

Sealing the Gaps: A Case Study in Proactive Weatherization Program Design

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ABSTRACT

A multi-year evaluation of two coinciding residential weatherization programs provides an opportunity to identify specific success factors and program design risks. Between 2011 and 2013, two residential weatherization programs concurrently operated within partially-overlapping service areas of Arkansas. Despite similarities in scope, market, and context, the two programs experienced very different results, with one program quickly becoming more successful in meeting its savings goals. The initial weatherization program was created by the state's seven investor-owned utilities (IOUs) in order to provide weatherization services for customers of all income levels while also leveraging resources from the long-established and federally-funded statewide Weatherization Assistance Program (WAP) for qualifying low income customers. The state's community action agencies delivered the IOU program in conjunction with the WAP, combining funds from both sources to provide a common set of services to "severely inefficient homes".¹ However, the WAP began to encounter difficulties with funding uncertainties, and the IOU program struggled with low project throughput rates. In response to under-performance of this program, two of the seven sponsoring IOUs partnered to implement a separate cross-fuel weatherization program that exclusively targeted customers within their shared service territory without leveraging WAP funds. The new program quickly reached its own goals, while the federally-leveraged program continued to struggle, despite high demand for weatherization services in the customer base. Evaluation, measurement, and verification (EM&V) of both weatherization programs across a three-year cycle allowed the evaluator to identify key factors contributing to the success of the newer program; this paper discusses these factors and explores how separation from the statewide WAP allowed for increased program activity and operational flexibility.

Introduction

The Arkansas Weatherization Program (AWP, WAP-coordinated program²) began in 2007 as a utility-funded residential energy efficiency offering that would leverage federal funding from the statewide Weatherization Assistance Program (WAP). The WAP-coordinated program provides utility funds to partially offset the cost of energy audits and associated energy efficiency measures, with the remaining funds being provided either by customer co-payments or by the WAP for customers who meet the WAP income-qualified requirement. This design allows for the program to comply with Arkansas Public Service Commission (APSC) rules which dictate that utilities may not use income as a criterion for program eligibility, while also working to maximize the leverage of federal funds. Initially, participants providing a private co-payment for their energy audit were required to pay up to 75% of the \$456 audit cost upfront, while the utilities would cover between 25% and 50% of the cost. In July of 2011, the program pricing structure was modified so that private co-pay customers would pay between \$50 and \$196 for the audit upfront depending on how many of the participating utilities provided service to the customer. This change was made in order to make the audit more affordable for customers. For customers qualifying for WAP funding, the combined federal and utility sources fully cover the cost of

¹ This term "severely inefficient home" was developed as the categorical identifier for the target market for weatherization programs in Arkansas by all IOUs and ACAA, and as such the authors have opted to use this same term here.

² The authors will refer to the "Arkansas Weatherization Program" as the "WAP-coordinated program" so as to avoid confusion of the two programs in this paper.

the initial energy audit, and up to approximately \$8,000 can be spent on associated energy efficiency measures (previously the cap was \$3,000).

The Oklahoma Gas and Electric (OG&E) Weatherization Program began in 2010, and was created as a separate program from the WAP-coordinated program. This program was created by OG&E in response to shortfalls from the WAP-coordinated program in OG&E's service territory. OG&E established its own utility-managed weatherization program in order to create a local focus for weatherization services, and to have the ability to modify the program as needed. Additionally, a similar OG&E program had been offered in Oklahoma as a low-income weatherization program. The eligibility requirements and program offerings for the OG&E Weatherization Program were designed to be very similar to those of the WAP-coordinated program. While the WAP-coordinated program leverages Department of Energy (DOE) funds that target low-income customers through the WAP, the OG&E Weatherization Program was designed to fully fund weatherization projects without leveraging federal funds.

In 2011, Arkansas Oklahoma Gas Corporation (AOG) partnered with OG&E in offering and managing the OG&E Weatherization Program, which both expanded the available customer base and increased program operational resources. The resulting utility-only program is funded by the utilities via ratepayers; participants receive in-home energy audits and energy-efficiency improvements, and are not required to provide a co-payment. Utility funding for each home was initially capped at \$2,500 but was increased to \$3,000, allowing for additional measures to be implemented.

