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Short Mountain Methane Power Plant: Past, Present, and Future

Vision

In 1985, Emerald People's Utility District had gas on the brain - methane gas to be exact. At the time, more than 60 facilities in the United States were actively turning methane gas released by landfills into electricity, and none of them were in the Pacific Northwest. "Here we had this great landfill, right in our backyard, and nothing was being done to capture the gas it produced," said Bob Mieger, then EPUD conservation supervisor. "The site literally reeked of potential."

During this time period, the Environmental Protection Agency began moving forward with legislation to mandate all landfill operators to recover and dispose of a minimum 65 percent of the methane produced by each facility. Here was the potential: A methane power plant on the Short Mountain landfill in Goshen would not only help Lane County by capturing the toxic methane gas being released into the air, but also help EPUD by producing electricity for the District well into the future.

Collaboration

In 1985, EPUD approached Lane County with the concept of a landfill-gas-to-electricity plant at Short Mountain. The proposal was met with enthusiasm by the County Waste Management Division, which recognized the potential to solve several problems at the same time. "Wonderful," was the word used to describe the project by Mike Turner, then manager of the Lane County Waste Management Division. To move the process forward, the County publicly issued a request for proposal, which was later awarded to EPUD. The initial contract between EPUD and Lane County was signed on September 17, 1986. Amongst the signers were former speaker of the Oregon House Dick Eymann for EPUD, and future Oregon Congressman Peter Defazio for Lane County.

Risks and Benefits

Though the initial contract was signed, the approval process was far from over. The Short Mountain methane power plant project would take seven years to move from conception to construction.

The potential benefits of the project were clear. Less methane gas would be released into the air. Less odor would emanate from the landfill. The County would meet new EPA standards and avoid having to spend more than a million dollars to build a gas collection system, plus additional annual costs for labor, maintenance, and production. The County would receive royalty payments based on the percentage of electricity generated by the facility as well as property taxes paid by EPUD for the facility. EPUD would create 2.5 new jobs and have access to locally-generated power.



But there were risks associated with the project as well. While the technology was proven, it would still be the first project of its kind in the Pacific Northwest. The Short Mountain landfill had no liner and a lot of ground water, both untested factors at the time. In addition, EPUD was buying power from the Bonneville Power Administration at 1.7 cents a kWh at the time. Other plants producing methane from landfills were producing electricity at rates of 6-7 cents per kWh. Could EPUD produce power at a rate that would make the \$1.6 million investment profitable? Would the project fail, resulting in an across-the-board rate increase for EPUD Customer-Owners? The project risk was on EPUD shoulders, but staff remained optimistic regarding the high potential of the project.

Negotiations

In 1987, EPUD hired project consultant EMCON at their own expense to conduct a feasibility study of Short Mountain landfill in regard to producing methane gas. As a result of this and other studies, EPUD realized the initial contract with the County would need to be renegotiated. The initial contract agreed to pay the County an upfront advance of \$250,000 on future royalty payments of 22.5 percent per annum of the value of electricity generated by the facility. After further study however, EPUD realized those payments would cause the utility to lose money on the project for 20 years. "The cost of producing electricity from landfill gas must meet or beat the utility's avoided cost of purchasing power elsewhere," said then EPUD senior resource planner Alan Zelenka. "Otherwise, it's not a good deal for our ratepayers."

The new contract proposed an up-front payment to the County of \$25,000 and royalty payments of 4.5 percent, with a minimum guarantee of \$15,000 per year. Additional amendments also extended project timelines and allowed more provisions to terminate the contract if either party found the project unacceptable for any reason during the pre-construction phase. Initially, several members of the Lane County Board of Commissioners disliked the changes and the County discussed issuing another RFP on the project. Eventually however, terms were settled and the amended contract was signed on June 21, 1989.

"The guaranteed royalties may not be a lot of money, but its \$15,000 that was just going up in smoke before," Turner said. "We think it's a good project. We've been working closely with Emerald on it and think it's great that Lane County and EPUD can enter into a joint government contract like Short Mountain. The big advantage to Lane County is that we're recovering a resource that would simply go to waste otherwise, and this project is really the only way to do that."

The contract was amended one final time in November of 1990, before coming to the EPUD Board for final approval. At this point, EPUD had conducted exhaustive studies and analysis, held a public hearing, received a recommendation to move forward from its citizen's advisory committee, finalized the contract with the County, solicited project bids, and selected a project developer. It was now up to the EPUD Board of Directors to make the final vote on the future of the project. The Board had been split in previous votes, citing concerns with costs and viability of the project, but on March 26, 1991 with staff



encouragement and approval, they voted to move ahead with the project.

