



Colorado Integrated Solar Project

General Project Description

The Colorado Integrated Solar Project will connect thermal energy from a parabolic-trough-concentrating solar plant with the steam cycle of Unit 2 at Xcel Energy's Cameo Generating Station, located east of Grand Junction, Colorado. It is the first actual demonstration of the concept using parabolic-trough solar technology anywhere in the world.

Project development

In January 2009, Xcel Energy sought approval from the Colorado Public Utilities Commission (CPUC) for an Innovative Clean Technology (ICT) program. The program would test and demonstrate promising clean energy projects using new, advanced solar, wind, biomass and energy-storage technologies, an important part of the company's clean energy strategy.

In May 2009, the CPUC approved the first ICT project, the Cameo hybrid solar-coal plant demonstration. In August 2009, ground was broken on the \$4.5 million project. There will be a year of performance testing through 2010.

Project goals

The project's demonstration goal is to produce the equivalent of one megawatt of electric power from renewable solar energy at the plant's existing 49-megawatt coal generating unit. Its larger goal is to test the commercial viability of using solar power to reduce the overall consumption of coal, reduce emissions from the plant, and if successful, increase the opportunity for cost-effective renewable power generation in Colorado.

Project facts

Location: Approximately 16 miles east of Grand Junction, Colorado, along Interstate 70.

Project cost: \$4.5 million

Size of solar field: 6.4 acres

Rows of solar troughs: 8

Lengths of troughs: 500 feet

Square feet of surface area: 70,400

Heat of transfer fluid: 575 degrees

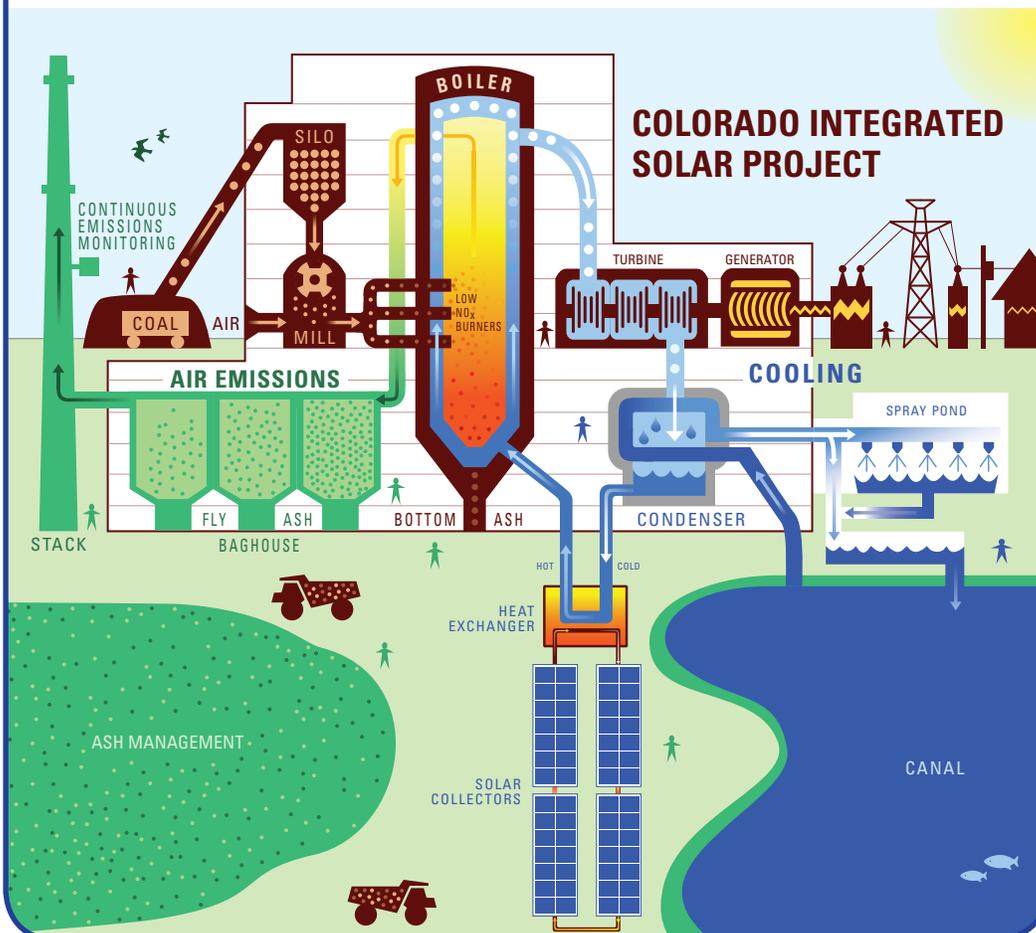
Minimum heat to operate system: 375 degrees

Carbon dioxide emissions reduction: 2,000 tons

Coal reduction: 900 tons

How the system works

- Parabolic trough solar collectors are specially designed curved, ultra pure glass mirrors. The mirrors concentrate the incoming solar radiation at the focus of the parabola, where a line of receiver tubes is located.
- The tubes are filled with a heat transfer fluid, which is a food-grade mineral oil. The fluid circulates through the tubes and is heated to about 575 degrees Fahrenheit.
- A pump circulates the heat transfer fluid through the solar field and the heat exchanger.
- At the heat exchanger, the heat from the transfer fluid is transferred to the water that is piped from the condenser to the boiler of the existing plant. Where this heat transfer takes place, the feed water is about 360 degrees. The process will increase that temperature to about 407 degrees.
- In the boiler, coal that has been ground into a fine dust is burned. There are hundreds of pipes in the boiler that are full of water. The boiler heats that water until it becomes steam. If the water is heated before it enters the boiler, less coal is needed in order to make the steam.
- The steam then turns the big blades of the turbine, which turns the generator that makes electricity.
- The electricity is delivered to customers across a network of transmission lines, substations and distribution lines.



Xcel Energy and environmental leadership

According to the U.S. Department of Energy's National Renewable Energy Laboratory Xcel Energy's Windsource[®] program continues to be the No. 1 voluntary green-energy program in the country with nearly 72,000 participating customers.

The American Wind Energy Association ranks Xcel Energy as the nation's No. 1 wind energy provider.

The Solar Electric Power Association ranks Xcel Energy No. 5 among U.S. utilities for solar capacity.

Xcel Energy is focused on reducing greenhouse gases (GHGs). By bringing on more wind and solar energy, making changes to our existing plants, and providing energy efficiency programs, Xcel Energy is on track to reduce carbon dioxide (CO₂) emissions by 15 percent from 2005 levels by 2020.

Xcel Energy was one of the first utilities in the nation with a plan to reduce CO₂ emissions and since 2003 it has reduced these emissions by a cumulative 26 millions tons.



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