CHP

EPA COMBINED HEAT AND POWER PARTNERSHIP

ENERGY STAR

2010 ENERGY STAR® Award

Combined Heat and Power

Presented to

Port Arthur Steam Energy LP

By the United States Environmental Protection Agency in recognition of the significant pollution reduction and energy efficiency qualities of Port Arthur Steam Energy.

Awarded on November 2, 2010

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Winners of the 2010 ENERGY STAR® CHP Award

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Public Recognition

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- Award Winners

Port Arthur Steam Energy

Numerous government agencies (including EPA and DOE) and private companies agree that the recovery and use of industrial waste energy represents a massive energy savings and efficiency opportunity in the U.S. Port Arthur Steam Energy (PASE) is a great example of how that opportunity can be realized.

The PASE system produces electricity and steam using otherwise-wasted heat from a coke production facility owned by Oxbow Corporation. The Oxbow plant began operations in 1935 and has the capacity to produce 700,000 short tons per year of calcined petroleum coke, which is used primarily in aluminum production.

2000 °F flue gas exhausts from Oxbow's three large coke-production kilns. While similar processes at other industrial sites typically ignore the tremendous energy value of that exhaust, PASE captures and uses the heat in the flue gas to produce up to 450,000 pounds per hour of high-pressure steam. Most of the steam is routed to a neighboring petroleum refinery and used for crude oil processing with the remainder used on site to produce up to 5 MW of electricity.

The CHP system displaces 100% of the fuel that would be used by typical on-site thermal generation and purchased electricity. Consequently, the CHP system effectively reduces CO_2 emissions by more than 159,000 tons per year. This reduction is equivalent to the annual emissions from more than 27,000 passenger vehicles.

EPA is proud to recognize the outstanding pollution reduction and energy efficiency qualities of this project by presenting **Port Arthur Steam Energy LP** with a 2010 ENERGY STAR CHP Award.

Gainesville Regional Utilities South Energy Center

The Shands Cancer Hospital–a new hospital campus adjacent to the existing Shands Hospital at the University of Florida–opened its doors in November 2009. The 500,000 square foot facility houses approximately 190 patient beds and includes a critical care center for emergency and trauma services. To ensure uninterrupted treatment for its patients and to meet energy-efficiency goals, Shands Healthcare and Gainesville Regional Utilities partnered to develop and operate a CHP system that provides 100 percent of the electricity and other energy used by the hospital.

Designed by Burns and McDonnell, the CHP system generates up to 4.3 MW of electricity using a natural gas-fired turbine manufactured by Solar Turbines. Otherwise- wasted heat from the turbine exhaust produces steam used for space heating, space cooling and dehumidification. Because reliability is of foremost importance in an emergency-care facility, the CHP system is housed in a protective structure designed to withstand the 100 mile-per-hour winds of a Category 3 or 4 hurricane.

With an operating efficiency of more than 60 percent, the CHP system requires nearly 25 percent less fuel than a typical energy-supply system. As a result, the CHP system effectively reduces CO_2 emissions by more than 10,500 tons per year. This reduction is equivalent to the annual emissions from more than 1,800 passenger vehicles.

EPA is proud to recognize the outstanding pollution reduction and energy efficiency qualities of this project by presenting the **Gainesville Regional Utilities** with a 2010 ENERGY STAR CHP Award.

Landis Sewerage Authority Combined Heat and Power Project

Landis Sewerage Authority (LSA) has taken a diverse approach toward implementing its goal of becoming one of the most environmentally-friendly wastewater treatment plants in the state of New Jersey. With the objective of achieving a near-zero carbon footprint and optimizing the recycling and reuse of byproducts from the treatment process, LSA uses treated biosolids to fertilize 550 acres of corn, hay, straw and southern yellow pine trees, and operates a windmill, solar array and CHP system to generate electricity for the facility.

A portion of the biogas produced by a wastewater treatment plant's anaerobic digester is typically used to heat water for use on site. The remainder is flared and goes unused. LSA realized this traditional approach presented an opportunity for increased energy savings and instead utilizes the otherwise-wasted biogas to fuel a 170 kW CHP system. In addition, heat produced by the system's internal combustion engine is captured and used to produce hot water for facility space heating and to warm the anaerobic digester. Biogas and electricity production are maximized by a digestion-enhancing natural peat extract from Prodex.

The CHP system requires approximately 34 percent less fuel than would be used by a typical energy supply system. Consequently the CHP system effectively reduces CO_2 emissions by more than 800 tons per year. This reduction is equivalent to the annual emissions from more than 140 passenger vehicles.

