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Lopez Canyon Landfill Energy Facility Project Summary June 2016



"Smart investments in green technology are key to building a more sustainable future for Los Angeles. This project will help the City of Los Angeles meet its renewable energy mandates and sustainability goals."

—City of Los Angeles Mayor, Eric Garcetti



Project Overview

Project Team



Project: Renewable Landfill Gas to Energy Project
Owner / Operator: FORTISTAR
Project Completion: January 29, 2016
Equipment: 2 CAT 3616 Engines
Capacity: 6.4 MW Gross
Location: Lopez Canyon Landfill
Project Term: 20 Year Power Purchase Agreement to LADWP

Energy is both a national and international issue, but when you get down to the realities of real-life energy need and production, it is, most of all, local. Local energy projects serving local businesses and communities, like the City of Los Angeles, California.

Concerns about how to address climate change have become a staple of the news cycle. Not a day goes by without comments from leaders, whether it's Warren Buffett talking about the importance of energy storage for electric utilities or U.S. Environmental Protection Agency Administrator Gina McCarthy talking about the threat posed by methane emission.

Lopez Energy, at the Lopez Canyon Landfill, is a facility which will include landfill gas compression and treatment systems, CAT diesel engines and utility electrical interconnection. Landfill gas will be drawn from the landfill and supplied to the engines through gas compression and treatment equipment—with the energy generated delivered straight to Los Angeles residents by the new interconnect with LADWP.

The Partnership

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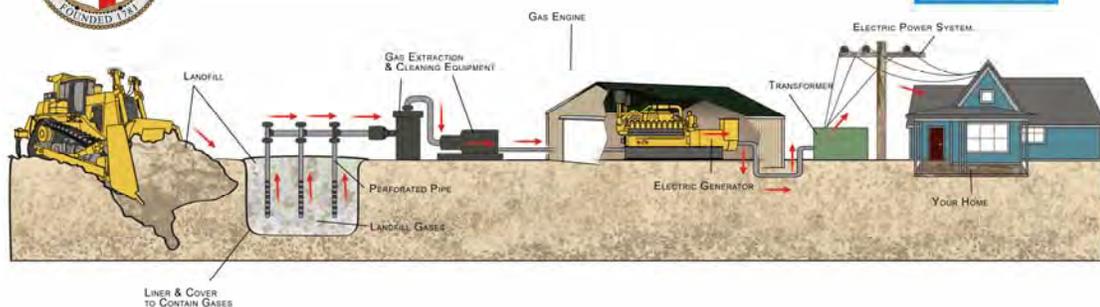
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“With this landfill gas station, Lopez Canyon is a valuable renewable energy resource in the Northeast San Fernando Valley. This project will help the City of Los Angeles meet its renewable energy mandates and sustainability goals.”

—Councilmember Felipe Fuentes, representing the Seventh Council District.



Lopez Facility Standout Features

- Runs as a “baseload” 24/7 facility burning landfill gas to produce reliable electric energy
- State of the art controls and data collection systems will allow the facility to optimize performance, maximizing output. Advanced data collection will allow for more “predictive” as opposed to “reactive” maintenance. By optimizing operations through the use of technology the project can continue to be economically viable for all parties.
- A functioning “on the ground” relationship between all parties will ensure the landfill, energy project, and utility are symbiotic, working together on environmental and generation issues

