Bonneville Power Administration
UES Portfolio Evaluation Plan
CY2017 Activities

NAVIGANT

Contributors

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1. Overview

BPA, along with its public power utility partners, acquires savings from a portfolio of energy efficiency programs and measures. Currently, the portfolio includes the following measures and savings estimation techniques:

- Custom measures, requiring site-specific calculation of savings.
- Calculator measures with a standardized savings estimation algorithm and site-specific parameter values.
- UES measures utilizing a constant savings value for each measure application.

This document provides a plan that builds off of BPA's on-going impact evaluation of select UES measures. Specifically, this plan describes the activities and approaches the team will undertake in calendar year (CY) 2017. It also outlines follow-up work from sampled HVAC measures from the CY2016 evaluation sample. Finally, this plan establishes a research plan for reviewing the Regional Sales Allocation Tool used within the Simple Steps program.

The following sections provide the background, context and objectives of the CY2017 impact evaluation activities.

1.1 Overview of BPA Approach to Impact Evaluation

Over the last four years, BPA and the RTF have developed a series of documents to provide guidance on how to estimate savings. Portions of these documents provide guidance on how to estimate savings from the projects that comprise the UES portfolio.

- RTF Guidelines[1] - the guidelines the RTF uses to judge the quality and reliability of the savings estimates, costs, benefits, and lifetimes for all types of efficiency measures. In June of 2014, the RTF adopted the updated version of the Guidelines that states that the RTF will provide guidance on delivery verification for UES and Standard Protocols.
- RTF Delivery Verification Requirements – beginning in May of 2015, the RTF identified key data that needs to be collected (or checked) to ensure reliability of RTF savings estimate. These requirements included detailed checklist and updated measure specifications.
- BPA Quality System Strategy & Implementation (QSSI) –presents a framework for establishing BPA's system used to assure high-quality programmatic energy savings or "quality system." This quality system framework focuses on programmatic energy savings. It includes: Standards, Planning Policies, Oversight Policies, Impact and Process Evaluation Policies and Savings Policies for Custom Projects, Calculators, and Unit Energy Savings.

[1] *Regional Technical Forum, Roadmap for the Assessment of Energy Efficiency Measures, June 17, 2014. https://nwcouncil.box.com/s/evp8nz4ifsi7yytb4iy7fg7ueayxv90r*

- BPA Implementation Manual[2] – The Manual, together with the customer's Energy Conservation Agreement (ECA) and specifications in BPA's energy efficiency reporting system, provides the implementation requirements for projects reported to BPA.

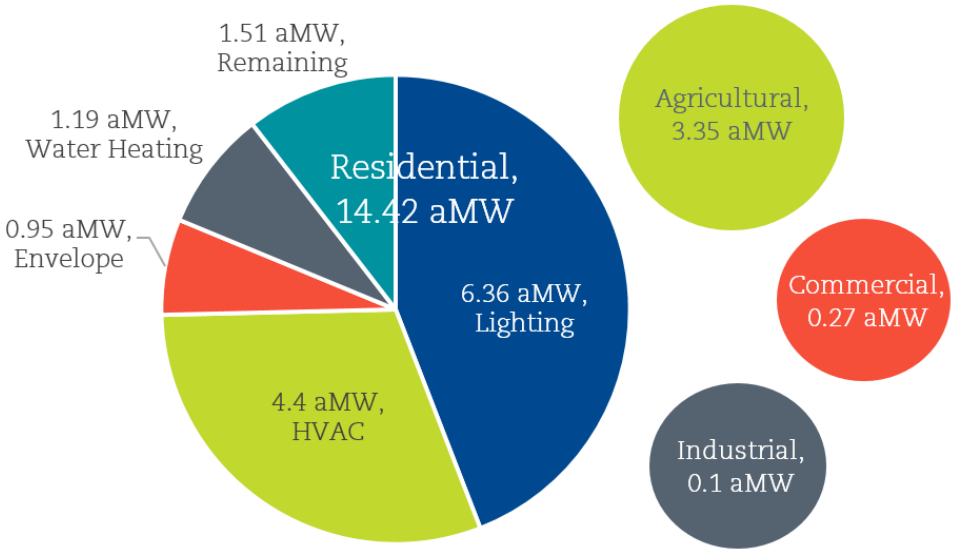
1.2 CY2016 UES Impact Evaluation Activities

In CY2016, BPA initiated the impact evaluation of its UES portfolio by defining the following objectives:

- Evaluate the energy savings for consistency with the savings claimed. Where appropriate, assess savings to inform RTF or BPA Qualified estimates.
- Assess cost-effectiveness. Report the cost-effectiveness of the UES savings for each evaluated measure, using the 7th Plan inputs and ProCost[3].
- Where relevant, provide strategic feedback to improve program operation and measures. Develop recommendations on data collection, oversight and program procedures, including but not limited to documentation and data handling, to improve reliability and reduce cost for future evaluation years.

With input from various stakeholders, BPA ultimately prioritized evaluating the measure groups that provided the largest savings in fiscal year (FY) 2015, which include residential lighting, HVAC and envelope measures.

