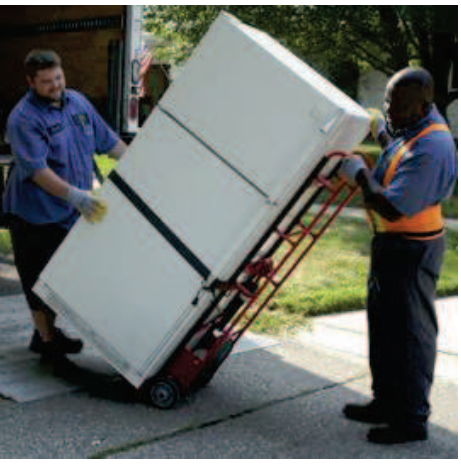
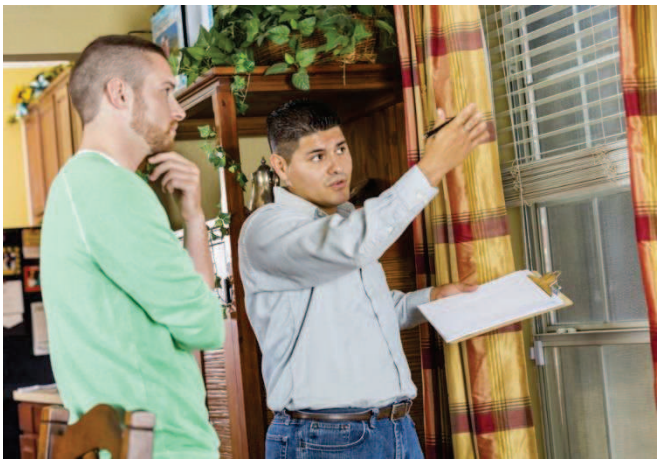
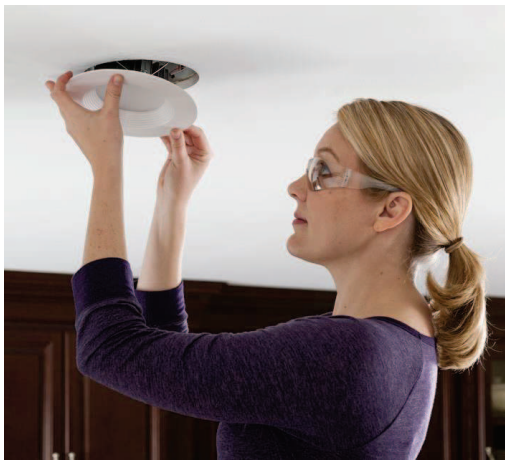
Energy Efficiency Programs Evaluation

Final Report

December 21, 2017

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Executive Summary

Fort Collins Utilities (Utilities) and Platte River Power Authority (Platte River) tasked Research Into Action and its partners, Apex Analytics and Mesa Point Energy, with evaluating their residential and commercial energy efficiency programs. The evaluation focused on the programs Utilities and Platte River identified as high-priority for 2017 research in initial discussions. In the residential sector, these programs include:

- The components of the Efficiency Works Home program (audit, direct install, rebates),
- Appliance rebates,
- Appliance recycling,
- Midstream lighting,
- Home Energy Reports (HER).

In the commercial sector, these programs include the three elements of the Efficiency Works Business program (audits, rebates, and Building Tune-Up).

The evaluation focused on program years 2014, 2015 and 2016. Over the three-year period, the evaluated programs, combined, accounted for 78% of Fort Collins Utilities' reported gross electric savings and 91% of program spending (including both incentives and administrative costs).

Below, we present key findings from the impact and process evaluations, along with conclusions and recommendations, organized by program.

Programs Evaluated

A brief description of each evaluated program is below, the body of the report presents detailed evaluation findings for each program, and each program-focused chapter begins with a more detailed description.

- **Efficiency Works for Business** seeks to increase energy efficiency in commercial buildings. The program incorporates three elements: ASHRAE Level 1 audits to help customers identify energy efficiency opportunities, incentives to reduce the cost of efficient equipment or improvements, and retro-commissioning through the Building Tune-Up offering. Platte River administers the Efficiency Works for Business program in Fort Collins, Longmont, Loveland, and Estes Park.
- **Efficiency Works for Homes** focuses on household energy savings while also supporting improved indoor air quality. The program provides home efficiency audits to identify and prioritize energy efficiency improvements, in which the auditor may also install lighting products and small domestic hot water devices (showerheads and aerators).[1] The program offers rebates

[1] Prior to 2017, all participants in Efficiency Works for Homes were required to have a home efficiency audit. In 2017, the program dropped this requirement for participants interested in replacing HVAC equipment only.

for 23 individual home improvements involving the building envelope and mechanical systems. In 2015, the program began experimenting with a streamline delivery path, designed to simplify the decision-making and upgrade process for participants using standardized pricing and grouping measures into packages. Platte River administers the Efficiency Works for Homes program in Fort Collins, Longmont, Loveland, and Estes Park.