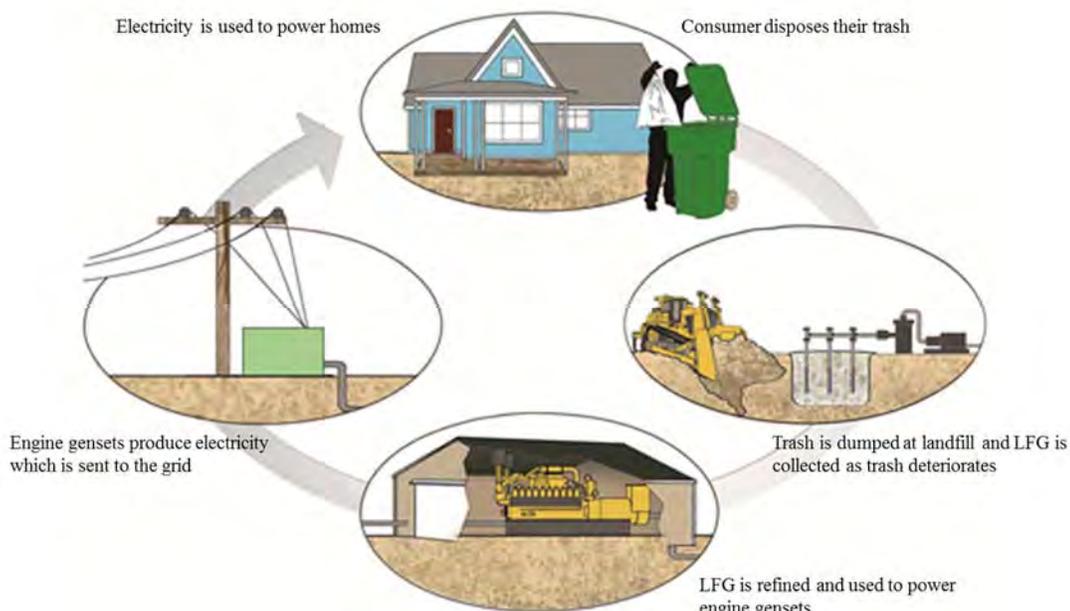


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The Project

Lopez to Energy Project Highlights

- First began operations in 1998
- New substation allows for power sales to LADWP from one of two engines.
- New emissions reduction system to be in operation last quarter 2016 will meet latest SCAQMD emissions requirements.



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General Design Considerations

- The Lopez Energy facility uses 1 of the 2 CAT 3616 engines for green energy delivery to LADWP. The other engine sells green energy to SCE.
- CAT 3616 produces 3,300 Kw of energy at 4,160volts.
- Net energy delivery to LADWP is 3000 Kw at 34.5 kilovolts

Project Schedule—

- LADWP contract signed April 9, 2015
- LADWP sales began January 29, 2016



“The importance of developing and maintaining renewable energy supplies in this region cannot be overstated. And by leveraging key partnerships between the public and private sectors, we can find a way to secure the future of our residents, our businesses and our environment.”

—California State Assemblywoman Patty López (D-San Fernando)

Landfill Gas to Energy

Methane Emissions from Landfills

Adapted from information provided by the Landfill Methane Outreach Program, a division of the United States Environmental Protection Agency - www.epa.gov/lmop. Municipal solid waste (MSW) landfills are the second-largest source of human-related methane emissions in the United States, accounting for approximately 22 percent of these emissions in 2008. Landfill Gas (LFG) is created as solid waste decomposes in a landfill. This gas consists of about 50 percent methane (the primary component of natural gas), about 45 percent carbon dioxide (CO₂), and small amounts of non-methane organic compounds. Methane emissions from landfills represent a lost opportunity to capture and use a significant renewable and sustainable energy resource.

Converting Landfill Gas to Energy

Instead of escaping into the air, LFG can be captured and used as an energy source. Using LFG helps to reduce odors and other hazards associated with LFG emissions, and it helps prevent methane from migrating into the atmosphere and contributing to local smog and global climate change through greenhouse gas emissions. LFG is extracted from the landfill using a series of wells with a vacuum system. This system directs the collected gas to a central point where it can be processed and treated depending upon its ultimate use. From this point, the gas can generate electricity, replace fossil fuels in industrial and manufacturing operations, or be upgraded to pipeline-quality gas where it may be used directly or compressed into an alternative vehicle fuel.