Figure 1. FY2016 UES Portfolio Summary by End Use and Sector*



** Savings from Energy Smart Grocers deemed measures are not included in this summary.*

[2] *Bonneville Power Administration, Energy Efficiency Implementation Manual, October 1, 2014. http://www.bpa.gov/EE/Policy/IManual/Documents/FINAL_October_2014_Implementation_Manual.pdf*
[3] *ProCost is a model developed by the Northwest Power and Conservation Council and is used by the RTF to estimate the cost effectiveness of efficiency measures.*

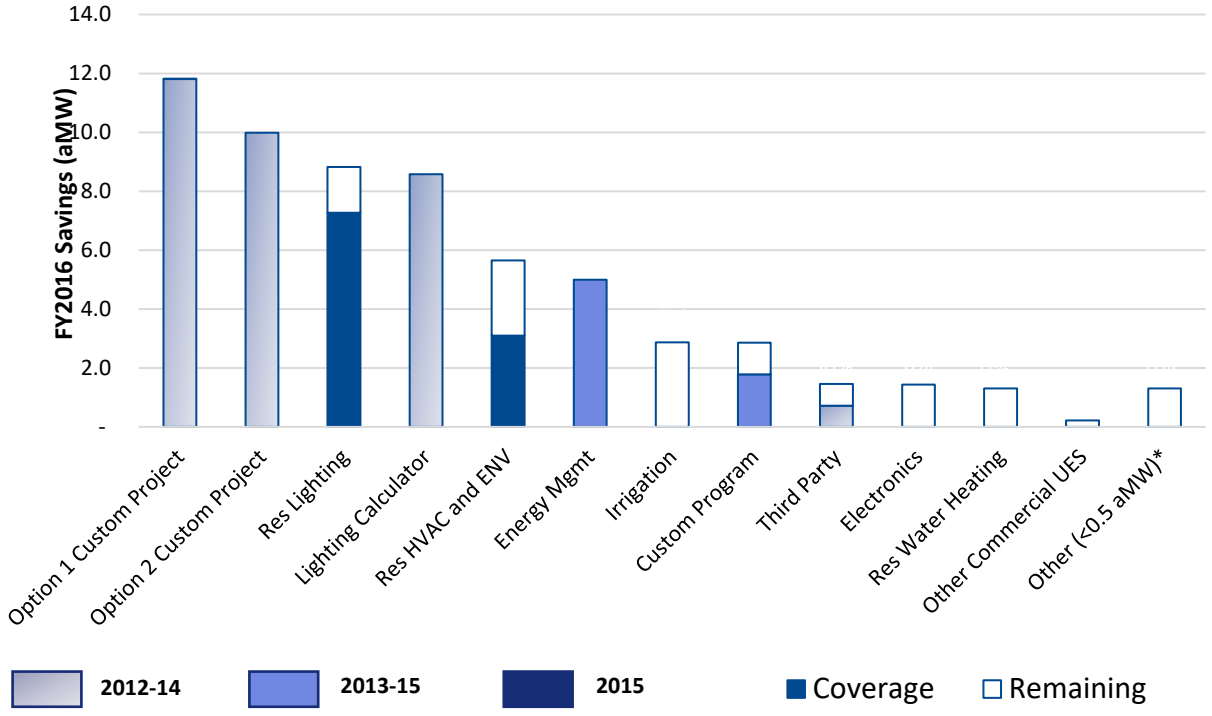
Source: Summarized from BPA's IS2.0 database, accessed 03/07/2017

Together with BPA, the evaluation team is currently evaluating the impact of these select UES measures as outlined in the BPA UES Portfolio Evaluation Plan for CY2016 Activities.[4]

1.3 Planning for CY2017 UES Impact Evaluation Activities

To select the next set of measure groups to evaluate, the team first considered the existing evaluation coverage of the UES portfolio, as summarized in Figure 2.[5] The shading in this figure reflects whether an evaluation has been conducted and how recently. The darkest shading indicates the measure groups that have received the most recent (or even on-going) evaluations. White indicates measure groups that have not yet been evaluated.

Figure 2. BPA has Evaluated the Impact of ~76% of its UES Portfolio to Date



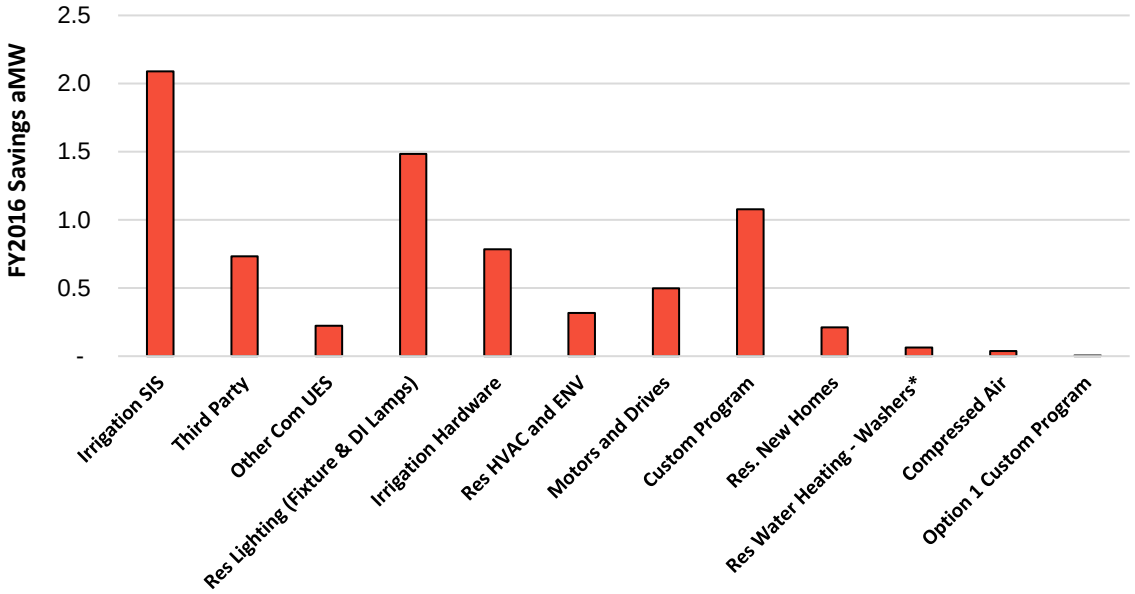
**Includes all measures that contribute <0.5 aMW each of FY-2016 savings*
Source: Summarized evaluation coverage between FY2012 through present, shown using FY2016 IS2.0 savings data (aMW).