- **Midstream Retail Lighting** works with lighting retailers and manufacturers to increase consumer adoption of efficient lighting by offering general advertising, in-store signage, sales associate training, and instant customer incentives through price markdowns on qualified lighting products.
- **Appliance rebates** incentivize the purchase of ENERGY STAR® rated appliances, saving both energy and water. The program offers rebates for clothes washers ($50) and dishwashers ($25). The program also offers double rebates as special promotions and places point of purchase (POP) marketing materials to help inform customers of the program and potential savings.
- **Appliance recycling** seeks to remove old and inefficient refrigerators and freezers from the grid. The program offers customers $35 (as in the appliance rebate program, the program offers double rebates, up to $70, during special promotional periods) to recycle a working refrigerator or freezer.
- **Home Energy Reports (HER)** encourage homeowners to make efficient choices and behaviors that will reduce their energy use. The HER program mails residential customers personalized, bi-monthly reports containing energy information. The reports show household electricity consumption along with comparisons to both "efficient neighbors" and "average neighbors". Utilities contracts with a third-party vendor, OPower,[2] that processes energy use data, selects the "neighbors," designs, produces and mails the reports to customers.

Evaluation Objectives

Fort Collins Utilities and the Platte River Power Authority conducted this evaluation to independently verify program outcomes and identify opportunities for program improvement. To this end, the process and impact evaluations addressed certain common research questions for all programs. Table ES-1 lists these questions.

Table ES-1: Research Objectives to Be Addressed Across Programs

Evaluation Type	Common Research Questions
Impact	• How much savings (kWh, kW, therms, water, etc.) has the program generated (gross savings)? How much of those savings are attributable to the program (net savings)? • How do the program's costs compare to its savings? Provide the information to report cost effectiveness from various perspectives and the relative impact of each program on the portfolio cost effectiveness. • What assumptions and methods does the program use to estimate energy savings, and

[2] Note that Oracle acquired OPower in 2016.

Evaluation Type	Common Research Questions
	how could they be improved to increase the accuracy of those estimates?
Process	• What value, including non-energy benefits, do customers find in the program? How satisfied are customers with the program? Does participation influence customer satisfaction with Fort Collins Utilities or other Platte River Power Authority utility clients? • What motivates customers and/or trade allies to participate in the program? • What barriers prevent additional customers and/or trade allies from participating in the program? • What opportunities exist to streamline program processes (both internal and customer-facing)?

In addition to these common research questions, through conversations with Utilities and Platte River staff, the evaluation team identified a variety of specific research questions that expanded on these topics and tailored them to the needs of the individual programs. These detailed research objectives are listed in Section 1.2 and in the chapters presenting detailed, program-level findings in the body of the report.

Research Approach

Six key evaluation activities inform the findings presented in this report:

- **Surveys**: The evaluation team surveyed:
  - 375 residential Fort Collins Utilities customers that participated in one or more of the evaluated programs (a 21% response rate)
  - 402 nonresidential Fort Collins Utilities customers that participated in the Efficiency Works Business program (a 16% response rate)
  - 383 residential Fort Collins Utilities customers that had not recently participated in any of the evaluated programs (an 8% response rate)
- **In-depth interviews**: The evaluation team conducted in-depth interviews with 28 market actors involved in delivery of the evaluated programs, including auditors, installation contractors, lighting retailers, and lighting manufacturers.
- **Database review**: For each evaluated program, the evaluation team reviewed program tracking data to ensure the program was tracking the fields necessary to evaluate energy savings and to identify inconsistent or missing data.
- **Project file review**: For a representative sample of projects, the evaluation team reviewed supplemental information to the program tracking data to assess the savings calculations.
- **Engineering review:** The evaluation team reviewed the engineering calculations and assumptions used to estimate energy savings for each of the evaluated programs and identify opportunities to bring assumptions in-line with industry best practice.

- **Site visits:** The evaluation team visited 14 of the sampled project sites in Fort Collins to confirm that measures had been installed as described in the program tracking database and project documentation.

Both in selecting projects for detailed evaluation review and in conducting surveys with program participants and non-participants, the evaluation team drew sufficient samples to provide estimates at 90% confidence with 10% precision among customers of Fort Collins Utilities.

Definitions

This report uses the following terms:

- **Ex ante gross savings:** Savings values reported by the program implementer, calculated using engineering or deemed methods (on a measure, project, or program level). Values reflect all installations through the program, without consideration of program influence.
- **Ex post gross savings:** The gross savings values calculated by the evaluator based on evaluation findings, also called verified savings.
- **Ex ante net savings:** Savings values reported by the program implementer, adjusted to consider the influence of the program on the installation (program attribution).
- **Ex post net savings:** Verified gross savings adjusted to account for program attribution. Realization rate: The ratio of ex post savings to ex ante savings (RR = Ex Post / Ex Ante). Typically calculated on gross savings values, but can also be calculated from net savings. A realization rate greater than one indicates verified savings were greater than reported savings, while a value lower than one indicates verified savings were less than reported.
- **Net-to-gross:** The net to gross ratio is the adjustment made to gross savings to account for program attribution. Two components, free ridership and spillover, determine the net to gross ratio, which is calculated as NTG = 1 – Free Ridership + Spillover.[3]
  - Free ridership represents projects that would have occurred without change in the absence of the program.
  - Spillover represents energy saving actions or measure installations influenced by the program that do not receive direct program incentives.

