

# RNG by the Numbers

**300** containers per day of municipal solid waste received at Roosevelt Regional Landfill from 5 Western U.S. states and British Columbia

**175** full-time employees at Roosevelt Regional Landfill and supports dozens more jobs from contractors and vendors

**10** full-time Klickitat PUD employees working at H.W. Hill Renewable Natural Gas Project

**30** age of Republic Services Roosevelt Regional Landfill

**21** years the Klickitat PUD has operated a facility at the H.W. Hill Renewable Natural Gas Project site

**2.9** miles of underground pipeline that connects H.W. Hill Renewable Natural Gas Project to Williams Northwest Pipeline

**20** year long-term sales agreement

**53** percentage of methane in landfill gas

**98** percentage of methane in gas produced by H.W. Hill Renewable Natural Gas Project

**11,500,000** cubic feet per day of landfill gas that can be processed

**18,000,000** gallons of gasoline equivalent that can be produced per year



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# H.W. HILL RENEWABLE NATURAL GAS PROJECT

## Renewable Resources Powering the Future



**ROOSEVELT, WASHINGTON**

# History of RNG Project

In early 2014, Klickitat PUD was focused on declining wholesale electrical power prices and the impact low prices might have on the PUD's generation projects.

Klickitat PUD's commissioners saw this decline and directed staff to maximize the value of the assets owned by the PUD.

Staff began researching alternative uses for the gas that is produced by the landfill. At the same time Klickitat PUD was doing this research, the U.S. Environmental Protection Agency qualified landfill gas as meeting the requirements of being a cellulosic biofuel under the 2007 Renewable Fuel Standard (RFS II).

Cellulosic biofuel is the most valuable of all the biofuels identified in the RFS program because they result in at least a 60% reduction in life cycle greenhouse gas emissions.

Klickitat PUD approached Republic Services about the possibility of using the gas to fuel trucks on the landfill. It was quickly realized that the landfill could produce enough fuel in 13 days to fuel the trucks for an entire year!

Staff at Klickitat PUD then worked with nearly 100 companies (including developers, off-takers, equipment suppliers, engineers and even municipal agencies) to put together a project that is one of the largest and most efficient renewable natural gas facilities to be found anywhere!

Under a 15 year sales agreement, the facility will sell gas for 5 years at a fixed price that recovers debt repayment and operating and maintenance expenses.

Excess gas volumes will assist with Klickitat PUD electric rates. In years 6 through 15 of the agreement, all gas is sold at market prices with all debt on the facility now retired.

# Partnerships

The Klickitat PUD H.W. Hill Renewable Natural Gas Project is the result of a unique partnership with Klickitat County, Klickitat PUD and Republic Services Roosevelt Regional Landfill.

As part of the permitting process, Klickitat County retained the gas rights for the methane gas produced by the landfill. Klickitat County then deeded those rights to Klickitat PUD to generate renewable energy.



Additionally, Klickitat PUD has landfill gas optimization agreements with Republic Services whereby Republic Services and Klickitat PUD work collaboratively to maximize the amount of gas harvested.

# Past Projects

The H.W. Hill Facility has been through a successful project succession. Each project has been an opportunity to learn, grow and build upon the previous successes.

In 1999, Klickitat PUD commissioned the Landfill Gas I, or reciprocating engine project, generating up to 10.5 megawatts of electricity.

In 2010, Klickitat PUD commissioned the Landfill Gas II, or gas turbine combined-cycle project, generat-

ing up to 26 megawatts of electricity.

In 2018, Klickitat PUD commissioned the Renewable Natural Gas Project, producing up to 5,700 dekatherms per day or the equivalent of more than 18 million gallons of gasoline per year to be used as renewable transportation fuel!

With each phase of expansion, the capacity to process more fuel, more efficiently and with fewer emissions was achieved.



# Unique Production Processes

Pipeline natural gas that is used in homes and businesses to cook, heat and generate electricity is composed primarily of methane, known molecularly as CH<sub>4</sub>.

Landfill gas is generated in the landfill by anaerobic (without oxygen) decomposition or organic (plant and animal) material. The by-product of this decomposition is CH<sub>4</sub> and CO<sub>2</sub>.

Naturally occurring, sulfur-reducing bacteria that is widely found in our environment also produce trace amounts of H<sub>2</sub>S (hydrogen sulfide). To collect the gas that is produced in the landfill, a vacuum is applied through a network of nearly 300 wells resulting in an intrusion of atmospheric air (N<sub>2</sub> and O<sub>2</sub>) into the gas stream.

The combination of all of these results in landfill gas that



is 53% methane, 36% CO<sub>2</sub>, 7% N<sub>2</sub>, 3.5% H<sub>2</sub>O and 0.5% O<sub>2</sub> (with trace amounts of H<sub>2</sub>S).

The H.W. Hill facility removes water, H<sub>2</sub>S, CO<sub>2</sub>, O<sub>2</sub> and N<sub>2</sub> (in that order) and produces pipeline gas that is over 98% pure CH<sub>4</sub>, exceeding pipeline gas quality standards.

The H.W. Hill facility also utilizes unique technology for use on landfill: Cryogenic Nitrogen Removal. After all contaminants are removed with only nitrogen left to be removed, the gas is used as its own refrigerant and is cooled to -280° F, liquefying the CH<sub>4</sub>, causing the N<sub>2</sub>

to separate from the CH<sub>4</sub>. This process results in reduced electrical load of the facility and saves up to 16 million kilowatt hours of electricity per year!



# Project Benefits to Ratepayers and to Klickitat County

For nearly 20 years, the H.W. Hill Landfill Gas project has helped to insulate Klickitat PUD ratepayers from fluctuations in the electricity market.

The Renewable Natural Gas Project will continue to provide rate support for customers of Klickitat PUD.

Under long-term fixed price contracts, the gas produced will be sold at a fixed, guaranteed price

that will cover the cost of operation of the facility, pay off the acquired debt by 2023, and provide additional revenue to support rates.

Klickitat PUD also contributes \$250,000 annually to the Landfill Gas Infrastructure Fund.

The Landfill Gas Infrastructure Fund can help to provide resources for water and wastewater improvement projects throughout the county.

