Emerging Technology
Distributed Generation

Rock Island Arsenal Fuel Cell Siting Study

Background

Rock Island Arsenal (RIA) is the largest government-owned weapons manufacturer arsenal in the western world. The Arsenal manufactures gun mounts, artillery carriages, recoil mechanisms, and other equipment for the Armed Forces as well as assembling tools, sets, kits, and outfits that support equipment in the field. The Arsenal's stone buildings are also the home to approximately 40 tenant organizations that receive facility support services such as general supply purchasing, security, information technology, and building and infrastructure maintenance. RIA's three major missions are: (1) manufacturing, (2) logistics, and (3) base operations.

Study Description

In 2000, under management and funding from the U.S. Army Construction Engineering Research Laboratory (CERL), AESC and a team of consultants evaluated the feasibility of siting a 1-MW molten carbonate fuel cell (MCFC) at RIA. The study was conducted in three phases.

The first phase of the fuel cell feasibility study surveyed four potential sites at Rock Island Arsenal. Phase I identified a location near the Central Steam plant as the most favorable site, and concluded that the fuel cell should be grid connected, supplying electrical energy to the entire installation, rather than a specific building or facility. Phase I also identified numerous opportunities for use of waste heat recovered from the fuel cell, including plating operations located reasonably close to the central plant site and accessible through the summer steam distribution system.

Phase II of this study examined in detail the location near the Central Steam plant. The Phase II study used the conclusions resulting from the Phase I study for detailed project analysis. In addition, the fuel cell would cogenerate and supply heat that would augment the Central Heating Plant steam load, thus displacing some coal purchases.

Phase III performed detailed modeling of the fuel cell potential cost and environmental benefits specific to RIA's energy situation. Because of the complexity and interaction of RIA's process and environmental energy consumption along with associated costs, the model captures energy loads, RIA local generation, and fuel prices to ascertain the fuel cell's impact at a known level of certainty.

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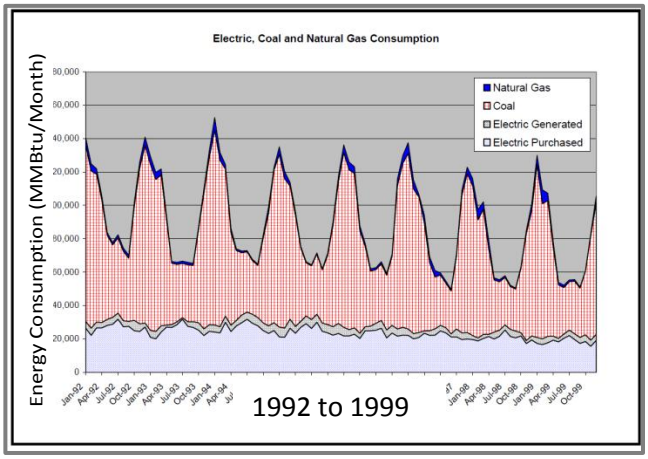
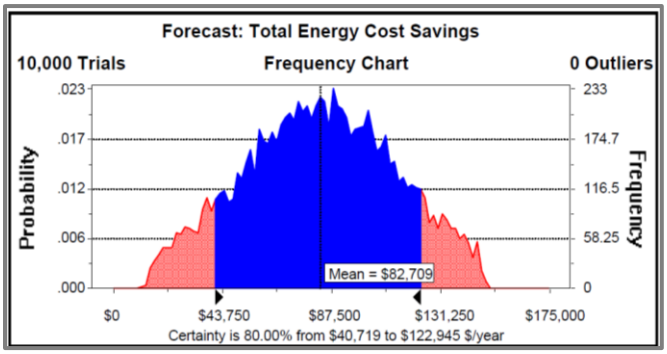
Situation Description

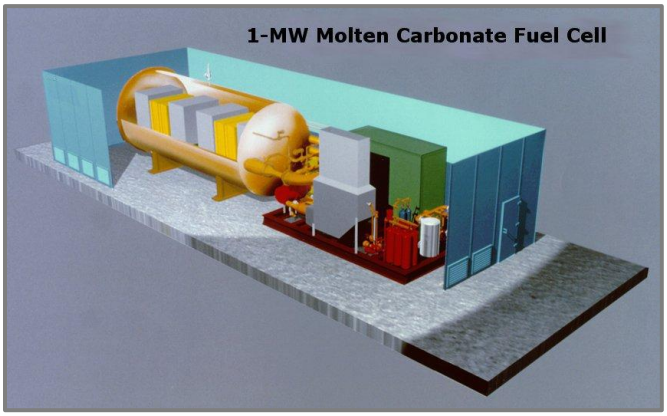
Approximately 40 tenants and 4,000 employees work at RIA to support the Arsenal's operations manufacturing development and production mission. RIA has an aggressive energy management program designed to reduce energy consumption, environmental impact and cost without limiting the Arsenal's ability to carry out its mission. RIA utilities include an internal electric distribution system, low-pressure natural gas, steam network (supplied by a coal fired central steam plant) and a 3-MW hydroelectric generating station.



Project Results

Analysis of three different sites at RIA resulted in selecting the central steam plant as the optimal location for a 1-MW fuel cell. Detailed stochastic analysis of the benefits of the fuel cell implementation resulted in a net savings of $82k per year with a CO_2 emissions reduction of over 4,000 tons per year at 80% certainty.





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