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DATE: December 15, 2011

TO: SJVUAPCD Governing Board



FROM: Seyed Sadredin, Executive Director/APCO
Project Coordinator: Samir Sheikh

RE: **APPROVAL OF PROJECT SELECTIONS AND
ADDITIONAL FUNDING FOR THE DISTRICT'S
TECHNOLOGY ADVANCEMENT PROGRAM**

RECOMMENDATIONS:

1. Approve the selected projects from the District's Technology Advancement Program's July 5, 2011 Request for Proposals and authorize the Executive Director/APCO, on behalf of your Board, to execute agreements with the Board Chair's signature for the following projects:
 - a. \$350,000 for Pure Power Technologies' proposal to demonstrate a non-urea NO_x reduction retrofit system for diesel trucks.
 - b. \$300,000 for California Bioenergy's proposal to demonstrate advanced two-staged controls to a biogas engine system to achieve near zero NO_x.
 - c. \$258,000 for US Hybrid Corporation's proposal to demonstrate a plug-in hybrid wheel loader in a dairy application.
 - d. \$75,580 for Energy Conversions, Inc's proposal to demonstrate a natural gas conversion kit for two stroke diesel locomotive engines.
 - e. \$270,534 for Electricore, Inc's proposal to demonstrate a fully autonomous agricultural sprayer based on a zero-emission, all-electric vehicle platform.
 - f. \$28,250 for Sun-Maid Growers of California's proposal to demonstrate an emissions reducing raisin tray burning system.

- g. \$300,000 for Thermata's proposal to demonstrate a concentrating solar steam system to offset boiler fuel consumption and emissions.
 - h. \$292,830 for US Hybrid Corporation's proposal to demonstrate a plug-in hybrid propane/electric work truck.
 - i. \$250,000 for Leva Energy Inc.'s proposal to demonstrate a power-generating burner that recovers wasted energy through a microturbine.
 - j. \$242,500 for the City of Manteca's proposal to demonstrate a serial hybrid hydraulic refuse truck.
 - k. \$230,000 for the Association of Compost Producers' proposal to demonstrate a positively aerated static compost pile system utilizing electric conveyers and equipment.
 - l. \$350,000 for PG&E Fleet Engineering's proposal to demonstrate an extended range electric drive Class 6 bucket truck with electric worksite operation capacity.
2. Authorize the Executive Director/APCO, on behalf of your Board, to select projects identified in this Request for Proposals if one or more of the above projects is unable to accept the funding offered, or to reallocate funding to future competitive selections.
 3. Allocate funding of \$3,000,000 for the next Technology Advancement Program Request for Proposal to solicit additional demonstration projects for advanced emission reduction technologies.

BACKGROUND:

Despite major reductions in emissions and corresponding improvements in air quality, San Joaquin Valley continues to face difficult challenges in meeting the federal ambient air quality standards. As an extreme non-attainment area for ozone, the District's *2007 Ozone Plan* contains a "black box" that represents necessary reductions in emissions for which a technology has not yet been identified. At the same time, the United States Environmental Protection Agency (EPA) is in the process of promulgating more stringent air quality standards. It is virtually impossible for the San Joaquin Valley to attain the new standards for ozone and particulates without significant advancements in low-emission technologies for mobile and stationary sources.

On March 18, 2010, your Board approved the District's Technology Advancement Program, a strategic and comprehensive program to identify, solicit, and support technology advancement opportunities. The program's primary goal is to advance

technology and accelerate the deployment of innovative clean air technologies that can bring about emission reductions as rapidly as practicable.

On December 16, 2010, your Board approved project selections from the program's first competitive request for proposals (RFP) allocating \$1.2 million in funding for six projects. With that approval, your Board allocated a further \$1,380,000 in incentive funding for the second Technology Advancement Program RFP. To that end, District staff issued a competitive RFP on July 5, 2011. An additional \$658,501 in funding was reallocated to this RFP from the previous RFP as three of the six selected projects were cancelled at the applicants' requests. Furthermore, given the significant number of high-quality projects proposed under this RFP, the District recommends utilizing an additional \$909,193 of currently appropriated funds for the recommended selection of projects totaling \$2,947,694.