As per orders from the Arkansas Public Service Commission (APSC, 2013), both AOG and OG&E continued to participate in funding the WAP-coordinated program while concurrently offering the separate AOG/OG&E Weatherization Program (utility-only program) within their partially-overlapping service territory. Both the WAP-coordinated program and utility-only program were operational during the 2011-2013 program cycle.

Evaluation Methodology

On behalf of the Arkansas Community Action Agencies Association, the program administrator, ADM Associates, Inc. (ADM) conducted evaluation, measurement, and verification (EM&V) of the WAP-coordinated program. ADM also conducted EM&V of the utility-only program. ADM served as the evaluation contractor for both of these programs during the 2011-2013 program cycle.³

Evaluation of the programs consisted of impact evaluation activities (including regression analyses of participant and non-participant billing data), onsite residential measurement and verification, Technical Reference Manual (TRM) review and savings validation, and survey-informed net savings analysis. Evaluations samples were developed to meet 90% confidence and $\pm 10\%$ precision.

Additionally, ADM conducted process evaluation activities for the WAP-coordinated program and utility-only program, including participant and non-participant satisfaction and feedback surveys, in-depth interviews with utility program management staff and community action agency directors, assessment of program tracking databases, examination of program theory and logic, and review of program documentation. Table 1 displays the number of interviews, site visits, and surveys conducted as part of the evaluation for each program by program year.

Concurrent evaluation of both programs throughout the 2011-2013 program cycle allowed ADM to draw comparisons between the programs and to identify key design and operational features that contributed to relative program performance over time.

³ ADM continued as the EM&V contractor for both programs into the 2014 and 2015 bridge years.

Table 1. Evaluation Data Collection for WAP-coordinated program and utility-only program by Year

Data Collection Component	Program year	Number completed	
		WAP-coordinated program	Utility-only program
Utility Staff Interviews	2011	7	2
	2012	10	4
	2013	10	4
Implementation Staff Interviews	2011	2	0
	2012	10	3
	2013	6	0
Site Visits	2011	0	0
	2012	54	75
	2013	0	58
Participant Surveys	2011	0	0
	2012	227	300
	2013	68	68
Non-participant Surveys	2011	0	0
	2012	0	200
	2013	0	0

Program Design Comparison

Although the WAP-coordinated program was designed to leverage federal funds for income-qualified customers, while the utility-only program was designed to target severely inefficient homes using only utility funds, the two programs share many design and operational characteristics. These include similar eligibility requirements, a similar set of services and measures, comparable audit procedures and tools, and a partially-overlapping customer base. This allows for a more useful comparison of the two programs and more accurate isolation of key program design factors that have affected program performance.

Over 90% of the target market is located in the Fort Smith metropolitan area. Table 2 compares key demographic characteristics in the AOG/OG&E target market to statewide metrics.

Table 2. Comparison of Key Demographic Characteristics, Fort Smith Metro vs. Arkansas Statewide⁴

Eligibility Component	Statewide	Fort Smith Metro
Poverty Rate	17.1%	16.7%
% Housing built prior to 2000 ⁵	82.3%	84.8%
Home Ownership	57.9%	57.7%
% Aged 65+	14.8%	14.1%
% with Bachelor's Degree	20.1%	16.1%
% English Fluency	96.1%	94.9%

⁴ American Community Survey 2009-2013 5-year data. Data collected from <http://factfinder.census.gov>.

⁵ At the time this paper was authored, the statewide market potential study for Arkansas was not yet complete. As a result, the authors have opted to use census housing stock data. Due to this, the housing stock comparison demonstrates the percent of homes built prior to 2000, as opposed to homes built prior to 1997 (the criteria used for both weatherization programs).

