

APPENDIX C: ENERGY AND RENEWABLE ENERGY UPDATE

Metro staff provides annual update on its implementation of Metro's energy program. For the purposes of the report back regarding Item #57 of the February 2016 Board Meeting, staff is including the information as Attachment D, herein. The following summarizes FY16 Energy Program activities and accomplishments.

Energy Efficiency Project Update

- Implemented energy saving projects and identified new opportunities, including:
 - Completed lighting retrofits at fuel islands and steam bays at Divisions 5 and 9, which are expected to save the organization over \$11,720/year in utility costs;
 - Completed the installation and commissioning of an advanced wireless lighting controls system and lighting retrofits at Division 22, resulting in measured annual energy savings of nearly 1,000,000 kWh and avoided utility costs of \$113,000 annually;
 - An ASHRAE Level II energy audit was completed at the Gateway Building. The purpose of the audit was to identify and quantify energy savings from proposed lighting and mechanical measures. Implementation of the proposed energy efficiency measures will contribute to the overall goal of achieving an Energy Star Rating to allow the LEED re-certification process to commence;
 - Metro's Energy Management Program (EMP) staff completed the 30% design packages for Buildings 1-6 at Metro's Central Maintenance Facility (CMF) based on the \$2.5M energy improvements that were identified during FY15. The energy improvements identified are expected to save nearly \$120,000 annually;
 - As part of the agency's annual Capital Program, the following are approved energy efficiency capital projects:
 - Division 30, Building 5 Air Scrubber Project: Metro's ECSD staff was asked to support the design of a ventilation system for the body shop within Building 5 at Metro's CMF to improve the current conditions within the space. In addition to supporting a permanent system, Metro's EMP staff was asked to investigate and recommend low cost short term solutions to improve the ventilation system and indoor air quality. Compressed air portable dust collector units were specified as an effective short term solution and will be purchased for the facility's use. Metro's EMP staff completed a Basis of Design (BOD), which outlines the requirements of the new central vacuum system that will replace the existing Rotoclones. Replacement of the Rotoclones with a central vacuum system will result in increased operating efficiencies and reduced equipment energy operating costs. Based on the outlined requirements, the proposed central vacuum system is projected to

save over 5,000,000 gallons of water annually. The procurement is expected to be initiated by the end of the calendar year.

- As part of the FY14 capital program, Metro staff applied for and was awarded nearly \$4.2M to implement comprehensive energy efficiency and renewable energy projects at multiple bus divisions. In addition, \$1.5M was awarded to implement energy efficiency projects at two rail divisions. Metro's EMP staff completed the 30% design packages and is ready for procurement. The procurement is expected to be initiated by the end of the calendar year and will require board approval.
- Gateway Lighting Retrofit Project: Using the investment grade lighting audit that was previously performed in 2010 as a basis, Metro's EMP staff conducted an updated lighting audit to focus on spaces that have since undergone changes and any interior or exterior lighting that was not previously included. Proposed recommendations include the retrofit of existing fixtures with new LED fixtures or retrofit kits and the installation of advanced lighting controls such as daylighting controls, fixture tuning, and occupancy sensors. Based on preliminary energy savings calculations, this project is projected to save approximately 2,800,000 kWh and avoided utility costs of over \$300,000 annually.
- Gateway DHW Heat Recovery Project: In response to analyzing the most efficient system to heat the domestic hot water (DHW) at the Gateway building, a proposal emerged to utilize waste heat from the elevator motors that is currently ejected using air conditioners to heat hot water used in the high rise. This opportunity is expected to cost \$50,000 and result in annual savings of \$10,000. Southern California Gas Company has committed \$15,390 to Metro in incentives for this project. The project will nearly eliminate the use of existing cooling equipment by taking all waste heat and pumping it into the domestic hot water system. This creates a positive feedback loop wherein the more the elevators are used; the more natural gas is offset because it is no longer used to provide hot water for the building.
- Select CNG Fuel Stations implemented recommended lockouts and if implemented successfully at all divisions, the lockout can potentially save Metro nearly \$260,000 in annual energy costs with no capital expenditure necessary.

LEED Program Update

- Continued the pursuit of Metro's goal to achieve LEED-Existing Building (EBOM) certification at all existing maintenance facilities. LEED-EBOM progress in FY16 included:
 - Division 7 campus achieved LEED-EBOM Silver Certification. This site represents Metro's second LEED-EBOM certified maintenance facility and one of only a few in the country.
- LEED requires verification of compliance with ASHRAE Standard 62.1, which details the specific ventilation requirements different space types, including auto repair and offices. Extensive analysis and outside air (OSA) testing completed at Divisions 9 and 15 identified units that were not in compliance with ASHRAE 62.1. In order to proceed with the LEED Certification process, a corrective action plan will be developed to implement the minor repairs and adjustments to these units.

