



The Frito-Lay plant in Killingly, Connecticut is about 50 miles east of Hartford and covers 370,000 sq. ft.—more than eight acres.

Photo courtesy of Frito-Lay North America, a division of PepsiCo

Combined Heat and Power System Increases Reliability and Reduces Emissions

Project Demonstrates High Potential for CHP in Food Processing Industry

Frito-Lay North America, Inc., a division of PepsiCo, installed a combined heat and power (CHP) system at its food processing plant in Killingly, Connecticut, in 2009. The installation was supported by a state grant under Connecticut's Energy Independence Act, which encouraged businesses and government agencies to install innovative systems to ease demand on the state's power grid. The U.S. Department of Energy (DOE), in partnership with the Energy Solutions Center¹, supported twelve months of detailed data monitoring and analysis of the system.



The CHP system is comprised of a Solar Centaur® 50 natural gas combustion turbine and a Rentech HRSG equipped with supplemental duct firing. *Photo credit Frito-Lay North America, Inc.*

¹ The *Energy Solutions Center* is a non-profit organization of energy utilities and equipment manufacturers that promotes energy efficient natural gas solutions and systems.

“Working with the State of Connecticut and the Department of Energy, we were able to invest in sustainable business practices that benefit this community and the country by providing relief to the Northeast power grid and using technologies with a lower environmental impact.”²

– Leslie Starr Keating, Senior Vice President of Supply Chain, North America Foods, PepsiCo



The CHP system was designed to be electric-load following and have the capacity to meet nearly 100% of the plant’s electrical power needs as well as the majority of the facility’s annual steam needs. Photo credit Frito-Lay North America, Inc.

Estimated Benefits

Efficiency	70% overall CHP efficiency
Emissions Reduction	<ul style="list-style-type: none"> • 93% reduction in overall NO_x emissions • 89% reduction in site NO_x emissions • 99% reduction in SO₂ emissions • 12% reduction in CO₂ emissions
Cost Savings	\$1 million annually
Reliability	Provides over 90% of the electrical demand and 80% of the steam load for the facility, with an operating availability of 96.4%

In order to reduce the energy costs and environmental impact of the Killingly plant while easing congestion on the constrained Northeast power grid, Frito-Lay installed:

- A 4.6 megawatt (MW) Solar Turbines Centaur® 50 natural gas combustion turbine;
- A Rentech heat recovery steam generator (HRSG) equipped with supplemental duct firing;
- Combustion air inlet chilling to increase power generation in warm weather; and
- A selective catalytic emission reduction system.

The CHP system, designed to be electric load following, has the capacity to meet nearly 100% of the plant’s electrical power needs and provide a majority of the facility’s annual steam needs.

“Killingly is about 25% more efficient than our standard plant...I have other plants calling me and saying they really want to install a CHP [system].”

– Al Halvorsen, Senior Director of Environmental Sustainability at PepsiCo

² “Combined Heat and Power Helps Frito-Lay Facility Get Off the Grid,” The Air Conditioning, Heating and Refrigeration NEWS, Oct. 5, 2009.

Converting Waste Heat into Steam

Before the installation of the CHP system, the Killingly plant steam requirements were provided by three dual-fired (natural gas and residual oil) boilers. The three boilers were over thirty years old, and if one boiler needed service, the remaining two boilers could no longer meet the plant's peak steam load. The CHP system can now provide about 80% of the steam load for the Killingly facility. The unfired steam production from the gas turbine exhaust is approximately 24,000 lb/hour, and maximum supplementary fired steam production is as high as 60,000 lb/hour.

High Potential for CHP in Food Processing Industry

CHP systems can be utilized in a wide range of industrial facilities. Industries with high and continuous demand for both electrical and thermal energy are particularly well suited for CHP installations. Such energy-intensive industries include food processing, as well as paper manufacturing, petroleum and biofuel refineries, chemical industry, and metals production.

"The Northeast power grid is one of the most stressed. Putting in a system that had an environmental benefit while also giving us some stability against power loss [was the reason for the installation]."³

– Aurora Gonzalez, Senior Director of Public Relations, Frito-Lay North America



The Frito-Lay plant has electrical interconnect, including switchgear, primary power wiring, relays, etc., allowing power generation in parallel with Connecticut Light and Power's electrical grid. *Photo credit Frito-Lay North America, Inc.*



The plant processes more than 500,000 pounds per day of potatoes and corn for its snack food products including Lay's potato chips, Doritos chips, Fritos corn chips, and Tostitos tortilla chips. *Photo credit Frito-Lay North America, Inc.*

³ "Distributed generation kept lights on after Irene," *HartfordBusiness.com*, a publication of the Hartford Business Journal, September 5, 2011, last updated June 1, 2012.



PepsiCo, and Frito-Lay North America executives were joined by representatives from the State of Connecticut and the U.S. Department of Energy for the ribbon-cutting ceremony at the Killingly plant. *Photo credit Frito-Lay North America, Inc.*

Running in Island Mode

The Killingly plant—a 24/7 operation—has the capability to run in island mode using the CHP system if the power grid goes down. In 2009 and 2010, flying squirrels shorted out local service, leaving the entire area without power for hours. However, Frito Lay's CHP system continued operating—for six hours in the first incident and eight hours in the second—allowing the plant to maintain production. This added power reliability avoided product losses and prevented the need for food safety re-inspections, resulting in significant cost savings.

The ability to run in island mode also means that the plant is less susceptible to outages caused by severe storms. The Killingly plant was intentionally powered down one day prior to Tropical Storm Irene in 2011. Three days after the storm, more than 60% of Killingly remained without power, but with the CHP system, Frito-Lay was able to resume production

less than 24 hours after the storm had passed.⁴ The Killingly plant also remained operational during a late October 2011 snowstorm that had knocked out power to nearby areas. The plant would also have operated during Superstorm Sandy in 2012 and a blizzard in February 2013 if the roads had not been shut down by the governor.

LEED® Gold Certification, ENERGY STAR Recognition

The Frito-Lay plant in Killingly, Connecticut, about 50 miles east of Hartford, is its fifth largest production facility in Frito-Lay North America's \$13 billion convenience food business.

The facility covers 370,000 sq. ft., more than eight acres, and has more than 600 employees, making it one of the largest employers in northeastern Connecticut. The facility was awarded LEED® Gold for Existing Buildings certification in 2011 by the U.S. Green Building Council. The facility received the award for its sustainability strategy, including its CHP system.⁵ Frito-Lay North America's parent company, PepsiCo, received the DOE-U.S. Environmental Protection Agency (EPA) ENERGY STAR Energy Management Partner of the Year Award in 2007 (Frito-Lay was recognized similarly in 2006), and has been presented awards for Sustained Excellence each year since 2008. ■



The Frito-Lay Killingly plant began operation in 1980. It operates 24 hours a day, 7 days a week. *Photo credit Frito-Lay North America, Inc.*

⁴ "Distributed generation kept lights on after Irene," *HartfordBusiness.com*, a publication of the Hartford Business Journal, September 5, 2011, last updated June 1, 2012.

⁵ "PepsiCo's Frito-Lay Killingly Facility Celebrates Becoming Connecticut's First Existing Manufacturing Site to Achieve LEED® Gold," Frito-Lay North America, Inc., May 10, 2011.