Eligibility Requirements

As per a ruling by the Arkansas Public Service Commission (APSC), eligibility requirements for IOU energy efficiency programs in Arkansas may not include a required income level for participants⁶ (APSC, 1998). Thus, both the WAP-coordinated program and utility-only program opted to target “severely inefficient homes”. Participants in either program must be a residential customer of at least one sponsoring utility. The primary screening criterion is age of residence: for both programs, the residence must be built prior to 1997. Subsequently, there are seven additional secondary criteria determining eligibility for either program. These criteria include limits on pre-existing insulation levels, efficiency levels of existing equipment, and air infiltration issues identified through blower door testing. Overall, a potential participant must meet the home age criterion as well as three out of the seven possible secondary criteria to be eligible for either program. However, a home which is eligible to participate is not necessarily eligible for all measures. For example, a home built prior to 1997 with R-30 ceiling insulation, a non-working furnace, leaking ducts, and R-0 floor insulation would be program-eligible but would not receive the ceiling insulation measure. Both the WAP-coordinated program and utility-only program use these seven criteria, with only minor differences such as the specific limit on R-value of pre-existing insulation. A comparison of the eligibility requirements for the two programs is shown in Table 3.

Table 3. Comparison of WAP-Coordinated Program and Utility-Only Program Eligibility Requirements

Eligibility Component	WAP-Coordinated Program	Utility-Only Program
Residence Age	Built prior to 1997	Built prior to 1997
Ceiling insulation	Less than or equal to R-30	Less than or equal to R-22
Wall insulation	Equal to R-0	Less than or equal to R-4
Floor insulation	Equal to R-0	Equal to R-0
Windows	Single pane windows with no storm windows attached	Single pane windows with no storm windows attached
Heating system	Non-working system, or working system with AFUE less than 70%	System with AFUE less than or equal to 78%
Cooling system	Non-working system, or working system with SEER of 8 or less	System with SEER of 10 or less
Building Envelope	Air infiltration problems identified through a) visual inspection of ductwork, walls, floors, ceilings, doors, and windows; or b) pre-blower door test	Air infiltration problems identified through either a pre-blower door test or visual inspection procedures

Measures Offered

The WAP-coordinated program and utility-only program both provided attic insulation, air infiltration reduction, residential lighting replacement, low flow shower-heads, and water heater jacket

⁶ In *Harris v. City of Little Rock*, 344 Ark. 95, 105,40 S.W.3d 214,221 (2001), the Arkansas State Supreme Court ruled that it is not within the APSC’s authority to direct utility funds to low income programs. The ruling stated that such charges bear “...no reasonable relationship to the benefits conferred on those receiving the services.” In Docket No. 06-004-R (in which the rules for energy efficiency were developed for Arkansas), the APSC as well as ACAA came to the determination that the WAP-coordinated program would be better-served if the criteria were based on home age and inefficiency, as these criteria were not included in the *Harris v. City of Little Rock* decision.

and pipe insulation during 2011-2013. These measures accounted for the majority of gas and electric savings in each program. However, the WAP-coordinated program was designed based on the “whole home” approach to residential energy efficiency, and provided a wider mix of measures than the utility-only program. These additional measures included window replacement, duct sealing, floor and wall insulation, and heating and cooling replacement.

Program Delivery

Local community action agencies worked with customers to determine their eligibility for the WAP-coordinated program and income-qualified WAP funding, and enroll them in the program. After the customer was approved, and the in-home audit was performed, optimal energy efficiency measures for WAP-coordinated program participants were identified through the use of National Energy Audit Tool (NEAT) software. Contractors chosen by the local agencies then installed these measures in the home. Data regarding measures installed and measure inputs were collected on-site and then provided to Frontier Associates for savings calculation within their EnerTrek software system.

In contrast, the utility-only program was implemented through the use of three⁷ contractor firms that were not associated with local community action agencies and did not provide WAP services. Similar to the WAP-coordinated program, these contractors conducted initial in-home audits and then identified cost-effective energy efficiency measures by using EnerTrek to calculate expected measure savings and savings-to-investment ratio (SIR).

The two programs used Frontier Associates as a database provider and had their ex ante measure savings calculated through the EnerTrek system based on protocols provided in the Arkansas Technical Reference Manual (TRM).

