Avista Income Based Payment Program / Balance Management Arrangement Pilot Program Evaluation

Final Report

Submitted by Evergreen Economics

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Executive Summary

In August 2018, Avista hired Evergreen Economics to evaluate a pilot program that has the primary objectives of easing the share of income spent on energy bills (energy burden) and reducing arrearages of low-income customers. The pilot program is comprised of two components: the Income Based Payment Program (IBPP) and the Balance Management Arrangement (BMA).

The IBPP targets customers with the lowest incomes (10 percent to 50 percent of the federal poverty level, or FPL) to alleviate the burden of energy costs by inferring the reduction it would take to make a customer's bill no more than 6 percent of their income. The IBPP fixed percentage discount is designed to address the affordability of energy while also keeping customers mindful of their energy use.

IBPP customers who had arrearages at the time of enrollment were also offered the opportunity to participate in the BMA component. BMA is a one-time benefit designed to assist eligible low-income participants by reducing arrearages and rewarding regular payment behavior for those customers who have arrearages or a balance they cannot pay at the time of IBPP enrollment. Customers can have 90 percent of their arrearages covered if they consistently pay on the remaining 10 percent of their arrearages over the year of the pilot program.

In this report, we present findings from research activities shown below that reflect upon a full year of pilot program implementation.

Research Activities

Interviews with recruitment agencies and Avista staff

A review of participant and non-participant data

A mail and phone survey with participants who:

- Were dropped from the pilot program after missing two payments
- Participated in a full year of the IBPP component of the pilot program
- Participated in a full year of the IBPP/BMA pilot program
- Did not participate in the pilot program but have received an annual energy assistance grant in the past

Statistical analysis of the effect the pilot program is having on:

- Energy consumption and costs
- Disconnections and missed payments
- Energy burden

The research activities listed above led to the following conclusions:

- The process to qualify customers for the pilot program is **more resource intensive compared to the existing grant programs.**
- The pilot program's engagement methods are valued by pilot program participants. This includes both initial recruitment and early support explaining the first few bills to participants.
- **Overall satisfaction with the pilot program was extremely high:** 97 percent of mail survey respondents reporting that they were extremely satisfied.
- **There was a decrease in missed payments over the duration of the pilot program**. IBPP decreased the likelihood that a participant would have a missed payment by more than 58 percent. Further, the combined effects of IBPP and BMA decreased the likelihood that a participant would have a missed payment by more than 63 percent. The combined effects of IBPP and BMA also led to a decrease in the likelihood of disconnections of 95 percent.
- **Energy usage increased by 4 percent across pilot program participants** though there was still an overall decrease in the size of customer bills. Our analysis suggests that for each $1.00 discount provided by the IBPP pilot program, the actual bill cost for participants fell by $0.75. In other words, the IBPP discount had 75 percent of the intended impact on participant bills.
- **The pilot program successfully lowered energy burden** for all participants to below 12 percent but did not fully reach the goal of 6 percent for all participants.

Thirty three percent (based actual income) and 43 percent (based on imputed income) of participants reached the 6 percent goal.

- **Customers also noticed these benefits**:
    - Ninety-seven percent of respondents across the entire pilot program reported seeing their bill decrease.
    - Ninety-three percent of respondents said that the pilot program made it easier for them to pay their bill.
    - Ninety-six percent of respondents said the pilot program made it easier for their household to cover other costs such as bills, food, and other living expenses.
- Many participants reported not recalling participating in Low Income Rate Assistance Program (LIRAP) Heat and/or the Low Income Home Energy Assistance Program (LIHEAP) in the past despite the data showing high levels of participation in the 15 months prior to the pilot program. In our survey of non-participants, only a small group of respondents recalled ever hearing about the pilot program. This limited our ability to draw conclusions as to why customers may prefer one program structure over another. However, we did see that **non-participants were more likely than participants to rely on retirement income and to be satisfied with a once-a-year grant**. This suggests there is value in both types of assistance within Avista's population of low-income customers.
- **Customers who were removed from the pilot program due to missed payments were unable to pay bills for a variety of reasons** including a change in income or the need to pay for a surgical procedure. There is no mechanism in the pilot program to update income information, which could work to the benefit of some participants and to the detriment of others.

1 Introduction

Avista launched a one-year pilot program in October of 2018 focused on low-income customers. The pilot program had two components: the Income Based Payment Program (IBPP) and the Balance Management Arrangement (BMA). A brief description of each pilot program component evaluated by Evergreen Economics is included in Table 1.

Table 1: Pilot Offerings

	Program Goal	Offering	Qualification Requirements
IBPP	*Reduce rate of disconnections and/or arrearages while keeping customers mindful of their electricity usage*	• Average benefit of $1,050 per participant. • Fixed percentage discount that reduces monthly bill to approximately 6 percent of income taking prior year's usage into account.	• Electric residential customer (no dual service customers) or co-tenant.[1] • Household income 10%[2] to 50% of federal poverty level. • After qualification, customer can choose between a once a year LIHEAP/LIRAP Heat grant and pilot program participation. • Qualified customers may not receive LIRAP Heat or LIHEAP while accepting the monthly reduction. They are also not able to be involved in Comfort Level Billing.
BMA	***For customers:*** *Encourage stable payment behavior* *Reduce burden of arrearages* ***For Avista:*** *Reduce disconnection and reconnection expenses* *Reduce bad debt carried*	• 90% of arrearages are amortized over 12 months; if the customer pays 10% of the arrearages over the 12-month period, 90% of the arrearages are forgiven. • Annual benefit not to exceed $350. • Customer can also seek emergency assistance which should cover the amount *billed.*	• Enrolled in IBPP. • Terminated after two missed payments (four total call attempts given: two after first missed payment, and two after the second missed payment).

[1] If the co-tenant were removed from the account during the pilot program, the discount would remain on the original account.
[2] This was lowered to 6 percent during the course of recruitment to achieve enrollment goals.

Avista partnered with two agencies to recruit existing customers into the IBPP component of the pilot program, and Avista CARES staff were responsible for following up with qualified IBPP participants to see if they were also interested in participating in BMA.

The two agencies tasked with recruiting customers into the IBPP component of the pilot program are:

- **Spokane Neighborhood Action Partners (SNAP):** SNAP is a community action agency that serves Spokane County; the majority of households served by Avista are located in this county. SNAP has several programs designed to help individuals and families move out of poverty. One of the agency's core programs is focused on energy related needs, and recruitment for this pilot program was implemented under that program. (Snapwa.org)
- **Rural Resources:** Energy-related work (including recruitment into the LIHEAP and LIRAP Heat programs) comprises close to 25 percent of the activities performed by Rural Resources. The organization works with populations located in more rural regions of Washington. (Ruralresources.org)

The original target for the IBPP pilot program was 300 participants; however, both agencies reported challenges in recruiting customers. Because of this, the original outreach that focused on households between 10 percent and 50 percent of the FPL was expanded to include customers at (and above) (and above) 6 percent of the FPL. This widened the recruitment pool to 90 customers for Rural Resources and 625 customers for SNAP (Table 2). A total of 170 customers were enrolled into IBPP by the two agencies.

Table 2: Income Based Payment Program

Organization	Original Target	Eligible Customers[3]	Customers Recruited	Recruitment Success Rate
SNAP	225	625	134	60%
Rural Resources	75	90	36	48%

To inform customers of the total benefit they would receive, the agencies utilized a calculator that takes into account a number of factors to determine the benefit amount (an

[3] Customers were eligible to enroll in IBPP if they were between 10 to 50 percent of the federal poverty level and had received grants in the past. If a customer had an energy assistance credit on their account, they were not a candidate for enrollment if their energy assistance credit was greater than their annual energy burden.

average of $1,050). The factors that go into the calculation include excess burden, income to calculate the maximum energy burden (percent of annual income spent on energy bills), monthly discount amount, and the annual electric bill.[4]

The pilot program ran from October 2018 to October 2019. Over the course of the year, we surveyed customers who had dropped out of the pilot program and of the 16 dropouts we were able to connect to a total of seven of them and conducted interviews with recruitment agencies and Avista staff in July of 2019. At the end of the pilot program, we conducted mail surveys with the following groups:

- Participants in a full year of the IBPP pilot program;
- Participants in a full year of the IBPP/BMA pilot program; and
- Non-participants who have received an annual energy grant in the past.

We also used a comparison group of non-participants, along with weather, Census, and billing payment and severance data, to understand:

- Energy consumption and costs;
- Disconnections and missed payments; and
- Energy burden (limited to pilot program participants).

This research all served to address the following research issues:

- Whether the pilot program has significantly different impacts on participant disconnection rates compared to the existing LIRAP Heat and/or LIHEAP;
- The impact of the IBPP and/or BMA on participants' energy burden;
- Participant reactions to the pilot program and the reasons customers selected the IBPP instead of a grant through an existing program;
- Process elements, including whether the process to qualify customers for the pilot program is more or less resource intensive compared to the existing programs;
- The effectiveness of engagement methods; and
- Actual customer benefits compared to pilot program expectations.

[4] For a customer that does not reside in the home for a year or more, a surrogate amount is used for the calculation of their annual electric bill.

2 Methods

Evergreen Economics received a variety of datasets from Avista as part of our evaluation of the IBPP/BMA pilot. Table 3 summarizes the data we received and the key variables and date ranges by each source. Additional information on each of these data sources can be found in Appendix A: Additional Methodology Details.

Table 3: Data Received

Data Source	Variables Provided	Date Range	Filters	Accounts (N retained of provided, if applicable)
Summary Bill and Usage	Account ID, bill date, bill amount ($), billed usage (kWh), IBPP discount amount	August 2017 to October 2019	Duplicated values	12,081
Summary Payments	Account ID, payment date, payment amount	August 2017 to October 2019	None	12,081
Project Share	Account ID, share date, tender source, payment amount	August 2017 to October 2019	None	12,081
Adjustments	Account ID, adjustment date, adjustment type, adjustment amount	August 2017 to October 2019	None	11,546
BMA	Account ID, BMA bill date, BMA bill amount, BMA credit amount	October 2018 to September 2019	None	72
Severances	Account ID, severance process	May 2015 to December 2019	None	12,081
Demographics	Household ID, age, race, gender, income, disability status	Snapshot at time of enrollment	None	170

In addition to data provided by Avista, we used weather and US Census data in our analysis.

Weather Data

To understand the effect of weather on key program impacts, we acquired, cleaned, and utilized weather data. As a first step in this process, we determined the latitude and longitude of participant residences addresses and the comparison group match. This was done using Geocodio, an online application that takes street addresses (found in the billing

data) and determines their geographical coordinates. We then compared these geographical coordinates to a list of known weather stations that provide weather data to the public via the National Oceanic and Atmospheric Administration. Each customer was assigned to the closest[5] usable weather station (second closest weather stations were retained as backups).

Given this list of matched weather stations, we pulled the available weather data for each station for the study period. We then cleaned these data to remove missing and invalid observations, and imputed missing temperatures where feasible using surrounding observations. We then aggregated the weather data to calculate daily average cooling degree-days (CDD) and daily average heating degree-days (HDD).

US Census Data

Demographic data were not available for non-participants, and the participant demographic data were difficult to match to participant usage data.

As an alternative source of demographic data for both participants and non-participants, we used census data from the 2017 American Community Survey 5-year estimates. While this dataset contains numerous demographic fields, we focused on household and income-related demographics such as count of households by income bracket, count of households that speak limited English, and count of households and people who identify as American Indian,[6] among many others. While initially reported by the census as counts of households, we also divided these values by the total number of of households in each census tract to create proportional counts for each demographic of interest.

Using the geographical coordinates provided by Geocodio, we were also able to determine the census tract of each participant and comparison group account. This enabled us to understand the average demographic characteristics of the areas that immediately surround each of the customers in this study.

The data described above were used to:

1. Identify the comparison group
2. Calculate the effect of the pilot program on energy usage
3. Calculate the effect of the pilot program on missed payments or disconnections

[5] As determined by the Haversine method.

[6] The count of people that identify as American Indian enabled us to identify the census tracts in Avista's service territories that cover Native American Indian Reservation land. These tracts are 53019940000 (Colville Reservation) and 53065941000 (Spokane Indian Reservation).

4. Calculate the effect of the pilot program on energy burden
5. Sample for customer surveys

Additionally, we received contact data from Avista in order to conduct in-depth interviews.

2.1 Comparison Group Development

The purpose of a comparison group is to introduce additional stability into a regression model by controlling for variation in energy usage over time due to systematic changes that are unrelated to the program being evaluated. For example, average household energy use during the program period may have changed significantly due to factors not included in the model, such as economic conditions, supply shocks within the regional electricity market, or society-wide changes in residential energy usage. A model without a comparison group would attribute these external influences to the program; however, inclusion of a comparison group controls for these factors and therefore is better able to isolate the impact of the program being studied.

A comparison group contains households that are similar to participant households with respect to energy usage, geographic location, and elective participation in an energy assistance program. Assignment of a residential customer to the comparison group is not random, but rather determined based on one or more criteria (e.g., monthly energy consumption). Because of this, we refer to the analysis as a quasi-experimental design, thereby acknowledging that the comparison group does not meet the standard of a control group within a randomized control trial experimental design.

The first step in this process was to convert the date ranges from billing cycles (e.g., Sept. 10 – Oct. 20) to calendar months (e.g., Oct. 1 – Oct. 31). This transformation is necessary to ensure that any difference in energy usage between two customers is not simply attributable to a difference in time period. Note: this has no impact on the total annual energy usage or billed amount. The process for this conversion included:

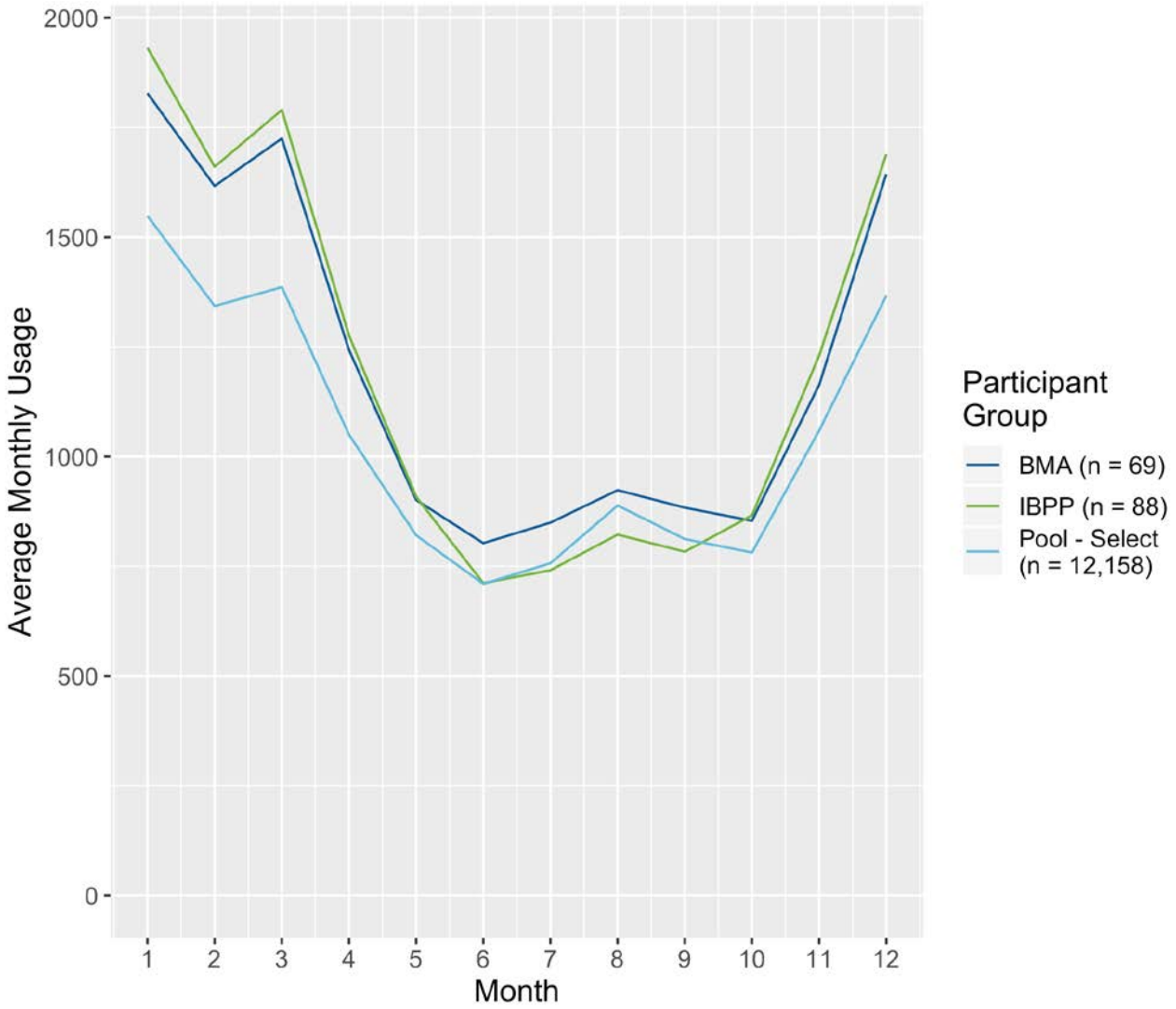
1. Identify the current bill cycle's start date, based on the prior cycle's end date;
2. Calculate the number of days in the billing cycle;
3. Divide the total energy usage (kWh) and billed amount ($) by the number of days in the cycle to estimate the average for each day in the cycle;

4. Spread the average daily energy usage and billed amount over each day in the billing cycle;[7]
5. Re-aggregate bills by calendar month.[8]

As part of the interim IBPP/BMA evaluation delivered to Avista on June 7, 2019, we created a comparison group pool of 12,414 customers with similar characteristics to the IBPP and BMA participants from a population of 21,917 households that received another form of energy assistance (LIRAP Heat, LIHEAP, emergency payment, or LIRAP Senior/Disabled Outreach). See the interim report for details (Appendix D: Interim Report). Figure 1 shows the energy usage of these three groups over a full year prior to the start of the pilot program.