DISCUSSION:

Improved program recognition and expanded outreach for this Technology Advancement Program RFP, including collaboration with the Environmental Protection Agency, resulted in a significant increase in submitted proposals. The District received proposals for fifty projects, requesting over \$13 million in funding. The proposals included multiple projects from each of the three technology focus areas identified for the program; renewable energy, waste solutions, and mobile sources. The projects were scored in five weighted categories, with a maximum possible of 100 points.

Scoring Categories

Relevance to Attainment Plans (35 points)—This category includes an assessment of the benefit provided by a proposed technology in assisting the Valley to comply with federal air quality standards, particularly for ozone and particulates. Important factors include the size of the source category that might benefit from the technology, and the potential emission control effectiveness of the technology. Another consideration includes the potential for the source category benefitting from the proposed technology to significantly grow, and thus require the need for additional emissions reductions.

Co-Benefits (15 Points)—This category includes an assessment of other emissions benefits provided by a proposed technology, in addition to those that assist the Valley in complying with federal air quality standards assessed under *Relevance to Plans*. This includes toxic air contaminants, green house gases, and nuisance emissions. Cases where a proposed technology could cause other emissions increases would be assessed unfavorably in this category.

Technology Cost-effectiveness (20 points)—This category includes an assessment of the expected cost-effectiveness of a proposed technology, including the economic viability of a proposed technology upon commercialization. Information used to make this assessment includes the projected cost of the technology, and the expected control effectiveness of the technology. Final scores in the category were influenced by how well information was justified through supporting documentation.

Funding Requested and Leveraging (20 points)—This category includes an assessment of the value a proposed project contains in terms of requested funding, the percentage of the total project cost that represents, and the amount of non-District funding and other resources being brought into the project. Final scores in this category were influenced by how well funding and leveraging commitments were justified through supporting documentation.

Project Readiness (10 points)—This category includes an assessment of how prepared the project is to begin operations, and how likely the project is to succeed. Final scores in this category were influenced by supporting documentation from project partners, including host cites and funding partners, as well as the established history of the proposing company and their history of cooperation with the District. The scoring process resulted in the following ranking and recommendation to fund the top nine projects at the levels indicated in the table below, with the next thirteen projects as backup projects:

Company	Score	Recommended Funding	% of Total Project Cost	% of Requested Funding
Pure Power Technologies	66.75	\$350,000	35%	100%
California Bioenergy	66.50	\$300,000	59%	78%
US Hybrid Corporation (Hybrid Wheel Loader)	66.25	\$258,000	35%	100%
Energy Conversions, Inc.	63.50	\$75,580	20%	100%
Electricore, Inc.	62.00	\$270,534	100%	100%
Sun-Maid Growers of California	61.50	\$28,250	40%	100%
Thermata, Inc.	58.00	\$300,000	29%	100%
US Hybrid Corporation (Hybrid Work Truck)	56.00	\$292,830	43%	100%
Leva Energy, Inc.	55.25	\$250,000	33%	50%
City of Manteca	52.50	\$242,500	43%	100%
Association of Compost Producers	52.25	\$230,000	75%	100%
PG&E Fleet Engineering	52.00	\$350,000	31%	100%
Total		\$2,947,694		

Your Board's approval of this item will enable Staff to finalize contracts with the applicants. Two of the proposed projects are recommended for funding at a lower level than is requested in their proposals.

Proposal Summaries

PurePOWER Technologies

Santa Clara, CA

Mobile Sources Technology Focus Area

PurePOWER Technologies proposes to demonstrate and test a prototype NO_x reduction retrofit system with selective catalytic reduction and a rechargeable, solid-state ammonia after-treatment system. The project proponent will demonstrate this technology on two 2007-2009 model year medium heavy-duty diesel trucks in the Valley. The proposal indicates that the after-treatment system will sufficiently reduce NO_x to meet the current 2010 emissions limit.

If successful, this technology will have a positive impact on heavy-duty diesel truck emissions inventory; therefore, the project ranked high in the relevance-to-plans category. Also, if successful, this technology should prove to be a cost-effective alternative option to urea NO_x reduction retrofit systems.

California Bioenergy

Dallas, TX

Renewable Energy and Waste Solutions Technology Focus Areas

California Bioenergy proposes to optimize and expand the emissions control systems used at the Bidart Dairy digester in Bakersfield, California. The digester gas system currently uses a non-selective catalytic reduction (NSCR) system. The project will tune the NSCR system to achieve very low NO_x emissions, and install a second after-treatment system that uses hydrogen selective catalytic reduction to reach near-zero NO_x emissions.

