WHITE PAPER

ACHIEVING HIGH IMPACTS IN LOW INCOME MULTIFAMILY HOUSING

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1. ABSTRACT

Since 2007, Frontier Energy has implemented the Agencies in Action program for CenterPoint Energy Houston Electric in Texas. The program provides comprehensive and cost-effective weatherization and energy efficiency services to income eligible residential electricity customers. Starting in 2015, Frontier Energy developed and incorporated a Multifamily HVAC program component aimed at replacing aging HVAC systems in all-electric multifamily housing with new, high efficiency heat pumps. The Multifamily HVAC program design makes use of a unique competitive bidding process, plus scoring, ranking, inspection and legal due diligence procedures developed by Frontier Energy in order to ensure that projects are selected and completed on time, within budget, and with minimal surprises along the way. The approach ensures that low income residents in multifamily homes can benefit from the program, and leverages program funds by requiring a share of the cost to be provided by for-profit owners of multifamily properties serving low-income tenants. Data reveals that the program has consistently yielded increasing savings and cost effectiveness since inception, due primarily to the competitiveness of the bidding process and gradually increasing equipment efficiencies.

2. BACKGROUND AND INTRODUCTION

Investor-owned electric utilities in Texas' deregulated market are referred to as Transmission & Distribution Utilities (TDUs), and are required to meet certain energy efficiency goals annually. The Public Utility Commission of Texas (PUC) Substantive Rule §25.181 (Energy Efficiency Rule) establishes procedures for meeting these goals. To comply with the Energy Efficiency Rule, the TDUs offer energy efficiency programs to customers within their respective service territories. These programs involve the installation of energy efficiency measures such as insulation, high efficiency lighting, photovoltaic systems, and more.

Texas TDUs are required to spend no less than 10% of their annual energy efficiency program budgets on comprehensive weatherization programs benefitting low-income customers. Eligibility to participate in these programs is limited to households with incomes before taxes that are at or below 200% of the Federal Poverty Guidelines. In these programs, eligible measures must produce a Savings to Investment Ratio (SIR) of 1.0 or greater, as determined by the National Energy Audit (NEAT) modeling tool developed by the US Department of Energy. Claimed energy and demand savings, however, are determined by the Texas Technical Reference Manual (TRM) and sometimes differ significantly from savings estimated by NEAT. Utilities have some flexibility in program design and implementation to limit or encourage certain measures to reflect these differences.

3. UNIQUE CHALLENGES

Market saturation by mature weatherization programs, high population growth, a relatively young and efficient building stock, and increasing energy efficiency baselines often make identification of eligible low-income customers, homes and measures challenging. Many Texas weatherization agencies face difficulties in meeting annual production and expenditure goals, and some are at risk of funding reduction. Major weather events such as storms, hurricanes, and flooding leave otherwise eligible properties ineligible for energy efficiency funding until needed repairs are addressed.

TDUs' strategies for overcoming these barriers vary, depending in large part on the geography and demographic characteristics of their service areas. CenterPoint Energy's electric service area, for example, is concentrated in and around the greater Houston area, is densely populated and urbanized, and has a high concentration of multifamily housing serving low-income tenants.

Additional issues arise in the context of providing weatherization services to multifamily housing. Weatherization programs serving single-family homes provide small (a few thousand dollars' worth) capital improvements for property owners who also tend to occupy the home and reap the long-term benefits of energy savings. In the multifamily context, weatherization grants can be much larger (potentially hundreds of thousands of dollars) and fund capital improvements to properties that frequently are owned by for-profit investors. Energy savings still accrue to income-eligible tenants, but utilities and implementers are more reluctant to fully fund the costs of eligible improvements without a significant share borne by for-profit property owners.

4. FRONTIER ENERGY'S SOLUTION

Within this context, Frontier Energy developed and deployed a new approach in 2015: a low-income weatherization program component that highlights replacement of aging HVAC systems in all-electric multifamily housing with new, high efficiency heat pumps. This single measure is targeted to yield high savings and cost-effectiveness as determined by both the NEAT audit and the Texas TRM, but is not the only measure offered.

