

2009 Case Study

Wolf Creek Nuclear Operating Corporation

Intern: Emily Coon
Major: Mechanical Engineering
School: Kansas State University

Burlington, Kansas



Company background

In 1985, Wolf Creek Generating Station became the first nuclear power plant in Kansas. The plant, operated by Wolf Creek Nuclear Operating Corporation, provides the surrounding areas with emission-free electricity using a pressurized water reactor. Wolf Creek not only generates 1,200 megawatts of electricity, enough to power 800,000 homes, but also employs 1,000 workers from Burlington, Kansas, and the surrounding areas. Wolf Creek Nuclear Operating Corporation is a subsidiary of three owners: Kansas City Power and Light, Westar Energy, and Kansas Electric Power Cooperative. The ownership percentages are 47 percent, 47 percent, and 6 percent, respectively.

Project background

In an effort to reduce costs and demonstrate the company's commitment to energy efficiency, the intern was assigned the task of identifying possible areas for reducing energy consumption. Projects of focus included replacement of HVAC units, warehouse lighting design, office floor timers, and electric vehicle procurement.

Incentives to change

Wolf Creek consumes 45-46 MW of electrical power during normal operations. This consumption results in a loss of revenue for the owners by taking power off of the grid that could be sold to customers. Not only does Wolf Creek want to increase revenue for the owners by decreasing consumption, but it is also attempting to set a standard for the industry and prove that it is possible to optimize plant operations and increase energy efficiency concurrently.

Projects reviewed for E2/P2 potential

1. HVAC unit replacement

Six air-conditioning units on top of Wolf Creek's main office building, the Clyde Cessna, have become extremely unreliable, as they have surpassed their

recommended 10-12 years of use. The units, installed in 1995, have an energy efficiency ratio (EER) of 7.9. The intern recommended replacement of the units in order to save on energy and maintenance costs. New units will utilize the refrigerant R-410a in place of the currently used R-22. Unlike R-22, R-410a does not deplete the ozone layer if a leak occurs. The replacement units will have an EER of 10.0, which, upon installation, could save Wolf Creek 215,280 kWh and \$16,835 annually. This project has not yet been approved for implementation.

2. UVC lamps

Ultraviolet lamps, particularly the "C" wavelength, can be used to irradiate the evaporator coils of HVAC units. The lamps kill microbial growth on the coils, which is detrimental to air flow and efficiency of the unit. Wolf Creek workers have collected parts and begun the installation of one lamp into a unit on site. Once the lamp is installed, changes in mold growth will be observed. If there is a substantial decrease in growth, further measurements will be made to record efficiency changes on another test unit. At this time, savings cannot be quantified.

3. Warehouse lighting

The main warehouse on site has a current lighting layout that does not accommodate the needs of the workers. Lighting levels are too low, and luminaires are not placed effectively. The intern presented many options to rectify the situation: occupancy sensors can be installed to save energy in high-rack aisles when they are not in use; T12 lamps can be switched out with T8 lamps to save energy; luminaires, which are directly above racks and not supplying light to the aisle, can be decommissioned; or a new layout can be installed. The most significant savings will be seen with the new layout. With the new design in place, lighting levels will be sufficient for workers and Wolf Creek could save 393,584 kWh and \$30,778 per year. This project has not yet been approved for implementation.

4. Office floor lighting

Six floors contain the majority of the office space on site. They consist of open floor plans with hundreds of cubicles. Overhead lighting remains on at all times, even after workers leave for the day. It was recommended that timing devices be installed to shut the lights off when office spaces are not in use.

In addition, fluorescent lights, which are mounted under cabinets in each cubicle, are often left on throughout the night. An article was posted in the bi-weekly company newsletter asking workers to be conscious of this issue and to turn the lights off when not in use. Fifty-eight cubicle lights were found on in an after-hours survey.

Use of timers and shutting off cubicle lights could save 669,847 kWh and \$52,375 annually. Installation of timers has not yet been approved for implementation.

5. Electric vehicle procurement

With electricity being Wolf Creek's product, much interest was shown in replacing one or more of the fleet vehicles with a battery-powered electric vehicle. Two different options exist. An electric vehicle can be used on site, which will not travel over 25 mph, or an electric vehicle can be used in place of the company's mail van, which must meet highway speeds on its trips to and from the post office in town.

Replacing the on-site vehicle could save 189 gallons of fuel and \$588 annually. Replacing the mail van could save 666 gallons of unleaded gasoline and \$1550 per year in fuel and maintenance costs. Currently, no plans have been made to acquire an electric vehicle.

Summary of 2009 E2/P2 intern recommendations for Wolf Creek Nuclear Operating Corporation

Project description	Annual estimated environmental impact	Annual estimated cost savings	Status
HVAC unit replacement	215,280 kWh/ 768 lbs waste	\$16,835	Recommended
UVC germicidal lamps	Not determined	Not determined	In progress
Warehouse lighting	393,584 kWh	\$30,778	Recommended
Office lighting	669,847 kWh	\$52,375	Recommended
Electric vehicle (Zap Electric Utility)	189 gal of gasoline	\$588	Not recommended
Electric vehicle (Phoenix SUT)	666 gal of gasoline	\$1550	Not recommended
Total savings *	1,278,711	\$99,989	
GHG reductions *	908.3 metric tons CO2e		

* Does not include projects that are "not recommended" or "further research is needed."