Renewable Energy Update

- Metro continues its progress in meeting and exceeding the Renewable Energy Policy goal of 33% use of renewable power by 2020. Current estimates for calendar year 2015 total at least 24.03% use of renewable power.

Metro's existing photovoltaic (PV) systems at Division 8, 15, and 18 have been experiencing technical difficulties as detailed below and as a result have underperformed. A contract has been awarded to Skybridge Renewables to repair all known problems at the sites to bring these units not only operational, but also to upgrade the systems to current technology and specifications. A contract modification is currently in progress to include additional recommendations as detailed below and it is expected that the repair work will be completed by the end of this calendar year.

- Division 8
 - Current Status: While Skybridge Renewables was on-site to assess the current state of the system they found that the system was not operational. They were able to get at least three inverters operating and the system is now producing.
 - Repair Plan: The old inverters will be replaced with string inverters, which will make this system operational for years and improve the performance.
- Division 15

- Current Status: During Skybridge Renewal's inspection of the existing system, they discovered a few bad modules that were then isolated in order to bring the system operational.
 - Repair Plan: The old inverters will be replaced with string inverters, which will make this system operational for years and improve the performance. Additionally, 40 modules will be installed to return the system to its nameplate capacity of 500 kW.
 - Division 18
 - Current Status: During Skybridge Renewal's inspection of the existing system, they identified two bad strings. As a result of cleaning and rebooting, the system is operational and appears to be producing. However, they also found the monitoring gateway has been removed. Therefore, the system performance of this system is not known.
 - Repair Plan: Rooftop and Inverter repairs and tune-ups are recommended for Division 18 to improve the performance.
- In reaction to the issues uncovered at Metro's existing PV stations, a comprehensive preventative maintenance process was developed and implemented. ECSD and facility maintenance staff are working together to implement protocols that will ensure all systems receive regular maintenance, produce as expected and system failures are communicated and addressed in a timely fashion. Detailed training sessions on the preventative maintenance procedures have been held with facility maintenance staff and will continue to be offered as refresher course and to new staff over time. During a training session at El Monte station (Terminal 19), it was observed that the 89 kW system was underperforming. Further investigation led to the discovery that several micro-inverters were inoperable. Corrective actions were deployed by the system installer to bring the inverters operational and the system performance has since improved.
- As part of the preventative maintenance program, a series of video clips were developed related to the most critical PV system maintenance procedures and safety to provide on demand training support. In an effort to provide technical assistance with addressing concerns/issues with the PV systems, a hotline was established to field calls from facilities maintenance staff. If warranted, the hotline will also be used to schedule an onsite visit to address the system concerns.
- Metro continues their efforts in fulfilling commitments in the Renewable Energy Policy to incorporate renewable energy into Metro facilities. During FY16 solar panels were installed at two Metro facilities (Divisions 13 and 24), which are

expected to avoid over 800,000 kilowatt hours per year from being purchased, reducing electric utility costs by approximately \$100,000 annually.

- Procurement process has been initiated on a set of new photovoltaic (PV) systems that will leverage the recently authorized Alternative Financing Mechanism authority and expand Metro's system portfolio by more than 50%. Summary of the approach and systems are as follows:
 - Shaded and PV wired parking structures are specified for Division 9 and rooftop installations are proposed at Division 11, 22 and Expo Maintenance facility.
 - The entire project is expected to install 1.73MW in capacity and projected to avoid nearly 3,000,000 kWh from being purchased from SCE.
 - The proposed financing structure, known as a Power Purchase Agreement (PPA), will be funded through a Public-Private Partnership at no up-front capital cost to Metro.
 - Metro will agree to a price per unit of energy and purchase all the energy produced by the system for the life of the system.
 - This approach will constitute the 2nd renewable energy-related public private partnership at Metro following the system installed at Division 30 by Chevron Energy Services.
 - Roofing replacements will be included at Divisions 11 & 22 as part of the project; specifics of the cost and financing structure are currently being analyzed.
- Metro's maintenance divisions provide a large expanse of parking lots that provide an ideal opportunity for ground mounted PV systems, which represents the largest opportunity for large scale solar installation. The buses operate through these lots, requiring a modified carport to be constructed to raise the panels up and above the buses. Initial screenings were performed to assess viability from a physical, operational, and potential energy generation standpoint. Based on this assessment, three potential sites have been identified as the most favorable bus divisions for deployment of solar canopies.
- An area near the Metro Gold Line Highland Park Station was identified as a safety concern for Metro passengers and neighborhood residents. Metro ECSD staff, at the request of multiple parties, developed a sustainable, low cost solution for providing area lighting to address this safety concern. Solar powered lighting systems were installed to meet the need for outdoor lighting in this area.