[7] During the first month of IBPP participation, the discount amount ($) was spread over a subset of days at the very end of the billing cycle.
[8] Calendar months with fewer than 26 days after this expansion were treated as missing values for the comparison group matching.

Figure 1: Energy Usage of Participants and Comparison Pool

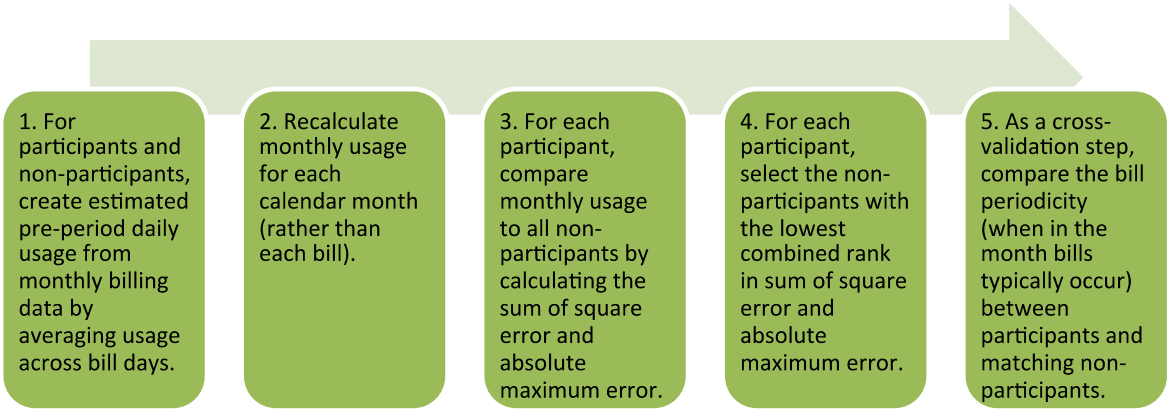


Note: This figure only includes customers with energy usage spanning all 12 months prior to the start of the IBPP/BMA program.

For each of the 169 participants with energy usage data, we restricted the comparison group pool to a subset of 12,157 customers with energy usage and billing data that span the full pre- and post-period that aligns with participants. In most cases, this was a period of around 24 months ending in October 2019. Evergreen then measured the difference in monthly electricity usage between the participant and each of the potential comparison

customers during each calendar month prior to participation in the pilot program.[9] Whichever comparison customer most closely matched the energy usage of the participant during this baseline period was selected as the best available comparison (1:1 match). Figure 2 provides a summary of the comparison group matching process, from the initial data transformation all the way through to cross-validation.

Figure 2: Comparison Group Creation Process



As shown in Table 4, we started with 172 participants and 12,414 customers in the comparison pool. We had to drop five participants due to insufficient billing data for the evaluation, as a result of their service account being closed (e.g., moved to a different home). After the matching procedure, we were left with 156 participants and 131 comparison customers (with 19 matched to more than one participant).

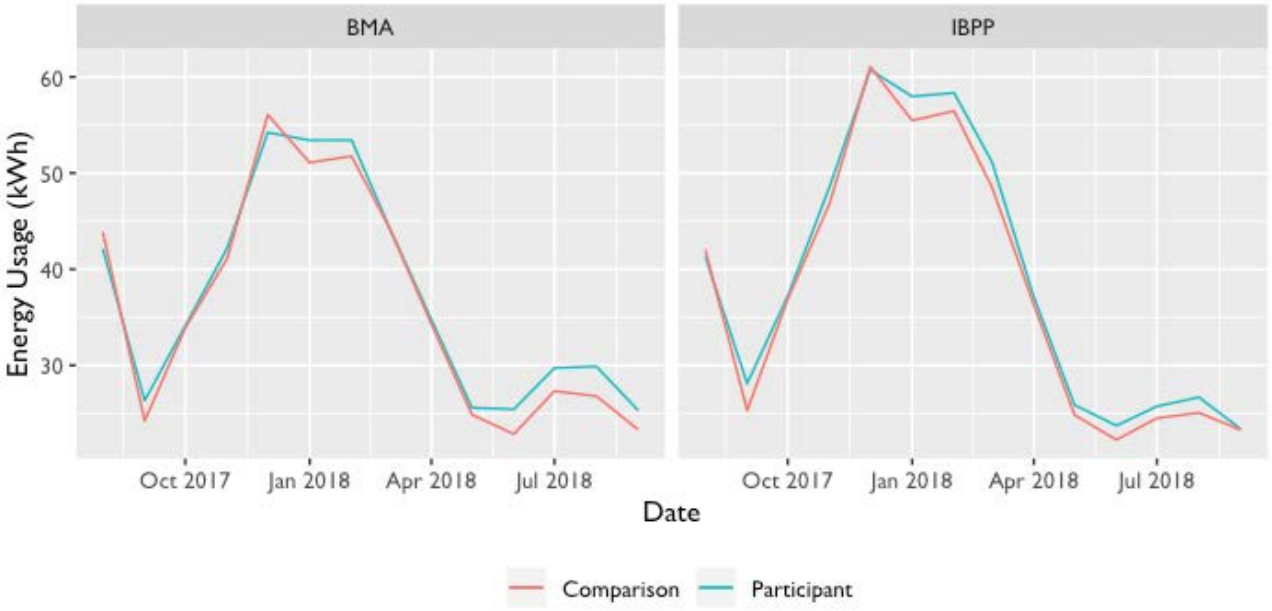
Table 4: Distinct Customers in Sample

Data Description	Participant (n)	Comparison Customers (n)
Baseline sample (interim evaluation report)	172	12,414
Energy usage data for full study period	169	12,157
Final matched sample	156	131

Figure 3 shows the monthly electricity usage during the pre-period of IBPP and BMA participants (red) and their matched comparisons (blue).

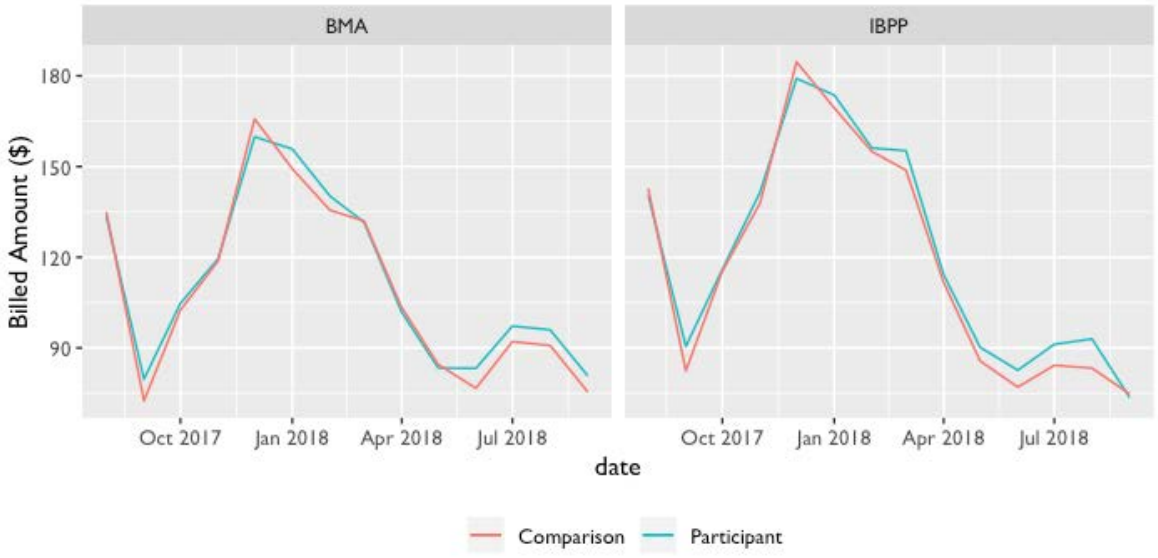
[9] We chose the customer from the comparison group pool that minimizes the sum of squared errors in electricity consumption by calendar month.

Figure 3: Energy Usage of Participants and Matched Comparison Customers by Month by BMA and IBPP



To validate our matching procedure, we also compared the monthly utility bills of participants (red) and their matched comparisons (blue), as shown in Figure 4. The two groups appear similarly well matched during the baseline period for most available characteristics including service account tenure (number of months), frequency of account severances, weather conditions (represented by CDD and HDD), and regional Census data (e.g., proportion of households with seniors or children, renter occupied housing, presence of Native Americans, disability status, and average family size.)

Figure 4: Utility Bills of Participants and Matched Comparison Customers by Month



2.2 Pilot Program Effect on Energy Consumption and Costs

The effect of the pilot program on energy consumption and costs was estimated with two fixed effects regression models. In both instances, we utilized the matched comparison group to control for variation in energy usage over time that was due to systematic changes, rather than due to the pilot program itself. The data for each comparison customer were restricted to the same study period as their matched participant to maintain a balance between the two groups (in number of observations as well as seasonality).

We tested variations of each model, filtering the input data for daily kWh (0.1<kWh<30.0) and number of days required to represent the calendar month (>15 days) and found no change in any of the coefficients. This suggests that there are no outliers with a significant impact on the model output—hence, we chose to retain all available participants and their matched controls for the full study period in the final model (i.e., no filters applied).

Energy Consumption Model Specification

To determine the effect of the pilot program on energy consumption, we used the fixed effects model shown in Equation 1. This utilizes the full sample of 156 pilot program participants (n=68 BMA and n=88 IBPP only) who were successfully matched and the matched comparison group of similar low income households. The post-period indicator takes on a value of 1 when a participant receives the IBPP discount for the full calendar

month, and 0 for months without any discount (before or after the program).[10] The post-period indicator is shared between participants and their matched control customer.

This model includes heating degree-days (HDD) and cooling degree-days (CDD) calculated from a base temperature of 65°F to control for the effect of weather on both groups. The monthly indicator variables help control for other seasonal variations that are independent of weather, such as an increase in lighting during winter months when the days get shorter. All terms are expressed in average daily values to normalize for the number of days in each calendar month (e.g., 31 in January versus 28 days in February). We tested a variety of model specifications, with squared degree-day terms and/or additional variable interactions. These increased the complexity of the model but had no significant impact on our estimated pilot impact or overall model fit. Therefore, we opted to proceed with the simplest model.

This model is similar to the one that Evergreen used very successfully in our recent evaluation of Avista's LIRAP Senior and Disabled Customer Rate Discount Pilot program. We have also used this basic model in other impact evaluations for low income programs, including evaluations for Idaho Power, Ameren Missouri, and two separate statewide low income program evaluations for the California investor-owned utilities (IOUs).

Equation 1: Energy Usage Fixed Effects Regression Model Specification

$$kWh_{it} = \alpha_i + \beta_1 Post_{it} + \beta_2 (Post_{it} * Part_i) + \beta_3 HDD_{it} + \beta_4 CDD_{it} + \sum_{m=2}^{12} \beta_m Month_m + \varepsilon_{i,t}$$

Where:

$kWh_{it} =$ Average daily electricity usage by customer i during time period t

$\alpha_i =$ Customer fixed-effect

$Post$ $=$ Indicator variable for whether billing period occurs after the start of the pilot program

$Part =$ Indicator variable for pilot program participants only (0 for comparison group)

$HDD =$ Average heating degree-days (base of 65°F)

$CDD =$ Average cooling degree-days (base of 65°F)

$Month_m =$ Series of indicator variables for each calendar month (excluding January)

$\alpha, \beta =$ Coefficients estimated by the model

[10] If a participant received the IBPP discount for a portion of the calendar month (e.g., 15 of the 30 days), then the post-indicator will take on a value between 1 and 0 (e.g., 0.5 = 15/30).

$\varepsilon =$ Random error, assumed to be normally distributed

Our primary interest in the output will be the coefficient on the $Post * Part$ interaction variable, which will provide an estimate for the change in daily kWh attributable to the program. $Post$ will absorb any systemic changes from pre- to post-implementation of the pilot program, which is not attributable to the program because this change must also be exhibited by the comparison customers (else it would be in $Post * Part$). The customer fixed effect (α_i) provides our best estimate for each customer's baseline energy usage, the kWh that is stable throughout the time period (independent of weather and season).

Energy Cost Model Specification

To determine the effect of the pilot program on energy cost, we used the fixed effects model shown in Equation 2. This utilizes the same sample of IBPP and BMA participants and the matched comparison group of other low income households. This model includes the same controls as the energy usage model because bill amount ($) is heavily influenced by the variation in kWh energy usage (which is very seasonal/weather dependent).

The main difference in this model is the use of discount amount ($Disc\_Amount$) instead of the more broad post-intervention indicators ($Post + Post * Part$). The discount amount is always $0 for the comparison group (pre and post), as well as the participant group before receiving energy assistance through IBPP. The discount is positive during IBPP participation. [11] Again, we tested a variety of model specifications, with squared degree-day terms and/or additional variable interactions. These increased the complexity of the model but had no significant impact on our estimated pilot impact or overall model fit. Therefore, we opted to proceed with the simplest model.

Equation 2: Energy Cost Fixed Effects Regression Model Specification

$$Bill\_Amount_{it} = \alpha_i + \beta_1 Disc\_Amount_{it} + \beta_2 HDD_{it} + \beta_2 CDD_{it} + \sum_{m=2}^{12} \beta_m Month_m + \varepsilon_{i,t}$$

Where:

$Bill\_Amount_{it} =$ Current bill amount ($) for customer i during billing period t

$Disc\_Amount_{it} =$ IBPP discount amount ($) for customer i during billing period t

[11] Customers in the comparison group received energy assistance in the form of one-time grants from LIHEAP or LIRAP Heat. These are NOT treated as bill discounts, but rather as payments. Both grant programs and discounts can improve a customer's ability to pay their bill; this will be seen as an impact on the customer's ability to pay their bill (avoid a missed payment), not as an impact on the bill itself.

$\alpha, \beta =$ Coefficients estimated by the model

$\varepsilon =$ Random error, assumed to be normally distributed

The coefficient on *Disc_Amount* will provide the reduction in bill amount ($) for each $1 discount paid by the IBPP program. If the program has no impact on energy usage (and thus, only impacts the bill amount directly), then this coefficient will be 1.0. If it is <1, then some of the discount is being offset by an increase in costs from energy usage or other factors.

2.3 Pilot Program Effect on Missed Payments and Disconnections

Timeline Dataset

To understand the factors related to missed payments and disconnections, we utilized the customer data provided by Avista to understand the events (e.g., bills, payments, adjustments) that led up to missed payments and disconnections. This was augmented by outside data on household demographics and weather to build complete explanatory models for these two important program impact areas.

The first step in this process was to restrict the billing, share, payment, adjustment, and severance data down to just the IBPP and BMA pilot program participants and their comparison group equivalents, described above. These data were further restricted so that only data after each customer's first bill were retained.

Next, the restricted datasets (billing, share, payment, adjustment, and severance) were summarized to describe the events that occurred for each customer, for each dataset. That is, each dataset was reformatted to describe the event type (bill, payment, etc.), event date, event amount in dollars (if applicable), and any relevant information about discounts. These datasets, when combined into a single dataset and arranged by date, show an event-by-event history for each customer account.

Before moving forward, this combined dataset was cleaned to remove any duplicated events. This cleaning process revealed that all of the information provided to us as part of the payment data had identical matches in the share data. Because of this, we removed all payment data from our combined dataset and instead focused on the share data, which had the same information but with additional detail such as payment tender source.

The next step in understanding missed payments and disconnections was to reinterpret the list of events to define the bill cycles within which each event occurred. For this analysis, we defined a bill cycle as the period from the bill date to the day before the next

bill occurs for each account (i.e., the days in which a customer would be expected to pay a bill that they have received). Within each of these bill cycles, we identified the presence of payments, discounts, and disconnections for each customer.

We recorded a payment where there was a payment that matched to the share data, a transfer between the service account (in the case of overpayment), or an applied deposit following a disconnection. Initially, missed payments were defined as the absence of a listed payment type. Upon further review, however, we determined that missing payments that occurred immediately before or during cancelled bills should not be considered missed payments.

To identify bill cycles that were affected by the IBPP and BMA components of the pilot program, we added flags for each component. For IBPP, we identified any bill that was discounted by the IBPP according to the billing data. We defined a BMA bill cycle as a bill cycle in which the customer received an IBPP discount, and was also within the BMA bill date range for each account based on the BMA data we received from Avista. With the bill-to-bill events determined for each customer, the dataset was further restricted to ensure that the first and last bills for the comparison group fell within the range of their corresponding pilot program participant.

As a final cleaning step of the customer data, we restricted our observations to bill cycles that covered the typical bill cycle length of between 26 and 33 days. This filter was important to ensure that customers who had instances of especially short bill cycles (usually the result of cancelled bills) were not considered to have missed a payment when they were given an abnormally short amount of time to do so. With this filter applied, it became apparent that numerous participant bills were dropped due to cancelled bills on around March 15, 2019. To correct for this imbalance relative to the comparison population, if a participant was missing a bill cycle for March 15, 2019, the same cycle was dropped from their comparison match.