[4] *Navigant Consulting, Inc. April 2016. Bonneville Power Administration UES Portfolio Evaluation Plan CY2016 Activities. https://www.bpa.gov/EE/Utility/research-archive/Documents/Evaluation/BPA_UES_Evaluation_Plan_FINAL_04012016_V3.pdf*
[5] *This summary includes all evaluations that occurred between FY2012 and the present.*

Together with stakeholders, BPA reviewed the unevaluated measures' relative contributions to savings, uncertainty and programmatic significance. Balancing objectives of coverage, research needs, timely feedback and cost /effort of the evaluation, the team together with BPA decided to exclude the measure groups listed in Figure 3 from 2017's plan due to several considerations including:

- Other on-going research (e.g., Scientific Irrigation Scheduling)
- Program changes (e.g., clothes washers, direct install lamps, residential lighting fixtures)
- Large customer burden required to verify delivery (e.g., direct install lamps, irrigation hardware)
- Too small of savings to justify the effort (e.g., irrigation hardware)

Figure 3. UES Measures Not Selected for Impact Evaluation in CY2017



** Residential Water Heating – Clothes Washers. Per conversations with program team, Clothes washers is being excluded from 2017 evaluation as contribution to savings is decreasing.*
Source: Summarized from FY2016 data included in an extract from IS2.o dated 3/7/2017

1.4 CY2017 Evaluation Coverage

- BPA identified seven measure groups across the Residential, Agricultural and Industrial sectors to be evaluated during CY2017. Evaluating these measure groups will allow BPA to achieve roughly 85 percent coverage of the entire UES portfolio. These measure groups, organized by sector and size of savings, are listed in Table 1.

Working together with stakeholders and building off of ongoing evaluation activities, BPA identified two additional objectives for CY2017:

- Conduct the phase II data collection and analysis of residential HVAC and envelope measures. The team will conduct additional verification activities to better understand the findings resulting from the ongoing billing analysis.
- Review the Retail Sales Allocation Tool (RSAT). The team will review the assumptions within and the implementation of the current platform used to allocate the sales of energy savings measures achieved through BPA's Simple Steps program to utilities.

Table 1 : Coverage Planned for CY2017

Sector	Evaluation Measure Group	Savings (aMW)
Residential	Phase II CY2016 Residential HVAC and Envelope Billing Analysis	5.72*
	HVAC Ductless Heat Pumps - Zonal	1.70
	Power Strips	0.82
	Water Heating - Showerheads	0.77
	Water Heating – Heat Pump Water Heater	0.19
	State Grants - Low Income Weatherization[6]	0.16
	Retail Sales Allocation Tool (RSAT)	N/A
Agricultural & Industrial	De-energization	0.20
	BPA Green Motors[7]	0.11

**FY2015 savings.*
Source: Summarized from FY2016 data included in an extract from IS2.o dated 3/7/2017

[6] *These savings are for FY2015 sourced from BOOM report for October 2016. These savings will be revised once the FY2016 savings are available.*
[7] *These savings are for FY2015 sourced from BOOM report for October 2016. These savings will be revised once the FY2016 savings are available.*

2. Evaluation Methodologies

This section describes the approaches, data collection and sampling frame planned to evaluate the impact of the selected UES measures. This methodology builds on the guidelines set forth in the Quality System Strategy & Implementation (QSSI) document, Regional Technical Forum (RTF) Guidelines[8] and the BPA Implementation Manual (IM)[9].

2.1 General Approaches

The evaluation team aims to select the best approach available to conduct evaluation while balancing strategic considerations including a measure's status, contribution to savings, uncertainty in claimed savings and programmatic importance.

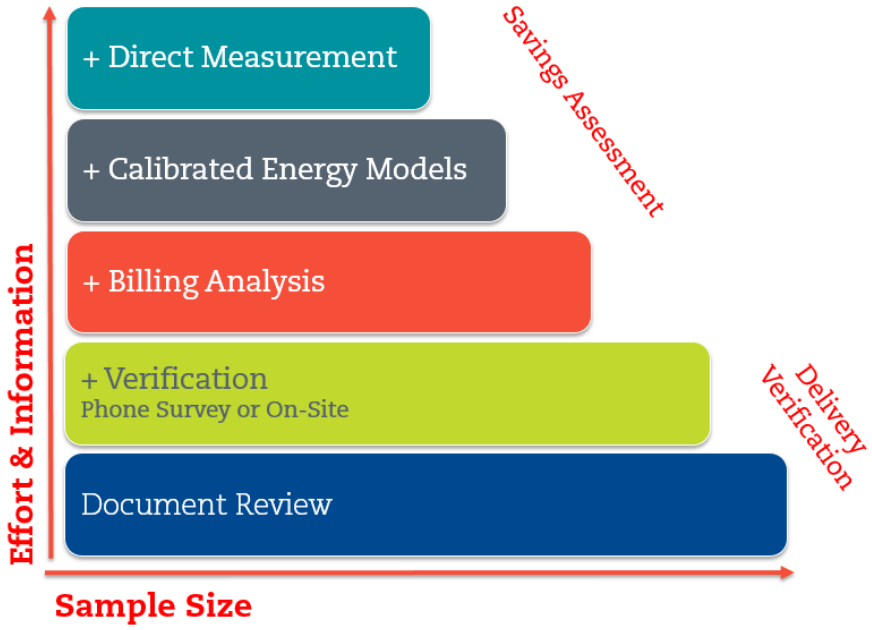
Measure status, per the RTF Guidelines, defines the savings estimation approach that should be used to evaluate savings. Specifically, the RTF guidelines specify that impact evaluation can be only completed via delivery verification for Proven measures. For non-Proven measures, the Guidelines specify that evaluation must conduct a savings assessment or completion of RTF-specified research plan on a sample.

Delivery verification can generally be completed via two approaches: review of project documentation or installation verification through end-user contact such as phone surveys or site visits. As such, delivery verification is lower effort, and provides insight into total program savings by verifying quantity, but not about per-unit saving values. Assessing savings, on the other hand, requires more effort, but yields greater insight into installed measure savings. Approaches here can include billing analysis using energy consumption data, calibrated energy models or direct measurement.