Program Performance

The WAP-coordinated program and utility-only program achieved very different results during the 2011-2013 program cycle. The utility-only program was very successful and exceeded its savings goals for both utilities after its first year of operation. Figure 1 and Figure 2 display key performance metrics for the utility-only program compared with WAP-coordinated program for AOG and OG&E, respectively (AOG, 2013) (OG&E, 2013) (ACAAA, 2013). The WAP-coordinated program had specified budgets and goals for each IOU in Arkansas, and the WAP-coordinated program values in Figure 1 and Figure 2 reflect this.

⁷ The number of contractors was increased from two to three during the 2012 program year.

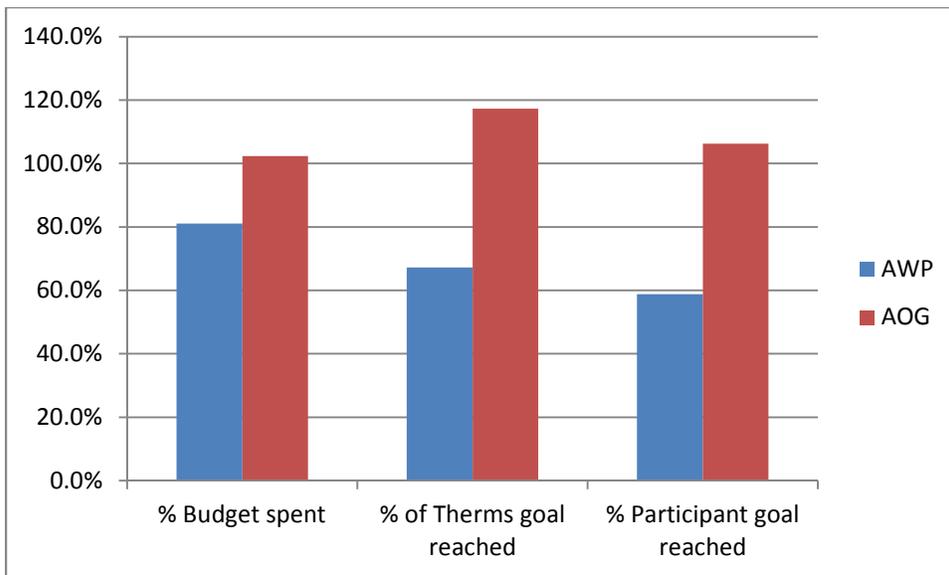


Figure 1. 2011-2013 performance: AOG vs. WAP-coordinated program

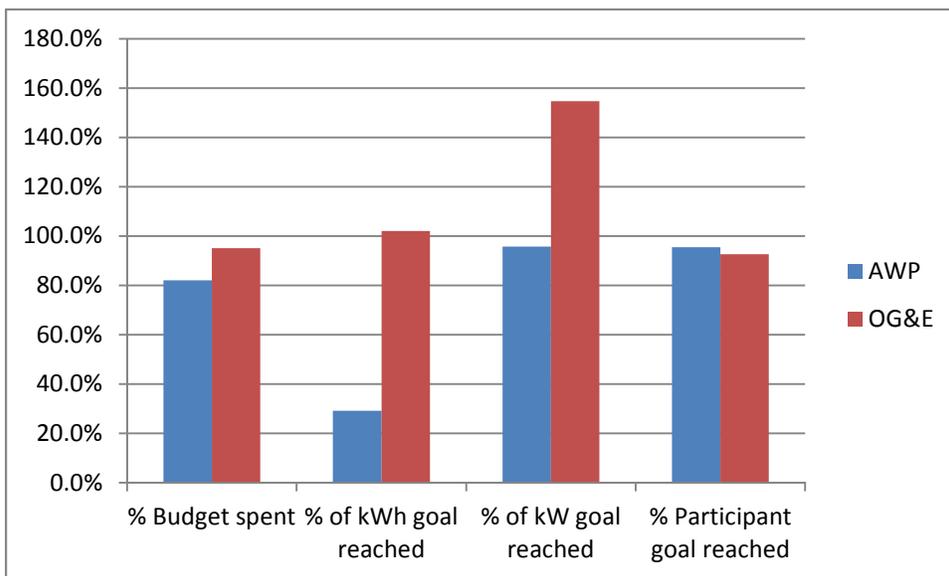


Figure 2. 2011-2013 performance: OG&E vs. WAP-coordinated program

Program Success Factors

Despite the clear similarities in program theory, operation, and delivery, the programs achieved significantly different levels of success. Savings and participation levels for the WAP-coordinated program decreased each year, while the utility-only program experienced the opposite effect and was able to exceed its savings goals after its first year of operation. During the course of evaluating the programs, ADM identified several factors seen in the utility-only program that may explain its comparative success. The primary program features that likely allowed the utility-only program to outperform its counterpart are its ability to provide consistent and reliable funding, geographically condensed marketing, its use of a dedicated contractor base, and its manageable administrative structure. Several of these factors are common topics of debate in weatherization program design: the decision to collaborate with other organizations introduces added complexity, but with the potential payoff of organizational synergy and cost-savings. However, the decision for a utility to self-administer (or, as in

the case of the utility-only program, develop a limited collaboration), the process is simplified but the sponsoring organizations may face a higher fixed cost of operation.

Exclusively Utility-Funded Implementation

One key difference between the two programs was the use of external funds to leverage program operations. The utility-only program exclusively used utility dollars to fund its weatherization work, while the WAP-coordinated program relied on a combination of utility funds and federal funds distributed to participating community action agencies. Ideally, this arrangement would use utility funds to efficiently leverage federal funding and substantially increase the number of weatherization projects that the agencies are able to perform. Such a model has been used in other jurisdictions with significant success (as seen for over 20 years in Iowa, for example). However, ADM's interviews with utility staff and community action agency staff suggested that the WAP-coordinated program's inherent link to the WAP resulted in performance issues due to federal funding reductions and statewide program reorganization.