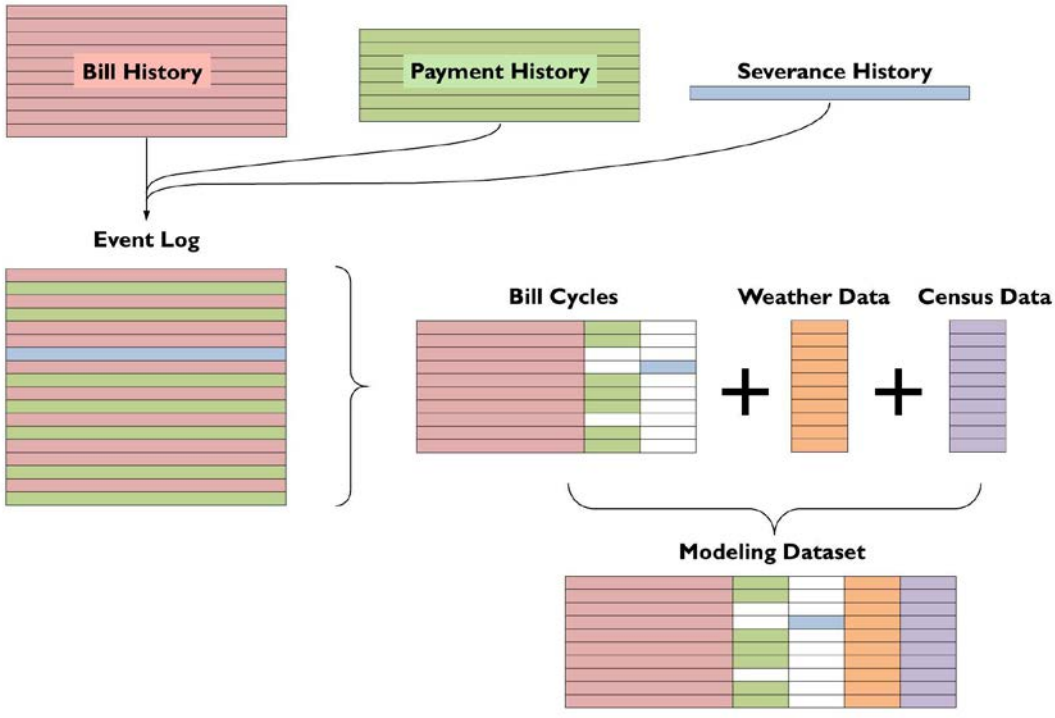
In the final step prior to modeling, we appended demographic information from the census and weather data to the bill cycle dataset. From the census, we appended data on the demographic characteristics of each customer's census tract. For the weather data, we calculated the average daily HDD and CDD across each customer's bill cycle.

Table 5 summarizes the steps involved with producing the dataset used for modeling missed payments and disconnections. Figure 5 presents the steps visually.

Table 5: Bill Cycle Data Steps

Step	Impact
1. Restrict bills, share/payment, adjustments, severances to parts and matched comparison	Drop from population (12,087) to 287 account IDs
2. Create event logs for each dataset with account ID, date, event type, and amount (if applicable)	NA
3. Combine event logs and remove duplicates	Remove 5,277 of 21,368 total events
4. Identify bill cycles, payments, missed payments, discounts, and disconnections	Events translated to 7,716 total bill cycles
5. Filter to reasonable bill cycle lengths and balance observations	Drop to 7,684 bill cycles used in model
6. Append weather and census data	NA

Figure 5: Bill Cycle Graphic



Models for Missed Payments and Disconnections

We developed and estimated statistical regression models to explain the variation in missed payments and disconnections and to understand the potential impact of the IBPP and BMA components of the pilot program on these outcomes while holding all other variables constant. We used the same model specification for both missed payments and disconnections because the determinants of each should be similar.

Given the true/false nature of missed payments and disconnections, we used a logistic regression model to estimate the probability of each outcome occurring. The logistic regression model is a non-linear, S-shaped distribution function that constrains the estimated probabilities to lying between zero and one (i.e., 0 percent up to 100 percent chance of occurring). The logistic function is mathematically straightforward to estimate (using statistical software), and the estimated probabilities fall within the zero-to-one interval.

The final set of explanatory variables included in our logistic models was selected based on their incremental relationship to the respective dependent variable. Many pairs of variables within the Census datasets were highly correlated—that is, they have a strong positive or negative linear relationship. Because of this, they have the same or a very similar relationship with the dependent variable, which can lead to problems in the estimation of the econometric model. For this reason, the final model specifications shown in Equation 3 and Equation 4 are limited to a subset of variables selected for their explanatory power and ease of interpretation. We explored a variety of model specifications, including the use of interaction terms.

To better understand the distinct impacts of IBPP and BMA, we isolated the unique observations of each. For our model, we identified bill cycles where only an IBPP benefit was being received versus bill cycles where both BMA *and* IBPP benefits were received. This enables us to understand the marginal benefit that enrollment into BMA provided to customers who also received IBPP discounts.

In addition to the model inputs that explain program impacts, we also included additional variables that might also explain missed payments and disconnections including proxies for income and household composition. We also included an estimated impact for weather in the form of average daily HDD for each day of the bill cycle.[12] Our models also include an indicator for a household being located on a reservation,[13] which the 2019 Avista Low

[12] CDD was excluded given the limited cooling season in Avista's service territory. Alternative model specifications that included CDD showed no relationship with missed payments or disconnections.
[13] Defined as census tracts 53019940000 (Colville Reservation) and 53065941000 (Spokane Indian Reservation).

Income Needs Assessment Report indicated is related to the occurrences of missed payments and disconnections.

Equation 3 and Equation 4: Logistic Models of Missed Payments and Disconnections

$$Equation\ 3\text{: } P(Missed\_Payment_{it}) = \frac{1}{1 + e^{-Z}}$$

$$Equation\ 4\text{: } P(Disconnection_{it}) = \frac{1}{1 + e^{-Z}}$$

Where:

P(Missed_Payment$_{it}$) is the probability of a missed payment occurring for customer *i* at time *t*

P(Disconnection$_{it}$) is the probability of a disconnection occurring for customer *i* at time *t*

e is the logistic function and is equal to 2.718. It is the base for the natural logarithm ("*ln*") and, because of its unique properties, is the most common function for the analysis of probabilities

$$Z = \beta_0 + \beta_1 IBPP\_Only_{it} + \beta_2 BMA_{it} + \beta_3 Reservation_{it} + \beta_4 HDD_{it} + \beta_5 Less\_than\_35k_{it} + \beta_6 Seniors_{it} + \beta_7 Children_{it} + \beta_8 Renters_{it} + \varepsilon_{i,t}$$

And where:

BMA_{it} = Had both IBPP discount and BMA credit (True/False) for customer i during billing period t

$Reservations_{it}$ = Indicator for household i being located on a Native American Reservation

HDD_{it} = Average daily HDD for customer i during period t

$Less\_than\_35k_{it}$ = Proportion of households in Census Tract of customer i that earned less than $35,000

$Seniors_{it}$ = Proportion of households in Census Tract of customer i that had a senior

$Children_{it}$ = Proportion of households in Census Tract of customer i that had a child

$Renters_{it}$ = Proportion of households in Census Tract of customer i that rented their home

α, β = Coefficients estimated by the model

ε = Random error, assumed to be normally distributed

The coefficients estimated in a logistic regression model possess little intuitive meaning beyond their sign (negative or positive). However, we used the coefficients to estimate the marginal effect that IBPP and BMA had on the probability of missed payments and disconnections. For binary variables, such as program participation, marginal effects

measure how the probability of missed payments and disconnections changes as the value of the binary variable is switched from zero to one, while holding the values of all other variables constant. For continuous variables such as average daily HDD, marginal effects measure how the probability of missed payments and disconnections changes as the value of the continuous variable increases by one unit, while holding all other variables constant. Since IBPP and BMA are represented in the logistic regression models as an indicator variable, the marginal effect is equal to the impact that participating in the components of the pilot program had on the likelihood that a customer had a missed payment or disconnection. Table 15 (located in Appendix C: Detailed Regression Outputs) describes the underlying characteristic distributions that we used to estimate impacts on missed payments and disconnections.

In summary, our modeling approach utilizes Avista data sources to create a timeline of customer bill cycles, which then undergoes statistical modeling to estimate program impacts on missed payments and disconnections while controlling for external factors like weather and regional differences. The result is the effect that each program had on the likelihood that a missed payment or disconnection would occur, relative to the comparison group of customers who received an energy assistance grant (LIHEAP, LIRAP Heat, or emergency payment).

2.4 Pilot Program Effect on Energy Burden and Achieving Bill Cost Target of 6 Percent

We explored energy burden, which is the total cost of utility bills (electric and gas, where applicable) as a proportion of household income. This metric is commonly used to evaluate the financial need of low-income households.

The IBPP Pilot Program component was designed with a goal of reducing energy burden to no more than 6 percent. In other words, an IBPP participant who was enrolled for a full year of the program should have an annual energy bill cost of approximately 6 percent of their household income.

We faced difficulties linking the demographic data (with household income) provided by SNAP and Rural Resources to Avista's billing records. The agencies track customers with a distinct household ID, while Avista tracks customers with an account ID and service agreement number. We reviewed all available records from both parties, including customer service address (with unit number), and were able to successfully match 58 percent of the IBPP participants with energy usage data to their demographic data (n=91 of 156 with a matched comparison customer).

The IBPP discount assigned to each participant was derived from their household income and prior year of energy costs, as shown in Equation 5. Hence, we are theoretically able to

impute income for the remaining participants as long as we know the IBPP discount and a total annual bill cost during the pre-period.

Equation 5: Relationship Between Income and IBPP Discount

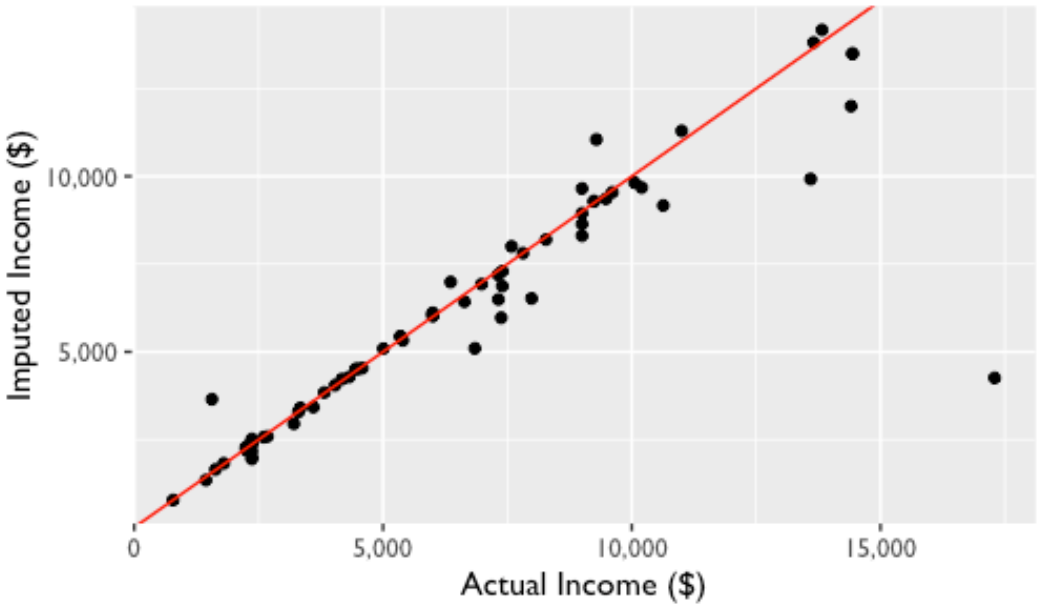
$$Discount = 1 - \frac{AnnualCost_{Pre} - HouseholdIncome * 0.06}{AnnualCost_{Pre}}$$

$$HouseholdIncome = \frac{(Discount - 1) * AnnualCost_{Pre} + AnnualCost_{Pre}}{0.06}$$

Figure 6 shows our imputed household income (y-axis) against the actual household income listed in the demographic files provided by the agencies (x-axis) for the subset of participants with a successful link between data sources and a full 12 months of bills prior to the start of IBPP (n=69 of 91).[14] The red line provides a visual guide for where the two values perfectly align. In most cases, we see that our imputation is a good approximation of actual income, falling close to the red line. There is one clear outlier, where the IBPP discount and pre-period bills led us to impute income as $4,250 when the actual income reported by the agencies was around $17,000. To ensure that our imputation method is not introducing too much uncertainty into the analysis of energy burden, we report energy burden impacts for the sample with imputed income (n=114) as well as the subset with actual income reported by the agencies (n=91).

[14] This validation test was limited to the 69 participants with a full 12 months of pre-period billing data. While the remaining 22 participants had sufficient data to be retained for the billing analysis, we needed a full 12 months of billing history to ensure that our imputed income was reasonable.

Figure 6: Actual Reported Household Income vs. Imputed Income



We did not receive any demographic data for the comparison group. It was not possible to impute income for this group, because the size of the energy assistance grants received by these customers is not a function of household income; this was only an option for IBPP participants. Hence, the assessment of energy burden impacts is limited to a comparison between pre- and post-period energy burden of IBPP participants, not an impact relative to other forms of energy assistance available.

2.5 Customer Surveys

We conducted a total of four surveys with Avista customers. The survey of customers who had dropped out of the program was conducted mid-pilot program, and the remaining three surveys were sent out after the completion of the pilot program.

Dropout Survey

In May 2018, Evergreen sent a pre-notice letter followed by a mail survey to a total of 16 pilot program participants who were dropped from the pilot program after missing two payments. If we did not get a response from customers via mail, we followed up via phone. We were able to complete surveys via mail or by phone with a total of 7 of the 16 dropped pilot program participants.

End of Pilot Program Survey

Evergreen conducted three different surveys in November of 2019. The response rate for each survey is shown in Table 6. Evergreen sent each survey in a flat envelope and included a $5 bill to thank the customer for participating in the survey, and included a pre-

addressed and stamped envelope to return the completed survey. We sent a survey to every active IBPP or IBPP/BMA participant.

To develop the non-participant group, we first determined households that received LIRAP Heat and/or LHEAP in the two years prior to October 1, 2019, according to the data from the Low Income Needs Assessment recently completed by Evergreen Economics for Avista. We then filtered for only open accounts that are not participants in IBPP/BMA. We then randomly sampled 500 of the remaining 7,530 accounts.

Table 6: Income Based Payment Program

Survey Group	Surveys Sent	Surveys Received	Response Rate	Incentive Provided
IBPP Participants	73	34	47%	$5 included in survey mailer, $25 for completed survey
IBPP and BMA Participants	70	39	56%	$5 included in survey mailer, $25 for completed survey
Non-Participant Survey	500	152	30%	$5 included in survey mailer

A copy of each mail survey can be found in Appendix B: Survey Instruments.

2.6 In-depth Interviews

In June 2018, Evergreen Economics conducted a total of four interviews with eight staff members at Avista, SNAP, and Rural Resources. In all but one interview, multiple staff members were present. Each interview lasted close to 45 minutes and covered the following topics: recruitment, LIRAP Heat/LIHEAP comparisons, and pilot program progress. The interview guide for these discussions can be found in Appendix D: Interim Report.

3 Findings

This section of the report incorporates findings from Evergreen's review of program documentation, participant data, Census data, weatherization data, and survey results. Findings are organized by the following topics:

- Participant background
- Pilot program satisfaction
- Decision to participate
- Impacts of pilot program participation
- Pilot program expansion

Overall, the pilot program received high satisfaction ratings, reduced disconnection rates, lowered energy burden (though not below 6 percent for all participants), and slightly increased energy consumption. Despite the appeal of the pilot program, there were non-participants who were satisfied with their once-a-year LIHEAP/LIRAP Heat grant. In general, these non-participants were more likely to be retired, which may mean they are more likely to have a need to supplement their fixed incomes during periods with high bills (typically the winter heating season).

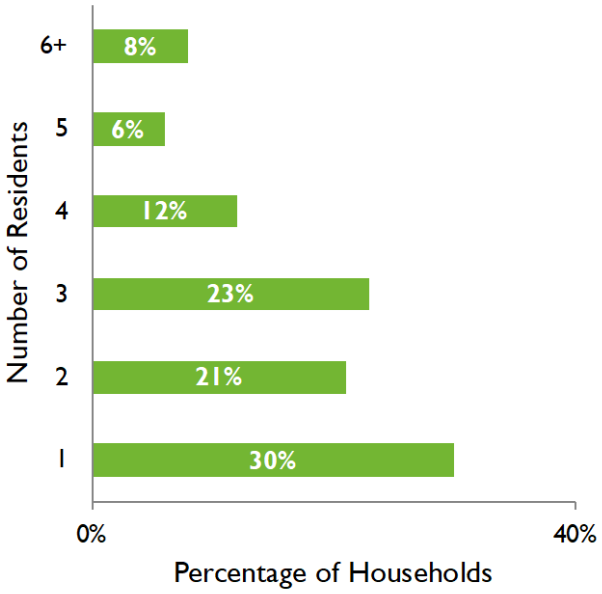
3.1 Participant Background

In this section, we share demographic data to help understand the types of customers who were recruited and enrolled in the pilot program.[15]

The households that enrolled in the pilot program range in household size as shown in Figure 7. This includes a small portion of customers that have since been removed from the pilot program (mostly due to missed payments). Thirty-seven percent of households have no children, while 9 percent have four or more children.