Figure 3 shows how these approaches stack up in terms of effort required and information provided. Generally, each additional layer requires more data or burden, while also providing greater insight. For CY2017, the team plans to leverage existing delivery verification requirements in a manner that maximizes low-rigor approaches for the sampled measures, only adding additional approaches where needed.

[8] *Regional Technical Forum, Roadmap for the Assessment of Energy Efficiency Measures, June 17, 2014. https://nwcouncil.box.com/s/evp8nz4ifsi7yytb4iy7fg7ueayxv90r*
[9] *Bonneville Power Administration, Energy Efficiency Implementation Manual, October 1, 2014. http://www.bpa.gov/EE/Policy/IManual/Documents/FINAL_October_2014_Implementation_Manual.pdf*

Figure 4: The Relationship between Burden, Value and Evaluation Approach



Source: Navigant

2.2 CY 2017 Approaches

In CY2017, the evaluation team plans to deploy two primary evaluation approaches:

- document review of a sample of each selected measure group (listed in Table 1),
- opt-in billing analysis of residential ductless heat pumps (DHP) replacing zonal systems.

As a part of the second phase analysis of residential HVAC and envelope measures, initially described in the CY2016 UES Evaluation Plan[10], the evaluation team will deploy the following additional evaluation approaches:

- document review of a sample of installation forms for DHP eFAF projects, to better understand results,
- web/phone surveys of a target sample of DHP eFAF projects, to better understand outlier results,
- opt-in billing analysis of an expanded set of DHP replacing electric forced air furnaces (eFAF) projects and prescriptive duct sealing (DS) projects.

In addition, the evaluation team plans to conduct the following research activities:

[10] *Navigant, UES Impact Evaluation Plan for 2016, April 10, 2016, https://www.bpa.gov/EE/Utility/research-archive/Documents/Evaluation/BPA_UES_Evaluation_Plan_FINAL_04012016_V3.pdf*

- literature review of existing Low Income Weatherization program evaluations conducted in the region to date,
- review the development and implementation of the RSAT.

Table 2: Summary of CY2017 Impact Evaluation Activities

Sector	Measure Group	FYs Included	Measure Status	Doc Review	Opt-In Billing Analysis	Web & Phone Surveys	Literature Review	Research
Residential	Phase II Data Collection and Analysis for CY2016 Res HVAC and Envelope Billing Analysis	2015-2016	Proven	✓	✓ DHP eFAF ✓ Pres DS	✓		
	Ductless Heat Pumps replacing Zonal Heat	2015-2016	Proven	✓	✓			
	Power Strips	2016	Planning	✓				
	Showerheads	2016	Planning	✓				
	Heat Pump Water Heaters	2016	Planning	✓				
	State Grants – Low Income Weatherization	N/A	N/A				✓	
	RSAT	N/A	N/A	✓				✓
Agricultural	De-energization	2016	BPA Qualified	✓				
	BPA Green Motors	2016	Small Saver	✓				

Source: Navigant & BPA

As shown in Table 2, the team plans to conduct a documentation review for the residential APS, showerheads, heat pump water heater, de-energization and Green Motors measure groups. As noted above, per the Guidelines, this approach may satisfy delivery verification requirements, but it will not function as impact evaluation for these five un-Proven measure groups. Instead, the team plans to use this activity to provide BPA with insight into what is occurring with the delivery of these very small contributors to overall UES portfolio savings. These insights may also be used to provide input for future evaluation cycles or may be integrated with other research efforts to meet all evaluation requirements.

The details of the activities included in Table 2 are provided in the following sections.

2.2.1 Document Review

The evaluation team will review required project documentation and defined delivery verification requirements to assign one of the following three types of savings for each sampled project receiving document review:

1. Verified Savings: If the evaluation team does not identify any discrepancies between the provided project documentation and the claimed utility savings, the team will attribute full credit.
2. Revised Savings: If the evaluation team identifies that the appropriate measures are reported, but there are minor discrepancies (e.g., conflicting model numbers, different measure reported), savings will be revised[11] to the appropriate UES value and then included in the analysis.
3. No Savings: If the evaluation team identifies that any required data is missing in the project documentation (customer files) or a parameter is missing, zero credit will be attributed to that particular sampled project.

The detailed delivery requirements for each of the selected measures groups are provided in Appendix A through F.

2.2.2 Opt-In Billing Analysis

The evaluation team will leverage the detailed regression modeling methodology derived and vetted as a part of the CY2016 UES impact evaluation to estimate savings for an opt-in billing analysis of prescriptive duct sealing, DHP eFAF, and zonal projects. This regression analysis uses a fixed-effects conditional savings regression model with paired pre- and post-participation months to estimate savings, and it is described in detail in the CY2016 UES Evaluation Plan[12].

2.2.3 Web and Phone Surveys

The evaluation team will conduct web and phone surveys to verify installation details for select sampled projects. These surveys will gather home and system operating characteristics for DHP eFAF projects and will follow the customer contact protocols detailed in Section 4.3. Web surveys are the preferred method; phone surveys will be used only where email addresses are not available. Due to the value of high response rates and the small sample pool, the evaluation team will provide a cash incentive to the respondent.[13]

Utilities will be able to review the draft survey instrument and provide their comments. After finalizing the design, the evaluation team will program and pre-test the survey. Prior to conducting the survey, the evaluation team will provide utilities the survey timeline, the final instrument, the target end-user contact list, call center talking points, and advance letter content that may be used

[11] This revision will not be conducted in the BPA reporting system, instead in the evaluation process
[12] *Navigant, UES Impact Evaluation Plan for 2016, April 10, 2016, https://www.bpa.gov/EE/Utility/research-archive/Documents/Evaluation/BPA_UES_Evaluation_Plan_FINAL_04012016_V3.pdf*
[13] This will be in the form of an electronic Amazon gift card, or where preferred, a Visa gift card sent via the United States Postal Service.

as a mailer to provide a heads up to the sampled end-users. Sampled utilities will also have the option to send the web survey link and/or field the calls themselves.

