

# **Integrating evaluation to expand an innovative water and energy savings program in the United States**

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## **ABSTRACT**

This paper describes how our team integrated evaluation into a government-led water and energy savings program in California, USA to provide critical feedback for a regional expansion of this program.

The Bay Area Regional Energy Network (BayREN) organization is comprised of the Association of Bay Area Governments (ABAG) and nine counties in the San Francisco region (an area with ~2.5 million households). The Water Bill Savings Program (WBSP) began in 2012 as a small effort using disparate funding sources, various measures, and different return-on-investment levels for customers. BayREN is expanding the program by creating a regional funding option for water utilities so that they could easily offer the program to their customers.

We assessed the journeys of both multi-family and single-family customers as they moved through the program to ensure that a future program would work smoothly and appeal to a broader population. We provided evidence-based findings for each stage of the current program process so the implementer could adjust the program for a regional effort. We also worked closely with the program implementer to make explicit the program theory for a regional program so that the program could clearly state their purpose and future evaluations could test the model.

## **Introduction**

Grounded Research used program process mapping, customer journey mapping, and program theory/logic models to help an existing program consider their challenges as they expanded from a program with three pilots to a regional effort. We integrated results throughout the multiple month evaluation process so that the implementer could begin to make real time changes in their planned design. Through use of these evaluation tools, we were able to clearly delineate the various regional roles and activities of each of the key actors and show where the program should make changes for the future. Additionally, the logic model outputs and outcomes pointed to areas for future evaluation. This paper gives a high-level background about the program, our evaluation scope, and data collection efforts with a focus on our use of each of the evaluation tools, as well as high level results of the evaluation.

## **Background**

The Bay Area Regional Energy Network (BayREN) provides energy efficiency programs to ~2.5 million households within nine San Francisco Bay Area counties. BayREN is funded by California electric and gas utility ratepayers (under the auspices of the California Public Utilities Commission, CPUC), as well as through grants and funding from member agencies, other state and federal agencies, and foundations.

The Water Bill Savings Program (WBSP) is managed by the Sonoma County Regional Climate Protection Authority (a BayREN member) and implemented by Frontier Energy. The program is a unique on-bill program that allows municipal water utility customers to pay for water and energy efficiency improvements through a monthly charge associated with the water service and water meter at the customer’s location. With no up-front costs, this program is designed to deliver utility water and energy bill savings that will exceed the program charge. The program measures save water and energy at the location where improvements are installed. (Figure 1 shows this program concept below.)

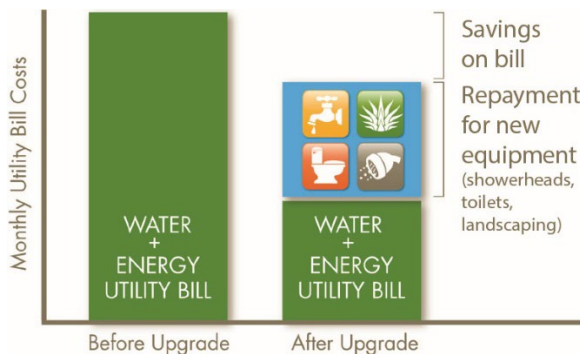


Figure 1. Example of Program Concept

During the first several years of the program, the program implemented three pilots by partnering with three water districts. Each district established a tariff that allowed the utility to recover the monthly charge, verified customer eligibility and adjusted their billing systems to support repayment processes. Adjusting their billing systems included placing a line-item on-bill surcharge on the bill, tracking and collecting the on-bill surcharges, issuing repayments to BayREN and transferring customer accounts if needed (as customers move, the charge stays with the water meter in the home so the account number must be updated for new customers).

The program offered measures that were calculated to save more on the combined customer’s water and energy bills than the on-bill surcharge. Specifically, the program offered single family and multi-family residential indoor plumbing fixtures (e.g., low flow showerheads, low-water use toilets, etc.) and turf replacement/drought tolerant landscaping. Additionally, one pilot also offered commercial irrigation system retrofits and weather-based irrigation controller installation.

During the pilot phase, the program occurred in three jurisdictions (the towns of Windsor and Hayward and the East Bay Municipal Utility District, EBMUD). Each jurisdiction offered the program somewhat differently. A comparison (e.g., models, improvements level of investment) is shown in the table below.