[15] Note that the data presented here include 12 customers who eventually were dropped from the pilot program due to unpaid bills. We chose to keep them in our analysis to better understand the characteristics of the customers that originally enrolled in the pilot program.

Figure 7: Number of People in Household



The proportion of participant households with an elderly member is much lower compared to the broader population, which is to be expected, as the program targets customers with *some* income, and older customers are more likely to be retired. Ten percent of the participant population has a resident that is 60 or older, and in Spokane and Stevens Counties, the number of households with someone 60 or older is 42.9 percent and 32.9 percent, respectively.[16]

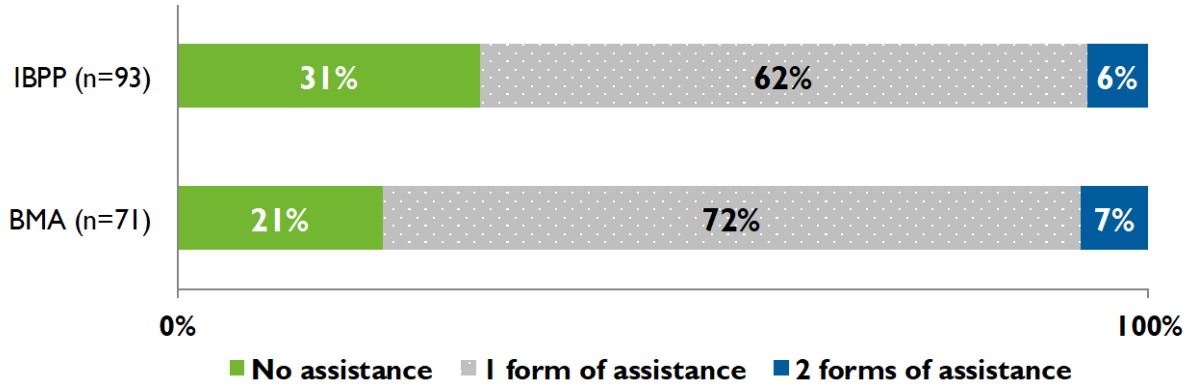
There is a high percentage (44%) of households that have at least one resident with a disability (defined by the recruitment agencies).

In three quarters of the pilot program households, all adults are considered income earners. In these homes, there are an average of 1.07 total adults, meaning that most households in which all adults are income earners are single adult households. With the exception of four households, half of the adults in the household earn an income.

To get a sense of how the pilot program participants leveraged assistance to pay their bills *before* the pilot program, we reviewed past assistance participation data covering an average of 15 months per household. The majority of participants utilized only one out of three forms of assistance that we reviewed: LIRAP Heat, LIHEAP, or an emergency payment (Figure 8). Over 20 percent of respondents did not use any form of assistance.

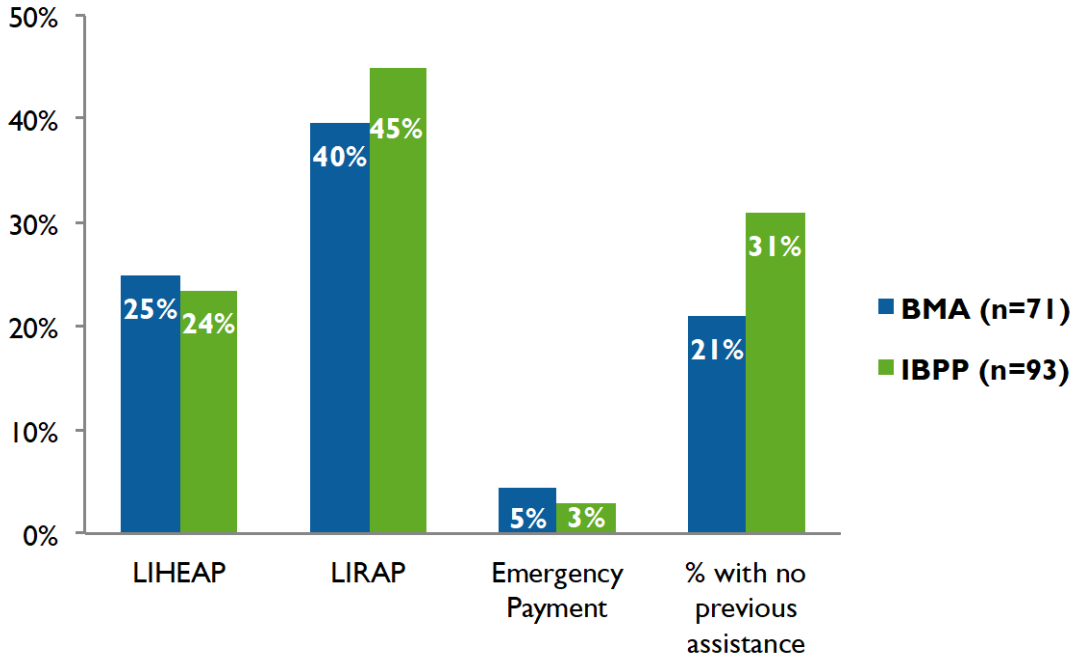
[16] According to the 2010 Community Housing Survey.

Figure 8: Total Forms of Assistance Utilized per Person (over an average of 15 months before pilot program participation)



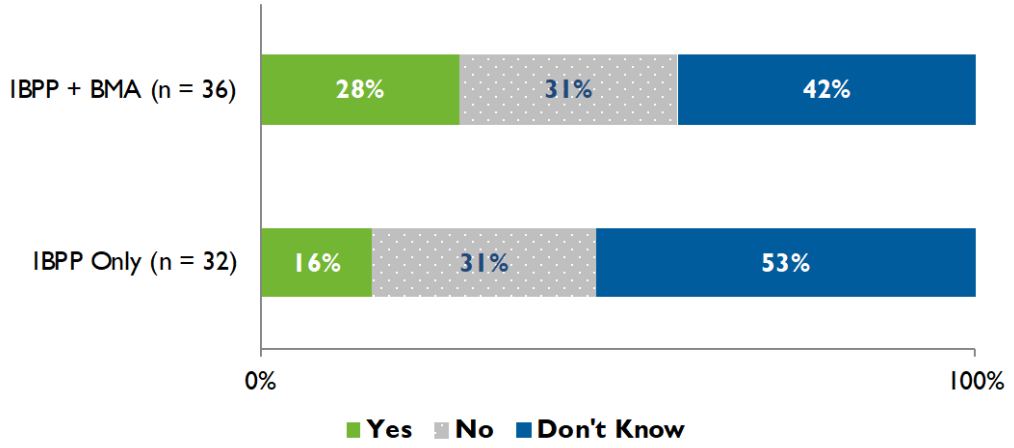
The most common form of assistance was LIRAP Heat, followed by LIHEAP (Figure 9).

Figure 9: Percent of Participants Who Used Other Form of Assistance



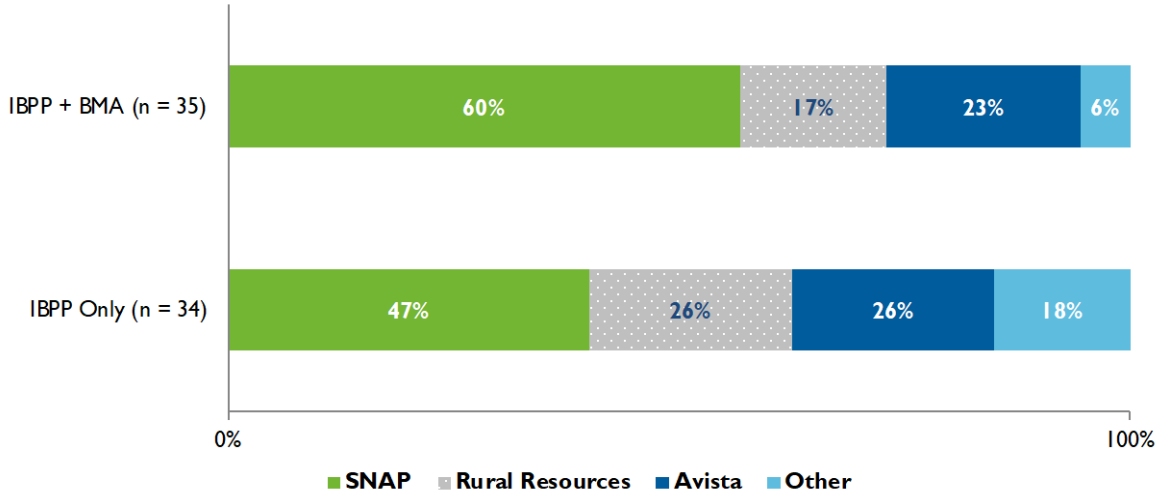
Despite the findings from the participant data, the majority of participants in the pilot program who responded to the mail survey reported that they did *not* recall receiving a LIRAP Heat or LIHEAP grant in prior years, as shown in Figure 10.

Figure 10: Percentage of Respondents Who Recalled Receiving a LIRAP Heat or LIHEAP Grant in the Past (n=68)



It is somewhat surprising that they do not recall receiving LIRAP Heat or LIHEAP grants in the past, given the findings from the participant data and due to the fact that almost all respondents heard about the program from either SNAP or Rural Resources, which also inform customers about the LIRAP Heat/LIHEAP grants (Figure 11). This may be due to name recognition issues with the LIRAP Heat or LIHEAP grants and they may know them by some alternative name.

Figure 11: Source for Hearing about Pilot (n=69)



3.2 Program Satisfaction

Overall satisfaction with the program was extremely high. Ninety-seven percent of participants who responded to the survey reported that they were extremely satisfied.

Other metrics of satisfaction were similarly high and were also consistent across both IBPP and IBPP/BMA participants.

- Ninety-seven percent of respondents across the entire pilot program saw their bill decrease.
- Ninety-three percent of respondents said that participation in the pilot program made it easier for them to pay their bill.
- Ninety-six percent of respondents said the pilot program made it easier for their household to cover other costs, such as bills, food, and other living expenses.

Not a single respondent reported that the BMA component of the pilot program made it *harder* to pay their bill, and only one respondent from each pilot program group (IBPP only and IBPP/BMA participants) reported that the IBPP component of the pilot program made it *harder* to pay their bills. None of the respondents reported that the pilot program made it harder for them to cover other household costs.

Another way to understand the value respondents saw in the pilot program is to ask them what pilot program benefits they would tell their friends and family about, if they were sharing information about it with a friend. Overall, respondents shared that the pilot program allowed them to better manage their money overall and that participation made it easier to pay their bills. Below is a summary of responses by participant type (BMA participants, BMA participants talking about the IBPP part of the program, and the IBPP only participants).

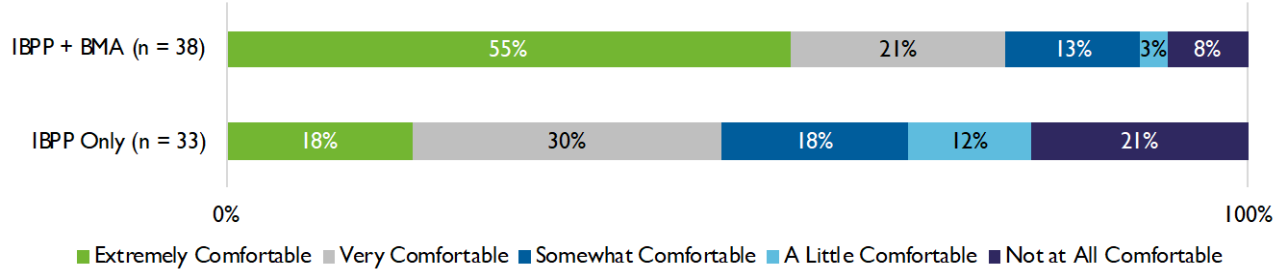
- For the BMA pilot program, respondents said that money management was the main benefit of participating in the BMA program (12 of 17 respondents). These participants mentioned that the lower electricity bills allowed them to pay other essential household expenses while keeping their electricity on. Participants mentioned that they became confident that they could make future payments on time after being on this program. Additional benefits mentioned included being able to catch up on previous payments (4 of 17) and the caring staff members at Avista.
- When BMA program respondents were asked about the IBPP portion of the pilot program, they said that they enjoyed the lower bills and the monetary savings that they had while they were participating (17 of 32). Another benefit mentioned was the ease of paying the bill while on the pilot program, and three participants specifically mentioned that their lower electricity bills allowed them to pay other bills on time and reduced their stress.
- For respondents who only participated in the IBPP portion of the pilot, they highlighted that the program makes it more affordable to pay their bill (16 of 29).

Three additional participants specifically mentioned the benefit of the program providing year-long benefits (versus just receiving a lump sum in the winter). Six participants mentioned that they were able to better manage their household finances, as they were able to allocate more money elsewhere once they began to participate in the pilot program. Another respondent highlighted that a benefit of the pilot program was being able to catch up on and eventually get ahead on payments.

The majority of respondents found the details of the IBPP component of the pilot program to be somewhat to very clear (96%). The BMA pilot program was also clear to respondents, with 91 percent of the 23 respondents reporting that it was either somewhat or very clear. Seventy-eight percent of BMA pilot program respondents felt that the payment details on their bills were very or extremely clear.

Customers were less consistent in their reported level of comfort with reaching out to Avista if they were about to miss a payment. Increasing customer comfort reaching out to Avista was an objective of the pilot program, particularly for BMA participants, who had received personal outreach for enrollment from Avista CARES staff. This earlier outreach seemed to be beneficial, as BMA participants were much more likely than IBPP-only participants to report that they were extremely comfortable reaching out to Avista (Figure 12).

Figure 12: Comfort Level Reaching Out to Avista Before Missed Payment



When we asked why respondents were uncomfortable reaching out to Avista, close to a third of IBPP-only participants (9 of 33 respondents) reported that they were embarrassed about their inability to pay their bills or were too embarrassed to talk to Avista staff about it over the phone, though respondents who had reached out to Avista noted that the staff from Avista were helpful. Four respondents reported that they had unpleasant experiences with Avista staff members (e.g., staff was rude, staff sounded robotic—"it felt like talking to a number rather than a person").

Over half of the respondents who participated in the BMA component of the pilot program reported that they thought employees were very polite and informative when

they called. A very small proportion of respondents participating in the BMA component of the pilot program (3 of 36) noted that "some employees are more helpful than others."

3.3 Decision to Participate

In this section, we look at both participants and non-participants to better understand the decision-making process to participate in the pilot program compared to existing offerings including a once-a-year grant.

3.3.1 Participant Perspectives

We asked respondents about what their motivations were in deciding to participate in the pilot program Among those who were only participating in the IBPP component of the pilot program, the main reason was they wanted the extra assistance that the Avista pilot program provided to help them pay their bills on time and reduce the amount that they owed each month (17 of 32 respondents). Eight participants mentioned specifically having a low income, and they said that participating in the pilot program helped them despite their limited income. Six participants in this group mentioned that the Avista pilot program has really helped them manage their money and budget better for the upcoming months. We see this mentioned again later as something that respondents would highlight when telling others about the program.

Similarly, people in the IBPP + BMA group cited that the extra assistance that Avista provided in paying their bill was the primary reason for them participating in the IBPP component of the pilot program (25 of 38). An additional 12 people cited low incomes as their reason for participating in the program (there were many single parents, individuals with disabilities, and veterans who mentioned their low incomes), while one person said that the program was chosen for them.

When asked just about the BMA component of the pilot program, the most common reason for participating was due to expensive past bills; participating in the BMA component of the pilot program helped them reduce their past bills and catch up with their current payments (9 of 23). Seven participants also mentioned that the BMA component overall made it easier to pay their bills on time. Two people mentioned that they participated in this component of the pilot program simply because it was offered with IBPP.

When we asked participants specifically about why they chose the pilot program over another form of assistance, participants appreciated that assistance was spread over the year.

From the perspective of BMA participants, half reported that they were glad they decided to participate (5/10), and the other half mentioned they liked the idea of paying a smaller

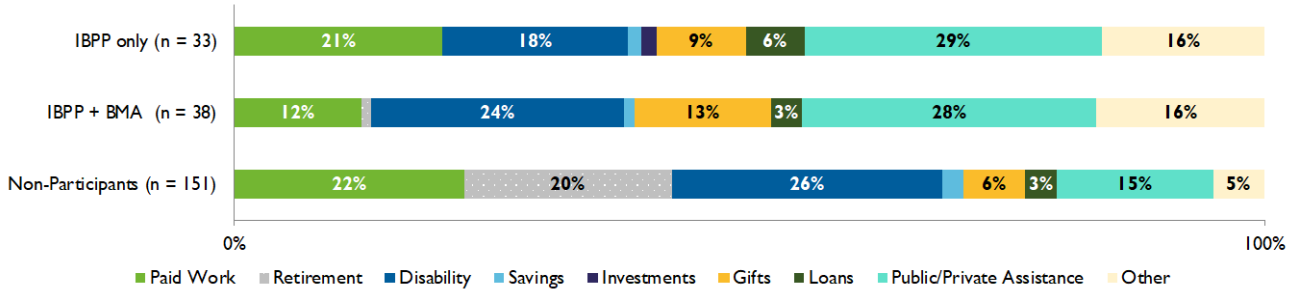
amount of money throughout the year versus receiving a one-time assistance, and that this allowed them to remain on top of all of their bills (5 of 10). This was similar to the perspective of the IBPP participants who responded to the question and reported that they heavily preferred receiving a smaller amount of assistance over an entire year rather than one larger sum (5 of 5).