Results

This section summarizes findings from the impact and process evaluations. It begins with findings on program impacts at the portfolio and program levels, followed by key findings and conclusions and recommendations specific to each program, drawing on both impact and process evaluation activities.

[3] A third component, market effects, is included in some net to gross calculations to account for changes in the marketplace for energy efficient devices resulting from the programs. Estimating market effects can be complex and resource-intensive, and this evaluation uses only free ridership and spillover in determining net savings values.

Impact Evaluation

The gross annual electric energy realization rates that the evaluation returned were nearly identical across the residential and commercial portfolios. The verified annual electric kWh savings for the combined 2014-2016 program years were higher than the reported results for the portfolio. The residential portfolio returned 102% and the commercial portfolio returned 103% gross verified annual electric savings. The three-year total annual electric kWh savings for the portfolio was over 68 million kWh, with the evaluated residential program impacts representing 55% and commercial 45% of the verified gross kWh savings. The sector and overall portfolio ex ante claimed and ex post verified gross savings are shown in Table ES-1 below.

Table ES-1: Fort Collins 2014-2016 Gross Impacts

	Ex Ante Gross kWh savings	Ex Post Gross kWh Savings	Gross kWh Realization Rate
Residential Portfolio	36,686,974	37,570,342	102%
Commercial Portfolio	29,901,077	30,771,064	103%
Overall Portfolio	**66,588,051**	**68,341,406**	**103%**

The net annual electric energy savings the evaluation returned (ex post net savings) were also very close to the claimed net annual electric energy savings (ex ante net savings). The verified annual electric kWh net savings across 2014-2016 program years were higher than reported results for the portfolio, with realization rates for net savings of 101% for the residential and 110% for the commercial portfolio. The three-year total annual electric energy net savings for the portfolio was over 61 million kWh, with the evaluated residential program impacts representing 57% and commercial 43% of the verified net kWh savings. The sector and overall portfolio ex ante claimed and ex post verified net savings are shown in Table ES-2 below.

Table ES-2: Fort Collins 2014-2016 Net Impacts

	Ex Ante Net kWh Savings	Ex Post Net kWh Savings	Net kWh Realization Rate
Residential Portfolio	34,491,777	34,842,963	101%
Commercial Portfolio	24,151,388	26,566,589	110%
Overall Portfolio Programs	**58,643,165**	**61,409,552**	**105%**

The evaluation team estimated the cost-effectiveness of the 2014-2016 programs using the leading cost effectiveness modeling tool, Integral Analytics "DSMore." The focus of the cost-effectiveness testing was based on following three different cost-effectiveness perspectives, or tests (as defined by the California Standard Practice Manual):

- Utility Cost Test (UCT)
- Modified Total Resource Cost (TRC) test

› Participant Cost Test (PCT)

The 2014-2016 residential programs portfolio were cost effective across all three perspectives (benefits exceeded costs, or test ratio was greater than or equal to 1.0).[4] The evaluated findings for the residential portfolio resulted in Utility Cost Test (UCT), Total Resource Cost (TRC), and Participant Cost Test (PCT) cost-effective ratios of 1.11, 1.00, and 3.05, respectively (Table ES-3). The 2014-2016 commercial programs portfolio were also cost effective across all three perspectives. The evaluated commercial findings resulted in UCT, TRC, and PCT cost-effective ratios of 2.23, 2.43, and 4.93, respectively. Though it is complicated to compare cost effectiveness results across program administrators (due to different avoided cost assumptions, and accounting for and inclusion of both non-energy costs and benefits), the cost-effectiveness of the Fort Collins programs are in line with other jurisdictions the evaluation team has reviewed. A more detailed discussion of these tests and the cost-effectiveness analysis is included in Appendix A.

Table ES-3: Fort Collins 2014-2016 Portfolio Cost-Effectiveness Results

	UCT	TRC	PCT
Residential Portfolio	1.11	1.00	3.05
Commercial Portfolio	2.23	2.43	4.93
Overall Portfolio Programs	**1.76**	**1.81**	**4.12**

A review of the more granular program-level results shows that while the portfolio realization rates were close to the originally claimed (ex ante) values, individual program performance varied. The gross annual electric verified realization rates ranged from 74% for the Consumers Products Appliance Rebate Program to 120% for the Midstream Lighting Program. The Commercial Rebates component of the Efficiency Works Business program showed consistent verified savings, which was the primary driver of the 102% commercial gross realization rates, since it accounted for 99% of the EW Business Program savings.