Table 1. Comparison of Water-Energy Nexus Pilots Supported by BayREN

	<b>Windsor</b>	<b>Hayward</b>	<b>EBMUD</b>
<b>Customer Segment</b>	Single Family and Multi-family (MF)	MF only	MF and commercial
<b>Dates of program activity</b>	2012-2015	2016-present	2016-present
<b>Improvements*</b>	Water- and energy-saving	Water- and energy-saving	Water-saving only
<b>Model</b>	Pay-As-You-Save (PAYS®)	PAYS®	Not restricted to PAYS® requirements
<b>Available Capital</b>	\$4M	\$1M	\$150,000
<b>Capital Distributed</b>	\$442,810 (11% of available capital)	\$142,933 (14%)	\$16,846 (11%)

\*All three jurisdictions offered toilets and showerheads/aerators. (Only Windsor allowed for drought tolerant landscaping for residential customers.) Weather-based irrigation controllers and irrigation system repair were eligible in both Hayward and EBMUD. Hayward also allowed for central hot water, common area lighting, and other energy efficiency improvements that save energy for the water utility customer.

As shown above, the program model differs across the three pilots. Two of the areas used a Pay As You Save (PAYS®) model where the cost of new equipment is paid back via an on-bill mechanism. (Cillo 2008) EBMUD offered something similar that did not meet all of the requirements of a typical PAYS® program. In the EBMUD pilot, customers could decide how they wanted to finance (with 10-20% decrease, breaking even, or even paying more than the surcharge, or co-pay). EBMUD’s pilot also required that all the improvements have a payback period of 5 years or less (rather than the standard 10 years or less period in the other two jurisdictions), which limited the possible improvements offered through the program.

The types of measures installed through the program varied. Hayward offered water conservation and common area energy improvements because investing in both water and energy savings supported their city’s climate action plan. EBMUD, however, as a water retailer, supported only water conservation improvements, although some of these improvements did include embedded energy savings. For all areas, the surcharge is on the water bill; participants in all three pilots saved water and at least natural gas related to water heating, with Windsor and Hayward participants also saving electricity, depending on the energy efficiency measures they had installed.

BayREN sought to use the findings from the three pilot described above to inform the regional model. Based on their analysis, 66 municipal water utilities may be able to cost-effectively offer improvements to single-family and multi-family homes through a fee-based on-bill savings mechanism. BayREN has successfully obtained the initial capital for the expansion and, as of the end of 2019, is in the midst of designing the regional effort for a planned 2020 roll out. The study described below informed the 2020 program roll out.

## Scope

The study focused on participants to give feedback on the existing pilot programs and help inform the development of the regional WBSP. In subsequent research (not included in this paper) we conducted interviews with non-participating water districts<sup>1</sup> and contractors. The study:

1. Provided insight on customers’ perspectives on their barriers and drivers for participating, their understanding of the program benefits and terms, and their satisfaction with the program and program follow up.
2. Provided a description of participating water districts’ perceptions of the benefits and barriers associated with the program and reasons for acceptance or refusal to participate.
3. Provided information on contractors’ perceptions of the benefits and barriers associated with the program and reasons for acceptance or refusal to participate.
4. Clearly and thoroughly documented the program logic and processes.
5. Provided recommendations to improve the existing offerings and support a more regional model.

## Methodology

The study drew on data collection from participants and near participants (that is, individuals who expressed interest but declined the program). Because many of the populations were limited in size, the overall sample sizes were small. The details for each of our data collection efforts are shown in the table below.

Table 2. Data Collection Details

Description	Details
Upfront listening session and ongoing discussions with implementers	Multiple discussions

<sup>1</sup> We use the term “water district” to refer to the water utility and/or town or city that is responsible for the water district.

In-depth interviews with participating water districts and key contractor (one hour each)	3 water districts (out of 3 water districts) 1 contractor (out of 1 contractor)
Single family (SF) residential online survey - participants	45 survey respondents (out of a population of 118)
Multifamily (MF) owners and manager in-depth interviews – participants	6 interviews of 8 available MF contacts Provided a \$100 honorarium for their time and insights
MF owners and manager in-depth interviews – near participants	6 interviews of 12 near participants Provided a \$100 honorarium for their time and insights.
Literature review of similar programs and an earlier study of the Windsor participants	10 studies and follow up discussions
Review of program databases	Windsor, Hayward

Using the data above, the evaluators purposefully used tools that would support implementer decisions and integrated results from those tools throughout the evaluation period. The bullets below describe the tools we used for this study.