3.3.2 Non-participant Perspectives

Non-participants who responded to our survey reported that the main reason they did not participate in the pilot program was that they were mostly (83%) unaware of the pilot program as an alternative to a LIHEAP or LIRAP Heat grant. Before narrowing our analysis to the 25 respondents who were aware of the pilot program, we first looked at the broader group of non-participant respondents to see if there are traits that may indicate their possible interest or disinterest in the pilot program compared to their current once-a-year grant.

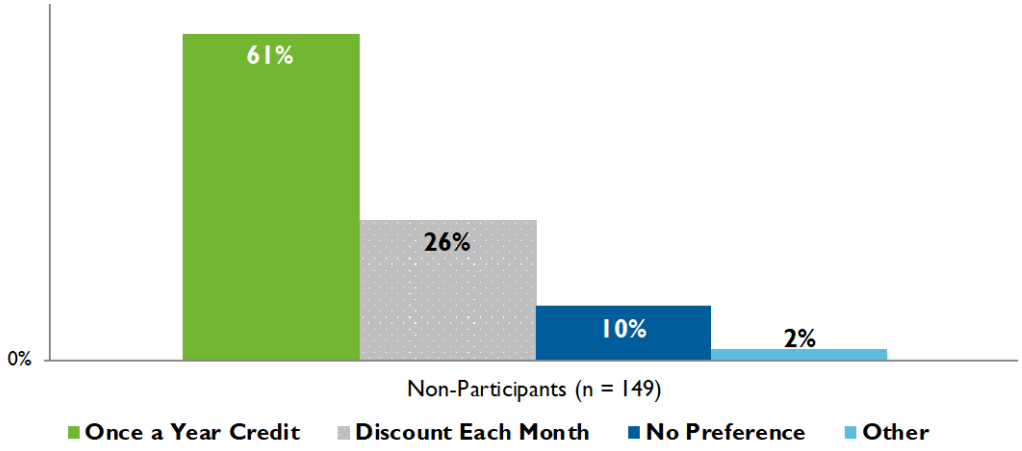
To better understand why certain qualified customers decided not to participate, we asked them how they pay their bills. Non-participants are much more likely to depend on retirement income compared to participants, who were more likely to rely on public or private assistance (Figure 13).

Figure 13: Income Sources Used to Help Pay Bills



The increased likelihood of reliance by non-participants on retirement funds, which are typically relatively consistent each month, may partially explain their preference for one-time grant assistance (Figure 14) in the winter, when bills are generally higher. Their retirement funds may help to cover a flat amount each month, and paying bills may become more difficult on a fixed income when bills increase in the winter. This is further supported by 68 percent of the non-participants reporting that they get the same income each month.

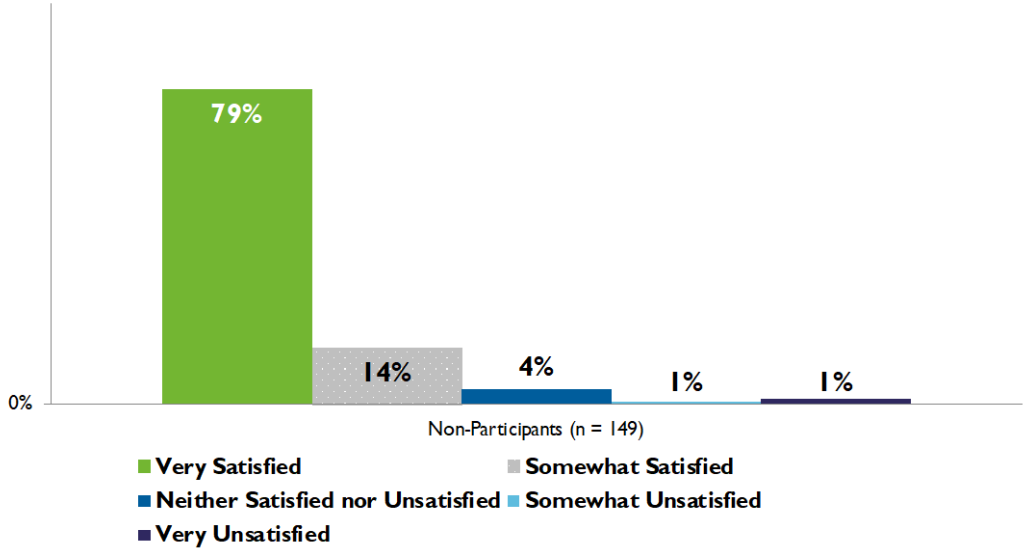
Figure 14: Preferred Frequency of Assistance Among Non-Participants (n=149)



Nearly half of non-participant respondents reported missing a payment of their electricity bill in the past year. In our analysis of non-participants, we noted that this number was slightly larger than half, with 73 percent of the comparison group missing a payment in the pre-period. A much smaller proportion (9%) reported having had their power shut off in the past year, suggesting that respondents were able to make up their payment soon after missing it.

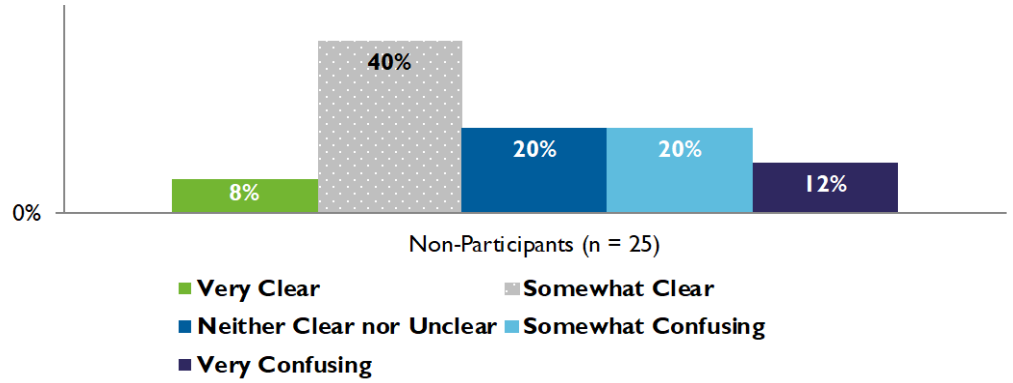
Non-participants were satisfied with the one-time grant they received through LIRAP Heat or LIHEAP. Seventy-nine percent of respondents reported being very satisfied, and an additional 14 percent reported being somewhat satisfied.

Figure 15: Satisfaction with LIHEAP or LIRAP Heat Grant Among Non-Participants (n=149)



Only 25 of the 149 non-participant survey respondents had any recollection of hearing about the IBPP or BMA components of the pilot program. These respondents offered a range of responses regarding the level of clarity.

Figure 16: Clarity of Details of IBPP From Non-Participants Who Recalled Hearing About the Pilot (n=25)



This confusion may have contributed to the decision by respondents not to participate, though only a quarter of the non-participants who remembered learning about IBPP and/or BMA could even recall why they did not participate. Responses ranged across this

small group of customers, though confusion was the most frequently cited reason for not participating. Specific responses included:

- Being confused about the program details (2 of 6).
- Being unaware that the program existed (1 of 6).
- Choosing their assistance based on what was easily available or recommended (1 of 6).
- Being unable to verify their income information in time to participate in the program (1 of 6).
- Receiving an increase in income that made their participation no longer necessary (1 of 6).

3.4 Impacts of Pilot Program Participation

This section covers the measurable changes that participants experienced through pilot program participation. This analysis includes comparison to a control group, comparison to the pre-period for participants, and self-reported metrics from survey participants.

3.4.1 Changes in Electricity Consumption and Energy Bills

Our impact assessment utilized fixed effects models with a matched comparison group to understand changes in electricity consumption and in energy bills for the pilot program participants. The comparison group helps to control for additional external factors that may be affecting energy use during the time period that the IBPP/BMA pilot program was implemented.

Table 7 provides some key results of the regression model for electricity consumption, including the model coefficient estimates, error, and statistical significance. The full regression output is provided in Appendix C: Detailed Regression Outputs.

Our primary interest is the coefficient on the $Post * Part$ interaction variable, which provides an estimate for the change in daily kWh attributable to the pilot program. In this case, we see a statistically significant increase in energy usage attributed to participation in the IBPP/BMA program of over 1.4 kWh per day. The $Post$ variable absorbs any systemic changes from pre- to post-implementation of the pilot program, which is not attributable to the pilot program because this change must also be exhibited by the comparison customers. The model estimated a small average change from pre- to post-period consumption of -0.1 kWh (i.e., a reduction), but this coefficient is not statistically significant.

Table 7: Electricity Consumption Fixed Effects Model Results

Variable	Coefficient Estimate	Standard Error	Significance Level
Post	-0.096	0.431	82%
Post*Part	1.413	0.602	2%
HDD	0.868	0.088	<1%
CDD	2.634	0.227	<1%

This relationship between cost and energy usage is not uncommon in rate assistance programs and is not of great concern when the overall goal is primarily to lower bills. The discounts make energy more affordable, leading customers to make small changes to their behaviors to improve comfort (e.g., set thermostat to a more comfortable temperature, increasing energy usage for heating).

Table 8 shows the key results of the regression model for bill costs. Again, the full regression output is provided in Appendix C: Detailed Regression Outputs. All three of these variables were statistically significant at the 5 percent level, as evidenced by the low p-values in the right-hand column of the table. The coefficient on *Disc_Amount* suggests that for each $1.00 discount provided by the IBPP component of the pilot program, the actual bill cost for participants fell by $0.75. In other words, the IBPP discount had 75 percent of the intended impact on participant bills. If the program discount had not impacted energy usage, this coefficient would have been closer to 1.0. This suggests that some of the discount is being offset by a simultaneous increase in costs from increased energy usage (which was confirmed in the previous model, Table 7).

Table 8: Bill Cost Fixed Effects with Comparison Group Model Results

Variable	Coefficient Estimate	Standard Error	Significance Level
DiscDollars	-0.751	0.011	<1%
HDD	0.049	0.009	<1%
CDD	0.299	0.022	<1%

Table 9 summarizes the estimated IBPP pilot program impacts from each of our models on a daily and annual basis with a 95 percent confidence interval around each estimate. The program led to a 57 percent reduction in bill costs with an average savings of $789 per year ranging from $598 to $980 (43% to 71%). The rate did also lead to a statistically significant increase in energy usage, but this was a relatively small increase of 4 percent, or 515 kWh per year.

Table 9: Estimated Changes in Energy Consumption and Bill Cost

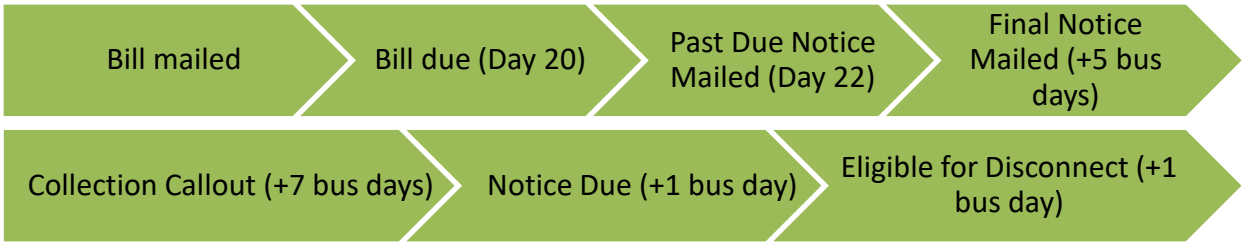
Time Period	Model	Unit Change	Change (%)
Annual	Energy Consumption	515 kWh ± 431	4% ± 3%
	Bill Cost	-$789.23 ± $191.01	-57% ± 14%
Daily	Energy Consumption	1.4 kWh ± 1.2	4% ± 3%
	Bill Cost	-$2.16± $0.52	-57% ± 14%

3.4.2 Changes in Disconnection Rates

One major goal of the pilot program is to reduce the number of disconnections among low-income customers. Customers are disconnected after one unpaid bill, though generally the disconnection process can take up to three months to occur after a missed payment (Figure 17).

Program implementers (both at Avista and those who recruited customers into the pilot program) are aware that customers sometimes utilize this lag in order to delay payment until right before disconnection. This allows them to focus on other bills.

Figure 17: Avista Disconnection Process



We conducted statistical modeling to understand the ability of the pilot program to decrease the occurrence of missed payments and disconnections among participants.

Table 10 presents our results for the program impacts on missed payments including the percentage impact of each variable on missed payments, and the statistical significance level of each variable. Based on the results of our missed payment model, participating in IBPP decreased the likelihood that a participant would have a missed payment by more than 58 percent. Furthermore, the combined effects of participating in IBPP and BMA decreased the likelihood that a participant would have a missed payment by more than 63 percent.

Based on our results, demographic characteristics also play a key role in the likelihood that a customer will have a missed payment. For example, our results suggest that living on a

Native American reservation increases the likelihood that a customer (participant or non-participant) will have a missed payment by nearly 40 percent. On the other hand, households with seniors (2.8% decrease in likelihood) and households with children (3.1% decrease in likelihood) are less likely to have missed payments, while renters (1.9% increase in likelihood) are more likely to have missed payments. Surprisingly as the proportion of households earning less than $35,000 increases, the likelihood of missed payments decreases by 2.5 percent. Average daily HDD also has an unexpected impact, decreasing the likelihood of missed payment by 2.3 percent. Overall, however, none of these factors has as strong of an impact on missed payments as program participation.

Table 10: Change in Likelihood of Missed Payment

Marginal Change	% Impact	Significance Level
Customer enrolled in IBPP (1)	-58.4%	0.001
Customer enrolled in BMA (2)	-63.8%	0.001
Home located on Reservation	39.9%	0.050
Average temperature during heating season 10 degrees lower (3)	-2.3%	0.001
10 percentage point increase in households earning less than $35,000	-2.5%	0.010
10 percentage point increase in households with seniors (4)	-2.8%	0.010
10 percentage point increase in households with children (5)	-3.1%	0.001
10 percentage point increase in households that are renter occupied (6)	1.4%	0.050

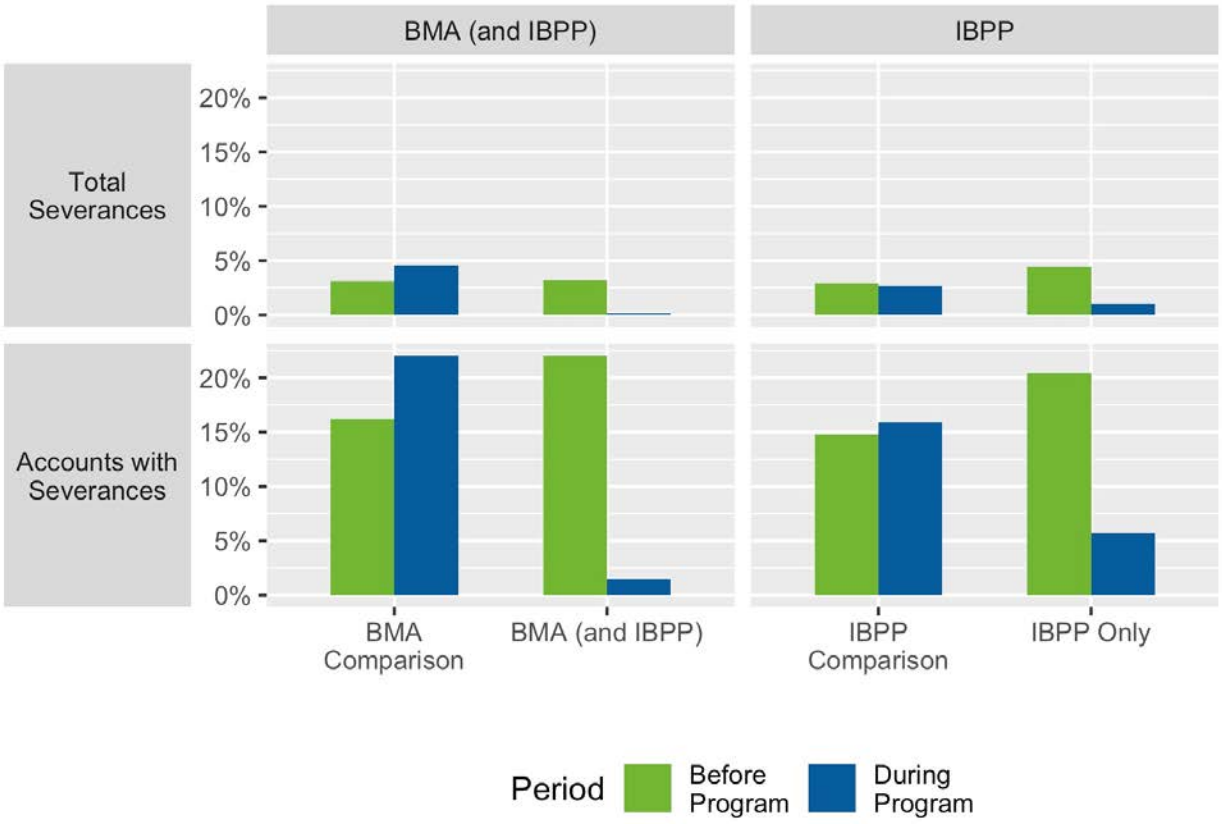
(1) Customer is not enrolled in BMA.
(2) Customer is enrolled in IBPP.
(3) Average temperature during heating season was 48ºF during study period.
(4) Weighted average of Census tracts included in study was 35 percent.
(5) Weighted average of Census tracts included in study was 30 percent.
(6) Weighted average of Census tracts included in study was 50 percent.