Figure 1. Frontier Energy meets on-site with each project team to qualify every project prior to award.

For-profit-owned apartment complexes are initially screened and provisionally selected for award based on an evaluation of submitted heat pump proposals. Other measures, most commonly ceiling insulation and direct install measures such as LED lights and water efficiency measures, are also evaluated and awarded if they qualify.

Properties owned and submitted by non-profit organizations are similarly screened, but award selections are made based on a number of criteria including project scores, demonstrated need, previous participation in the program by project team members, availability of additional measures, etc.

Each fall, owners of multifamily properties are invited to competitively bid for incentives covering a share of the cost of heat pump replacement projects on multiple units at a complex. Bids are scored based on the cost-effectiveness of each proposal, so bids requesting lower incentives and/or greater savings are preferred. Incentives are offered to fund the highest ranked projects that meet all due diligence requirements, subject to annual spending limits applicable to sponsors, property owners and ownership groups, and contractors. Final awards are offered to selected projects in the December-March timeframe, so that equipment can be ordered and construction can begin during the spring, before HVAC contractors hit their busy summer season.

Once construction begins, Frontier field inspectors meet and communicate with the project team to ensure that all program requirements are being met, systems are installed in accordance with quality standards, and data is provided to support all savings claims. Frontier inspects all installed systems and arranges for incentive payments to be made periodically and as units are completed.

The program design makes use of unique scoring, ranking, inspection and legal due diligence procedures developed by Frontier Energy to ensure that projects are selected and completed on time, within budget, and with minimal surprises along the way. The approach also ensures that low income residents in multifamily homes can benefit from the program, while leveraging available program funds by requiring property owners to share in the cost of improvements.

5. OUTCOMES

This paper reviews the impacts, cost-effectiveness, and trends of CenterPoint Energy's Multifamily HVAC program implemented by Frontier Energy over the past 5 years. By compiling information obtained from all bids received, as well as actual installation data from awarded and completed projects, we obtain granular insight into program outcomes and trends. This review is limited to projects completed between 2015 and 2019.

PROGRAM APPLICATION/AWARD TRENDS

Since 2015 the number of applications received and awarded in the multifamily heat pump program has been trending upward. The program budget has remained constant over this period; thus, increases in the number of applications received demonstrate increasing competitiveness of the bidding process. Beginning in 2017, Frontier Energy and CenterPoint Energy also began limiting the amount of funds available to any single project in a program year in order to spread program funding and risks more widely; this change has increased the number of awarded projects annually.