Table ES-4: Fort Collins Program-Level 2014-2016 Gross kWh Impacts

	Ex Ante Gross kWh savings	Ex Post Gross kWh savings	Gross kWh Realization Rate
Consumer Products – Appliance Rebate	535,206	397,585	74%
Consumer Products – Appliance Recycling	1,750,590	1,827,972	104%
Home Energy Reports	28,883,042	28,883,042	100%
Midstream Lighting	4,779,398	5,735,753	120%
Efficiency Works Homes	738,738	725,990	98%

[4] The cost effectiveness results presented in the executive summary tables represent tests that were run with $53/MWH avoided costs. There were two avoided cost scenarios run for Fort Collins and both are included in Appendix A. Since the evaluation team believes the $53/MWH were more appropriate to use for Fort Collins, we only report those results for simplifying the executive summary.

	Ex Ante Gross kWh savings	Ex Post Gross kWh savings	Gross kWh Realization Rate
Commercial Rebates	29,381,272	30,285,819	103%
Commercial BTU	519,805	485,245	93%
Overall Portfolio Gross Savings	**66,588,051**	**68,341,406**	**103%**

Table ES-5: Fort Collins Program-Level 2014-2016 Net kWh Impacts

	Ex Ante Net kWh savings	Ex Post Net kWh savings	Net kWh Realization Rate
Consumer Products – Appliance Rebate	428,165	206,744	48%
Consumer Products – Appliance Recycling	927,813	808,615	87%
Home Energy Reports	28,883,042	28,883,042	100%
Midstream Lighting	3,202,197	3,842,955	120%
Efficiency Works Homes	1,050,560	1,101,607	105%
Commercial Rebates	23,745,941	26,136,661	110%
Commercial BTU	405,448	429,927	106%
Overall Portfolio Gross Savings	**58,643,165**	**61,409,552**	**105%**

A review of the cost effectiveness at the program-level shows a greater divergence between programs than was the case for savings impacts. This is attributable to the inclusion of delivery and incentive costs and how cost-effectiveness is calculated. The Home Energy Reports program, which represented the majority (83%) of residential net electric kWh savings, had the largest impact on the cost effectiveness of the residential portfolio, and was the most cost effective (TRC perspective) residential offering. The Efficiency Works Homes program, which represented three percent of net verified annual electric savings, received the lowest cost effectiveness score among residential programs. In total, the residential portfolio generated just under $500,000 dollars in net UCT lifetime benefits less costs. The rebate component of the Efficiency Works Business Program was highly cost-effective over the evaluated program years, while the BTU component of Efficiency Works Business was the lowest performing program of the portfolio. This likely reflects the higher cost of delivering these complex and customized projects. In total, the commercial portfolio generated just over $7.7 million dollars in net UCT lifetime benefits less costs. Portfolio-wide, the 2014-2016 programs generated over $8.6 million in TRC benefits.

Table ES-6: Summary of 2014-2016 Program Level Cost-Effectiveness

	UCT	TRC	PCT
Consumer Products – Appliance Rebate	0.57	1.26	3.15
Consumer Products – Appliance Recycling	1.09	0.98	5.49

	UCT	TRC	PCT
Home Energy Reports	1.51	1.66	Infinite
Midstream Lighting	4.74	1.95	3.64
Efficiency Works Homes	0.37	0.38	1.11
Commercial Rebates	2.31	2.78	5.10
Commercial BTU	0.23	0.23	1.20
Overall Portfolio Programs	**1.76**	**1.81**	**4.12**

Program Highlights and Recommendations

This section presents specific findings from the impact and process evaluations of each program.

Efficiency Works Business

The Efficiency Works Business program seeks to increase energy efficiency in existing commercial buildings. Customer engagement in the Efficiency Works Business program is heavily driven by a trade ally network, where many local trade allies build their business models around the incentive program offered through Efficiency Works.

Key Findings

- **Overall, program savings as reported by the implementer are reliable and accurate, resulting in realization rates generally at or above one.** Interactions throughout the evaluation process indicate that program staff are dedicated and work hard to help ensure the program meets best practices.
- **The program largely calculates reported savings values accurately in accordance with industry norms. For some projects, documentation of savings could be stronger.** In some cases, documentation and verification activities, especially for larger projects, more complex projects, custom projects, or measures with less certain savings, did not provide sufficient certainty that installation and operation occurred as anticipated. Program staff reported they have recently taken, and plan additional, steps to increase the consistency of documentation in the future.
- **Program savings algorithms and deemed savings values are generally within industry norms, but could be better organized and archived in one location to ensure proper savings calculations are being used.**
- **Evaluation findings validate the program's assumed net-to-gross ratio.** The evaluation estimated a NTG ratio for Efficiency Works Business rebates of 0.863 for both Fort Collins and the larger Platte River territory, an estimate very close to the value of 0.856 the program had used previously. This net-to-gross ratio reflects a free ridership rate of 26% based on participants survey data and an assumed spillover value of 12.7%, based on an in-depth analysis of commercial rebate program spillover the evaluation team conducted in another jurisdiction.