The District is interested in the success of clean bioenergy production through the use of biowaste, particularly in terms of developing ultra low-NO_x technologies to mitigate the potential impact from the large-scale development of these types of projects. Projects such as this one, if successful, move the Valley closer to that goal. This proposal scored relatively high in the relevance-to-plans category based on the potential to reduce NO_x emissions and demonstrate viable bioenergy options. The ability of digester projects like this to reduce greenhouse gas emissions adds to the relatively high score in the co-benefits category.

*US Hybrid Corporation
Torrance, CA*

Mobile Sources Technology Focus Area

The project proposed by US Hybrid is to collaborate with CALSTART to convert a Terex OEM wheel loader to plug-in hybrid operation, and identify fuel savings and emission reductions. Hybrid electric technology, which has been available in the light-duty vehicle category in the past, is only recently being applied to off-road vehicles. This proposal will advance the transfer of this technology into this category, and serve to verify and quantify the emission reductions associated with the system. The wheel loader will be tested at Maddox Farms, a dairy located in Fresno County. The proposed hybridization includes electric-only operation, idle elimination, and provides power for electric attachments.

The outcome of this proposal has the potential to affect a large segment of the off-road vehicle emissions inventory; therefore, this project ranked high in the relevance to plans category. Likewise, the reduced fuel usage and associated greenhouse gas reductions helped this proposal to rank high in the co-benefits category. The expected fuel savings will also reduce the long-term cost of ownership for the technology, resulting in good overall cost-effectiveness.

This project was originally proposed by Terex and selected for funding during the previous Technology Advancement Program RFP. Terex was unable to continue the project and cancelled their participation; however, their project partner, US Hybrid, wished to complete the project and resubmitted the proposal under the current solicitation.

*Energy Conversions, Inc.
Tacoma, WA*

Mobile Sources Technology Focus Area

The project proposed by Energy Conversions Inc. (ECI) will demonstrate ECI 100% natural gas pre-chamber conversion kits on large, locomotive diesel engines. The first stage of the project will test two large, 2-stroke diesel engines equipped with ECI conversion kits. The test engines will be Electro Motive diesel locomotive engines. After conversion, the engines will be tested to determine if they meet Tier-2 emissions standards for locomotive and marine engines. During the second stage of the project, ECI will install one of the conversion kits on a short-line locomotive, and test the other engine will to determine if it can meet Tier-4 standards when equipped with exhaust-gas recirculation and a diesel-oxidization catalyst.

The conversion from a diesel-fuel fired locomotive to a natural gas powered engine has significant emission reduction benefits, thus its relatively high score in the relevance-to-plans category. Likewise, such a conversion helps to reduce greenhouse gas emissions, which helped this proposal score high in the co-benefits category. The

District's portion of the entire project is only 20.4%, with ready commitment from ECI for the remainder. This assisted the proposal in receiving a high score for project readiness.

Electricore, Inc.

Valencia, CA

Mobile Sources Technology Focus Area

Electricore, Inc. proposes to build and demonstrate the world's first zero-emission, completely autonomous agricultural spray vehicle. Electricore will work with Trexa, LLC, who has developed a low-cost, commercial, electric off-road vehicle platform that will be combined with a commercial orchard pull-rig agricultural spray trailer. Electricore will oversee the demonstration at Tech Agricultural's farms outside of Buttonwillow, in Kern County. The vehicle will operate autonomously based on robotics developed by the Robotics Institute at Carnegie Mellon University.

Successful implementation of this technology could have a significant impact on the inventory of emissions from agricultural tractors, which are numerous in the Valley. Therefore, the project ranked high in the relevance-to-plans category. Likewise, the reduced fuel usage and the associated greenhouse gas reductions helped this proposal to rank relatively high in the co-benefits category. The selection of this proposal is also a function of its readiness to implement and reputation of the technology innovators—specifically Carnegie Mellon University.