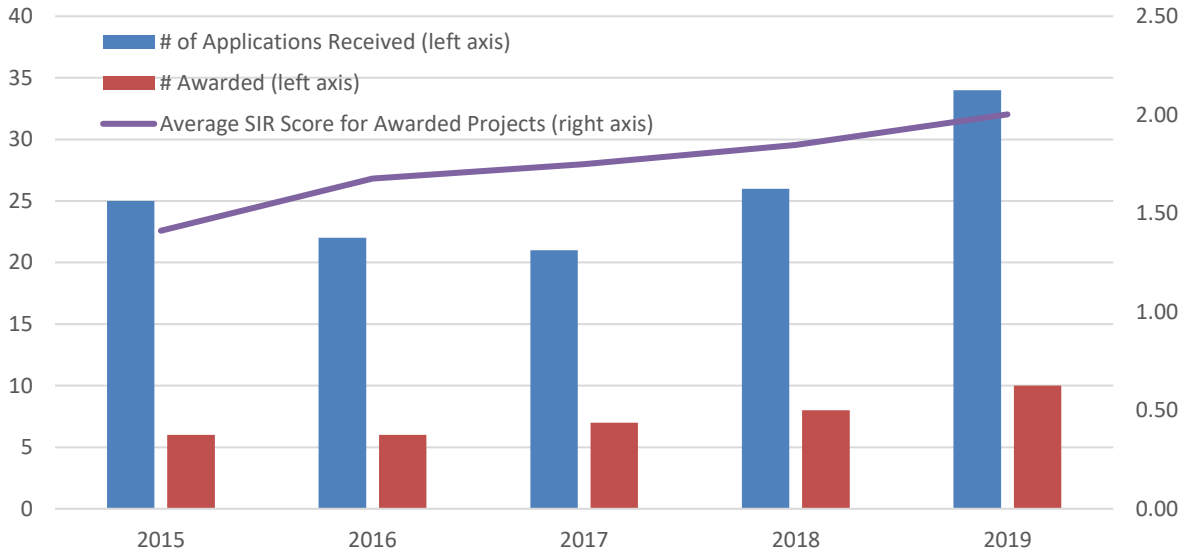

Figure 2. The program has become increasingly competitive in terms of the number of applications received and in the cost-effectiveness of awarded projects.

The nature of CenterPoint Energy's urban service area has made these trends possible. The program benefits strongly from having large numbers of qualifying multifamily properties and air conditioning contractors who are experienced in working with CenterPoint Energy, who are familiar with the annual bid process, and who work diligently to identify and propose new projects during each program cycle.

SYSTEM SIZE, EFFICIENCY AND INCENTIVE COST TRENDS

To gain insight into trends in the configuration of awarded and implemented projects, Frontier Energy evaluated three key heat pump properties:

- AC Tonnage: A ton, as used in the HVAC field, describes how much heat the AC unit can remove from a home in one hour. The measurement for heat is the British Thermal Unit (BTU). One ton of air conditioning can remove 12,000 BTUs per hour.
- SEER Rating: SEER (Seasonal Energy Efficiency Ratio) expresses air conditioning and heat pump cooling efficiency, which is calculated by the cooling output for a typical cooling season divided by the total electric energy input during the same time frame.
- HSPF: The higher the HSPF (Heating Seasonal Performance Factor) of a heat pump, the more energy efficient it is in heating. HSPF is a ratio of BTU heat output over the heating season to watt-hours of electricity used. It has units of BTU/watt-hr.

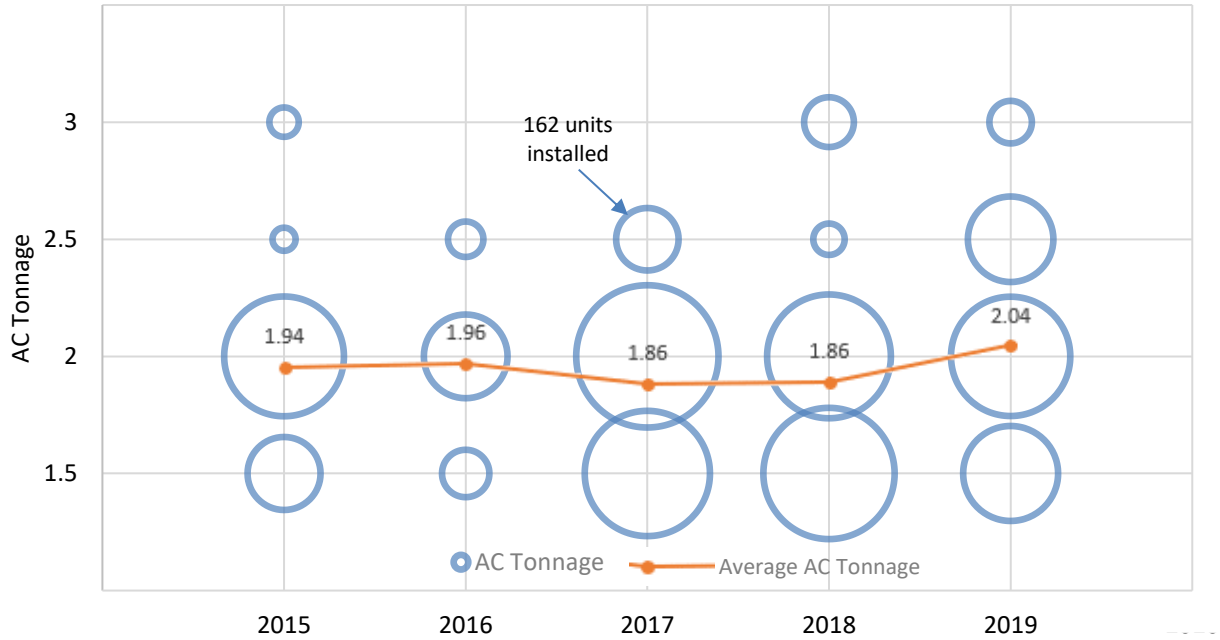

Figure 3. Installed heat pump cooling capacity has been relatively constant over time and is not a likely explanation for improving cost effectiveness of the program.