- **Program Process Mapping** Through multiple meetings with the implementer, we highlighted the program journey process (from beginning to end) through five unique program stages.
- **Customer Journey Mapping** We gathered data through a survey (single family customers) and in-depth interviews (multi-family customers) and structured it to explore the various stages of the customer journey. We ensured that both the online survey and in-depth interviews were comparable so we could provide the implementer with useful information about any possible differences in the implementation activities in the multi-family versus single family segments.
- **Program Theory** We described the theory behind the regional program and created a high level model.

The major limitations for this study included:

- Sample sizes due to the small population sizes and some missing contact information.
- Many of the current participants initially signed up to participate more than a year ago (and some as long as 5-6 years ago).
- Some Windsor single-family participants (estimated at <20 of 231) had been contacted before for a prior research study.
- We were not able to include participants from one of the pilots (EBMUD) in this research effort.

## Results

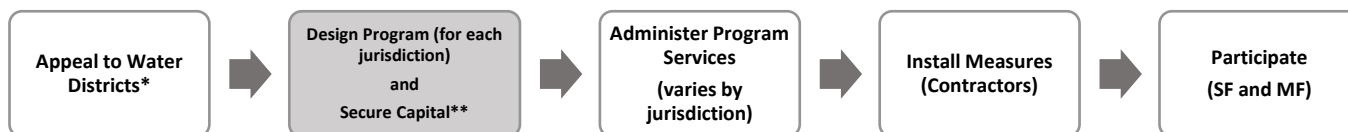
### Program Process Mapping

Through program process mapping, the research provided high level information of the program stages to highlight and compare the current program processes to the future regional effort.

We performed the program process mapping through multiple meetings with the implementer. Our first meeting was a purely listening session where we asked the implementer to talk us through the program and activities currently in place as well as what they were considering for future activities. Our team then grouped the different activities into different logical categories and laid them out visually, with one map representing the current program and a second map representing the desired future program. We brought these visuals to iterative meetings with the implementer and were able to surface key differences between the current program and the future regional program.

Based on the program process mapping, we found that while many elements of the pilots were similar across the three water districts, they had different funding sources, offered different measures, and chose different return-on-investment levels for customers. The organizations overseeing program administration also

varied across water districts. BayREN recruited the three water districts and then tailored the program to the specific jurisdiction (represented by the first two boxes in Figure 2) so differences arose as BayREN customized the program to the individual water district.



*\*Note that in the regional model, the program would be designed, and the capital would be secured prior to appealing to water districts, so this box would shift to the right.*

*\*\*The second box is highlighted to emphasize that the program is designed after appealing to water districts.*

Figure 2. Current Program Process

Data collection from the water districts and contractor supported understanding of the current program processes. Through hour long discussions, we learned how program should be designed and administered and heard that one water district viewed the BayREN program as a “next generation rebate” because it allowed for customization and flexibility; could allow for more projects; and could target those most in need. The water districts and the current installation contractor were highly satisfied. The water districts stated that the program does not require significant district resources to implement. Water districts saw several benefits to participating, including water savings and the ability to engage customers—particularly multi-family owners who have not been reached by other programs.

The contractor provided useful information about installing measures. The current contractor felt that the program was valuable because it provided credibility and had the potential to attract new projects; however, the program (as currently structured) was only working with one somewhat-unique contractor. Based on our findings, it was possible that the program may require a certain type of contractor who is more like an implementer than a typical contractor.

The regional Water Bill Savings Program intends to remove some of the duplication of effort that occurred each time the program was re-designed for a jurisdiction, while reducing both the time and effort required to get a program launched within each water district. This new regional program has similar activities but streamlined and rearranged some of the stages. Specifically, the regional model puts securing capital first as this capital is required before any regional activities can move forward, as shown below in Figure 3.