Given the relationship of missed payments to disconnections, we expected the results of our disconnection model to be similar to our results for missed payments. Table 11 summarizes the results of our disconnection model. As with our missed payment model, IBPP had a large and significant impact on decreasing the likelihood of disconnections among participants—a decrease of more than 95 percent. Our model initially suggests, however, that the combined effect of IBPP and BMA has an insignificant effect on disconnection. After reviewing the data, the cause of this modeling result appears to be that there are too few observations of BMA participants having disconnections for the

model to accurately explain the pilot program's impact. Therefore, while our model shows that IBPP decreases the likelihood of disconnections, further analysis is required to understand the effect that BMA (and IBPP) has on disconnections.

Figure 18 shows how the frequency of disconnections and the number of accounts that had a disconnection varied by participant group before and during the pilot program. While the comparison groups decreased or remained constant based on these two metrics, IBPP participants and BMA participants both dramatically decreased. Furthermore, the changes from pre-period to post-period were larger for BMA (and IBPP) participants than for IBPP alone. In fact, after the BMA component of the pilot program began, only one BMA participant had a disconnection. In sum, these facts suggest that BMA, like IBPP, leads to significant decreases in the likelihood that participants will experience a disconnection.

Figure 18: Program Impact Details



In addition to the program impacts on disconnections, we observed that households on reservations (67.1% increase in likelihood) have an increased likelihood of disconnection. Households with seniors (4.8% decrease in likelihood) and households earning less than $35,000 (3.6% increase in likelihood) have results in the expected direction while

households with children and rented households had an indeterminate effect. As with the missed payment model, average daily HDD (2.8% decrease in likelihood) was associated with a decrease in disconnection.

Table 11: Change in Likelihood of Disconnection

Marginal Change	% Impact	Significance Level
Customer enrolled in IBPP (1)	-95.1%	0.001
Customer enrolled in BMA (2)	NA	Not Significant
Home located on Reservation	67.1%	0.001
Average temperature during heating season 10 degrees lower (3)	-2.8%	0.050
10 percentage point increase in households earning less than $35,000	3.6%	0.100
10 percentage point increase in households with seniors (4)	-4.8%	0.050
10 percentage point increase in households with children (5)	NA	Not Significant
10 percentage point increase in households that are renter occupied (6)	NA	Not Significant

(1) Customer is not enrolled in BMA.
(2) Customer is enrolled in IBPP.
(3) Average temperature during heating season was 48°F during study period.
(4) Weighted average of Census tracts included in study was 35 percent.
(5) Weighted average of Census tracts included in study was 30 percent.
(6) Weighted average of Census tracts included in study was 50 percent.

In conclusion, while holding constant other explanatory variables, our models suggest that IBPP and BMA significantly decrease the likelihood of both missed payments and disconnections. Of the two components of the pilot program, IBPP has the stronger effects on its own, but because all BMA participants are also IBPP participants, BMA combined with IBPP has the strongest effects. Given that the comparison population for this analysis is exclusively customers that received LIRAP Heat or LIHEAP, the impact of IBPP and BMA goes above and beyond the impacts of those programs.

In addition to conducting statistical analysis, we were also able to speak to customers who had been disconnected from the pilot program. Of the 16 customers who had been removed from the pilot program, we were able to reach a total of seven customers either via mail survey or a phone call. Customers received $50 for taking part in this research.

All survey respondents were originally enrolled in IBPP, and an additional four reported being in the BMA component of the pilot program as well, though this was not reflected in the data. This indicates these four customers may not be clear on which components of the pilot program they are involved in. The program data show no removals for BMA participants.[17]

All seven respondents reported that they were removed from the pilot program due to missing one or more monthly payments. Two respondents reported that they wish they had an opportunity to explain why they missed their bill(s) so that they could get back on the rate.

- "…There is no grievance program so I could explain my situation and possibly get back on."
- "Maybe give more chances on payments because sometimes things happen, and funds are not available."

Two respondents explained why they missed their payments. The first respondent had double hand surgery and fell behind, and the second was laid off from their seasonal job. One of the recruitment agency staff also brought up job loss and noted that there is no way to adjust offerings as income adjusts throughout the pilot program period. A third respondent did not give an explanation for missing a payment but noted that they were "moving back to Seattle, anyways."

3.4.3 Changes in Energy Burdens

Our analysis on energy burden is limited to a gross impact of IBPP and BMA participation on energy burden. We did not have access to household income for the comparison group, and were unable to measure IBPP impact relative to existing energy assistance grant programs. On average, BMA participants received a total of $114.60 in benefits over the course of their participation.

Figure 19 shows the energy burden of IBPP participants with imputed income, in the pre- and post-period. The red line provides the IBPP program target for bill costs at 6 percent of household income. Prior to receiving energy assistance from the IBPP component of the pilot program, the participants had an average energy burden of 28 percent, with a range of 9 to 200 percent. After IBPP discounts were provided on their bills, one third (33%) of participants' annual bill costs dropped below the pilot program target of 6 percent.

[17] Severance data were available for 13 of the 16 customers who were removed from the pilot program. This may be due to differences in the timing of each set of data.

Though the remainder did experience burden above the pilot program target, there was still substantial improvement across all participants relative to the pre-period.

Figure 19: Energy Burden of IBPP Participants with Imputed Income (n=114)

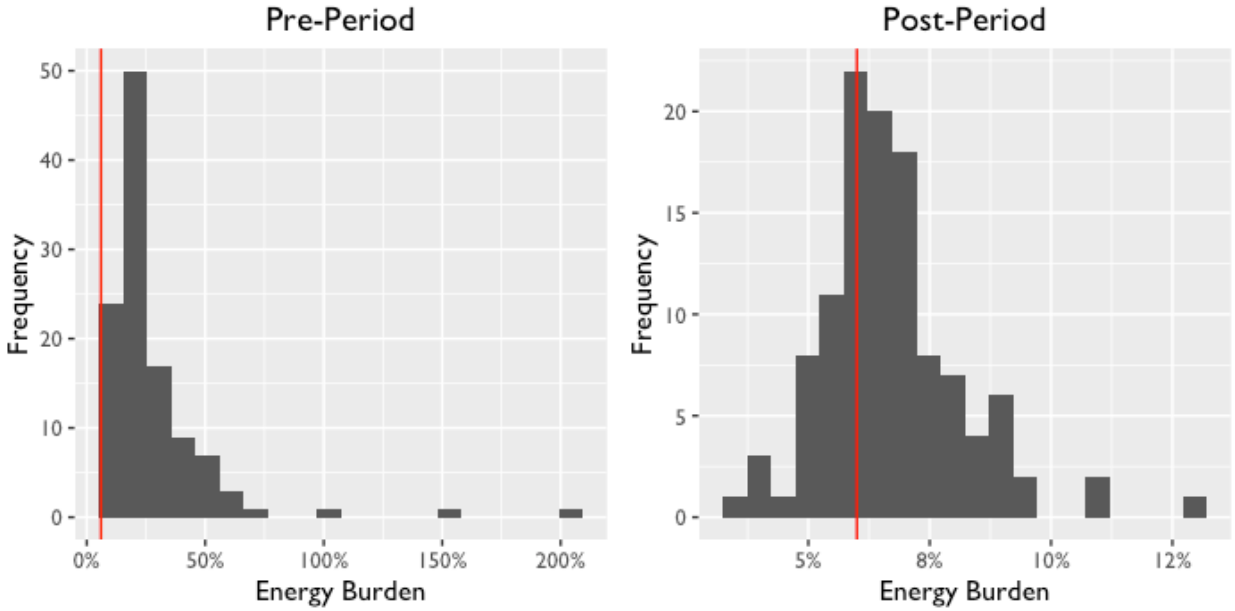
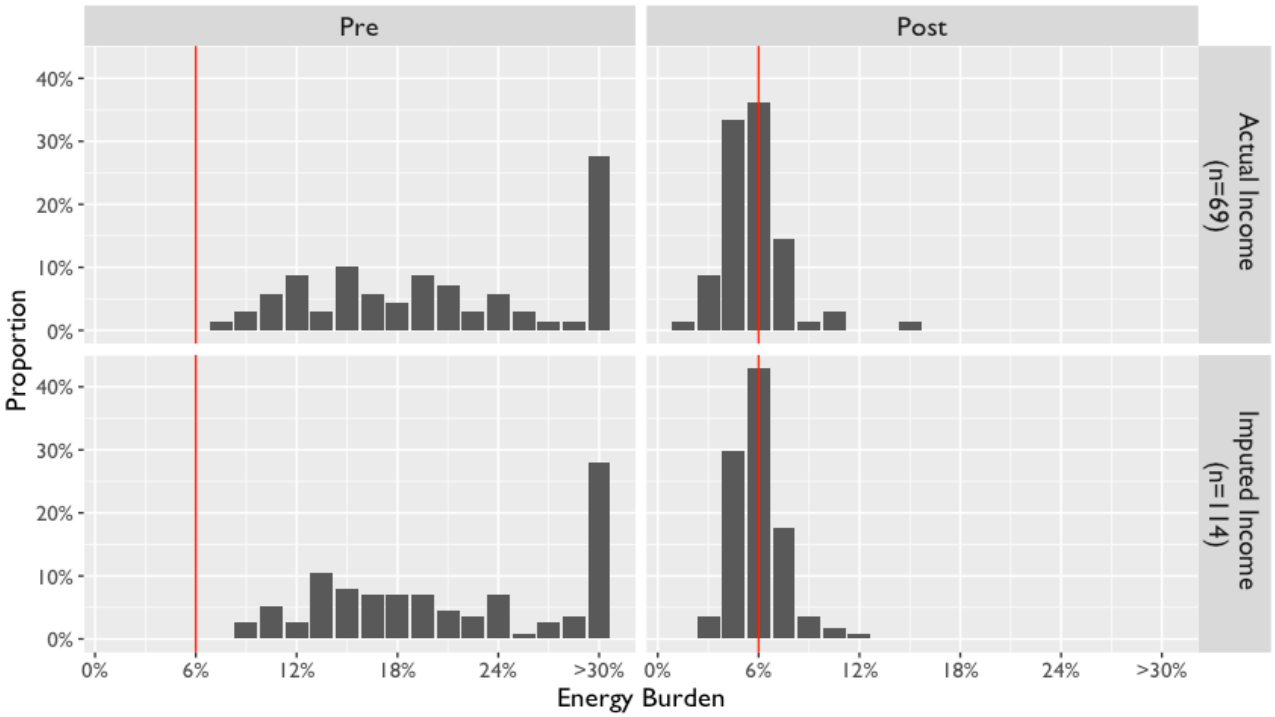


Figure 20 shows the energy burden of IBPP participants calculated from imputed income (top two bars) as well as actual income reported by the agencies (bottom two bars). The purpose of this chart is to show that our use of imputed income does not have a significant impact on the conclusions. There is a dramatic difference between the pre- and post-period energy burden, regardless of income source. A small minority of IBPP participants (8% with imputed income and 10% with actual income) had an energy burden below 12 percent in the pre-period. While receiving assistance from IBPP, nearly all participants (99%) had energy burden below 12 percent, with between 33 percent (of actual income) and 43 percent (imputed income) of IBPP participants falling below the program target of 6 percent burden.

Figure 20: Energy Burden of IBPP Participants by Actual and Imputed Income

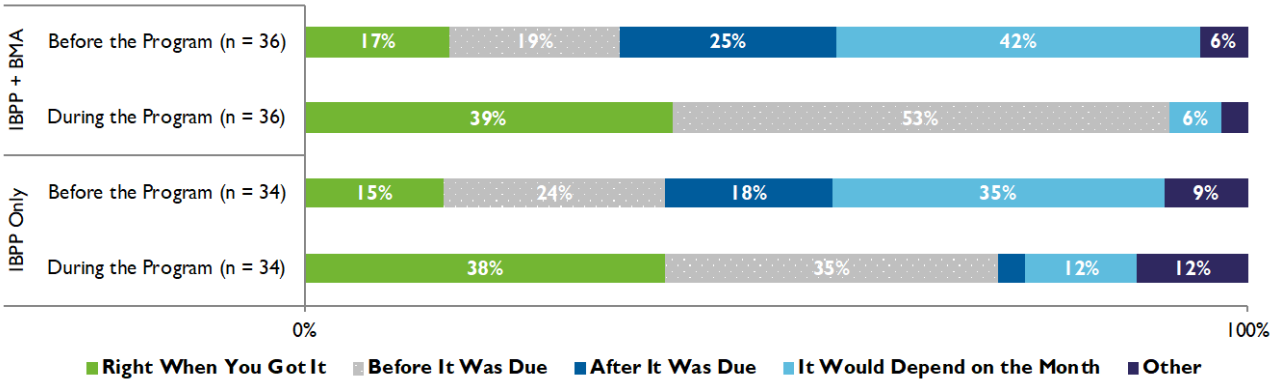


The IBPP discounts were successful at reducing bills to 6 percent of household income for 33 to 44 percent of participants. The remainder likely offset some of the bill savings offered by the discount with an increase in energy usage (as shown in Section 2.2 Pilot Program Effect on Energy Consumption and Costs). To achieve the targeted 6 percent burden, IBPP will need to either increase the discount amount or offer energy efficiency measures at the time of enrollment to help offset any increases in costs from energy usage (e.g., LED lightbulbs, weatherization, education).

3.4.4 Self-Reported Changes in Participant Behavior

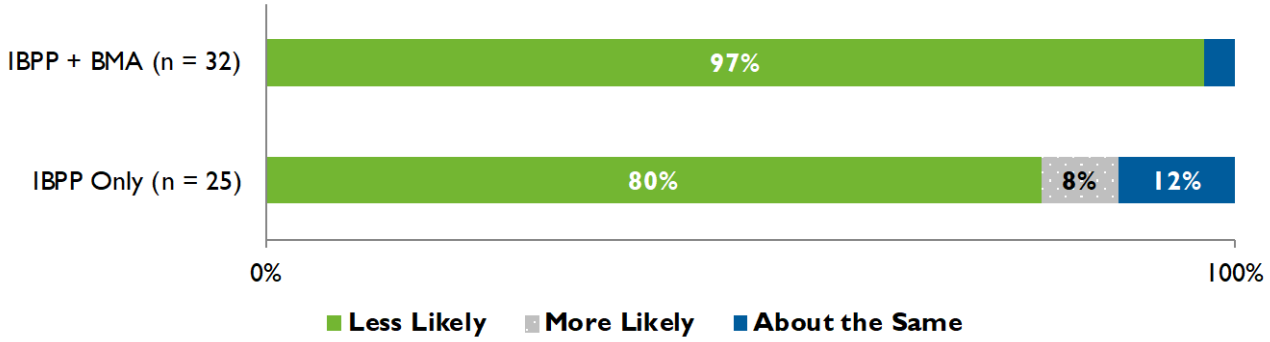
During the pilot program, participants reported paying their bill either right when the bill was due, or right when they got it more often compared to before the program.

Figure 21: When Respondents Would Typically Pay Their Bills Before and During the Pilot Program



Excluding respondents who reported never missing a payment in the past, the majority of pilot program participant respondents believe that they are less likely to miss a payment since they began participating in the pilot program. This aligns with the findings from our review of participant disconnection rates, which decreased significantly during the pilot program.

Figure 22: Participant Estimated Likelihood of Respondents to Miss Payments During Pilot Program Compared to Before Pilot Program (excluding those who reported never missing a payment in the past)



3.5 Pilot Program Expansion

We conducted phone interviews with staff at Avista and staff from SNAP and Rural Resources to get their perspective on the programs progression, successes and challenges.

We also reviewed hourly data from Avista staff along with the number of contacts made to each customer. On average, Avista staff interacted with BMA participants twice as much compared to IBPP only participants (5.6 times compared to 12.1 times on average). The total cost of staff time also shows that twice as many resources were utilized for BMA

compared to IBPP only participants. In terms of staff time, Avista spent $48.98 per participant on average for BMA participants, and $21.54 per participant on IBPP only customers.

On average, BMA participants received a total of $114.60 in benefits in terms of reduced bill costs over the course of their participation. When the bill discount is combined with the cost of staff time, the average cost to the program per BMA participant is $163.58, however this does not include the cost of recruitment from agencies, and the cost of planning and program implementation beyond CARES staff hours. This also excludes any benefits that accrue to Avista due to reduced arrearages.

During our initial staff interviews, we asked staff what thoughts that had on possible future pilot program expansion.

- **It will be challenging to make recruitment less time intensive.** Any automation may be time and budget intensive.
- **Even post recruitment, Avista CARES spends a portion of staff time on monitoring and management.** After recruitment, Avista CARES staff enrolls, monitors, and manages customers in the BMA component of the pilot program. Between November 2018 and January 2019, Avista CARES staff spent an average of 21.7 hours collectively per month on this work. Despite this, Avista CARES staff reported that after the initial enrollment, "It's easy – we have it all set up," though they also added that the personal touch of following up with customers and monitoring their payments can be a burden. A few customers even complained about being called about past due bills when they were so much smaller than they had been in the past.
- **There are certain segments of the population that this program helps to serve.** IBPP is very helpful for those at the lowest income range. When compared to LIRAP Heat and LIHEAP, one agency staff member reported that this pilot program would give a "bigger benefit to fewer people." Another noted that some of their customers could get a larger benefit from LIRAP Heat/LIHEAP compared to the pilot program. There is also still a need to address the portion of the population with no income. One intake staff member reported that there were a few customers who were high users and thus benefited more from LIRAP Heat/LIHEAP over IBPP.
- **The BMA component of the pilot program may unintentionally encourage customers to not pay their bill**, knowing that Avista may eventually help them pay off their unpaid bills at a later date.
- **The pilot program does not currently allow for customers to report a change in income.** We heard this both from customers in the dropped customer survey and

from program staff. This would be beneficial for some customers but may cause others to miss payments.