The average tonnage of units installed has remained relatively constant over time, primarily due to the predominance of smaller AC units in qualifying low-income multifamily properties. Thus, gains in cost effectiveness over time are not likely to be derived from differing unit sizes, but rather from higher efficiency ratings of installed projects and lower incentive costs bid to the program.

The figure below illustrates the trend of increasing SEER and HSPF ratings of installed heat pumps.

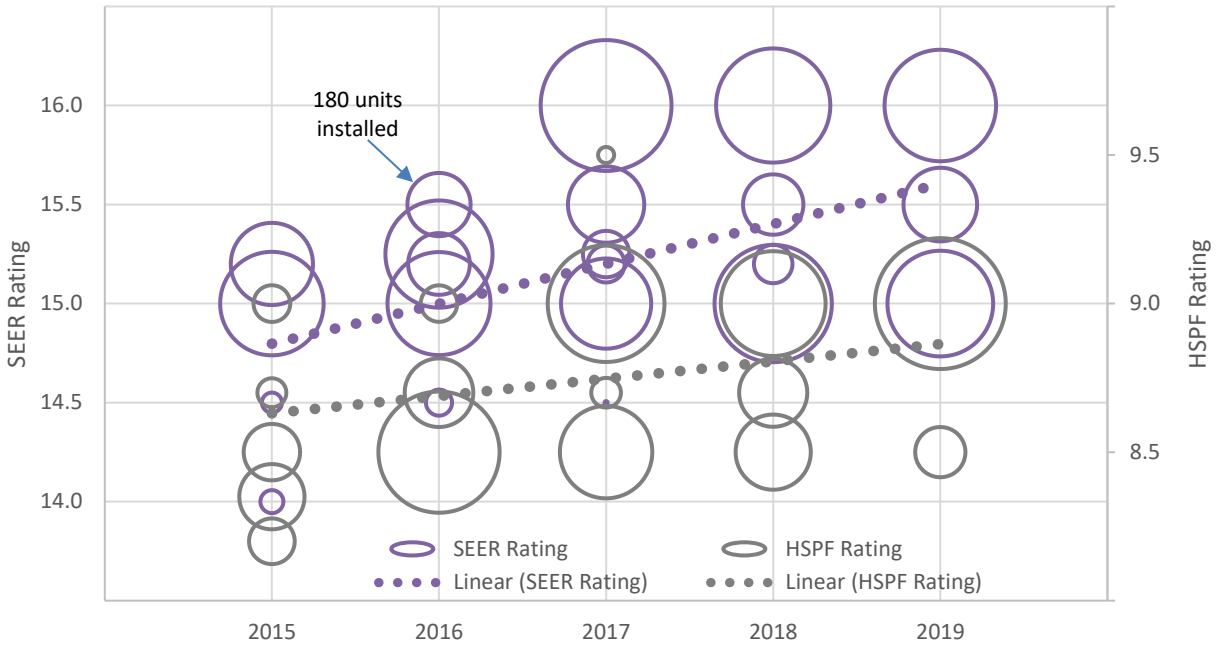

Figure 4. The average cooling and heating efficiency of installed heat pumps has been increasing.

Frontier Energy's competitive bidding process has also resulted in decreasing incentive costs per installed heat pump.