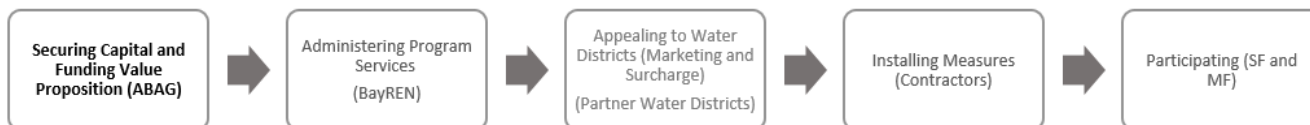


Figure 3. Expanded Regional Program Process

The study then used the program process map to examine each of the five program stages shown above and captured strengths and challenges of the current program to help the implementer move towards the expanded program. For example, discussions with the current water districts found the districts participated because they wanted to reduce water use or support greenhouse gas reduction goals. However, challenges in the current program that the expanded program design needed to overcome included: (1) being able to work with billing system and add the surcharge to the bill; (2) working with legal teams and risk management divisions; and (3) for some, developing a good process for transitioning customers who move out of participating buildings. To help determine how to overcome these challenges, our evaluation team recommended interviews with non-participating water districts and contractors so the program could pull in different perspectives as they designed the regional effort.

### Customer Journey - Single-Family Results

Through customer journey mapping, the research was able to provide an understanding of the customer experience, and customer feedback with each program touchpoint. We explored the program experience from

the perspective of single-family Windsor participants to understand barriers and key drivers for participation, customer understanding of program terms and conditions, and customer satisfaction with the program.

Based on the customer journey mapping among single-family customers, we found that residential Windsor participants went through three stages as part of their customer journey. (See Figure 4.)

- The customer journey began with the *pre-installation stage*, when they learned about the program, discussed possible participation, and signed a participation agreement.
- Within *the installation stage*, the customer worked with a contractor to have the new measures (e.g., toilets, landscaping) installed.
- In the last part of their journey, the *post-installation stage*, the customer accrues savings, and then through an ongoing process, pays for the improvements and the installation work through their water bill.

Most residential participants were somewhat or extremely satisfied with their overall program experience (81%). These customers were generally pleased with the installation and savings, although many did offer additional feedback on their experience.

In addition, 87% of residential participants felt that other households should participate in the program, indicating a high level of satisfaction and value to customers.

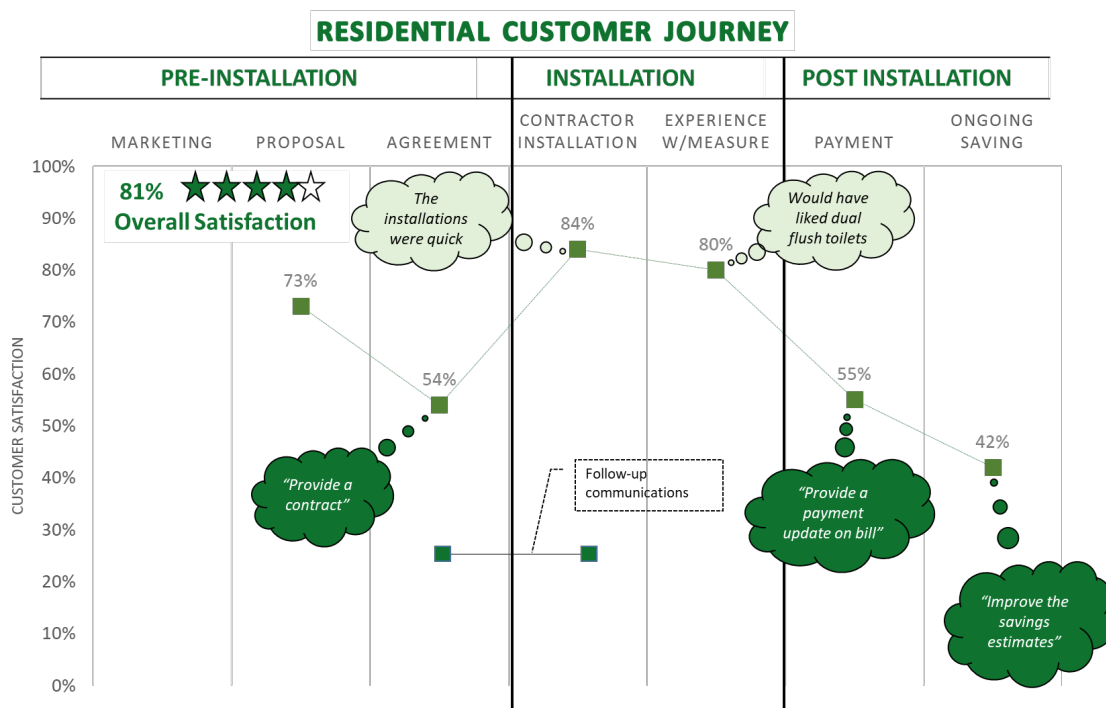


Figure 4. Satisfaction with Program Components Across the Windsor Customer’s Journey