When asked about funding levels during the evaluation, agency staff stated that the absence of American Recovery and Reinvestment Act (ARRA) funding significantly reduced participation potential, for both the WAP and the WAP-coordinated program. Agency staff explained that the ARRA funding had allowed the agencies to hire more implementation crews and that the lack of ARRA funding substantially reduced their resources and implementation potential. In 2012, the Arkansas WAP budget was cut by 60% as ARRA funding dried up. Though Arkansas ratepayer funding for the WAP-coordinated program was increased in this same period (program funding increased by 23% in 2012), the reliance of the WAP-coordinated program on WAP funding to fully-fund individual retrofits severely affected the program's ability to deliver on APSC-established goals.

In 2013, the WAP-coordinated program paused implementation activity in April due to funding issues, likely accounting for much of the additional decrease in participation levels during the program year (Figure 1, Figure 2). These issues were partially related to the initiation of WAP restructuring on a statewide level, and the overall fact that the timing and level of DOE funding for the WAP was uncertain. This resulted in the WAP-coordinated program having fewer participants in 2013 than past years, and the program did not meet the savings goals for any of the participating utilities. While leveraging of external funding is typically viewed as an important feature for comprehensive weatherization programs (Johnson, 2014), these results suggest that over-reliance on unstable funding sources can cause interruptions in program services and unpredictable savings and participation results.

AOG and OG&E staff reported being aware that federal funding levels were uncertain, and that the WAP-coordinated program may not be able to reliably and consistently produce completed jobs throughout the program cycle. Exclusively using utility funds to complete weatherization work through their joint program did not allow for as much money to be spent per home, but ensured that a set amount of funding would be available each year. This allowed AOG and OG&E to accurately predict the number of program participants and resulting savings each year, without any issues with program interruption or implementation delays. This resulted in a "stable and consistent" offering, which has been identified as one important aspect of a successful weatherization program (Quantum Consulting Inc., 2004).

Geographically Condensed Marketing

While the WAP-coordinated program was marketed by individual community action agencies across the service territories of the seven Arkansas IOUs, the utility-only program was primarily promoted by word-of-mouth, yard signs on participants' lawns, and program logos on contractor vehicles within the AOG and OG&E service territories. By using community action agencies as the main channel for WAP-coordinated program marketing, the program primarily catered to customers

who would meet the WAP's income-qualified requirement. According to utility staff during evaluation interviews, this caused the majority of customers who would not meet the WAP income requirement and would be able to provide a copayment for WAP-coordinated program services to perceive the program as a "low-income" offering.