- **Efficiency Works Business is largely trade ally driven.** The most common way participants found their contractor for the Efficiency Works project is through an existing relationship. At the same time, contractors reported most of their jobs come to them through prior customers or customer referrals. Those contractors who perform marketing (5 of 8) use energy efficiency as a primary message.

- **A minority of participating businesses received an audit through the program.** Program documentation indicates 24% of participating businesses received an audit and contractors reported that even fewer of their rebated projects have had audits. Those participants that do receive audits are motivated to learn how they can save on their energy bills, reduce energy waste, corroborate what a contractor promised, or help the environment.

- **The program has been influential in accelerating energy conservation among participating businesses.** Sixty-four percent of surveyed businesses reported purchasing and installing additional energy efficient equipment because of their experience with Efficiency Works., Almost two-thirds of those businesses (62% %) rated their experience with Efficiency Works as very or extremely important on their decision to buy and install the additional energy efficiency items**.** Of the businesses that installed additional upgrades, roughly half applied for rebates.

Conclusions and Recommendations

Conclusion 1: Platte River is currently working to improve project file management, an effort that evaluation findings suggest will be beneficial in ensuring that the program's project files and data tracking systems are complete and uniform. In particular, the program administrators are currently working to provide complete project file management, including centrally tracking data on assessments and more consistently documenting QA inspections of completed projects.

> **Recommendation 1:** Continue efforts to increase the detail and consistency of information tracked in the program database and collected in project files, including assessment and QA inspection data. Enhanced documentation and verification activities are particularly important for custom projects or other projects for which reliable savings values are not easily estimated.
>
> **Recommendation 2:** Improve tracking and documentation of deemed savings values and sources of savings assumptions, regularly update this documentation as deemed values change and new technologies and offerings enter the program.

Conclusion 2: The program has not been capturing interactive energy savings for projects that impact the temperature in conditioned space, reducing the need for air conditioning or increasing the need for heating, and thus may not be claiming all of the energy savings resulting from Efficiency Works projects.

> **Recommendation 3:** Include interactive savings resulting from reduced need for air conditioning or increased need for heating in estimates of energy savings for projects that reduce the use of energy in air conditioned spaces.

Conclusion 3: Larger building rehabilitation and remodeling projects may present an opportunity for energy efficiency improvements that Efficiency Works for Business is not currently taking advantage of.

> **Recommendation 3:** Identify and engage with contractors and other actors involved in planning and conducting remodeling projects in commercial buildings. Based on discussion with these

market actors, Efficiency Works staff should consider how, if at all, they might modify the program to more effectively leverage existing remodeling projects.

Building Tune-Up

The Building Tune-Up (BTU) component of the Efficiency Works Business program provides retro-commissioning services through program-qualified Retro-commissioning Service Providers (RSPs). Retro-commissioning seeks to assist with equipment and system functionality, and optimize integrated operation to reduce energy waste and improve building performance and occupant comfort. This program provides customers with expert building analysis and prescriptive services at a discount to help lower customers' energy and water costs. The BTU program utilizes the facility assessment component of Efficiency Works as a marketing and outreach channel for capturing customers; essentially a screening process to find invested and dedicated businesses. Additionally, the RSPs frequently bring projects into the program.

The BTU evaluation focused on verifying program savings and assumptions, as well as identifying opportunities to streamline program processes and overcome barriers to greater participation.

Key Findings

- **Building operators at the visited sites had a very positive view of the program and the assistance they received.** Interviewed participants expressed similarly high levels of satisfaction with all elements of the program, including finding a contractor, the presentation of findings, retro-commissioning outcomes, and cost-sharing requirements.
- **The evaluation noted incomplete documentation, uncertainties in project details, or inconsistencies between analysis results and reported savings.**
- **Some of the sites did not implement or maintain all of the measures, and this was the primary driver of a realization rate lower than one.**
- **The BTU program is complex, and this complexity may contribute to the BTU program's greater costs per unit of saved energy than the rebate component of Efficiency Works Business.**
- **A lack of understanding of the value of retro-commissioning among business owners may prevent greater uptake of BTU.** This was according to participants, auditors, and retro-commissioning service providers.
- **The level of documentation trade allies are required to provide to become an RSP and the low volume of retro-commissioning referrals through Building Tune-Up has frustrated some trade allies**.

Conclusions and Recommendations

Conclusion 1: The files for some BTU projects were not complete and providers used calculation tools and methodologies inconsistently.

Recommendation 1: Program staff should strive to provide consistent and clearly documented retro-commissioning measures and savings estimates.