A Generation Plant is Born

In 1991, EPUD signed a \$1.6 million contract with developer Energy Tactics, which had already completed eight projects similar to the one at Short Mountain. With their expertise, the first phase of the plant became operational on time and under budget in 1992. The second phase expansion project, which added two engines to the initial two, was completed in 1993 entirely with EPUD specially trained labor. No consultants or outside contractors were hired for the construction of phase two, resulting in a very cost-effective expansion project.

In addition to internal resources, EPUD was able to take advantage of several other agencies and programs to maximize the viability of the project.

In the early 1990s, Bonneville Power Administration released a program designed to encourage utility companies to invest in developing alternative energy generation plants. The EPUD/BPA Billing Credits agreement allows EPUD to generate power at Short Mountain, sell that power to BPA, then buy it back for its Customer-Owners at the Preference Rate in place at the time of production. This program has added to the viability of the project considerably over the years and will continue to until it expires in June of 2013.

In addition, EPUD was able to partner with the private investment group Zahren Financial Corporation. Through this rather complex partnership, Zahren was able to utilize the existing federal alternative energy tax credit of which EPUD, as a public entity, could not take advantage. Zahren became owner of the Short Mountain gas collection system and hired EPUD as general contractor for the facility. EPUD then ran the facility and purchased the gas produced back from Zahren to generate electricity to sell to BPA. Through the arrangement, EPUD was able to increase its annual cash flow by \$30,000 and avoid borrowing \$580,000 up front for the collection system. This agreement was mutually beneficial throughout both phases of the project and was continued until the tax credits ran out in 2006 for the phase-one agreement and 2008 for the phase-two agreement. EPUD is now full owner of the Short Mountain collection system and all gas produced therein.

Short Mountain Today

Today, the Short Mountain Power Plant runs with four engines and generates about 17 million kWh per year, enough to power about 1,150 homes. While the project remains viable, these production figures are well below initial estimates. According to early plans, the project would now have 7 engines, producing 50-60 million kWh, enough to power 4,000 homes. Why the discrepancy? Original plans were based on estimated garbage loads prior to the County-wide recycling efforts that began in 1992. Though EPUD supports all recycling efforts, it does make a big difference in the amount of "quality" garbage making its way to the dump. Food scraps, yard waste, and other decomposable garbage produce the largest quantities of methane gas. When these items were diverted, the number of engines needed to



process the methane was adjusted downward.

EPUD continues to make annual upgrades and improvements to the Short Mountain Methane power plant, including the annual installation of new gas wells. As with the phase two construction of the plant, all upgrades are completed in-house, without the use of contractors.

The Bottom Line

EPUD took a big risk moving forward with the Short Mountain methane power plant project and continues with some of this risk still today. There was no guarantee of success, there were many variables and unknowns, and the initial and continual monetary investments required were enough to hurt the utility were the project to fail. But the project did not fail. Thanks to careful planning, continued hard work, good partnerships, and a little luck, the Short Mountain methane power plant is a success, not only for EPUD but for the County and the greater community as well. Some now argue that the contractually specified 4.5 percent is not a large enough royalty payment to the County. EPUD argues that with risk comes reward, and that the County's avoided costs both initially and over time, are enough to compensate for the differences in percentage.

Since 1995, Lane County has received \$305, 046 in royalty payments and \$349,178 in property taxes from EPUD. In addition, they avoided spending millions in consulting and contracting fees to build the facility the County needed to meet the required EPA methane standards. Since the project began, they have also avoided annual costs estimated at \$600,000-\$800,000 for labor and facility upgrades.