In contrast, marketing for the utility-only program reached the general population of utility customers within the two utilities' service territories. The APSC did not allow for income requirements to be included in utility program rules, and the utility-only program successfully developed program awareness and interest among the portion of the customer base that would not likely qualify to participate in the WAP. Although the WAP-coordinated program made some efforts to recruit private co-pay customers, the program's marketing strategy was more conducive to recruiting participants from the population of WAP-qualified homes.

Dedicated Contractor Base

Although both the WAP-coordinated program and utility-only program incorporated on-site audits and measure installation from a specific set of contractor crews, the utility-only program hired dedicated contractor crews who would exclusively perform work under the utility-only program when necessary. In contrast, the WAP-coordinated program was delivered through the Arkansas community action agencies, whose contractors conducted audits and measure installation for both the WAP-coordinated program and WAP.

While the WAP-coordinated program was a separate entity from the federally-funded WAP, the number of audits and measure implementations conducted by contractors through the WAP-coordinated program was somewhat dependent on WAP activity and performance. During the ADM evaluation, utility staff stated that many agencies prioritize the WAP over the WAP-coordinated program, and that they typically elect to use available federal funding before seeking out projects which would rely on funds from the WAP-coordinated program. Additionally, interviewed staff mentioned that the agencies had been strongly encouraged to expend ARRA funds prior to using utility-provided funds in order to meet statewide WAP ARRA production targets.

Although the initial intention for the WAP-coordinated program was for agencies to combine utility funds and WAP funds for individual projects, many projects during 2011-2013 were completed using only WAP dollars. The savings from these WAP-only projects were not attributable to the WAP-coordinated program. Additionally, the WAP-coordinated program was designed such that participating customers would be able to provide a private co-payment for weatherization services if they did not qualify for the WAP or did not wish to be placed on the extensive WAP waiting list. However during the WAP-coordinated program evaluation, several agency staff members noted that they do not focus on recruiting non-WAP participants because those customers are typically much more difficult to find. One agency noted that they only use WAP-coordinated program funds when they are coupled with WAP funds, because that is the most efficient use of their resources.

Utility staff also stated that there were variations in each agency's ability or willingness to participate in the WAP-coordinated program. Some agencies expressed concern over future federal funding availability, as they typically use these funding expectations to plan for future weatherization activity. Utility staff also mentioned that some agencies declined to actively participate in the program due to the specific requirements of the WAP-coordinated program. As the WAP-coordinated program uses different documentation and data collection procedures than the WAP itself, some agencies were reluctant to take on these new tasks or modify their implementation and verification methods. As the agencies did not directly report to the utilities and were not required to complete any specific number of projects under the WAP-coordinated program, the utilities did not have a reliable course of action to encourage inactive agencies to participate in the program.

For the utility-only program, both AOG and OG&E consistently reported that their contractors had performed as expected and had been receptive to any program changes or additional utility needs. AOG and OG&E were able to predict contractor availability and production rates in advance, and added a third contractor during the 2012 program year due to increased participation rates. This program delivery structure was much more responsive to utility needs, and ensured that contractor interests and priorities were aligned with utility objectives.

Streamlined Administrative Structure

The utility-only program administrative structure consisted of two utilities jointly managing three installation contractors and a database provider. In contrast, the operational structure for the WAP-coordinated program was composed of many different entities: six active community action agencies⁸ and their contractors, the Arkansas Community Action Agency Association (ACAAA), seven utility providers, and the database provider. The WAP-coordinated program incorporated many organizations that would be required to communicate clearly and operate cooperatively in order for the program to avoid reporting delays and inconsistent program delivery. According to interviews with utility staff, this organizational structure placed the WAP-coordinated program in a somewhat fragile operational framework, where delays and performance issues were difficult to avoid. This is further-exacerbated in that community action agencies do not have a specific impetus to be involved in the WAP-coordinated program; ADM's evaluation findings revealed that many agencies dropped out of active participation in the WAP-coordinated program due to internal reprioritization of resources to other needed outreach in the communities they serve. The impacts of this are seen in the 57.2% decline in participating agencies, 76.6% decline in kWh savings, and 71.9% decline in therms savings between 2011 and 2013. It was observed by ADM in interviews with community action agencies and program administration staff that many of the agencies "lost steam"; after some early success in administering the WAP-coordinated program to their community, they had concluded that there were more pressing needs for their agencies' limited staff.