Conclusion 2: A lack of awareness of the availability and benefits of retro-commissioning services are a barrier to greater uptake of BTU, but raising awareness will require a targeted approach.

Recommendation 2: Efficiency Works should investigate targeted approaches to raising awareness of retro-commissioning among those businesses with the greatest potential to benefit.

Conclusion 3: The BTU program includes some unnecessary complexity. Approaches and documentation have limited consistency across projects due to third-party control, and some analysis activities may not directly contribute to savings realization.

Recommendation 3: To reduce cost and increase cost effectiveness, program implementers should develop and implement program design changes to streamline the program administration, investigation, and implementation phases of the program.

Conclusion 4: There is a disconnect between RSP expectations upon entering the program and the actual volume of BTU projects available for RSPs.

Recommendation 4: Efficiency Works staff should review the role they expect RSPs to play in recruiting BTU projects, ensure that role is clearly communicated to RSPs and contractors considering becoming RSPs, and provide RSPs with resources to support their role.

Recommendation 5: Efficiency Works staff should consider whether there is sufficient potential in the retro-commissioning market to support the number of RSPs currently registered with the program.

Efficiency Works for Homes

The Efficiency Works for Homes program, which Fort Collins Utilities has offered since 2010, seeks to increase the energy efficiency and increase the indoor air quality, comfort, and safety of existing homes.

Key Findings

- **The evaluation found a moderate level of free-ridership: 24% (64 of 268) of participants indicated they would have performed the home's retrofits in absence of the program.** Calculating the individual free-ridership and weighting across all participants by savings, leads to a 79% NTG ratio absent any spillover. This result was the same between audit-only direct install participants and that of prescriptive retrofit installations.
- **Efficiency Works Homes participants indicated a strong degree of spillover**: 37% (98 of 268) participants indicated making additional efficient improvements to their homes outside of the program, and, of these 98 participants, 44% believed the program had an extremely or very strong influence on their decision, while another 31% believed the program had a somewhat important influence on their decision.

- **The streamline path simplifies the decision-making process for participants, leading to greater uptake of measures, but contractors are dissatisfied with its current design.** Streamline path participants were more likely than standard path participants to be aware of available financing options and to report a clear understanding of next steps following the audit. At the same time, they were less likely to report that making the upgrades would require a great deal of effort. Contractors, however, expressed dissatisfaction with the administrative work required, the standardized pricing, and executing a scope of work they had not developed. None of the interviewed contractors wanted the number of streamline path projects they complete to increase.

- **Difficulty accessing data increased the resources required to complete this evaluation and limited its ability to verify savings assumptions.** The process of extracting assessment files from the program's Salesforce database was resource intensive for the implementer, and extracting data from those files, in turn, was labor intensive for the evaluation team. The assessment files did not consistently and uniformly provide data on baseline conditions.

Conclusions and Recommendations

Conclusion 1: The streamline path eases the upgrade process for participants, increasing the likelihood they will install rebated measures, but, to be sustainable, it must more effectively work with contractors.

> **Recommendation 1**: Investigate ways to increase contractor involvement in developing streamline path scopes of work and provide greater flexibility in standardized pricing while maintaining the streamline path's participant benefits. Efficiency Works staff should investigate other program administrators' approaches and gather contractor feedback on any proposed changes to the program.

Conclusion 2: Improved data tracking and an updated billing analysis provide opportunities to more effectively capture the full range of energy savings benefits the program achieves.

> **Recommendation 2**: Develop systems to capture assessment data in a more systematic way and store the data in a more readily accessible electronic format. Capturing data in a uniform, consistent way and storing them in a more easily-accessible, electronic database format would allow future evaluation efforts to conduct a more detailed, granular review of savings and assumptions.
>
> **Recommendation 3**: Conduct an updated billing analysis, including a review of spillover savings from audit-only participants.

Midstream Retail Lighting

The Midstream Retail Lighting program provides point-of-purchase rebates for sales of energy efficient lighting products, including LED specialty and general service lamps and lighting controls, at national and local retailers. Advertising, in-store signage, sales-associate training, and instant customer incentives, ranging from $1-$3 for general service lamps, $1-$5 for specialty lamps, $5 for occupancy sensors, and $10 for dimmers, drive participation. To provide incentives, Fort Collins Utilities, in partnership with the Platte River Power Authority, also works with manufacturers to reduce the cost of the items by partially

paying for them outright. Fort Collins Utilities launched the midstream retail lighting program in 2005, and in 2007 Platte River took over administration of the program and expanded it to all four owner municipalities.

Key Findings

- **As one might expect in a successful mid- and upstream program, market actors higher in the supply chain saw greater value from program incentives than those closer to the end user.** Manufacturers recommended reinstating the incentive for A-line bulbs or increasing the incentive for specialty LED bulbs, as well as transitioning outreach to harder-to-reach populations, such as those in rural areas. Retailers, in contrast, perceived that the program had a relatively minor effect on sales of efficient bulbs, although local managers partially attributed their efficient bulb sales to corporate-level support for the technology.

