# Agreement between California Energy Commission and Washington University

**Title:** Advanced Water Treatment Technologies for Onsite Water Reuse
**Amount:** $206,433.00
**Term:** 24 months
**PIER Contact:** Anish Gautam
**RD&D Committee:** 12/3/2009

## Funding

| FY | Program | Area | Initiative | Budget | This Project | Remaining Balance | |
|---|---|---|---|---|---|---|---|
| 09 | Electric | IAW | Water and Wastewater | $500,000 | $206,433 | $71,398 | 14% |

For the 2009 fiscal year, the total Electric budget is $62.5 million. Within the Electric program, the IAW program area budget is $2.75 million and, from this amount, $0.5 million was allocated to the Water and Wastewater budget initiative. If approved, the remaining initiative balance will be $71,398.

## Recommendation

Approve this agreement with Washington University for $206,433.00, with $85,000 in match funding. Staff recommends placing this item on the discussion agenda of the Commission Business Meeting.

## The Problem

Fresh cut fruit and vegetables utilize large amounts of fresh water for washing and rinsing operations. To minimize microbial contamination, wash and rinse water is chilled to temperatures as low as 38 degrees. Antimicrobial agents such as chlorine, tri-sodium phosphate and peracetic acid are often added to enhance microbial reductions. Once the cut products and the rinse solutions are separated, the water is returned to the rinse water source or discharged depending on the cleanliness of the water. However, precipitates from antimicrobial reactions and dirt from raw products often render the rinse water too contaminated for further use and it is expelled in a wastewater stream to either a wastewater facility or a land application wastewater field. Statewide, fresh fruit and vegetable processes consume massive amounts of energy in pumping and chilling water. Additional electricity is consumed pumping and treating the rinse water at a wastewater treatment plant. Antimicrobial chemicals such as chlorine and peracetic acid can be an environmental risk.

## Proposed Research

The proposed project will evaluate and test alternative disinfection technologies to chemical treatment at a celery processing plant owned by Duda Farms in Oxnard, CA. These technologies will include ozonated water, ultraviolet light (UV), and advanced oxidation treatment. These technologies will not create the microbial precipitates generated from chemical treatment thereby saving energy used to chill water and conserve fresh water supplies. The number of reuse days for the wash water will be increased from one to two or three, which would be a reduction in water use by 50 to 66.7%. This will correlate to a 50 to 66.7% energy savings for chilling water. For the Duda Farm this will result in a reduction of 3.75 to 5.0 million gallons per year, and over 50,000 kilo-watt hours/year. There will also be downstream benefits by reducing loading to wastewater treatment facilities or landfills. The project will test these

technologies against chemical disinfection by evaluating energy and water consumption and demand, wastewater generated and operating costs. For this project, Southern California Edison will provide the measurement and verification of on-site energy saving as well as work with the project team to determine the economics of the system.

## Research Justification and Goals

This project "[will develop, and help bring to market] increased energy efficiency in buildings, appliances, lighting, and other applications beyond applicable standards, and that benefit electric utility customers" (Public Resources Code 25620.1.(b)(2)), (Chapter 512, Statues of 2006)) by:

- Reduce the volume of fresh water for washing and rinsing fruits and vegetables, and consequently the amount of electricity to chill water, by 50 to 66.7% at fruit and vegetable processing plants.

## Background

The proposal was submitted through competitive solicitation, Emerging Technology Demonstrations Grants Program (ETDG) Opportunity Notice 08-006. This opportunity notice was structured to solicit proposals under four categories 1) Data Center, 2) Electricity Storage for Customer-side, 3)Industrial Energy Efficiency and 4) Water and Wastewater. This proposal was ranked 4 out of 12 proposals received through the solicitation under the Water and Wastewater category.

The fruit and vegetable of the food processing industry in California use approximately 30 billion gallons a year. If 10% of that water can be reused, the embedded energy associated with that water would be reduced 27 million kilo-watt hours/year. The proposed project goal is to reduce water use at the Duda Farm in Oxnard for celery processing by 3.75 to 5.0 million gallons a year, and reduce energy use for chilled water by 50,000 kilo-watt hours/year. If these results could be replicated throughout the state the fruit and vegetable processing industry will save 40 million kilo-watt hours/year. In addition to water and energy savings, the project will reduce the use of hazardous chemicals used for disinfection as well as reduce loading to wastewater treatment plants.

The proposed project will demonstrate the use of ozone injection, UV light, and advanced oxidation technologies to treat product water in the fresh cut fruit and vegetable industry to enable onsite water reuse. The project will monitor and assess the impact of the various technologies with regard to energy and water use.

The demonstration host facility, Duda Farm Fresh Foods, Inc (Duda), processes celery in Oxnard, CA. Through stringent water conservation practices the present water use is 25,000 gallons per operation day (plant is planning expansion that will require 50,000 gallons per day). The water is chilled to minimize microbial growth; an antimicrobial agent is also added to the celery flume wash water. During the process cycle, coarse particulate is screened from the wash water and recirculated, at the end of the production day the wash water with the dissolved antimicrobial agent is sent to a municipal wastewater plant for treatment.

Fresh make-up water, which must be pretreated is used in the next operating shift, water, water chilling, antimicrobial agent and wastewater cost make this process a candidate for the demonstration of advanced water reuse technologies.