2.2.4 RSAT Research

Based on the Simple Steps process evaluation[14] and on-going residential lighting impact evaluation, the team has identified the following research opportunities regarding the RSAT:

- Review allocation methods used by non-participating utilities
- Confirm the current allocation methodology is still accurate and representative
- Explore potential for double-counting
    - Sample By-Request line items to determine whether By-Request bulbs are also being purchased at participating Retail locations
    - Sample New Construction project line items to determine bulbs are also being purchased at participating Retail locations

2.2.5 Literature Review

Currently, BPA claims 3,000 kWh per home for homes provided with BPA funding through the state grants. The evaluation team shall conduct a literature review of relevant low-income weatherization studies to provide BPA with insight into the voracity of this savings estimate. The team will review the data sources included in the original studies used to justify the current estimate, including Weatherization Assistance Project evaluations and other regional and national weatherization studies.

The evaluation team will draft a memo outlining the findings of the literature review, including a table of results from relevant studies and commentary on their applicability to the BPA region. We will also recommend whether BPA keeps or adjusts its estimate of weatherization savings and if so, a possibly more reliable number based on secondary sources. Finally, our team may also provide high-level recommendations of the research approach if BPA would like to gain an updated, reliable number using primary sources in the future.

2.2.6 Cost Effectiveness

For each sampled measure group, the team will use the RTF model ProCost15 to estimate the lifetime sum of costs and benefits.[16] This model implements the Total Resource Cost (TRC) methodology which accounts for "all the costs of a measure with all of its benefits, regardless of who pays those costs or who receives the benefits"17. ProCost outputs the discounted sum of costs and benefits over a measure's life.

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[14] Navigant, Simple Steps Smart Savings Process Evaluation, September 2016, https://www.bpa.gov/EE/Utility/research-archive/Documents/Evaluation/160808_Final_Simple_Steps_Report.pdf
[15] ProCost is a model developed by the Northwest Power and Conservation Council and is used by the RTF to estimate the cost-effectiveness of efficiency measures.
[16] If there is not an existing RTF model, as is the case with De-Energization, the evaluation team will work with BPA to establish a work around.
[17] From the 6th Power Plan.

Based on the evaluation activities, the team will obtain measure quantities and verified energy savings for each sampled measure. To calculate the Total Resource Cost test (benefit divided by costs) for each domain and for the portfolio, the team will use the sample case weights to calculate an appropriately weighted sum of costs and benefits. The team will also calculate the Total Resource Cost test for each sampled measure excluding any non-electric benefits.

Data not provided by the program will be taken from corresponding measures in RTF measure workbooks. This includes annual Non-Electric Benefits (NEBs) such as O&M costs, and gas benefits from implementing measures.

2.3 Data Collection

This section describes the general data collection approaches planned for the continued impact evaluation of the BPA UES portfolio, as well as considerations for coordination BPA oversight. Measure-specific data collection approaches (data sources, collection processes and analysis) are discussed in detail in Section 3.

2.3.1 Data Sources

Primarily, the evaluation team will use project documentation (the documentation required per the IM), billing data and phone surveys to support the CY2017 evaluation activities. In order to function cost-effectively and efficiently, the evaluation seeks to leverage any and all data that is already collected from existing BPA and utility staff's data collection efforts. The evaluation team will collect additional data if needed to achieve reliable estimates of savings for the sampled measures.

2.3.2 Project Documentation

Project documentation may include data from IS2.0, files uploaded to BPA's EE Docs, data required in the Implementation Manual to be maintained by utilities and any additional information collected by third party implementers or program staff. Following the contact protocols outlined in Section 4.3, the evaluation team will work with BPA staff and participating utilities to obtain utility customer documentation and files for each sampled measure, when necessary. If files are missing critical information, the evaluation team will work with BPA to determine if the additional information is available through a supplemental request.

2.3.3 Utility Bills

The evaluation team will request billing data (on an opt-in basis) to support DHP-zonal evaluation and the second phase of billing analysis for DHP eFAF projects. In these instances, the evaluation will target a census of energy consumption data across the sampled utilities.

In order to reduce the burden on utilities and streamline the billing data request process, the evaluation team will provide a data template at the time of sample notification, consistent with the 2016 template. Provided for illustrative purposes only, Figure 13 in Appendix J provides an example of what this data template might look like.

2.3.4 Customer Contact

Where the evaluation approach includes customer contact (in the form of a web or phone survey,) the evaluation team will work with sampled customer utilities to determine the feasibility of having them share the web survey link or conduct the phone surveys, to support utility direct contact with their customers. The team will follow the pre-defined contact protocols provided in Appendix G.

2.3.5 Coordination with the Region

In 2017, the Northwest Energy Efficiency Alliance (NEEA) is seeking cost data on installed DHPs. NEEA and BPA have discussed options to coordinate and minimize data requests to customer utilities. NEEA will request DHP rebate data from its direct funders. For indirect funders, BPA will summarize (and therefore anonymize) the DHP zonal information collected through this evaluation and share with NEEA. Utilities have the option to let BPA know if you they have concerns, or to let NEEA know if they would like to work directly with them to provide all data on DHP projects.

2.4 Sample Design

This section provides a description of the general sampling strategy and the draft CY2017 sample design. Measure group-specific details are provided in Section 3.

2.4.1 General Sampling Strategy

BPA's QSSI policies have established a target for impact evaluation, striving for measure group-level evaluations to attain relative error of 10% at the 90% confidence level, with a minimum acceptable level of 80/20. The evaluation team proposed sampling strategy targets a 90/10 confidence and precision around this year's largest measure group, residential zonal DHP, and at least[18] 80/20 for the remaining smaller measure groups, attempting to reduce the number of utilities included in the evaluation, in order to minimize the burden on utilities and evaluation cost.

