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HAND DELIVER

The Honorable Chair and Members of
the Hawaii Public Utilities Commission
465 South King Street
Kekuanoa Building, Room 103
Honolulu, Hawaii 96813

Re: Hawaii Revised Statutes (HRS) § 269-45, Gas Utility Companies Renewable
Energy Report

To the Honorable Public Utilities Commission of the State of Hawaii:

In accordance with HRS § 269-45, The Gas Company, LLC doing business as Hawaii
Gas, hereby files its Annual Renewable Energy Report for 2016. Portions of the
report have been redacted in accordance with HRS § 269-45(a).¹

Sincerely,

Lori Y. Sun
Associate General Counsel
Hawaii Gas

¹ HRS § 269-45(a) states in part, "Due to the proprietary nature of the information required by paragraphs (3) and (4), that information shall be held in confidence by the commission; provided that any information obtained by the commission under this section, including confidential information, shall be made available to the department of business, economic development, and tourism or its authorized representative, which shall safeguard the confidentiality of that information."

Hawaii Gas

2016 Renewable Energy Report

Overview

The Gas Company, LLC, doing business as Hawaii Gas (Hawaii Gas), has prepared this Annual Renewable Energy Report for the Hawaii Public Utilities Commission in accordance with Hawaii Revised Statutes (HRS) § 269-45.

Hawaii Gas manufactures synthetic natural gas (SNG) for its utility customers on Oahu, and distributes propane through utility and nonutility systems throughout the State's six main islands. SNG and propane are clean-burning fuels that produce lower levels of carbon emissions than other hydrocarbon fuels, such as oil and coal. SNG and propane provide a safe, reliable, and economical source of energy to approximately 70,000 residential and commercial customers throughout the State, with almost half of those customers served by the SNG utility system on Oahu.

SNG is produced using naphtha, a byproduct of the existing oil refining process in Hawaii. The production process is approximately 85% efficient whereas electricity generation from oil-derived fuels is approximately 32% efficient. As a result, SNG delivers nearly three times more energy to the end-user per barrel of oil as compared to electricity produced from oil. Had customers on Oahu used electricity instead of gas energy, an additional 867,126¹ barrels of oil would have been needed. This amounts to a savings of \$36,646,508 based on an average cost of \$42.26 per barrel of low sulfur fuel oil.²

Current Non-Fossil Fuel Resources

Hawaii Gas produces SNG using a blend of naphtha and hydrogen, along with other feedstocks. Since 2000, approximately 50% of the hydrogen used to produce SNG has been from recycled water from the Honouliuli Wastewater Treatment Plant (WWTP). Recycled water from the WWTP is combined with methane and other gases to produce hydrogen and additional methane in Hawaii Gas' utility processes. In 2016, hydrogen produced from reclaimed water accounted for 2.8%³ of the total feedstock used to produce SNG.

¹ See Attachment 1.

² *Id.*

³ *Id.*

About Renewable Natural Gas Energy

Hawaii Gas is committed to increasing the use of renewable natural gas (RNG) in Hawaii. RNG is chemically equivalent to natural gas (methane) and is produced by purifying raw biogas to obtain a methane content of at least 98%. Today, raw biogas is produced at several landfills and wastewater treatment plants in Hawaii through the breakdown of organic matter by microorganisms. The resulting biogas contains approximately 60% methane and 40% carbon dioxide. By using proven purification technology, carbon dioxide can be removed to produce RNG energy with a methane content of 98% or more, making it chemically equivalent to natural gas, and ready for use in Hawaii Gas' existing gas utility distribution system to serve all customers.

However, there are challenges in using biogas produced at landfills and wastewater treatment plants. First, while some incremental improvements in biogas production may be possible, these resources are generally not scalable due to capacity limits. Second, landfills and wastewater treatment plants tend to be owned and operated at the county level, which limits Hawaii Gas' ability to have open access to these resources. The table below summarizes Oahu's known municipal biogas resources.

Table 1: City and County of Honolulu biogas production.