Electricity Generation

The generation of electricity from LFG makes up about two-thirds of the current LFG operational projects in the United States. Electricity for on-site use or sale to 3rd parties can be generated using a variety of technologies, including internal combustion engines, turbines, micro turbines, and fuel cells. The vast majority of projects use internal combustion (reciprocating) engines or turbines, with micro turbine technology being used at smaller landfills and in niche applications. Technologies such as Stirling and organic Rankine cycle engines and fuel cells are still in development.

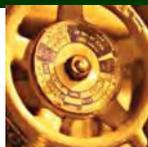
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"Working together with our public and private partners, our landfill energy project reduces greenhouse gas emissions that contribute to climate change, offsets the use and cost of non-renewable resources from fossil fuels such as oil, natural gas, and coal, and improves our local air quality."

—Enrique C. Zaldivar, Director of LA Sanitation



Landfill Gas to Energy (cont.)

Benefits of Landfill Gas Energy

Using LFG for energy is a win/win opportunity. LFG utilization projects involve citizens, nonprofit organizations, local governments, and industry in sustainable community planning. These projects go hand-in-hand with community and corporate commitments to cleaner air, renewable energy, economic development, improved public welfare and safety, and reductions in greenhouse (global warming) gases. Finding innovative ways to deal with their LFG contributes to the creation of livable communities that enjoy increased environmental protection, better waste management, and responsible community planning.

It Directly Reduces Greenhouse Gas Emissions

MSW landfills released an estimated 30 million metric tons of carbon equivalent to the atmosphere in 2008 alone. Given that all MSW landfills generate methane, it makes sense to use the gas for the beneficial purpose of energy generation rather than emitting it to the atmosphere.

Methane is a very potent greenhouse gas that is a key contributor to global climate change (over 21 times stronger than CO₂). Reducing methane emissions from MSW landfills is one of the best ways to achieve a near-term beneficial impact in mitigating global climate change.

LFG energy projects process the majority of the methane generated from the landfill, depending on system design and effectiveness. The captured methane is destroyed (converted to water and the much less potent CO₂) when the gas is combusted in a controlled manner to produce electricity.

Like all combustion devices, LFG electricity generation devices have some air emissions. However, LFG electricity generation projects significantly improve the environment, because of the large methane reductions, hazardous air pollutant reductions, and avoidance of the use of limited non-renewable resources such as coal and oil that are significantly more polluting than LFG.

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Landfill Gas to Energy (cont.)

It Indirectly Reduces Air Pollution by Offsetting the Use of Non-Renewable Resources

Producing energy from LFG reduces the need to use non-renewable resources such as coal, oil, or natural gas to produce the same amount of energy. This can avoid or reduce gas end-user and power plant emissions of CO₂ and criteria pollutants such as sulfur dioxide (which is a major contributor to acid rain), particulate matter (a respiratory health concern), nitrogen oxides (NO_x), and trace hazardous air pollutants.



It Creates Other Indirect Benefits

Collecting and using LFG to produce electricity improves the air quality of the surrounding community by reducing landfill odors, and reducing possible health risks from uncontrolled LFG. Gas collection can also improve safety by reducing explosion hazards from gas accumulation in structures on or near the landfill. Generating electricity from existing MSW landfills is also a relatively cost-effective way to provide new renewable energy generation capacity to supply community energy and sustainability objectives.

It Benefits the Local Economy

LFG energy projects generate revenue from the sale of the gas. LFG use can also create jobs associated with the design, construction, and operation of energy recovery systems. LFG energy projects involve engineers, construction firms, equipment vendors, and utilities or end-users of the power produced. Much of this cost is invest locally for drilling, piping, construction, and operational personnel, helping communities to realize economic benefits from increased employment and local sales.

It Reduces Environmental Compliance Costs

Current EPA regulations under the Clean Air Act require most landfills to collect and combust LFG. There are several compliance options, including flaring the gas or installing an LFG use system.

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