For residential zonal DHP[19] and residential HPWH, the evaluation team will use a two stage cluster sampling design, first sampling utilities, then sampling projects within each utility's participant population. The first stage sample of utilities will be stratified by size, according to a common set of criteria:

- Large contributors, making up greater than 6% of a measure group, will all be sampled (i.e., certainty sample).
- Small contributors, making up 0.25 or 0.5[20] to 6% of a measure group, will be sampled randomly in order to meet confidence and precision objectives.
- Tiny contributors, including the smallest contributors with savings that sum to 5% of the savings or less, will be excluded from the sample.

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[18] Based on interest expressed in conversations with the BPA residential program team in December 2016, the evaluation team will use 90/20 to determine the target sample size for the residential heat pump water heater measure group.
[19] Where possible, the evaluation team will work directly with the third party implementer to get project files.
[20] The evaluation team adjusts the threshold to 0.25 or 0.5%, on case-by-case basis, in order to maintain 50-55% of total measure group level savings in the Small contributors.

Two additional steps will be taken at the first-stage sample, in order to ensure representativeness and minimize burden.

1. To the extent possible, any utility drawn as a small contributor in FY2016 that received FY2015 evaluation will be dropped and replaced.[21]
2. After the sample is drawn, representativeness quotas will be checked to ensure that the random sample of utilities faithfully represents the overall population.

After the utility sample is stratified and drawn, project-level samples will be randomly drawn or a census of projects will be pulled in cases where billing data is needed. The second stage of cluster sampling will be performed differently for the large contributor stratum versus the small contributors, in order to optimize the sample efficiency.[22] For the large contributors, a stratified random sample of projects will be pulled across all of the large contributors combined. For the small contributors, a random sample of project files weighted by the saving's contribution or a census of billing data will be requested per utility. The project-level samples will be stratified as necessary to effectively capture efficiency and representativeness of the population.

For the Green Motors, residential power strip and residential showerheads measure groups, the evaluation team will use stratified random sampling. In addition to having smaller populations, the savings vary significantly from one project to another within these measure groups. For example, many projects (a project is an individual row in the IS2.0 database) represent large batch orders which have significantly higher savings than the remaining projects which have single or <10 power strips batched together.

The evaluation team segmented the existing populations of projects within each of these three measure groups into three strata. These were large, medium, and small, each composing approximately one-third of the total energy savings of each measure group. The evaluation team randomly selected projects proportionately within each stratum.

Finally, for the de-energization measure group, the team plans to evaluate a census of FY2016 projects. Table 3 summarizes the target sample design for the CY2017 evaluation activities.

[21] FY2015 evaluation was conducted for Residential HVAC, Envelope and Lighting domains. The evaluation team is trying to reduce utility burden where possible, and we do not currently believe this represents a bias to the sample.

[22] In general, a two-stage random sample design trades a reduction in the number of clusters drawn (in this case, utilities) for an increase in the number of individual projects drawn, unless the variability in the means of the clusters is higher than the variability in the means of the projects within a cluster. For the 2017 UES evaluation measure groups, we do not expect the differences amongst the clusters (utilities) to be very large, compared to the differences between projects. In order to gain an efficiency from clustering, the realization rates of projects for a given utility would need to be consistently high or consistently low compared to another utility.

Table 3. Final Sample Design for the CY2017 Impact Evaluation Activities

Measure Group	Sampling Technique	Strata	Assumed CV	Number of Utilities	Target Number of Projects
Res - Phase II Outlier Analysis	TBD	DHP replacing eFAF projects	N/A	**13**	**480**
Res - HVAC DHP Zonal (document review only)	Two Stage Cluster Sampling	Large Contributors	0.3	5	48
		Small Contributors	0.3	5	50
		Subtotal		**10**	**98**
Res - Power Strips	Stratified Random Sampling	***Subtotal***	0.3	**5**	**5***
Res - Showerheads	Stratified Random Sampling	***Subtotal***	0.3	**9**	**10**
Res - Heat Pump Water Heater	Two Stage Cluster Sampling	Large Contributors	0.3	5	9
		Small Contributors	0.3	3	22
		Subtotal		**8**	**31**
Agricultural – De-energization	N/A	N/A	N/A	**3**	**3** (census)
Agricultural - BPA Green Motors	Stratified Random Sampling	***Subtotal***	0.3	**N/A**	**9**

**This measure group has comparatively smaller sample size because there is a one line-item in the population representing ~9000 units and >40% of total savings for this measure group.*
Where possible, the evaluation team will work directly with the third party implementer to get project files.
Source: Navigant analysis of complete FY2016 IS2.0 data, pulled on 03/07/2017

These are the final sample sizes for the CY2017 evaluation based on an extract of FY2016 IS2.0 data pulled on March 7th, 2017 and the FY2016 EEDB data for BPA Green Motors measure group provided to the evaluation team in December 2016.

2.4.2 Utility-Specific Oversamples

The draft sample design will most likely not support statistically reliable estimates of savings for utility-specific measure groups. However, additional studies can be added to the sample design that would support estimates for specific utilities.

If utilities are interested in conducting an oversample in their territory to gain statistical significance, the utility can contact the evaluation contractor. The evaluation contractor will work with the utility to determine the sampling strategy for their study and the required confidence/precision. The participating utilities would have to separately contract with the evaluation team for the oversample.

BPA will fund the fixed costs associated with the impact evaluation (e.g., database development, sampling, evaluation protocols, training) and the utility requesting an oversample will fund the marginal costs of additional site-specific analysis costs (e.g., data collection and savings estimation).

The utilities will also be responsible for any expenses associated with preparation of utility-specific evaluation reports and presentations.