While the negative feedback was limited, negative comments generally were around the lack of savings, product issues (quality of product, specific installation requirements), and issues with landscaping. For example, a customer’s plants died after landscaping and the contractor did not return calls requesting replacements and another customer had ordered an elongated toilet seat, but received a toilet with a round seat.

### Customer Journey - Multi-Family Results

Based on the customer journey mapping among multi-family customers, we were also able to describe the experience for the more limited set of multi-family customers. Given the limited number of participants, we also drew on program databases, feedback from near participants (that is, those who explored the program but did not act, for Hayward only), and interviews with the water districts and program implementation staff to inform our analysis.

Overall, the multi-family customer journey appeared to be a positive one with high levels of program satisfaction and a perception that the program was running smoothly. The largest hurdles were getting the attention of multi-family building contacts (as many were too busy to make time for this program) and issues with the offer itself (i.e., customers didn't like the labor or interest costs or were skeptical of the savings).

Among existing participants, all were highly satisfied with the program, and all mentioned that they thought that other multi-family owners would participate (if the water bill is paid by the building owner or property manager). An overview of the multi-family customer journey is depicted in Figure 5 below.

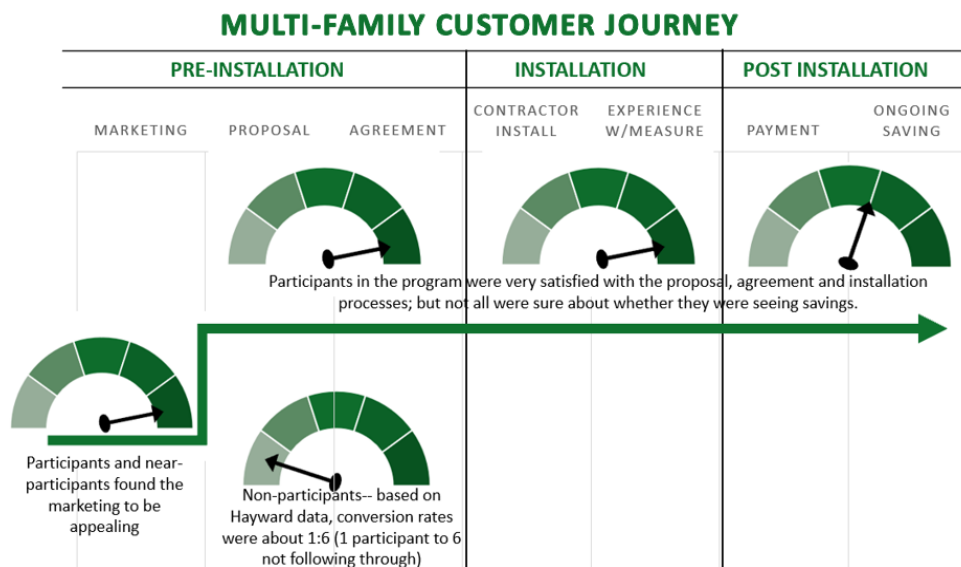


Figure 5. Multi-family Customer Journey

As shown above, through discussions with the program implementer, we learned that both single family and multi-family customers journeyed through three distinct participation stages. We structured our research to help the program understand where in the journey they may need to adjust their program. Our evaluation mapped the customer journey through these three stages where we asked participants about their satisfaction with the different implementation activities that occurred within the stages. We communicated the customer journey through a graphic that not only presented the satisfaction within each area, but also included qualitative information that epitomized the information heard and reflected the satisfaction score for that area.