All interview respondents during the 2011 and 2012 WAP-coordinated program evaluation, including utilities and agencies, acknowledged that overall communication among parties had been fairly infrequent, and that it was difficult to coordinate tasks or arrive at mutual understandings regarding program objectives and strategies. Program operations staff reported that the structure of the WAP-coordinated program involved many entities (utilities, contractors, and local agencies) working fairly independently of one another, which can cause barriers to active and continued communication among all parties. In contrast, AOG and OG&E consistently reported that they were able to effectively communicate about any emerging program issues and address them efficiently, and that they each understood their specific roles in managing the program.

In each evaluation year, ADM provided recommendations for both the utility-only program and WAP-coordinated program in an effort to further increase program performance, address any notable weaknesses, and take advantage of emerging opportunities. The utility-only program was fairly responsive to these recommendations, and few issues persisted across multiple program years. In the case of the WAP-coordinated program, the program was able to address certain data reporting, savings calculation, and implementation issues, but recommendations that would require coordination among multiple entities, such as developing an organizational chart that would clearly define each person's role and responsibility, were not addressed.

AOG and OG&E created their joint program in order to efficiently meet the needs of customers within their shared service territories, and all parties in their program administration structure were focused on this goal. For the WAP-coordinated program, utility staff members explained during

⁸ The number of active community action agencies was reduced from 14 to 6 during the 2013 program year.

interviews that the program is structured such that program goals are mainly determined and required by the utilities, while much of the operational control of the program is handled by local community action agencies. Utility staff members indicated that this structure created challenges in setting program expectations and contributing to overall program success throughout the year.

Conclusions

Although the WAP-coordinated program was designed as a collaborative, statewide program offering that would maximize weatherization services by leveraging federal funds, several outside factors served to hamper these efforts. Although staff from each utility wanted to and needed to provide weatherization services, the requirements set out in the energy efficiency rules (APSC, 2013) dictated that energy efficiency programs could not explicitly target low income customers. In this framework, a utility-sponsored and implemented program showed to be better-suited, in that such a program would not have the conflicting needs and goals seen in CAP agencies (who are primarily focused on providing a range of low income community services). The utility-WAP collaboration model was not viable under this constraint, in that it essentially would require CAP agencies to provide services to non-low income customers if they were to receive funding from the WAP-coordinated program.

In response to this misalignment of energy efficiency goals versus CAP agency mission statements, OG&E created a separate weatherization initiative that would specifically target customers in its service territory without relying on external funding or existing program delivery resources. After AOG partnered with OG&E to jointly fund and operate the program, the two IOUs developed a standalone offering that generated more savings and provided valuable weatherization measures to many more of their customers than would have received services under the WAP-coordinated program. The utility-only program design allowed for increased program activity and operational flexibility through exclusively using reliable and consistent utility funding, implementing services with a dedicated contractor base whose objectives were fully aligned with those of the program, and having an operational structure that could effectively communicate and respond to program needs and whose organizational goals did not conflict with those set out in the APSC rules.

This comparison in program models within the combined service territory of AOG and OG&E serves as a case study for ensuring that program theory aligns with local rules and goals pertaining to energy efficiency programs. The WAP-coordinated program was an ambitious undertaking in bringing together seven utilities, six CAP agencies, and ACAAAA. Further, it was the first utility-funded weatherization program offered to Arkansas residential customers. This model was not a case of “reinventing the wheel”; similar models are common in other states and, as mentioned above, have demonstrated success elsewhere. In this instance, however, the model was marred in part by inconsistent federal funding and conflicting organizational goals, to the extent that the benefits of collaboration were outweighed by the added logistical complexity. The self-administered model developed by AOG and OG&E in response to the shortfalls of the WAP-coordinated program simplified program administration and allowed for consistent and successful implementation, as validated by annual evaluations in the 2011, 2012, and 2013 program years.

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