NEXT STEPS

Metro staff will continue to implement the on-going programs as follows:

Energy Efficiency Projects

- Release large scale procurement across 6 divisions to implement all identified energy efficiency projects, which will save over \$350,000 annually. Project details are provided in Table 1 below.

Table 1. List of Energy Efficiency Improvement Projects at Selected Divisions

	Net Capital Cost, Includes Incentives	Total Annual Cost Savings	Annual kWh Savings	Annual Therm Savings
Division 3	\$580,880	\$54,091	470,215	5,431
Division 11	\$867,015	\$95,111	614,874	29,435
Division 22	\$208,712	\$52,550	451,235	290
Division 7	\$246,026	\$48,226	329,701	8,141
Division 15	\$368,480	\$73,101	623,765	9,888
Division 9	\$288,377	\$55,115	563,226	15,721
TOTAL	\$2,559,490	\$378,194	3,053,016	68,906

- Release procurement for large scale lighting retrofit and advanced controls at the Gateway Building that is projected to save over \$275,000 in utility costs annually.
- Establish a new capital project for the replacement of HVAC systems at the Central Maintenance Facility campus, which is expected to save nearly \$120,000 annually. Replacement of these HVAC systems, which are beyond useful life, is necessary to improve indoor air quality and to achieve an Indoor Air Quality prerequisite for LEED Certification. Project details are provided in Table 2 below.

Table 2. List of Energy Efficiency Improvement Projects at CMF Buildings 1-6

	Net Capital Cost, Includes Incentives	Total Annual Cost Savings	Annual kWh Savings	Annual Therm Savings
Unit Shops #1 and #2	\$841,582	\$31,006	309,043	5,805
Unit Shops #3 and #4	\$699,930	\$18,988	182,611	5,825
Building 5	\$687,087	\$52,509	261,568	19,365
Building 6	\$96,351	\$16,745	129,218	1,101
TOTAL	\$2,324,950	\$119,248	882,440	32,096

- Completion of the following projects:
 - Install heat recovery project at the Gateway building;
 - Complete installation of LED lighting at Division 7;
 - Establish a new capital project for retrofitting the existing lighting fixtures in the Gateway Parking Garage.
- Complete expansion of the Energy Data Platform as the remaining sub-metering systems are installed and commissioned.
- Continue using the Energy Program Site Implementation Process as outlined in the Energy Management Action Plan to implement and measure results from energy efficiency measures at 4-6 more maintenance divisions;
- Continue managing utility incentives for any and all Metro projects. Outstanding incentives pre-approved total nearly \$50,000.
- Implement remaining cost saving strategies related to the operation of CNG Fuel Stations. Successful implementation at all divisions is estimated to save nearly \$260,000 annually.
- Continue utilizing the Master Energy Project Dashboard as the central reporting tool while expanding to include all Sustainability related projects/assets.
- Complete quantification of benefits from transferring Metro rail propulsion billing to a structure known as conjunctive billing and develop a strategy to support obtaining conjunctive billing treatment from all electricity providers.

LEED® Program

- In order to proceed with the LEED Certification process, a corrective action plan will be implemented at Division 9 and 15, which will include air testing, adjusting, and

balancing for all units that were identified as not meeting the minimum OSA requirements as per ASHRAE 62.1. At the completion of repairs and adjustments, these units will be retested for compliance.

- Initiate LEED Certification applications at Division 9 and 15.
- Implement four remaining sub-metering systems to meet LEED Certification requirements.
- Continue supporting the Gateway Building staff as it prepares to recertify to Platinum level LEED® Certification in 2018.
- Continue expanding the use of Disadvantaged Business Enterprises in the LEED Certification Process
- Continue managing installed sub-metering systems and continually manage energy data.

Renewable Energy Program

- Continue measuring the generation performance of installed systems and implementing the preventative maintenance program.
- The concept of Community Solar presents an opportunity for Metro to realize operational savings, enhance relationships with Business Interruption Funds recipients, and support renewable energy goals. To pursue this opportunity, a proposed pilot program is under development. Disadvantaged Business Enterprises will be utilized for outreach in communities targeted for the pilot. The pilot programs will be designed based on communication with LADWP and SCE representatives to ensure that the pilot will best fit within LADWP and SCE's programs.
- Conceptual design studies will be developed for three bus division sites that were identified for deployment of solar canopies. Each site selected will undergo a financial analysis to evaluate various project financing options and alternative project delivery methods, including self-ownership, Power Purchase Agreements, and equipment leasing.

Energy Resiliency

- Explore applicable concepts of resiliency, business continuity, and emergency response as they relate to energy systems on or near Metro facilities, transit hubs, and right-of-ways. A white paper on this topic is being developed in conjunctive with Risk Management, Asset Management, and other departments.

Staff will report back to the Board periodically on accomplishments and challenges related to this Energy Program.