- **In the future, it may be better to recruit potential IBPP participants year-round** because doing so spreads recruitment across a period of time in which the agencies are already busy with LIRAP Heat and LIHEAP and would allow for customers to learn about the program via word of mouth, which often takes a longer period of time. In addition, BMA, unlike IBPP, is better served by once-a-year recruitment due to the funding schedule.

4 Conclusions

Below, we organize conclusions by research question.

Is the process to qualify customers for the pilot program more or less resource intensive compared to the existing programs?

The enrollment process is very time intensive both for agency and Avista staff. For agency staff, IBPP intake aligned with the timing for enrollment into LIRAP Heat/LIHEAP, where it is already a struggle to meet demand. We also heard from multiple interviewees that the enrollment process is very manual and that to automate the process would be expensive and time consuming. For both agencies *and* Avista CARES staff, this pilot has required additional work on top of an already full work load and schedule. For Avista CARES staff, this continued beyond the enrollment phase with tracking and follow-up communication.

Additionally, we heard that a goal of this pilot program is to create a better relationship between customers and Avista staff by making customers more comfortable contacting Avista when they are having trouble making a payment. Avista staff handle outreach and enrollment for BMA participants. This additional outreach seemed to have been beneficial as BMA participants were more likely than IBPP-only participants to say they are extremely to somewhat comfortable reaching out to Avista before a missed payment (71% compared to 48%, respectively).

How effective are engagement methods?

From the participant perspective, survey respondents reported that they found the details of the pilot program to be very clear. All BMA participants who responded to the survey also felt the payment details on their bill were somewhat to extremely clear.

The non-participant respondents who had heard about the pilot (while limited at 17 percent of non-participant respondents) were less clear on the details of the pilot program. Fifty-two percent of non-participant respondents said that the information they got was neither clear nor unclear, or some level of confusing. There was a large group of non-participants who did not recall using LIHEAP/LIRAP Heat in the past, despite the data showing high rates of past participation.

We also asked about engagement methods from the agency and Avista staff perspectives. Agencies and Avista staff reported a challenge in getting customers to respond to outreach when recruiting for BMA. One agency staff member reported that by expanding the recruitment window, they were able to recruit additional customers who had learned of

the pilot program via word of mouth, suggesting that this could be a useful recruitment vehicle if the pilot program is expanded to a full program.

Despite BMA being difficult to explain to customers, after a few bills, customers seem to understand how the program works. It would be beneficial for customers to hear about both components of the pilot program (IBPP and BMA) during initial agency contact, but there would be barriers to having agencies recruit for BMA, including an inability to have the most recent data on arrearages (at this point, only Avista has that information) and the possibility of unintentionally incentivizing a customer to miss payments in hopes that they can eventually participate in a BMA type of offering from Avista.

Why did customers select the IBPP instead of a grant through an existing grant program?

Only 22 percent of pilot program participants who responded to the survey recalled receiving a grant through an existing program in the past, though this varied from what we saw in the participant data, which showed over 68 percent of respondents receiving at least one or two forms of assistance over the 15 months before the pilot program. Generally, the assistance was either LIRAP Heat or LIHEAP and in a very small number of cases, it was an emergency payment.

Survey respondents who participated in only the IBPP component of the pilot program were asked about what motivated them to join that component of the pilot program. The main reason was that it helped them to pay their bills on time and reduced the amount they owed (17 of 32 respondents). Similarly, people in the IBPP + BMA group cited that the extra assistance that Avista provided in paying their bill was the primary reason for them participating in the IBPP component of the pilot program (25 of 38).

When asked just about the BMA component of the pilot program, the most common reason for participating was due to expensive past bills, and participating in the BMA component helped them reduce their past bills and catch up with their current payments (9 of 23).

We initially believed that looking at non-participants would help us understand why some customers decided to keep the once-a-year grant rather than participate in the pilot program. The respondents to the non-participant survey were mostly (83%) unaware of the pilot program as an alternative to a grant.

However, we were able to look at non-participants and see that they were more likely than participants to use retirement income to pay their bills. The proportion of participant

households with an elderly member is much lower compared to the broader population, which is to be expected, as the program targets customers with *some* income, and older customers are more likely to be retired. This also explains the increased self-reported dependence among non-participants on retirement income. Customers with retirement incomes may be better served by a program that helps them when their energy costs are higher than usual, as they are used to living off of a fixed income.

For some customers, the total IBPP benefit is larger than what they could receive with past assistance options that they used, making participation an easier choice. A few customers reported to recruitment staff that they preferred the one-time credit since it meant they did not have to worry about their bills for a few months. IBPP also is open to more households compared to federally funded assistance programs, since it does not require the same documentation requirements.

How are participants reacting to the pilot program?

Overall satisfaction with the pilot program was extremely high, with 97 percent of IBPP only respondents and 97 percent of BMA participants reporting that they were extremely satisfied. There was also a very high percentage of respondents who reported seeing their bill decrease (97%), who said it made it easier for them to pay their bill (93%), and who said the pilot program made it easier for their household to cover other costs, such as bills, food, and other living expenses (96%).

What are the actual customer benefits compared to pilot program expectations?

IBPP decreased the likelihood that a participant would have a missed payment by more than 58 percent. Furthermore, the combined effects of IBPP and BMA decreased the likelihood that a participant would have a missed payment by more than 63 percent. Some demographic characteristics also impact the likelihood that a customer may have a missed payment. Customers that live on a reservation are 40 percent more likely to have a missed payment than those that do not live on a reservation.

We saw a statistically significant increase in energy usage attributed to participation in the IBPP component of the pilot program of over 1.4 kWh per day, or a 4 percent increase. This relationship between cost and energy usage is not uncommon in rate assistance programs. The discounts make energy more affordable, leading customers to make small changes to their behaviors to improve comfort (e.g., set thermostat to a more comfortable temperature, increasing energy usage for heating).

The pilot program led to a 57 percent reduction in bill costs, with an average savings of $789 per year. Our analysis suggests that for each $1.00 discount provided by the IBPP

component of the pilot program, the actual bill cost for participants fell by $0.75. In other words, the IBPP discount had 75 percent of the intended impact on participant bills. If the pilot program discount had not led to an increase in energy usage, the bill impacts would have been closer to 100 percent.

Compared to before the pilot program, participants reported paying their bill either right when the bill was due, or right when they got it much more often.

Has the pilot program impacted disconnection rates compared to the existing LIRAP Heat and/or LIHEAP programs?

Our models indicate that IBPP and BMA significantly decrease the likelihood of disconnections (by 95%). Of the two components of the pilot program, IBPP has the stronger effects on its own, but because all BMA participants are also IBPP participants, BMA combined with IBPP has the strongest effects on missed payments. Given that the comparison population for this analysis is exclusively customers that received LIRAP Heat or LIHEAP benefits, the impact of IBPP and BMA goes above and beyond the impacts of those programs.

This aligns with what we heard from survey respondents. Excluding respondents who reported never missing a payment in the past, the majority of pilot program participant respondents believe that they are less likely to miss a payment since they started the pilot program.

What is the cause of households missing payments while enrolled in the pilot program?

All six dropped pilot program participants we heard from reported that they were unable to make a payment and were removed from the pilot program. One responded that they had a seasonal job at the time of enrollment and was then laid off, causing their income to change. There is no mechanism in the pilot program to update income information, which could work to the benefit of some participants and to the detriment of others. Another respondent had surgery, making it difficult for them to cover their bills.

What is the impact of the IBPP and/or BMA on participants' energy burden compared to the existing grant programs?

We calculated energy burden with both agency-reported income and imputed income, and both methods showed that nearly all IBPP participants (99%) had an energy burden below 12 percent compared to only 8 to 10 percent of IBPP participants before the pilot program. Thirty-three to 43 percent of pilot participants had energy burdens in the pilot program period that were between zero and 6 percent (the program target).

To achieve the targeted 6 percent burden, IBPP will need to either increase the discount amount or offer energy efficiency measures at the time of enrollment to help offset any increases in costs from energy usage.

We were unable to compare energy burdens of participants to energy burdens of the comparison group due to a lack of data on incomes for the comparison group.

What are the strengths and weaknesses of various strategies?

A comparison of LIRAP strategies is presented in Table 12.

Table 12: Comparison of Strategies

Strategy	Pros	Cons
Block Grant (such as LIRAP Heat or LIHEAP)	+ Useful for customers with flat and consistent incomes (such as retirees).	- Only able to use once a year (though may cover multiple bills). - Additional documentation needed for federally funded grants.
Percentage Discount (such as IBPP)	+ Takes into account varying incomes. + Customers were very satisfied with the pilot. + Reduces missed payments and disconnections. + Less documentation needed compared to federally funded grants.	- Additional explanation needed over block grant structure.
Rate Discount	+ Simple to explain to customers. + Customers were very satisfied with the pilot. + Reduces missed payments and disconnections. + Less documentation needed	- Does not take into account varying incomes
Arrearage Management (such as BMA)	+ Reduces missed payments and disconnections when combined with percentage discount. + Customers were very satisfied with the pilot.	- Complicated to run as a multi-year program as it may incentivize customers to run up arrearages. - Time intensive for Avista staff to educate, monitor and manage customers on the program. - Cannot be enrolled or managed by the agencies.

Should Avista attempt to consolidate the various LIRAP Heat options into a more unified platform, based on the results of the evaluation?

While the non-participant group who knew about the options for both a block grant (such as LIRAP Heat or LIHEAP) and percentage discount (such as IBPP) was small, it does appear that there are customers who appreciate each strategy. Consolidation may make sense from an operational perspective, but it may isolate customers if Avista chooses to offer either only a block grant or only a bill discount spread over the course of a year.

Appendix A: Additional Methodology Details

Billing and Usage Data

We received billing and usage data for a total of 12,081 accounts between August 2017 and October 2019. These data included account ID, service agreement, bill amount, billed usage (kWh), and IBPP discount amount as well as premise and billing addresses. Due to duplicated address information, a small number of duplicated observations were dropped, but the underlying observations did not change. These data contained 1,856 observations (<0.1%) of cancelled bills. These observations were dropped for analysis of usage, but retained for analysis of missed payments and disconnections.

Project Share Data

We received project share data for the same accounts and time period as covered by the billing data. These data included account ID, service agreement, share date, share source, and share amount. For analysis of missed payments and disconnections, share data were assumed to represent payments with of the source of the payment being determined by the tender source.

Summary Payment Data

We received summary payment data for the same accounts and time period as covered by the billing data. These data included account ID, service agreement, payment date, payment amount, and premise address. While these data were clean as is, we determined that all summary payment data were covered in more detail by the project share data. Therefore, the summary payment was ultimately not used in our analysis.

BMA Data

We received BMA data for 72 accounts between October 2018 and September 2019. These data included account ID, service agreement, BMA bill date, BMA bill amount, and BMA credit amount. It was assumed that accounts in these data were equivalent to "BMA Participants". As a function of program structure, BMA bills and credits were applied to a different service agreement than the other customer datasets. Therefore, in our missed payment and disconnection analysis, these data were primarily used for determining the participating account IDs and the range of BMA credit dates for each participant.

Adjustment Data

We received adjustment data for 11,546 accounts over the same period covered by the billing data. Accounts that did not appear in the adjustment data were assumed to have had no adjustments during the study period. The data included in the share data were account ID, service agreement, adjustment date, adjustment type, adjustment amount, and premise address. The adjustment data were critical to our understanding of missed

payments, because we determined that certain adjustment types should be considered to be payments. The adjustment data were also used to corroborate the BMA data (i.e., adjustment type of "Transfer Payment Arrangement")

Severance Data

We received severance data for 12,081 accounts between May 2015 and December 2019. These data included account ID, service agreement, severance date, and severance status. For 7,334 of the service agreements listed in the severance data, all values were missing (other than account ID and service agreement). We interpreted this to indicate that these service agreements had not had a disconnection between the dates covered. The severance data served as our dependent variable for our models of program impacts on disconnections.

Demographic Data

We received demographic data for 170 households at the time of program enrollment. Given that there was no method for consistently linking demographic data to other account data (e.g., usage data) and that there was no comparable dataset for non-participants, the use of this demographic data was limited. Further descriptions of these data and their analysis were part of our interim memo delivered July 7, 2019.

Appendix B: Survey Instruments

4.1 Non-Participant Survey Instrument

EVERGREEN ECONOMICS

1648 Martin Luther King Jr. Way
Berkeley, CA 94709

Office: 510.899.5555
www.evergreenecon.com

Dear [NAME],

I am writing you to ask for your help in understanding how to help customers pay their energy bills. The best way we have of learning about these issues is by asking people who have used these grants in the past to share thoughts and opinions. Your household is one of only a small number that have been selected to help in this study.

By taking a few minutes to share your thoughts and opinions about you will be helping us out a great deal to improve Avista's bill assistance programs. **To thank you for your help filling out this very short survey, a small token of appreciation is included. After you send back the survey, we will also mail you a check for $50.**

To make sure we hear from the people who remember using a grant to help pay one or more of their energy bills, please have the adult (age 18 or over) in your household who is responsible for paying your energy bills to be the one to complete the enclosed questionnaire.

The questions should only take about 5 minutes to complete. Your responses are voluntary and will be kept confidential. If you have any questions about this survey, please contact Avista CARES, by telephone at 1-888-700-2757. If you would like clarification about the survey questions, please call Martha Wudka at (510) 899-5558.

I hope you enjoy completing the questionnaire and look forward to receiving your responses.

Many thanks,

Martha Wudka

Evergreen Economics

Avista Bill Assistance Feedback Survey

1. **Do you pay the energy bills in your household?**

   ☐ Yes
   ☐ No - *Please pass the survey to someone in your household who pays the energy bills*

2. **Our records show that you have utilized the Low Income Home Energy Assistance Program (or LIHEAP) to get a one-time per year subsidy to help pay your energy bill. You would have done this through Spokane Neighborhood Action Partners (SNAP) or Rural Resources. LIHEAP is a Federal grant that helps to subsidize bills during the cold season when homes have more heating needs. This shows up as a credit on your bill.**

   Do you remember getting the LIHEAP subsidy on your bill to help pay for energy during the cold season?
   ☐ Yes
   ☐ No
   ☐ Don't know - *If you don't know, please pass the survey to someone in your household who may remember these programs*

3. **Overall, how satisfied are you with the LIHEAP subsidy?**
   Very satisfied
   Somewhat satisfied
   Neither satisfied nor unsatisfied
   Somewhat unsatisfied
   Very unsatisfied

4. **Thinking about how the LIHEAP subsidy works, if the total amount of money credited to you over the course of the year was the same, would you prefer getting one large credit to your bill one time a year, or a smaller discount each month?**
   ☐ Once a year credit
   ☐ Discount each month
   ☐ No preference
   ☐ Other: _____

5. **In the past 12 months, have you missed any payments on your electricity bill, even one?**
   ☐ Yes
   ☐ No
   ☐ Don't know

6. **In the past 12 months, have you had your power shut off by Avista, even one time?**
   ☐ Yes
   ☐ No
   ☐ Don't know

**** Please complete all pages ****

Avista Bill Assistance Feedback Survey

7. **What type of fuels do you use to heat your home? (Check all that apply)**
   - ☐ Natural Gas
   - ☐ Electricity
   - ☐ Wood
   - ☐ Propane
   - ☐ Other: _____
   - ☐ Don't know

8. **In the 12 months, was your household income about the same every month or did it change for some months?**
   - ☐ Same income each month
   - ☐ Changed
   - ☐ Don't know
   - ☐ Other: _____

9. **Which of these sources does your household use to help pay your bills? Check all that apply:**
   - ☐ Paid work
   - ☐ Retirement programs (social security, pensions, etc.)
   - ☐ Disability payments (SSI, worker's compensation, etc.)
   - ☐ Savings
   - ☐ Investments
   - ☐ Gifts from friends and family
   - ☐ Loans
   - ☐ Public or private assistance programs

*** Additional questions on next page ***

**** Please complete all pages ****

10. Now I want to ask you about another program that can help lower the cost of your bills. Instead of doing it once a year, this lowers your bill each month. This is called the Income Based Payment Program. This discounts your electricity bill to a lower amount based on your income.

Before now, had you heard about the Income-Based Payment Program described above? You may have heard of it last year from either SNAP or Rural Resources.

☐ Yes

☐ Don't know

If you don't know, please pass the survey to someone in your household who may remember hearing about this program

☐ No

If no one in your home remembers this program, please skip to the last page

11. How clear were the details of the Income-Based Payment Program when they were explained to you?

- ☐ Extremely clear
- ☐ Very clear
- ☐ Somewhat clear
- ☐ A little clear
- ☐ Not at all clear

12. Do you remember why you chose not to participate in the Income-Based Payment Program?

- ☐ Yes
- ☐ No

13. Please tell us why you chose not to participate in the Income-Based Payment Program.

14. Are any of the following reasons that you decided not to participate in the Income-Based Payment Program? Check all that apply.