2.4.3 Sample Selection and Management

Due to aggregate nature of the IS2.0 database, where, depending on the measure, a line item can represent one or many projects, the evaluation team may require additional information to create the final sample. For example, where multiple measures are reported in one-line item, the team may request additional household-level data from each of the sampled utilities in order to draw the sample. Similarly, where one household or site may participate in more than one measure, the evaluation team will attempt to view all relevant participation by unique site for the evaluation period, to attain the most comprehensive view of measures delivered.

3. Evaluation Measure Groups

The details of the evaluation measure groups, including measure status, delivery verification requirements, and potential data sources are included in Appendix A through F.

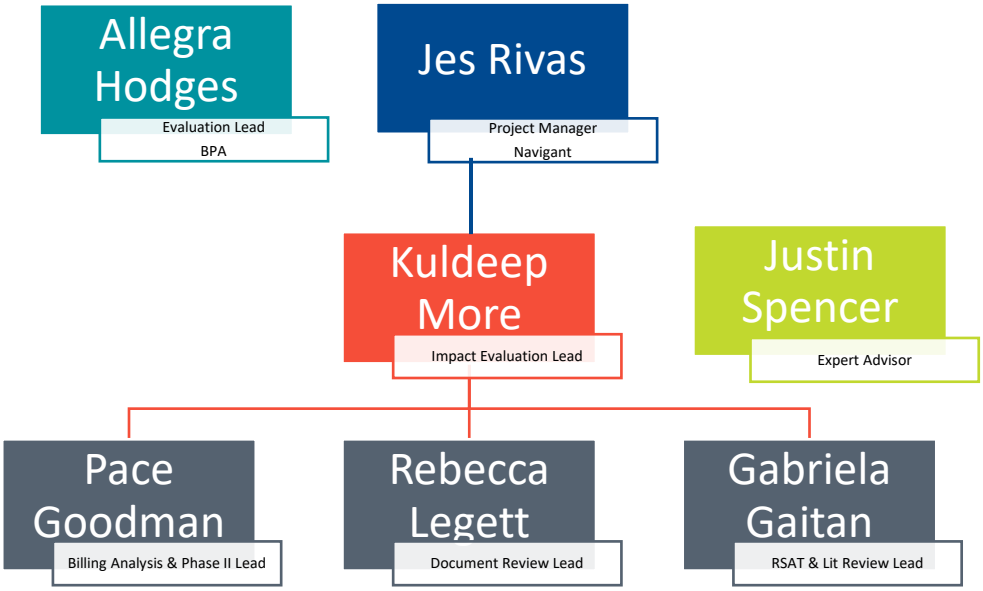
4. Project Management

This section provides the general staffing, schedule and reporting plan for managing the CY2017 evaluation activities.

4.1 Staffing

Navigant will be the prime contractor responsible for the evaluation and will be reporting to Lauren Gage, the COTR and project manager for BPA. The organization of the evaluation team is designed to maximize project management and consistency, while maintaining a high level of quality control. Jes Rivas will act as the project manager with Kuldeep More as the impact evaluation lead. Both will be responsible for advising the evaluation team on the quality and content of the work products that fully satisfy BPA's requirements. Justin Spencer will be the expert advisor for the evaluation team and BPA. Pace Goodman, Rebecca Legett and Gabriel Gaitan are the key experts and leads of the respective evaluation approaches, as shown in Figure 5.

Figure 5: Organization of CY2017 UES Impact Evaluation Team

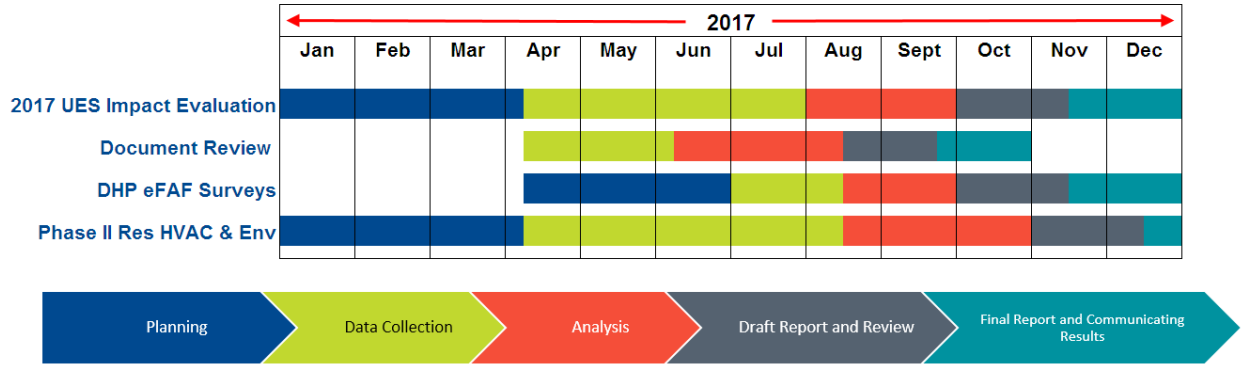


Source: Navigant

4.2 Schedule

The Evaluation team expects to complete the main CY2017 evaluation activities as outlined in Figure 6.

Figure 6: CY2017 Draft Evaluation Schedule



Source: Navigant

4.3 Communication

4.3.1 Coordination with BPA Oversight

BPA conducts reviews of UES projects as part of its oversight processes. These reviews verify that customer utilities comply with the IM, each utility's Energy Conservation Agreement and specifications in BPA's reporting system. As such, some of the work involved has similarities to certain aspects of this evaluation, e.g., file reviews for sampled projects. The evaluation team will work with BPA Contracting Officer's Technical Representatives (COTRs) as much as possible to coordinate efforts and communication to sampled customer utilities.

4.3.2 Evaluation Launch

Figure 7 shows the proposed evaluation launch for CY2017 evaluation plan.