Sun-Maid Growers of California

Kingsburg, CA

Waste Solutions Technology Focus Area

Sun-Maid Growers will modify and test a mobile prototype device called the Burn Boss® Air Curtain Burner. Successful use of this device will reduce emissions resulting from the burning of paper raisin trays used during the grape harvest. The technology has been shown to significantly reduce visible smoke and NO_x emissions compared to open burning.

The grape harvest coincides with District's highest ozone levels; reductions of these emissions greatly benefit air quality. Therefore, this proposal scored high in the relevance-to-plans category. The relatively low requested funding amount, combined with the readiness of the project to move forward, helped this project score high overall.

Thermata, Inc.

Pasadena, CA

Renewable Energy Technology Focus Area

Thermata, Inc. proposes to develop and demonstrate a pilot-scale roof-top concentrated solar-powered steam generation system to offset fossil-fuel used in conventional industrial boiler systems. Styrotek, Inc., in Delano, is the proposed host

facility. The solar-driven system provides maximum NO_x reduction when it's needed most—during the daytime and in the summer.

Potential NO_x reductions from the Valley industries with the need to generate steam and appropriate solar access result in a strong relevance-to-plans category score. The offset of fossil fuels for steam generation additionally resulted in a high co-benefit score.

*US Hybrid Corporation
Torrance, CA*

Mobile Sources Technology Focus Area

The project proposed by US Hybrid, in partnership with CALSTART and Roush, will demonstrate a plug-in electric-hybrid propane utility truck using a Ford F-250 truck base. US Hybrid will demonstrate and test the utility truck at Maddox Farms near Riverdale, California. The demonstration and testing will identify NO_x emission reductions, greenhouse gas reductions, and fuel savings.

The outcome of this proposal has the potential to affect a large segment of the on-road vehicle emissions inventory, in light of the extensive use of utility truck in agriculture and other industries. Therefore, this project ranked high in the relevance-to-plans category. Likewise, the reduced fuel usage, use of propane, and the associated greenhouse gas reductions helped this proposal to rank high in the co-benefits category. The expected fuel savings will also reduce the long-term cost of ownership for the technology, resulting in good overall cost-effectiveness.

*Leva Energy, Inc.
Santa Clara, CA*

Waste Solutions Technology Focus Area

Leva Energy, Inc. proposes to install and test two systems that recover wasted energy from ultra-low NO_x burners (ULNB). The system (Power Burner) integrates a gas-fired microturbine with a new ULNB into a system that can replace a burner on any boiler larger than 5 MMBtu/hr. The Power Burner recoups the energy lost with other ULNBs to cogenerate 100 kW of electricity with the same amount of fuel.

This technology's ability to provide boiler owners a faster payback on their investment has the potential to accelerate the adoption of ultra-low NO_x boilers in the valley; early reductions from this emissions category benefited this projects relevance-to-plans score. The use of waste heat to generate electricity also raised the proposals co-benefit category score.

City of Manteca

Manteca, CA

Mobile Sources Technology Focus Area

The City of Manteca proposes to demonstrate two new Autocar Xpeditor E3 refuse vehicles fitted with Parker RunWise advanced series hybrid-drive technology to reduce diesel fuel consumption, and associated NO_x and other emissions, by up to 45%. The City will purchase the trucks from Autocar and subcontract with infoWedge to install monitoring equipment and collect data from the hybrid truck and a conventional diesel truck, for comparison purposes. infoWedge will characterize the drive cycle; monitor a 30-day demonstration of the hybrid truck; monitor and report emissions testing; and monitor long-term (6 months) demonstration to evaluate usage patterns, fuel consumptions, and maintenance needs.

Successful implementation of this project will show the ability to reduce emissions through reduced fuel use in the medium heavy-duty diesel truck off-road category, which helped this proposal score relatively high in the relevance-to-plans category. The reduced diesel fuel use also reduces greenhouse gas emissions and lowers overall, long-term operating costs for end users. For these reasons, the proposal ranked relatively high in the co-benefits and cost-effectiveness categories.

Association of Compost Producers

Julian, CA

Mobile Sources and Waste Solutions Technology Focus Area

The Association of Compost Producers project is for the design and testing of the aerated static pile (ASP) method of composting for a large-scale composting facility. The proposed system consists of 3 components: substitution of diesel-powered loaders with electronic conveyor systems to build piles, the use of solar-powered electric blowers to replace diesel-powered windrow turners during the active phase of composting, and to build positively aerated static piles with finished compost biofilter covers.