- **Participant survey findings suggest the market continues to shift toward LED bulbs, as more respondents purchased LEDs than other bulb types and those who purchased LEDs bought more of them.** Respondents who purchased lighting products more frequently reported purchasing standard LED bulbs (50%) compared to other standard bulbs (33-41%), as well as specialty LED bulbs (28%) compared to other specialty bulbs (13-14%). Respondents also reported purchasing a greater number of LED bulbs than CFLs or incandescent/halogen bulbs.

- **The evaluation found higher gross savings than assumed for the Midstream Lighting program**. This was largely due to the higher baseline wattages for EISA exempt bulbs, as well as slightly higher annual hours of use. Overall, the program applied conservative values for the per-unit efficient light bulb savings estimates, and relied on established secondary sources for their claimed savings.

- **Given the lack of certainty with estimates for net-to-gross of midstream lighting programs, the evaluation team finds Platte River's ex ante net-to-gross ratio is appropriate, but recommends a decreasing ratio for 2017 and beyond to reflect rapid market adoption of LEDs.** A review of secondary sources and a national lighting database found that estimates from multiple studies coalesced around the program's currently assumed net-to-gross ratio of 66-69%. Although market actor interviews and customer surveys varied in their assessment of the influence of program incentives, they do not provide reason to question this estimate.

- **Uncertainty remains in key areas of controls' savings assumptions that should be researched if savings for this measure become large in the future.** First, there is an opportunity to update the underlying participant assumptions of controls placement, bulbs being controlled, number of bulbs per house, and bulbs per room type. This would require Fort Collins Utilities and Platte River to conduct a residential saturation study. Second, the percent savings referenced in the evaluation literature do not appear to be adequately researched with field studies to determine actual savings. Although we do not recommend that Fort Collins Utilities undertake this research, Utilities should recognize the inherent uncertainty in these estimates.

Conclusions and Recommendations

Conclusion 1: Reflecting the volatility of the residential lighting market, market actors were divided on the continued need for program incentives to drive LED uptake, with manufacturers seeing them as

necessary, retailers less so, and survey findings indicating a continuing shift toward LEDs. There are drawbacks to withdrawing incentives from the market too early as well as remaining in the market once it has transformed. In this type of volatile market, it can be beneficial for a program to target its interventions toward the market segments likely to be slowest to transform on their own.

> **Recommendation 1:** Focus incentives and market intervention on retail channels that are most likely to serve hard-to-reach customers and closely monitor the market to consider reintroducing incentives for A-line LEDs.

Conclusion 2: Gathering additional product details from participating retailers would allow for more accurate savings estimates.

> **Recommendation 2:** Require retailers to provide the data necessary to closely track lamps based on their baseline (e.g. EISA compliant or exempt).

Appliance Rebates

Since 2002, the Appliance Rebate program has offered rebates for consumers purchasing products, including ENERGY STAR® clothes washers ($50) and dishwashers ($25), that save both energy and water. The program maintains point of purchase (POP) marketing materials to help inform customers of the program and potential savings and occasionally offers double rebates as special promotions.

Key Findings

- **Overall, the 2014-2016 Appliance Rebate program evaluated gross savings – at 397,585 kWh – was 74% of claimed 2014-2016 gross savings (535,206 kWh).** The realization rate varied by measure, with clothes washers resulting in higher realized savings (77%) than dishwashers (57%).
- **The high free-ridership is consistent with other appliance rebate program attribution results across the country.** The free-ridership rate was found to be 59% for the appliance rebate program. The total spillover savings for the appliance rebate program was found to be 11%. The overall NTG was 52%.[5]
- **Energy efficiency is an important consideration in Fort Collins residents' appliance purchases, including both those who received appliance rebates and those who purchased appliances without a rebate.** Participants rated ENERGY STAR certification as an important element in their decision to purchase the model of washer or dishwasher they chose more often than they rated any other product feature, with 90% rating ENERGY STAR certification as important to their decision
- **While Fort Collins residents reported that energy efficiency was important in their appliance purchase decision, survey findings indicate that retail sales staff play an important role in bringing efficiency to customers' attention.** Combined data from all survey respondents who purchased clothes washers (both participants and nonparticipants) suggests that a model's

[5] Calculated as 1-FR+SO, or 1-0.59+0.11.

ENERGY STAR certification and the availability of a bill credit for purchasing an efficient model were the second and third most frequent items that store staff members brought up, after product features. In contrast, customers most often brought up a clothes washer's price, dimensions, and orientation.

Conclusions and Recommendations

Conclusion 1: Rebates do not appear to be influential in many appliance purchase decisions.

> **Recommendation 1**: Focus incentives on top-tier appliances (e.g., ENERGY STAR Most Efficient designation) and consider other delivery strategies

Conclusion 2: Sales associates play an important role in informing customers about energy efficiency and the availability of rebates.

