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June 28, 2018

E-PORTAL FILING

Ms. Carlotta Stauffer, Clerk
Florida Public Service Commission
2540 Shumard Oak Boulevard
Tallahassee, FL 32399-0850

Re: **Docket No. 20180004-GU – Natural Gas Conservation Cost Recovery**

Docket No. 20140196-EG -- Petition for approval of natural gas energy conservation programs for commercial customers, by Associated Gas Distributors of Florida.

Dear Ms. Stauffer:

Attached for electronic filing, please find the Associated Gas Distributors of Florida's CDD Activity Final Report, which is being filed in the referenced dockets in accordance with Order No. PSC-2015-0095-PAA-EG.

As always, thank you for your assistance with this filing. If you have any questions whatsoever, please do not hesitate to contact me.

Sincerely,

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TACTICAL ENERGY SOLUTIONS, LLC

AGDF CDD Activity Final Report

A Summary of AGDF Research Efforts conducted from 2013 through 2017

Joseph Eysie

6/26/2018

This report is being filed by AGDF pursuant to Order No. PSC-15-0095-PAA-EG, which required a final report for all AGDF funded conservation and development research efforts.

Table of Contents:

I. Objective

The objective of this report is to provide a summary of the four jointly-funded Conservation Demonstration & Development (CDD) projects conducted Associated Gas Distributors of Florida (AGDF) between 2013 through 2017.

II. AGDF Background

The Associated Gas Distributors of Florida (AGDF) is a trade association representing the following investor-owned natural gas utilities which are subject to the jurisdiction of the Florida Public Service Commission ("FPSC") under Chapter 366, F.S.: Florida City Gas ("City Gas"), Florida Division of Chesapeake Utilities Company ("Chesapeake"), Florida Public Utilities Company ("FPUC"), Florida Public Utilities Company-Indiantown Division ("Indiantown"), Peoples Gas System ("Peoples Gas"), Sebring Gas System ("Sebring") and St. Joe Natural Gas Company ("St. Joe").

III. Overview

The purpose of this document is to identify the key findings from the AGDF jointly-funded Conservation Demonstration & Development ("CDD") efforts and the implications of these findings.

IV. Nomenclature

AGDF- Associated Gas Distributors of Florida
CDD- Conservation Demonstration & Development
CERC- Clean Energy Research Center (Phase 1 GHP Field Test)
COP – Coefficient of performance
FSEC- Florida Solar Energy Center (OCF Field Test & Phase 2 GHP)
GHP- Gas Heat Pump
OCF- Oil Conserving Fryer
SEER - Seasonal Energy Efficiency Ratio

V. GHP Field Test Findings & Implications (Phase 1)

Findings

CERC's field test results emphasized the importance of load design when sizing GHPs, and that oversizing of systems negatively impacts the performance of the equipment. The oversizing of GHP equipment prevents the engine driven compressor from operating at full load design conditions; when the engine is most efficient.

The Coefficient of Performance (COP) of the GHPs varied from about 0.3 to about 0.9, with a maximum of 1.2 for GHP3 during a short, steady-state period. Using the field data, CERC determined that if the gas engines were running at full load design conditions and adequately sized, the COP of the GHP3 unit would be 1.79, which is in the range of expected COPs for GHP, and considered equivalent to a SEER 14.

Implications

There were multiple implications for these findings. The broader implications were that the technology works as expected when sized correctly, and established the potential for GHPs to serve as an alternative space cooling option for commercial facilities across Florida. These findings prompted a second phase of GHP research, including a secondary analysis of the impact of GHP sizing, as well as a deeper analysis of how the individual components of the GHP system contribute to total system efficiency.

VI. GHP Further Analysis Findings & Implications (Phase 2)

Findings

In conducting their GHP analysis, FSEC found that performance degradation on a GHP is most affected when a partial load is served under the lowest engine speed. Furthermore, FSEC found the internal electric loads (KW) and total electricity (kWh) consumed by the GHP were higher than expected. FSEC identified the ancillary electric breakdown of a 8-ton GHP Outdoor Unit, which found that the unit's Outdoor fans account for 56.8% of electricity consumption, the

cooling pump draws 9.1%, the compression clutch accounts for 8.2%, and the other electrical components account for the remaining 25.9% of the electric load.

FSEC also identified how the variability in commercial electric rates and a lack of GHP tariff rates present challenges for conducting economic payback analysis on a case-by-case basis. Additionally, in responding to follow up questions from their GHP analysis, FSEC indicated that GHPs would be most effective in small and medium commercial facilities seeking to replace central plant chillers in the (8-16 Tons) range.

Additionally, FSEC identified the Source to Site conversion ratios, which quantify the energy loss from energy source to the on-site consumption, for heat pump technology to be a ratio of 3.34 for electricity, and 1.047 for natural gas. FSEC found that total system efficiencies can reach 80% by utilizing GHP exhaust heat recovery for hot water and dehumidification.

Implications

As was the case with phase one of the GHP research, the findings from Phase 2 also produced wide-ranging implications. FSEC's findings brought attention to the internal electrical loads as an area where GHP manufacturers can improve the individual efficiency of each component to yield greater total system efficiencies. Manufacturers have already begun to address this issue, which is evident in newer GHP models.

FSEC's findings also highlighted how a natural gas GHP tariff would allow for better case-by-case economic analysis when conducting comparisons between electric heat pumps and GHPs. Also, by identifying the end use facilities that could most benefit from GHPs, AGDF member utilities can focus their attention on exploring GHPs in applications that make the most sense for their customers.

By specifying the Site to Source ratios that are most appropriate for comparing electric heat pumps and GHPs, AGDF members are given a working baseline for any future analysis on the source energy benefits of GHPs. This type of analysis could lead to a better understanding of the avoided energy benefits yielded by GHPs, as well as the corresponding avoided CO_2 benefits.

By detailing the specific configurations that could be designed to capture heat exhaust from GHPs, and with these water heating and desiccant technologies already commercially viable, there is a strong potential for designing higher GHP system efficiencies. The development of a GHP Energy Conservation Program could potentially facilitate the required cross-training and collaboration between the various manufacturers and installers. Such a program could also encourage designs and technology pairings that maximize GHP system efficiency.

VII. OCF Fryer Field Test

Findings

FSECs' field test results found that a retrofit from electric to natural gas fryers resulted in a reduction of 87.7 kWh/day, which is equivalent to $7.99/day in operating cost. The analysis assumed an average commercial cost of natural gas to be $1.02/thm. At this price, the cost of the added natural gas is $5.26/day, which saves $2.72/day, minus the auxiliary electric ($0.73/day),for a total savings of $728/year.

Implications

This research reaffirms the benefits of gas fryers. By compiling the findings into an educational course format, AGDF utilities were provided a valuable tool that is ready to be deployed and incorporated within energy conservation collateral efforts with the food service industry.