Potential reductions in PM, NO_x, and greenhouse gas emissions resulted in high scores for both the relevance-to-plans and co-benefits categories. The low-cost and non-proprietary nature of the method to be demonstrated allows the system to be adopted by any operator and result in high cost-effectiveness category score

Pacific Gas and Electric Company

San Ramon, CA

Mobile Sources Technology Focus Area

Pacific Gas and Electric Company proposes to develop and demonstrate an extended-range electric-drive Class-6 bucket truck with electric worksite operation capability. The system will improve on-road fuel efficiency and allow crews to work on-site without running the diesel engine. Emission reductions will be achieved by reducing consumption of 4,895 gallons of diesel fuel per vehicle per year.

Because of the number of class-6 utility work trucks that operate in the Valley, this project has the potential to demonstrate significant emissions reductions in the on-road vehicle category; therefore, this project ranked relatively high in the relevance-to-plans category. The reduced use in diesel fuel also positively impacted the scoring in the co-benefit and cost-effectiveness categories.

Other Proposals

In addition to these projects, there were eleven proposals not recommended for funding which may be appropriate as alternate projects if any of the recommended projects cancel. While some of these projects had strong merits, not all of them could be selected with the current funding. The applicants will be encouraged to resubmit their projects for future funding opportunities, and District staff will work with the applicants to identify opportunities for enhancing project proposals. Several of these projects were also proposed to be demonstrated, at least partially, in neighboring regions, and the District will explore the possibility of working with neighboring air districts to fund these proposals. These projects were:

- *Makel Engineering, Inc.*—Demonstration of autonomous low cost, low NO_x homogeneous charge compression ignition power generation system for dairy biogas applications
- *Motiv Power Systems*—Conversion of one Ford F450 to all electric operation for the City of Bakersfield Parks and Recreation
- *Environmental Energy & Engineering Co.*—Modify a facility to purify biogas into biomethane and recover the ammonia nitrate as fertilizer
- *Omnitek*—Testing and certification of a diesel-to-CNG conversion kit for Cummins ISX, CAT C-15, and Detroit Series 60 engines (bringing the engine to 2007 standards)
- *Biogas & Electric, LLC*—Demonstrate NO_x and SO_x reduction system for anaerobic digesters
- *Pena's Disposal Service*—Deploy, demonstrate, test, and verify a hybrid technology that employs a hydrostatic drive combined with brake energy recovery on a solid waste collection vehicle
- *Electric Vehicles International, LLC*—Develop a range-extended electric vehicle powertrain for shuttle bus applications and demonstrate three vehicles
- *ZERE Energy and Biofuels*—Demonstrate 100kw low- NO_x biogas-fueled Air Independent Oxidation system

- *C-Micro Systems Inc.*—Demonstration of low- NO_x aftertreatment system for engines on dairy digester gas
- *E&J Gallo Winery*—Design, build, and operate a commercial-scale wastewater treatment system that uses biogas to generate 1.4MW of clean renewable electricity
- *Sustainable Technologies*—Test the efficiency of an off-grid solar powered irrigation system

Of the remaining proposed projects there were some examples of quality projects which may be better suited to other incentive programs from the District. While they were innovative in their utilization of new technologies, existing or upcoming incentive programs are better fits for these projects.

One example of such projects includes a proposal by Rolling Frito-Lay Sales, LP to purchase thirteen new Smith Electric medium-duty all-electric trucks. This proposal would be a better fit to the new Zero-Emission/Hybrid Heavy-Duty Vehicle incentive program adopted by your board August 18, 2011.

Another proposal better suited to another upcoming district program is the project proposed by San Joaquin County to install real-time GPS units in their heavy equipment fleet to monitor and enforce idling, speed excesses, trip planning, and management. This proposal would be a better fit for the upcoming Public Benefits Grants program adopted by your board April 21, 2011.

These projects, and others that may be well suited to other funding sources, will be encouraged by District staff to apply or submit proposals to participate in appropriate other incentive opportunities.

FISCAL IMPACT:

The District has sufficient appropriations in the 2011-12 Adopted Budget to fund the \$2,947,693 of proposed technology advancement projects. Projects will be funded from District Rule 4320 (Advanced Emission Reduction Options) and EPA grant funding.