**Program Theory and Logic Model for the Regional Program**

We collaboratively worked with BayREN to develop a regional program theory and logic model, as well as recommendations for how to best support the regional program in the future. Our effort consisted of multiple meetings with the implementers where our evaluation team brought draft theories to the meetings as a starting point and updated based on feedback from the implementers. These meetings included several conversations amongst the implementation team about the different roles being fulfilled by those involved in the program and helped to differentiate and then clarify the program implementers expectations of each group.

Through program theory and process model, the research was able to describe the theory in support of a future regional program. (Weiss, 1998. Chen, 1990. Rossi et.al, 2004.)

Based on the program theory and logic model effort, we delineated the role of each of the key actors and found that (by actor below):

- Association of Bay Area Government's (ABAG's) regional fund (i.e., ABAG creates a line of credit, aggregates debt, issues bonds) would provide easy access to capital that would lead to easier opt-in for water districts because they won't need to go through the process (or the significant amount of extra time) to secure funding on their own. This would help with decision making and speed up the process

of participation. In addition, the continuation of a split of the fee (between the capital fund and the water district) would make the program more attractive to water districts to help to encourage their participation.

- BayREN as the solitary implementer would lead to regional consistency and economies of scale. Using a regional implementer would lead to efficient delivery of services.
- Water districts and their cities/towns would offer WBSP (including supporting marketing and adding the efficiency charge to the bill) because it broadens offerings already available to their customers (while not requiring too much on the part of the water district), and because it may appeal to a particular segment of the population not fully served through their other offerings (e.g., rebate offerings). Their participation included marketing and updating their billing systems.
- Contractors would participate in WBSP because they like having options to offer their customers and because the program can give the contractors credibility. To serve both the multi-family and single-family residential sector, the contractors would need to both be able to handle small-scale jobs at individual homes, as well as quickly install measures (potentially water and electrical) in multi-family facilities. In addition, if the regional program offers outdoor measures, they would ideally be skilled with irrigation systems and have qualified licensed landscaped contractors.
- Single-family residential customers and multi-family owners would participate (once educated) because the water district (or municipality) is credible and offers them a way to save water (which is the biggest appeal) and energy with no upfront cost. This program would accelerate the adoption of some measures (e.g., when code changes are coming) by helping customers install these measures prior to mandated deadlines.

In the logic model below, we provide a short version of the theory described above, as well as a brief description of the role and activities of each of the key actors. We also used this model to provide outputs and outcomes that can be evaluated as the program is developed and implemented (as shown in the bottom two rows of the figure below).



