel. The final amount of Metro’s share will be determined during the agreement negotiations.

The grant seeks no financial match from Metro. At the conclusion of the project period, Metro will determine if the WESS and the solar panels associated with the WESS meet the acceptable parameters of the project. At that time, Metro will either retain or remove the equipment from the affected facilities. If removed, KTSi will incur removal and decommissioning costs.

**ALTERNATIVES CONSIDERED**

Metro can choose not to accept this SCAQMD grant, but staff recommends otherwise. We have previously benefited from the execution of small grants such as this one. We have recently proven that the development and implementation of large scale programs usually emerge from the results of small pilot efforts.

In the past, we have missed out on opportunities like this grant because majority of our limited human resources are typically allocated for the development of large grant applications.
Rejection of the recommended Board action would also result in an opportunity cost to avail of the implementation of emerging technologies and infrastructure that can accelerate the fulfillment of the stretch goal stated in our Board-adopted Renewable Energy Policy.

NEXT STEPS

After the recommended Board Action is approved, staff will engage with KTSi, evaluate the terms of an agreement, and make the appropriate recommendation for CEO execution.

Prepared by: Cris B. Liban, Environmental Compliance and Services Department Manager

ATTACHMENT

Attachment A. Gold Line Renewable Energy Systems, Funding/Expenditures Plan
Krishniah N. Murthy  
Executive Director, Project Transit Delivery

Arthur T. Leahy  
Chief Executive Officer
### Gold Line Renewable Energy Systems Funding/Expenditures Plan

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<th>FY13</th>
<th>FY14</th>
<th>FY15</th>
<th>FY16</th>
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#### Sources of Funds

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**Total Project Funding**

| (1)(2) | $50,000 | $280,000 | $140,000 | $110,000 | $110,000 | $110,000 | $800,000 | 100%       |

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(1) Project 500012 to be initially funded by underruns from Project 300012: Environmental Remediation budget. Thereafter, funds reimbursed shall be returned to 300012 and remaining project tasks funded until completion by Kinetic Traction Systems, Inc. (KTSi).

(2) Metro is guaranteed at least $800,000 from the SCAQMD grant to cover incurred costs. Final amount will be determined prior to the execution of the agreement for this project with KTSi, up to a maximum of $1,600,000.