Facility	Therms/yr
Honouliuli WWTP	800,000
Kailua WWTP	311,639
Waimanalo Landfill	1,907,928
Kapaa Landfill (Kailua Area)	664,884
Kalaheo Landfill (Kailua Area)	289,080
Sand Island WWTP (w/ new digester)	1,413,838
Total	5,387,369

Biogas can also be produced through the anaerobic digestion of organic matter. Anaerobic digestion is a process where micro-organisms breakdown organic matter in the absence of oxygen. While feedstocks used to produce biogas can vary, there is only one feedstock resource that is scalable, i.e., energy crops. To minimize the cost of gas, it is key to select an energy crop that: 1) maximizes energy production per acre of land; 2) minimizes water requirements; and 3) utilizes the most efficient pre-treatment, digester, and purification technology available. It is widely known that biogas can be produced by anaerobically digesting energy crops, but the energy crops and technologies reviewed by Hawaii Gas to date are much higher than Hawaii Gas' current SNG production costs. Nevertheless, Hawaii Gas will continue to assess different varieties of energy crops and new and innovative pre-

treatment and digester technologies to identify the best approach to produce scalable and reasonably feasible RNG production in Hawaii.

Key Accomplishments in 2016

- In September 2016, the City and County of Honolulu awarded Hawaii Gas the Honouliuli Wastewater Treatment Plant fuel supply contract for the purchase of approximately 800,000 therms of biogas at a fixed price of \$2.00 per therm over the contract term, which expires in December 2024. Hawaii Gas filed an application with the Hawaii Public Utilities Commission in October 2016 for approval of related capital expenditures and the fuel supply agreement, which is currently under review. If the application is approved, the target date for operations would be early 2018.
- As part of the Honouliuli Wastewater Treatment Plant project, Hawaii Gas released a Request for Proposals (RFP) to purchase a biogas purification system, which would purify raw biogas from a methane content of approximately 60%, to greater than 98%, allowing for direct use in Hawaii Gas' existing SNG pipeline system.
- Hawaii Gas released a RFP to import renewable liquefied natural gas (RLNG) to Hawaii from the U.S. mainland. Based on the proposals received thus far, the method is possible, but the price of RLNG is not competitive with that of Hawaii Gas' existing SNG supply (more than twice the price).
- Hawaii Gas is currently evaluating energy crop options, pre-treatment processes, and anaerobic digester designs to assess cost, reliability, and system efficiency.

Summary

Hawaii Gas plays a vital role in Hawaii's energy portfolio by providing clean and cost-effective energy to commercial and residential customers. We are committed to Hawaii's clean energy goals, and will continue to look toward new, innovative, and economical ways to incorporate renewable energy sources and support the State's renewable energy future, while also reducing greenhouse gas emissions and aiding in waste diversion.

Attachment 1: Renewable Energy Report Summary
 Confidential - Pursuant to HRS § 269-45(a)

Annual Report to the Hawaii Public Utilities Commission		
Date:	February 2017	
2016 Renewable Energy Production Report to the Public Utilities Commission		
For the production of natural gas, biogas, biofuels, or biofeedstocks for use by the State gas utility		Barrel of Oil Equivalent (BOE)
		(5,446,140 BTU/bbl)
Percentage of total feedstock comprised of petroleum feedstock	97.2%	
Percentage of total feedstock comprised of non-petroleum feedstock ^{1&2}	2.8%	
The energy quantity in therms produced from petroleum feedstock Annual Therms		
The energy quantity in therms produced from non-petroleum feedstock Annual Therms ²		
Total		
Barrels of imported oil saved by using SNG instead of electricity ³		867,126
	\$ / barrel	
Dollars saved on imported oil for the Hawaiian economy ⁴	\$42.26	\$36,646,508
For every 1 (one) barrel of therm equivalent SNG, it would require 2.813 barrels of oil for generator fuel. ⁵		
As an example for heating water, if electrical cost would be \$100, the SNG cost would be \$35.54 (higher conversion efficiency).		
Footnote		
¹	Hydrogen produced in the reformer and water shift reactor from Reclaimed Wastewater. Therms based off feedstock flow.	
²	Plant stoichiometric basis (HHV) - R-hydrogen therm / Plant Feedstock therm - Use of recycled water from Honouliuli Wastewater Treatment Plant	
³	Calculated from plant conversion efficiencies with hot water production.	
⁴	Average \$42.26 /LSFO barrel (\$7.76/MMBTU) from HECO Monthly reports Jan thru Dec 2016.	
⁵	For every Barrel Therm Equivalent of SNG produced there is a savings of 1.728 Barrels of Oil saved (54.4614 therms / barrel).	

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 Pursuant to HRS § 269-45(a)