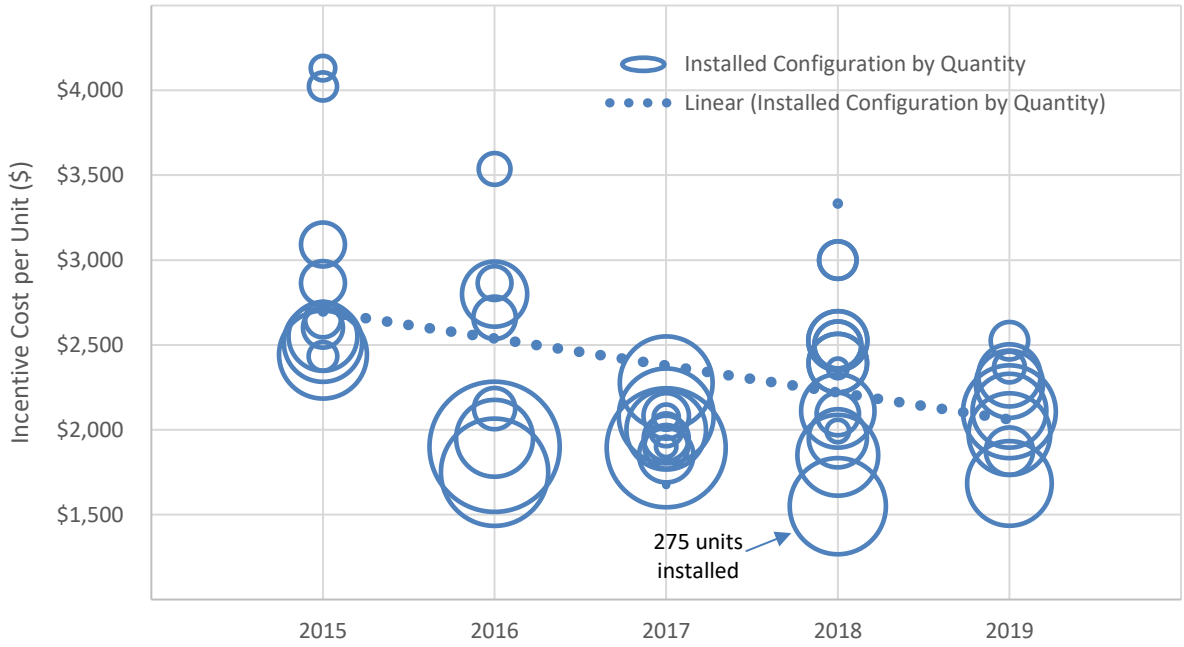

Figure 5. The program has exhibited a downward trend in the incentive cost per unit installed.

ENERGY SAVINGS AND COST EFFECTIVENESS TRENDS

Frontier Energy reviewed incentive costs against customer lifetime savings. Despite total implementation costs remaining relatively constant the amount of savings obtained from implementation has improved, largely a result of higher efficiency equipment being installed.