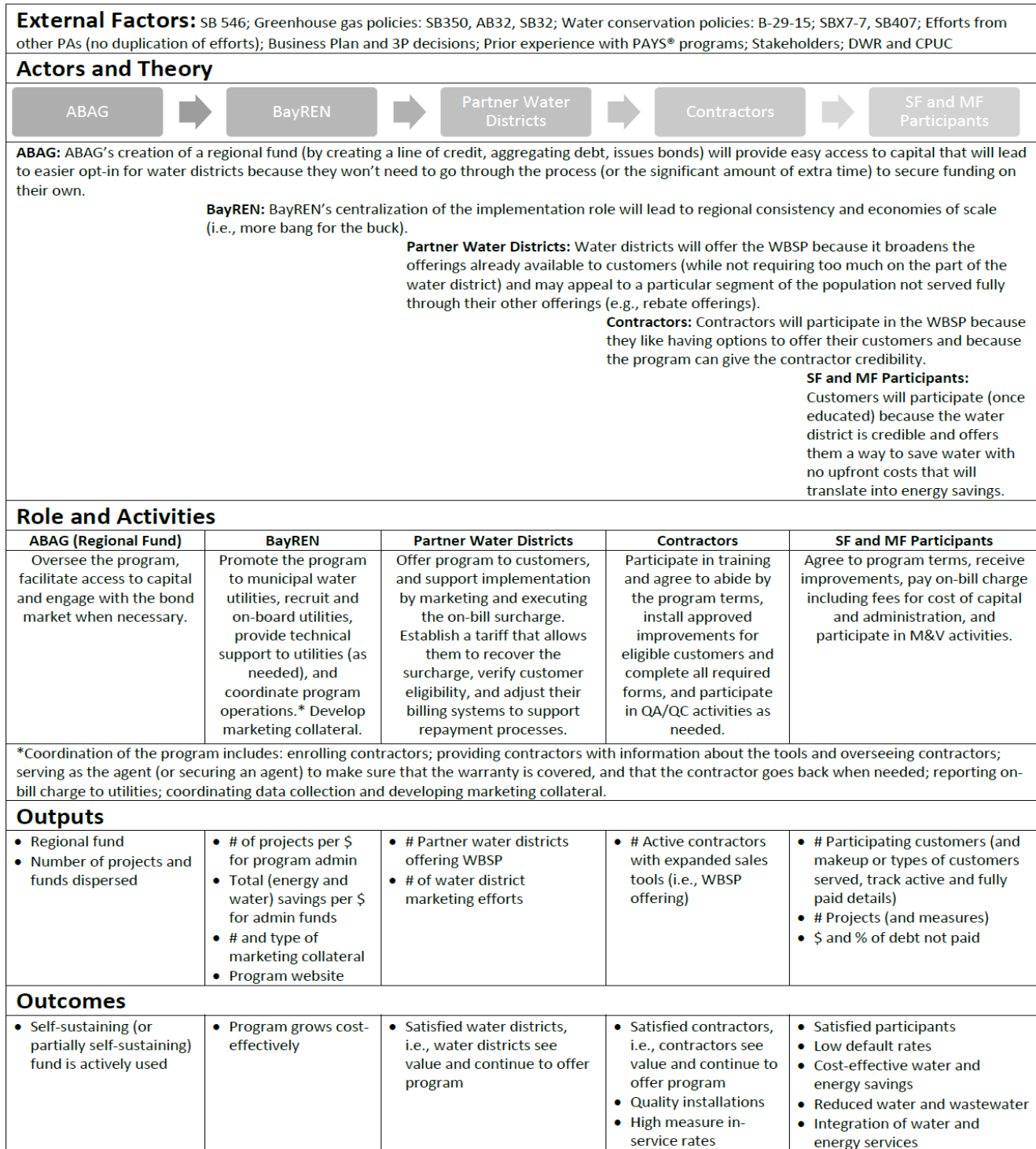


Figure 6. Regional Program Logic Model

As an unusual energy efficiency program (that is very closely tied to water agencies), it was crucial for the implementer to be able to clearly describe the program's purpose to outside stakeholders. As such, we used discussions around the program theory to help the implementer solidify why they thought their intervention was needed and what they expected to occur. We adjusted the logic models that are often used by energy efficiency programs to clearly communicate the program theory, roles, outputs, and outcomes.

## Conclusions

The integration of results from the different evaluation tools enabled our client to make data-driven choices as they designed their expanded program. Across the evaluation, our results conveyed that there was a good foundation for a regional effort led by BayREN. There was a high level of satisfaction for both the single-family and multi-family participants and the existing programs led to changes that would otherwise not have occurred while accelerating the adoption rate of water and energy saving improvements. In addition, we found that BayREN had already established and standardized many foundational program processes across the water districts, and that water districts and the current installation contractor were highly satisfied and saw several benefits to participating, including water savings and the ability to engage customers.

Results for each of the tools also provided a different lens for the implementer to consider, thus ensuring a holistic design with the best available information.

The program process mapping gave our client an understanding of the water district's acceptance of the current program and any problems with the process. This enabled the implementer to expand the program by streamlining processes and modifying the future design to be more appealing for water districts. The delineation of each stage also allowed us to understand roles more clearly. Finally, by mapping the program processes (and discussing the various activities within each stage), we were able to surface key differences between the current program and the future regional program so that the future program design was stronger than the pilot design.

The customer journey mapping allowed us to understand barriers and the best targets for the program. This enabled expansion by focusing on the most receptive market and reducing barriers such as customer paperwork and touchpoints. The graphics also presented the information in a format that was easy for the client to understand and communicate the need for changes in the customer experience.

The program theory and logic modelling helped our client describe the regional program so they could justify future funding. It also allowed the implementers to clearly state their purpose so that future evaluations could test the model, a step that is critical for the future demonstration of a successful program.

Through the use of these three tools, we were able to integrate feedback along the way, providing short write ups from each evaluation tool months earlier than the draft report so that our client could digest the information and consider the findings as they moved forward with designing their regional effort. Through this integrated approach, we received good feedback to incorporate in the draft report, and the client obtained critical (and timely) feedback for a regional expansion of an existing program.

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