EPA is proud to recognize the outstanding pollution reduction and energy efficiency qualities of this project by presenting the **Landis Sewerage Authority** with a 2010 ENERGY STAR CHP Award.

Eastern Maine Medical Center—Combined Heat and Power

Eastern Maine Medical Center (EMMC) is located in Bangor, Maine and houses over 400 patient beds attended by more than 300 physicians. The institution's accolades signify its dedication to exceptional and reliable healthcare services. EMMC received the 2008 Davies Organizational Award for its use of information technology to enhance patient care, safety and quality.

In 1998, a devastating ice storm in the region damaged local infrastructure and

caused many homes and businesses to be without power for several weeks. After EMMC lost dependable power for 16 hours during this period, management realized the necessity of critical power reliability. The solution came in 2006, when the hospital began operation of a natural gas-fired CHP system powered by a turbine manufactured by Solar Turbines. Generating up to 4.4 MW of electricity and 25,000 pounds per hour of steam for building climate control and hot water, the CHP system provides over 90% of the hospital's electricity and steam.

With an operating efficiency of approximately 70 percent, the CHP system requires over 25 percent less fuel than would be required to generate purchased electricity and to produce steam on site. Therefore, the CHP system effectively reduces CO_2 emissions by more than 10,000 tons per year. This reduction is equivalent to the annual emissions from more than 1,800 passenger vehicles.

EPA is proud to recognize the outstanding pollution reduction and energy efficiency qualities of this project by presenting the **Eastern Maine Medical Center** with a 2010 ENERGY STAR CHP Award.

Fairfield University CHP Plant

Fairfield University in Fairfield, Connecticut, joined the ranks of institutes of higher learning that produce their own heat and power because of mounting concerns over rising energy costs and a congested utility grid. In December 2007, the University began operating a CHP system that generates nearly 95 percent of the power needed by the campus and produces up to 66 percent of the school's high temperature hot water heating and cooling supply. The recovery and utilization of otherwise wasted heat from the 4.6 MW Solar Turbine has led to estimated annual savings of $2.2 million.

With an operating efficiency of approximately 55 percent, the CHP system requires approximately 22 percent less fuel than typical onsite thermal generation and purchased electricity. Based on this comparison, the CHP system effectively reduces CO_2 emissions by an estimated 7,400 tons per year. This reduction is equivalent to the annual emissions from more than 1,200 passenger vehicles.

EPA is proud to recognize the outstanding pollution reduction and energy efficiency qualities of this project by presenting **Fairfield University** with a 2010 ENERGY STAR CHP Award.

University of California San Diego CHP System

Over 50,000 faculty, staff and students utilize the 1,200 acres and 11 gross million square feet of the University of California San Diego campus. To meet the corresponding electrical and thermal demands, the university began operating a natural gas fired CHP system in 2001. With two Solar Turbines combustion turbines at its core and otherwise wasted heat recovered for use, the CHP system generates nearly 30 MW of electricity and produces 140 MMBtu/hr of steam that meets 95 percent of the campus thermal needs. The impressively low NOx emissions are one of the most remarkable features of the CHP system.

With an operating efficiency of approximately 66 percent, the CHP system requires approximately 26 percent less fuel than typical onsite thermal generation and purchased electricity. Based on this comparison, the CHP system effectively reduces CO_2 emissions by an estimated 82,500 tons per year. This reduction is equivalent to the annual emissions from more than 13,700 passenger vehicles.

EPA is proud to recognize the outstanding pollution reduction and energy efficiency qualities of this project by presenting the **University of California, San Diego** with a 2010 ENERGY STAR CHP Award.

University of Missouri CHP Plant

The University of Missouri has produced energy using CHP in one form or another for its Columbia campus since 1892. Six boilers, four steam turbine generators, and two combustion turbine generators with heat recovery boilers comprise the university's current CHP system and have the aggregate capacity to fully satisfy campus energy needs. This network of equipment produces up to 66 MW of electricity and over 1.1 million pounds of steam per hour to supply a daily population of over 40,000 people in 13 million square feet of campus facilities, including three hospitals, a research reactor and numerous research facilities. As part of the university's energy management and conservation program, otherwise wasted heat from the turbines is recovered to reduce fuel consumption, air emissions and energy costs.

With an operating efficiency of approximately 76 percent, the CHP system requires approximately 38 percent less fuel than typical onsite thermal generation and purchased electricity. Based on this comparison, the CHP system effectively reduces CO_2 emissions by an estimated 107,000 tons per year. This reduction is equivalent to the annual emissions from more than 17,900 passenger vehicles.

EPA is proud to recognize the outstanding pollution reduction and energy efficiency qualities of this project by presenting the **University of Missouri** with a 2010 ENERGY STAR CHP Award.