- ☐ I'm used to the once a year credit
- ☐ The application process was too difficult
- ☐ I did not qualify because of my heating type
- ☐ I did not qualify because of my income
- ☐ I forgot about it
- ☐ I was confused by it
- ☐ Other: _____
- ☐ None of the above

**** Please complete all pages ****

Avista Bill Assistance Feedback Survey

Thank you so much for your help. Who should we make out the $50 check to?
Clearly write your name:

_____

Where should we mail the $50 check?

_____ _____ _____
Street *City* *Zip*

If we have additional questions, what is the best way for us to contact you?

☐ Phone: (___)_____-_____ ☐ Email: _____

Please send this back to us in the included self addressed stamped envelope.

Avista has hired Evergreen Economics to help them evaluate their energy assistance program. If you have questions about the validity of this study, please contact Avista CARES at 1.888.700.2757. If you would like clarification about the survey questions, please call Martha Wudka at 510.899.5558.

**** Please complete all pages ****

4.2 IBPP and BMA Participant Survey

Avista Bill Assistance Feedback Survey

Dear [NAME],

I am writing you to ask for your help in understanding how to help customers pay their energy bills. The best way we have of learning about these issues is by asking people who have participated in Avista's bill assistance program to share thoughts and opinions. Your household is one of only a small number that have been selected to help in this study.

By taking a few minutes to share your thoughts and opinions about Avista's energy bill assistance programs you will be helping us out a great deal. **To thank you for your help filling out this very short survey, a small token of appreciation is included. After you send back the survey, we will also mail you a check for $50.**

To make sure we hear from the people who remember participating in either one of the programs described below, please have the adult (age 18 or over) in your household who is responsible for paying your energy bills be the one to complete the enclosed questionnaire.

The questions should only take about 5 minutes to complete. Your responses are voluntary and will be kept confidential. If you have any questions about this survey, please contact Avista CARES, by telephone at 1-888-700-2757. If you would like clarification about the survey questions, please call Martha Wudka at (510) 899-5558.

I hope you enjoy completing the questionnaire and look forward to receiving your responses.

Many thanks,

Martha Wudka

Evergreen Economics

**** Please complete all pages ****

1

Avista Bill Assistance Feedback Survey

1. **Do you pay the energy bills in your household?**

   Yes
   No - *Please pass the survey to someone in your household who pays the energy bills*

2. **Avista has two programs that help to reduce bills or save money. Our records show that you were enrolled both of these programs by the Spokane Neighborhood Action Partners (SNAP), Rural Resources, or by Avista CAREs**

   - **Income-Based Payment Program: Discounts your electricity bill to a lower amount based on your income.**
   - **Balance Management Arrangement Program: Reduces the amount you owe on past bills for each month that you pay on time going forward**

   We'll ask you about each of these programs on their own. First let's discuss the **Income-Based Payment Program.** On page 4, we'll ask you about the **Balance Management Arrangement Program.**

   Do you remember participating in the Income-Based Payment Program which helped lower your electricity bills?

   ☐ Yes ↓

   ☐ Don't know ↓ *If you don't know, please pass the survey to someone in your household who may remember these programs*

   ☐ No ↓ *If no one in your home remembers this program, please skip to the Page 4, Question 12*

3. **Where did you learn about the Income-Based Payment Program?**
   SNAP
   Rural Resources
   Avista
   Other: _____

4. **How clear were the details of the Income-Based Payment Program when they were first explained to you?**
   Very clear
   Somewhat clear
   Neither clear nor unclear
   Somewhat confusing
   Very confusing

**** Please complete all pages ****

Avista Bill Assistance Feedback Survey

5. **Why did you choose to participate in the Income-Based Payment Program?**

6. **Overall, did the Income-Based Payment Program increase your bill, decrease your bill, or did it stay about the same?**
   - It increased
   - It decreased
   - There was no change

7. **Overall, did the reduced bill from the Income-Based Payment Program seem to make it easier for you to pay, harder for you to pay, or was there no difference?**
   - It made it easier to pay my bill
   - It made it harder to pay my bill
   - There was no difference

8. **How satisfied were you with the reduced bill?**
   - Very satisfied
   - Somewhat satisfied
   - Neither satisfied nor unsatisfied
   - Somewhat unsatisfied
   - Very unsatisfied

9. **How clear was the discount on your bill?**
   - Extremely clear
   - Very clear
   - Somewhat clear
   - A little clear
   - Not at all clear

10. **Overall, did the reduced bill seem to make it easier for you to pay, harder for you to pay, or was there no difference?**
    - It made it easier to pay my bill
    - It made it harder to pay my bill
    - There was no difference

11. **If you had to tell a friend about Income-Based Payment Program, what benefits would you highlight?**

**** Please complete all pages ****

12. Now let's discuss the Balance Management Arrangement Program. Here is a reminder of what that program is. This program reduces the amount you owe on past bills for each month that you pay on time going forward.

Do you remember participating in the Balance Management Arrangement Program which forgave your debt to Avista if you paid 12 payments on time, in a row?

☐ Yes

☐ Don't know

If you don't know, please pass the survey to someone in your household who may remember these programs

☐ No

If no one in your home remembers this program, please skip to the Page 5, question 19.

13. How clear were the details of the Balance Management Arrangement Program when they were first explained to you?

Very clear
Somewhat clear
Neither clear nor unclear
Somewhat confusing
Very confusing

Why did you choose to participate in the Balance Management Arrangement Program?

14. How satisfied were you with the assistance paying off your past due amount?

Very satisfied
Somewhat satisfied
Neither satisfied nor unsatisfied
Somewhat unsatisfied
Very unsatisfied

**** Please complete all pages ****

Avista Bill Assistance Feedback Survey

15. How clear were the payment details on your bill?

Extremely clear
Very clear
Somewhat clear
A little clear
Not at all clear

16. Overall, did the reduced bill from Balance Management Arrangement Program seem to make it easier for you to pay, harder for you to pay, or was there no difference?

It seemed easier to pay my bill
It seemed harder to pay my bill
There was no difference

17. Did participating in the Balance Management Arrangement Program make it easier, harder or about the same for your household to cover other costs, such as bills, food, and other living expenses?

Easier
Harder
About the same

18. If you had to tell a friend about Balance Management Arrangement Program, what benefits would you highlight?

19. OK, *now let's think generally about what has changed since you started participating in the program.*
In the year before you were in this program, when would you typically pay your bill?

Right when you got it
Before it was due
After it was due
It would depend on the month
Other: _____

20. Now thinking about since you were on the reduced payments, would you generally pay your bill?

Right when you got it
Before it was due
After it was due
It would depend on the month
Other: _____

**** Please complete all pages ****

5

Avista Bill Assistance Feedback Survey

21. Since starting the bill assistance program, are you less likely to miss a payment, more likely to miss a payment, or is the likelihood of missing a payment about the same?

- Less likely to miss a payment
- More likely to miss a payment
- About the same
- I have never missed a payment

22. If you are about to miss a payment, how comfortable are you in reaching out to Avista?

- Extremely comfortable
- Very comfortable
- Somewhat comfortable
- A little comfortable
- Not at all comfortable

23. Which of these sources does your household use to help pay your bills? Check all that apply:

- Paid work
- Retirement programs (social security, pensions, etc.)
- Disability payments (SSI, worker's compensation, etc.)
- Savings
- Investments
- Gifts from friends and family
- Loans
- Public or private assistance programs

24. Are there any other strategies you use to pay your bills other than those listed above?

**** Please complete all pages ****

6

Avista Bill Assistance Feedback Survey

25. In the past, have you gotten help through LIHEAP to pay your energy bill?

Yes No Don't know

26. If yes, why did you choose to do this new program instead this type of help you've used in the past?

Thank you so much for your help. Who should we make out the $50 check to?

Clearly write your name:

_____

***Where* should we mail the $50 check?**

_____ _____ _____

Street *City* *Zip*

If we have additional questions, what is the best way for us to contact you?

☐ Phone: (___)_____-_____ ☐ Email: _____

Please send this back to us in the included self addressed stamped envelope.

Avista has hired Evergreen Economics to help them evaluate their energy assistance program. If you have questions about the validity of this study, please contact Avista CARES at 1.888.700.2757. If you would like clarification about the survey questions, please call Martha Wudka at 510.899.5558.

**** Please complete all pages ****

7

4.3 IBPP Only Participant Survey

1648 Martin Luther King Jr. Way
Berkeley, CA 94709

Office: 510.899.5555
www.evergreenecon.com

Dear [NAME],

I am writing you to ask for your help in understanding how to help customers pay their energy bills. The best way we have of learning about these issues is by asking people who have participated in Avista's bill assistance program to share thoughts and opinions. Your household is one of only a small number that have been selected to help in this study.

By taking a few minutes to share your thoughts and opinions about Avista's energy bill assistance programs you will be helping us out a great deal. **To thank you for your help filling out this very short survey, a small token of appreciation is included. After you send back the survey, we will also mail you a check for $50.**

To make sure we hear from the people who remember participating in the program described below, please have the adult (age 18 or over) in your household who is responsible for paying your energy bills be the one to complete the enclosed questionnaire.

The questions should only take about 5 minutes to complete. Your responses are voluntary and will be kept confidential. If you have any questions about this survey, please contact Avista CARES, by telephone at 1-888-700-2757. If you would like clarification about the survey questions, please call Martha Wudka at (510) 899-5558.

I hope you enjoy completing the questionnaire and look forward to receiving your responses.

Many thanks,

Martha Wudka

Evergreen Economics

Avista Bill Assistance Feedback Survey

1. **Do you pay the energy bills in your household?**

   Yes
   No - *Please pass the survey to someone in your household who pays the energy bills*

2. **Our records show that you were enrolled in an Avista program to lower the cost of your bill by the Spokane Neighborhood Action Partners (SNAP) or Rural Resources.**

   The program is called the Income Based Payment Program and it discounts your electricity bill to a lower amount based on your income.

   Do you remember participating in the programs described above?
   Yes
   No
   Don't know - *If you don't know, please pass the survey to someone in your household who may remember these programs*

3. **Where did you learn about the bill assistance program?**
   SNAP
   Rural Resources
   Avista
   Other: _____

4. **How clear were the details of the Income-Based Payment Program when they were first explained to you?**
   Very clear
   Somewhat clear
   Neither clear nor unclear
   Somewhat confusing
   Very confusing

5. **Why did you choose to participate in the program?**

6. **Overall, did the program increase your bill, decrease your bill, or did it stay about the same?**
   It increased
   It decreased
   There was no change

**** Please complete all pages ****

Avista Bill Assistance Feedback Survey

7. **Overall, did the reduced bill seem to make it easier for you to pay, harder for you to pay, or was there no difference?**
   - It seemed easier to pay my bill
   - It seemed harder to pay my bill
   - There was no difference

8. **How satisfied were you with the reduced bill?**
   - Very satisfied
   - Somewhat satisfied
   - Neither satisfied nor unsatisfied
   - Somewhat unsatisfied
   - Very unsatisfied

9. **How clear was the discount on your bill?**
   - Extremely clear
   - Very clear
   - Somewhat clear
   - A little clear
   - Not at all clear

10. **OK, now let's think about your experience before and after you started participating in this/these programs. In the year before you were in this program, when would you typically pay your bill?**
    - Right when you got it
    - Before it was due
    - After it was due
    - It would depend on the month
    - Other: _____

11. **Now thinking about since you were on the reduced payments, would you generally pay your bill?**
    - Right when you got it
    - Before it was due
    - After it was due
    - It would depend on the month
    - Other: _____

12. **Since starting the bill assistance program, are you less likely to miss a payment, more likely to miss a payment, or is the likelihood of missing a payment about the same?**
    - Less likely to miss a payment
    - More likely to miss a payment
    - About the same
    - I have never missed a payment

**** Please complete all pages ****

13. If you are about to miss a payment, how comfortable are you in reaching out to Avista?

- Extremely comfortable
- Very comfortable
- Somewhat comfortable
- A little comfortable
- Not at all comfortable

14. Did participating in this program make it easier, harder or about the same for your household to cover other costs, such as bills, food, and other living expenses?

- Easier
- Harder
- About the same

15. Which of these sources does your household use to help pay your bills? Check all that apply:

- Paid work
- Retirement programs (social security, pensions, etc.)
- Disability payments (SSI, worker's compensation, etc.)
- Savings
- Investments
- Gifts from friends and family
- Loans
- Public or private assistance programs

16. Are there any other strategies you use to pay your bills other than those listed above?

17. If you had to tell a friend about this program, what benefits would you highlight?

**** Please complete all pages ****

Avista Bill Assistance Feedback Survey

18. In the past, have you gotten help through LIHEAP to pay your energy bill?

Yes No Don't know

19. If yes, why did you choose to do this new program instead this type of help you've used in the past?

Thank you so much for your help. Who should we make out the $50 check to?

Clearly write your name: _____

Where should we mail the $50 check?

Street *City* *Zip*

If we have additional questions, what is the best way for us to contact you?

☐ Phone: (___)_____-_____ ☐ Email: _____

Please send this back to us in the included self addressed stamped envelope.

Avista has hired Evergreen Economics to help them evaluate their energy assistance program. If you have questions about the validity of this study, please contact Avista CARES at 1.888.700.2757. If you would like clarification about the survey questions, please call Martha Wudka at 510.899.5558.

**** Please complete all pages ****

Appendix C: Detailed Regression Outputs

This section provides detailed model output summaries from each of the regression models referenced in the body of the report.

- Table 13: Electricity Usage Fixed Effects Model Output
- Table 14: Energy Costs Fixed Effects Model Output
- **Error! Reference source not found.**
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- **Error! Reference source not found.**

Table 13: Electricity Usage Fixed Effects Model Output

Metric	Value
N observations	8,085
R-square	0.482
Adjusted R-square	0.462
F-statistic	482.5
Degrees of freedom	15
P-value	<0.001

Variable	Coefficient	Standard Error	P-value
Post	-0.096	0.431	0.823
Post*Part	1.413	0.602	0.019
HDD	0.868	0.088	<0.001
CDD	2.634	0.227	<0.001
Month02	-2.013	0.919	0.028
Month03	-0.442	0.855	0.605
Month04	-8.175	1.457	<0.001
Month05	-14.549	2.404	<0.001
Month06	-18.196	2.632	<0.001
Month07	-26.652	3.349	<0.001
Month08	-20.148	3.301	<0.001
Month09	-15.202	2.279	<0.001
Month10	-10.745	1.270	<0.001
Month11	-5.927	0.863	<0.001
Month12	-1.213	0.802	0.130

Table 14: Energy Costs Fixed Effects Model Output

Metric	Value
N observations	8,085
R-square	0.508
Adjusted R-square	0.489
F-statistic	575.1
Degrees of freedom	14
P-value	<0.001

Variable	Coefficient	Standard Error	P-value
DiscDollars	-0.751	0.011	<0.001
HDD	0.049	0.009	<0.001
CDD	0.299	0.022	<0.001
Month02	-0.019	0.093	0.841
Month03	-0.146	0.086	0.091
Month04	-1.044	0.146	<0.001
Month05	-1.987	0.240	<0.001
Month06	-2.385	0.261	<0.001
Month07	-3.521	0.329	<0.001
Month08	-2.858	0.325	<0.001
Month09	-1.984	0.227	<0.001
Month10	-1.157	0.128	<0.001
Month11	-0.659	0.087	<0.001
Month12	-0.013	0.081	0.870

Table 15: Marginal Differences for Impact Interpretation

Factor	Base Case	Marginal Case	Marginal Change
IBPP Only	No	Yes	Customer enrolled in IBPP
BMA (and IBPP)	No	Yes	Customer enrolled in BMA
On Reservation	No	Yes	Home located on reservation
HDD	16.78	26.78	Average temperature during heating season 10 degrees lower
HHS Earning <$35k	0.42	0.52	10 percentage point increase in households earning less than $35,000
HHS with Seniors	0.35	0.45	10 percentage point increase in households with seniors
HHS with Children	0.30	0.40	10 percentage point increase in households with children
Renters	0.50	0.60	10 percentage point increase in households that are renter occupied

Table 16: Disconnection Model Output

Metric	Value
N observations	7684
R-square	NA
Adjusted R-square	NA
F-statistic	NA
Degrees of freedom	7675
P-value	NA

Variable	Coefficient	Standard Error	P-value
(Intercept)	-2.6285	0.7872	0.0008
IBPP.onlyTRUE	-3.6841	1.0036	0.0002
had.BMATRUE	-15.1633	280.2934	0.9569
ReservationTRUE	1.6467	0.5049	0.0011
HDD	-0.0121	0.0056	0.0319
less_than_35k	1.6346	0.9810	0.0957
hhs_with_seniors	-2.5642	1.0109	0.0112
hhs_with_children	0.2673	1.0684	0.8025
renter_occ	-0.7084	0.6386	0.2673

Table 17: Missed Payment Model Output

Metric	Value
N observations	7684
R-square	NA
Adjusted R-square	NA
F-statistic	NA
Degrees of freedom	7675
P-value	NA

Variable	Coefficient	Standard Error	P-value
(Intercept)	-0.1028	0.3453	0.7660
IBPP.onlyTRUE	-1.3380	0.1258	<0.0001
had.BMATRUE	-1.5095	0.1885	<0.0001
ReservationTRUE	0.8407	0.3576	0.0187
HDD	-0.0091	0.0024	0.0001
less_than_35k	-1.1103	0.4007	0.0056
hhs_with_seniors	-1.1188	0.4164	0.0072
hhs_with_children	-1.2448	0.4806	0.0096

Appendix D: Interim Report

Please see the attachment included with the delivery of this report.