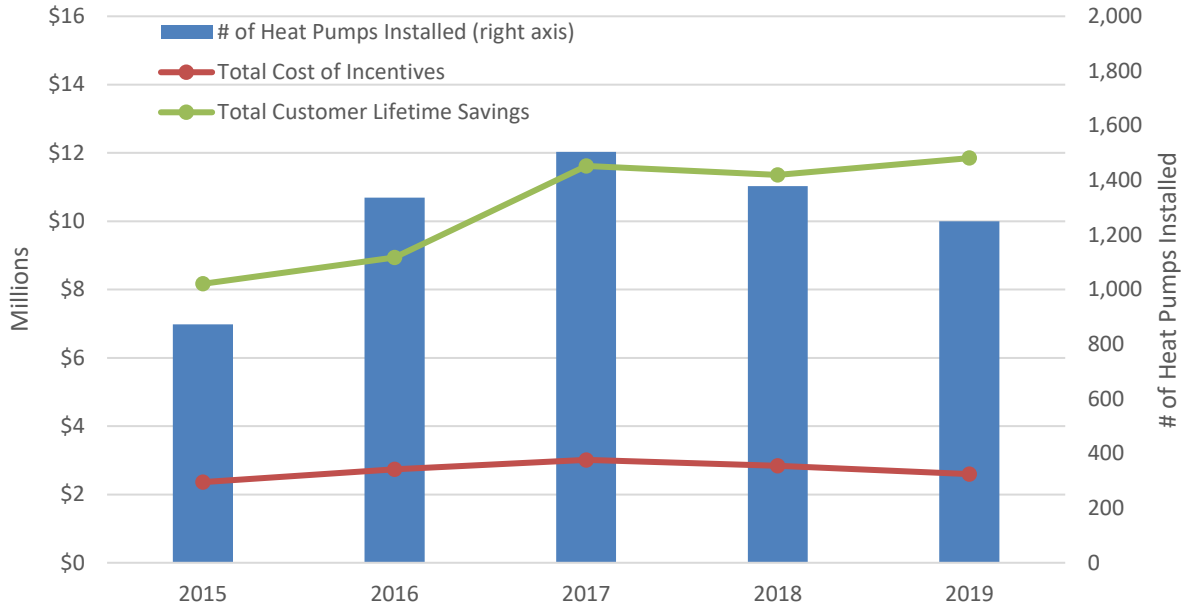

Figure 6. Customer lifetime savings have trended upwards even as incentive costs have remained relatively constant and installation volume has varied.

Frontier Energy also achieved an overall improvement in the amount of kW and kWh savings that the program has yielded per incentive dollar spent over the past several years.

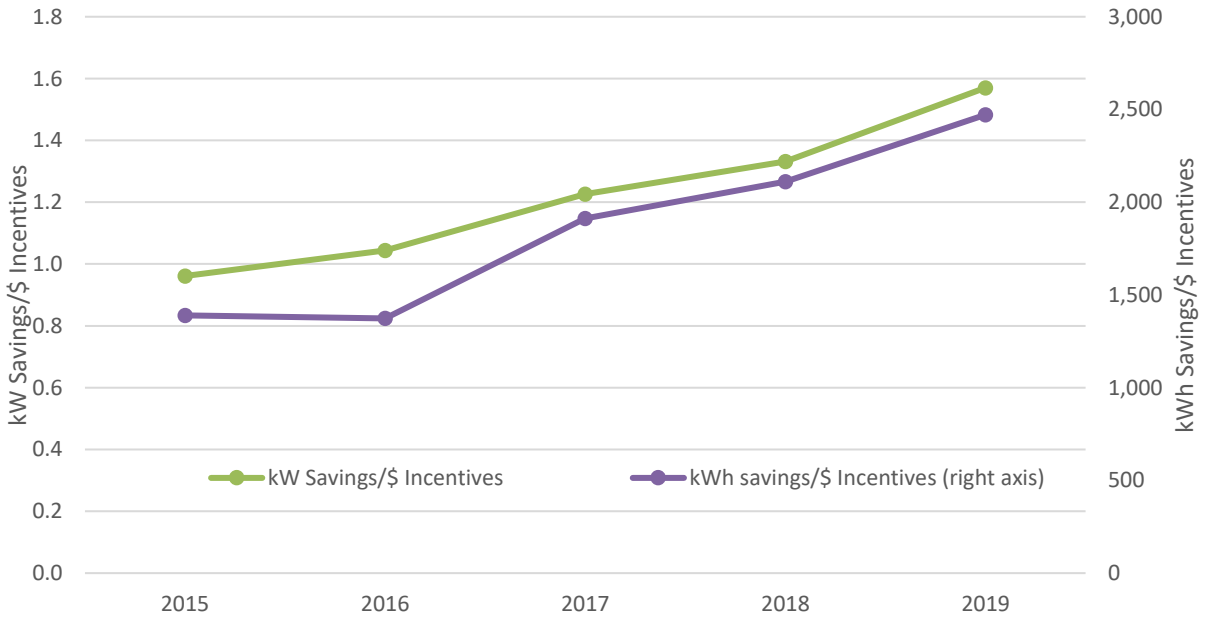

Figure 7. kW and kWh savings achieved per dollar of incentives spent has improved consistently over five years of program history.

6. CONTINUING IMPROVEMENTS

CenterPoint Energy and Frontier Energy have strived to continuously improve the Multifamily HVAC program and have observed that the program has been successful in continuously delivering quantifiable improvements in the value of the services provided to low income customers. Gains in program efficiency to date have been due primarily to development of a competitive bidding process that has yielded lower incentive costs per installed unit and greater efficiency of installed equipment.

7. PROGRAM CONTACTS

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