> **Recommendation 2:** As Fort Collins considers changes to the appliance rebate program, staff should seek ways that the program can continue to engage retail sales associates and support them in using energy efficiency as a selling point.

Appliance Recycling

Fort Collins Utilities' Appliance Recycling program, launched in 2004, offers incentives to customers of $35 (and occasionally up to $70 during promotional periods) to recycle a working refrigerator or freezer.

Key Findings

- **The net savings were driven primarily by those participants that would have had the unit disposed of or recycled in absence of the program**, typically through disposing of the unit themselves or having retailers pick up an older unit.[6] These free-riders represented 45% (29 of 64) of participants.
- **Participants are highly satisfied with the appliance recycling process** including the convenience of the pick-up day and time, the people who picked up the appliance, and receiving their bill credit in a reasonable amount of time.
- **Most participants replaced their recycled appliance with an efficient one.** Over three-quarters of participants (88%) indicated that they replaced their recycled appliance with a different one. and most of them (82%) indicated it is an efficient model (either ENERGY STAR rated or a high-efficiency model). Twenty-seven percent of participants reported that without the recycling service, they would not have replaced their appliance.

[6] Based on findings from previous research, the evaluation team assumes the retailer will not resell a unit that is more than ten years old. We acknowledge that there are significant non-energy benefits from the program's practice of fully decommissioning units and their components, rather than simply removing the refrigerant and sending them to a landfill, but we are not aware of studies that have quantified these benefits.

Conclusions and Recommendations

Conclusion 1: While Fort Collins Utilities' assumptions for gross electric energy savings were relatively accurate, gross savings may decline in the future as fewer models remain in circulation that were produced before National Appliance Energy Conservation Act (NAECA) standards took effect in 1990 and newer models begin to comprise a larger share of the program.

> **Recommendation 1:** Closely, and accurately, monitor program energy savings to identify any declines and determine whether changes to program design are warranted.

Home Energy Reports

The Home Energy Reports (HER) program provides residential customers with personalized, bi-monthly reports containing energy information delivered by mail. Fort Collins Utilities began providing Home Energy Reports in 2009. The reports compare customers' energy consumption with 100 nearby neighbors with similar houses, floor area, and heating sources. The reports show personal consumption in kWh along with "efficient neighbors'" and "average neighbors'" consumption. Other information in the report shows rankings for the previous 12 months and a section with ideas on how to save energy. These energy saving tips range from turning off lights to air sealing and insulation projects. Fort Collins Utilities contracts with a third-party vendor, OPower, that processes energy use data, selects the "neighbors," designs, produces, and mails the reports to customers.[7]

Key Findings

- **The methods used by Opower are reasonable and likely have led to reliable savings estimates.** Yet, in the long term, the lack of control group has several disadvantages. First, the savings are not verifiable by Opower or an independent evaluator. Ft Collins must trust that the historical RCT experience and that of other RCTs nationally are sufficiently reliable. Although this seems reasonable in the short term, the team thinks this assumption becomes more unreliable in the long term.
- **The lack of control group makes changes in implementation or design more difficult.** That is, if Fort Collins wants to undertake a major program change that is outside Opower's national program experience, select a different vendor, or internally produce home energy reports, it would be difficult or impossible to predict the savings.
- **Most Fort Collins Utilities customers read their Home Energy Reports and find them at least somewhat useful, particularly the ability to track their progress and receive information about when they use the most electricity.** The majority (89%) of residential participant and nonparticipant respondents recalled receiving Home Energy Reports, while few (3%) indicated that they have opted out.
- **Most Fort Collins Utilities customers have taken action to reduce their energy use as a result of their home energy reports**. More than three-fourths of survey respondents reported taking action to reduce their energy use as a result of their Home Energy Reports. Most often,

[7] Note that OPower was acquired by Oracle, Inc. in 2016.

respondents reported making behavioral changes and taking low-cost actions, although some reported taking larger actions like purchasing energy efficient products.

Conclusions and Recommendations

Conclusion 1: The modeled savings approach that the HER implementer uses to estimate energy savings is reasonable in the short term, but may become less reliable over the long term.

Recommendation 1: Consider re-establishing a control group.

Conclusion 2: Home Energy Reports are a valuable tool in encouraging Fort Collins residents to save energy.

Recommendation 2: Continue to provide mailings with feedback on residents' energy usage, but experiment with the content of those mailings.

Structure of This Report

The report begins with an introduction, describing the evaluation's scope and research objectives. Chapter Two describes the evaluation methodology. Each subsequent chapter focuses on one of the evaluated programs. Each program-specific chapter includes: a description of the program; research questions and approach; findings; and conclusions and recommendations. Each chapter further separates the approach and findings by process and impact. In addition, we include chapters on the best practices review and overarching conclusions and recommendations, both of which look at the portfolio as a whole. Survey instruments, interview guides, and raw frequencies are included in the appendices.