

Program Highlights

- ▶ California has helped to fund a sustainable waste-to-energy system for an agricultural product with high sulfur content. The process can easily be adapted for other agricultural and food waste products.
- ▶ The biogas in the fuel cells is saving \$50,000 to \$60,000 per month in electricity purchases and has eliminated the \$500,000 annual cost of disposing of the onion waste.
- ▶ The AERS project is the first in the nation to produce clean fuel cell energy from onion waste and to develop a gas treatment capable of meeting gas quality specifications for fuel cells.



California Energy Commission

PIER/ADVANCED ENERGY RECOVERY SYSTEM

The California Energy Commission's Public Interest Energy Research program has helped to fund an innovative waste-to-energy system at the Gills Onions facility in Oxnard, California. The Advanced Energy Recovery System (AERS) project at Gills Onions generates heat and power from onion waste as agricultural biogas. The project exemplifies California's leadership role in renewable energy projects, as well as its commitment and willingness to fund collaborative partnerships in emerging waste-to-energy systems. The biogas generated by Gills' onion waste is used to feed two 300-kilowatt fuel cells that produce heat and power for the facility. The system serves as a prototype and demonstration site for other agricultural business operations and food processors. Equally as appealing as the project's novel system is the payback period, estimated at three to five years.

Why Focus on Waste-to-Energy Methane Production?

The Advanced Energy Recovery System provides a model for sustainable energy and waste handling for the agriculture and food processing industries in the U.S. and beyond. The purpose of California Energy Commission (CEC) funding for the waste-to-energy project is to encourage the development of anaerobic digestion and biogas electricity generation that can help California provide renewable energy while reducing its air and groundwater pollution. The environmental benefits to the community from the AERS project implemented at the Gills facility include the reduction in the amount of disposed biowaste from 150 tons per day to essentially zero.

Through the Gills Onions AERS/CEC partnership, researchers developed and implemented a project that eliminates 14,500 tons of carbon dioxide equivalent emissions per year and saves almost 112,000 standard cubic feet of natural gas. While many European countries have made major progress in promoting renewable and sustainable waste-to-energy technologies, the Gills Onions project demonstrates America's leadership in developing value-added



uses for agricultural waste, combining anaerobic digestion with fuel cell power generation technology.

The total cost of the AERS project was \$10.8 million, including R&D, start-up, and CEC expenses. Only through creative financing, incentives, and grants was Gills Onions able to develop their waste-to-energy system with a reasonable payback period. Incentives, grants, and awards amounted to \$6.8 million, including \$500,000 from CEC.

CEC's PIER Program: A Model for Technology Partnerships

Funding for the AERS came specifically through CEC's Public Interest Energy Research (PIER) program, which relies on partnerships to carry out research and develop new projects. The partnerships are used to leverage investments, tap into California's research capabilities at state universities, and build on successful R&D work. PIER provides contracts and grants for research and development of energy technologies. Its Renewable Energy Research area strives to integrate renewable energy technologies into the existing electric grid and to tackle the long-term technical issues that renewable electric facilities currently face. Moreover, PIER advocates renewable energy technologies that make better use of renewable resources that currently pose environmental concerns (e.g. agricultural residues). PIER currently focuses on four objectives to meet California's electricity needs:

- Making improvements at existing renewable energy facilities to provide peak capacity and increased reliability.
- Expanding renewable distributed generation technologies to help provide electricity generation in high-demand areas.
- Developing renewable energy technologies, products, and services that provide affordable electricity.
- Conducting long-term research on advanced renewable technologies.

Implementing the Model

CEC's PIER program awarded \$500,000 to Gills Onions for its AERS project to help Gills develop the first system in the nation to produce clean fuel cell energy from onion waste while meeting the triple bottom line of economic, environmental, and social benefits. The biogas generated from the onion waste generates 0.6 MW of electricity to satisfy 75 percent of Gills' baseload power requirements. Additional project funding came from Sempra Energy, the local utility, which provided \$2.7 million in self-generation incentive funds. The project was also able to take advantage of the 30 percent federal renewable energy tax credit.

Gills Onions processes almost one million pounds of onions and creates nearly 300,000 pounds of waste each day. Prior to the AERS project, the waste—tops, tails, and peels of the onions—was composted and spread on agricultural fields at a cost of \$500,000 per year. Researchers at the University of California, Davis, discovered that digesting the onion solids and the juice yielded good biogas results: the juice yields 70-75 percent by weight through a two-stage screw press extraction method. The remaining solid "cake" is trucked to California farms for cattle feed.

Judges' Comments

CEC's Advanced Energy Recovery System takes advantage of a resource going to waste—in this case, from onion processing—and turns it into a valuable energy source, while eliminating the problem of trucking and disposing of the waste. The specific scope of project and investment may not be exactly replicable by other states, but the idea is: recycling waste materials and looking at the total supply chain of manufacturing a product to maximize lifecycle efficiency. It's a one-time investment that has an ongoing payback.



About the California Energy Commission

The California Energy Commission is the state's primary energy policy and planning agency. It was created by the Legislature in 1974; its responsibilities include forecasting future energy needs, licensing thermal power plants, promoting energy efficiency, supporting the renewable energy market, administering American Reinvestment and Recovery Act funding through the state energy program, and more. Within the last two years, the most important development in California's energy policy has been two landmark pieces of legislation for energy policy that focus on climate change and transportation.

For more information

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