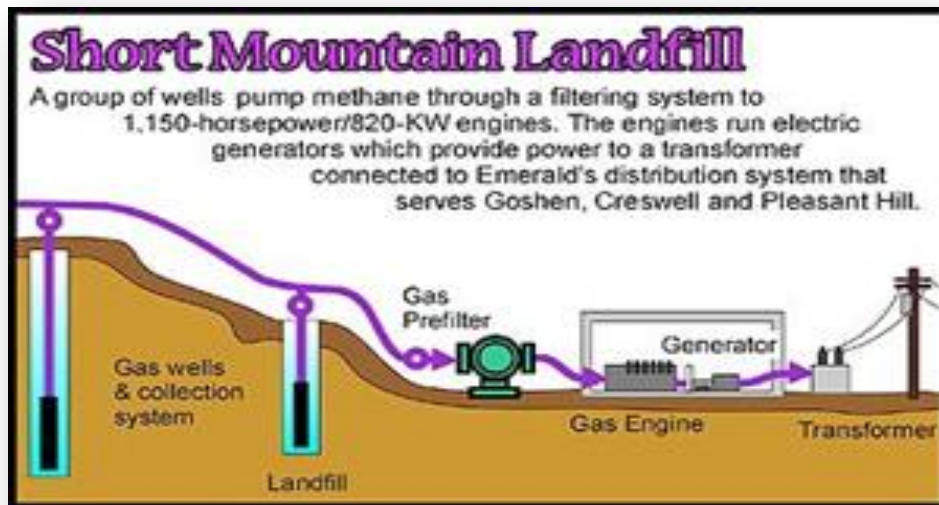
To date, EPUD has invested \$4,026,469 in the methane power plant at Short Mountain. Since 1985, the project has generated an average annual income of \$286,000, which goes to pay off initial debt incurred and fund future improvements. The total estimated project income to date, adjusted for lost earnings on the initial investment, is \$2,545,169. Though the initial project investment is paying off over time, EPUD still shoulders much of the project risk. EPUD is required through its contacts with BPA to continue generating power at Short Mountain through 2028. If for some reason the plant does not continue to generate the same levels of electricity, or if EPUD loses access to that power, they would be required to find replacement power at the much higher market cost.

EPUD has a strong vested interest in the Short Mountain methane power plant now and well into the future. This interest is not only fueled by years of hard work and investment, but also by the promise of expansion and improvement in the future.



Appendix- How Methane Recovery Works at Short Mountain

EPUD is extracting naturally occurring methane from the Short Mountain Landfill through vertical and horizontal wells in the landfill. The wells are connected in a system of plastic pipe called the collection system, which delivers the landfill gas to the power plant. A blower that creates a vacuum on the collection system draws the landfill gas from the wells. The landfill gas is then filtered and piped directly into large Caterpillar 3516 gas-fired internal combustion engines (1150 horsepower from 16 cylinders generating 800 kW each), where the landfill gas is burned to generate electricity. All ownership and operation of the landfill itself is done exclusively by the Lane County Solid Waste Management Division. EPUD owns and operates the collection system and power plant.



The flow chart above graphically demonstrates the process. Starting at the left, combinations of vertical and horizontal wells extract the landfill gas. 30 vertical wells, ranging between 45 and 85 feet deep, and 65 horizontal wells buried in the landfill capture the 1,200 cubic feet per minute of landfill gas used in the power plant. As new sections of the landfill are filled, Emerald will install additional wells to replace old wells. Once the landfill gas is extracted from the individual wells, it is piped through the collection system and brought to the power plant. The gas passes through a clean-up system that removes the moisture and filters out particulates and other impurities.

After the gas is cleaned, it's injected into the engine carburetors for combustion. The Caterpillar engines were specifically designed to run on landfill gas. Combustion of the gas in the engines turns the engine crankshafts, which turn the generators, which generates electricity. Through switching gear and step-up transformers, the electricity is tapped directly into the utility distribution grid for use by Emerald's customers in the Goshen, Creswell, and Pleasant Hill areas.



The project is also environmentally sensitive. Emerald is a partner with the U.S. EPA in its Climate Challenge Initiative to combat global warming. Landfill gas is essentially methane, which is a powerful greenhouse gas about 22 times more harmful than carbon dioxide. In the combustion process to create electricity, the landfill's methane is converted to carbon dioxide, thereby significantly reducing the greenhouse effect of the landfill. The benefits of a typical 2-megawatt plant like Short Mountain is the same as removing 17,000 cars and their emissions, or planting 23,000 acres of forest, or forgoing the burning of 430 railcars of coal! The U.S. EPA estimates that if the additional 600 landfills in the U.S. were to use this technology, we could generate 13.7 billion kWhs of electricity, the equivalent of 10 coal-fired power plants, generating enough electricity to meet the power needs of over a million homes. This would also reduce greenhouse emissions equivalent to taking 14 million cars off the road. By capturing the landfill gas, this project has also nearly eliminated the odor problems at Short Mountain.

Concern for the environment also motivated Emerald to choose equipment that uses the best emission-control technology available. The Caterpillar engines are specially designed to be "low emission" engines, low enough to meet the stringent California emission standards. The Lane Regional Air Pollution Authority approved and permitted the project. The Short Mountain Methane Power Plant takes an environmental problem and changes it into a green and profitable solution. In 1996, it was awarded the USDOE National Award for Energy Efficiency and Renewable Energy.