Figure 7: CY2017 Draft Evaluation Launch Plan

Evaluation Plan Roll-out	2016		2017							
	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Draft Evaluation Plan	X									
Feedback from Stake Holders on Draft Evalaution Plan		←	—	→						
Communication to utilities in the sample					X					
Finalize the Evalaution Plan and Sample					X					
Sample Notification to utilities						X				
Presentation to the sampled utilities						X				
Primary Data Collection							←	—	—	→
Data Clarification									←	→

Source: Navigant

4.3.3 Utility customer and End User Contact Protocol

The Navigant team will adhere to the detailed end user and utility contact protocol provided in the Appendix G. This protocol contains for how the evaluation team must contract customer utilities and end-users across all data collection efforts. Example introduction letters and call center talking points are also provided.

4.3.4 On-going Communication

Together with BPA, the Navigant team has established a consistent communication procedure to ensure the delivery of a quality evaluation that clearly conveys program performance. Key aspects of the communication approach are described below.

Navigant will provide the following throughout the course of the evaluation:

- Weekly written status updates and check-in meetings with BPA evaluation manager. Meetings will review action items, progress, data requests, schedules, and budgets.
- Monthly reports highlighting progress and key aspects of each evaluation task.
- Workshops with BPA staff and program managers, as needed, to identify key issues and concerns for evaluation and to facilitate communications between evaluation and program personnel.
- SharePoint site accessibility for BPA staff and utility representatives to securely post program data and share key program information, project progress, and deliverables.

4.3.5 Data Transfer Protocol

The evaluation team believes the safest approach to collecting any project documentation that contains sensitive information is to use a secure file transfer protocol. The evaluation contractor, Navigant, has access to a secure FTP system that can both send and request files, as well as encrypt data prior to sending. Utilities which prefer an alternative, such as direct email, can opt-out of providing the evaluation team their data this way.

4.3.6 Escalation Protocol

In order to strive to provide timely and actionable evaluation results, the team has created an escalation protocol to be initiated should data collection efforts become significantly delayed and pose an impact to the schedule. The protocol is:

1. Initial sample emails sent by evaluation EER with copy to utility EER and utility COTR.
2. If a utility requests more time, within the agreed-upon time limit, utility EER and utility COTR are notified
3. If a utility misses a deadline, then evaluation EER, utility EER, COTR and AE are notified of the missed deadline. The utility EER and the utility AE will discuss an approach to the data collection, including potential escalation to utility management.

4.4 Reporting

Upon the conclusion of evaluation activities, the team will prepare a final report that documents the methodology, findings and recommendations of this evaluation. The report will describe the methods and findings of the impact evaluation, provide aggregate-level results only, and will not include any customer or end-user identifying information. The team will also prepare deliverables to allow these evaluation findings to be presented at regional webinars and posted publicly on BPA's website. Additionally, and where available, the evaluation team will work with BPA to

provide sampled customers the anonymized measure-specific evaluation results for their service territories.

Specifically, the evaluation team will prepare report documents, presentations for internal and external webinars and concise 2-page highlight documents. All content will be reviewed by BPA project manager and internal evaluation teams. The evaluation team expects that report will have the following structure:

1. Executive Summary
    a. Study Overview
    b. Findings
    c. Conclusions & Recommendations
2. Introduction
3. Objectives
4. Methodology
    a. Data Collection
    b. Sample Design
5. Findings
    a. Evaluation Results
    b. Cost-Effectiveness Results
6. Conclusion & Recommendations
7. Technical Appendices and Data Products

5. Glossary

Coefficient of Variation (CV)

A normalized measure of dispersion of a probability distribution and defined as the ratio of the standard deviation, σ, to the mean, μ:

$$c_v = \frac{\sigma}{\mu}$$

Delivery Verification - RTF Guidelines stipulate that Impact Evaluation may be accomplished using delivery verification to estimate savings for Proven UES (Unit Energy Savings) measures, i.e., savings equal the verified delivery quantity multiplied by the proven UES savings value. Delivery verification may also be useful in measure development and providing feedback to programs. The RTF Guidelines provide the following additional definition:

> *"Delivery verification involves physical inspection of measures or documentation of measures at the location where the program operator delivers them. For measures delivered to an end use, this involves collecting data from the end user facility to confirm that equipment conforms to the measure specifications. For measures delivered upstream of the end use, for example efficient bulbs sold through retailers, this might involve inspection of retailer or end user records of bulb sales or purchases."*[23]

Evaluation Measure Group - In order to design an efficient evaluation, the evaluation team defined subsets within sectors as a group of measures that have similar end-uses, measure statuses and/or that use similar program delivery method.

Impact Evaluation

Impact evaluation is used to estimate savings from energy efficiency measures. According to the RTF Guidelines, "program impact evaluations estimate savings from a period of program operation. Program impact evaluations involve the analysis of a reliable sample of program participants (and possibly non-participants) to determine the savings." The RTF Guidelines generally refer to evaluation of a portfolio or program, but are flexible in how evaluators define "program."

Measure Status - In the RTF Guidelines, a measure's category defines the savings estimation that should be used to evaluate savings. The RTF approves four measure categories within the UES portfolio; Proven, Small Saver, Provisional and Other.

Other UES

This includes measures that fall into the RTF-Small Saver and Planning categories, as well as UES measures that have been created by program operators but are not recognized by the RTF, such as BPA-qualified measures. Savings estimation methods for these measures require conducting one or more studies that may require site-specific data collection and analyses.

[23] *Details of the delivery verification strategies included in the 2016 UES evaluation approaches are discussed in detail for each domain in the Appendices.*

Realization Rate

The term is used in several contexts in the development of reported program savings. The primary applications include the ratio of project tracking system savings data (e.g., initial estimates of project savings) to savings that (1) are adjusted for data errors and (2) incorporate evaluated or verified results of the tracked savings. In the Updated Guidelines, the realization rate does not include program attribution.

Relative Precision

Measures the expected error bound of an estimate on a normalized basis. It must be expressed for a specified confidence level. The relative precision (*rp*) of an estimate at 90% confidence is:

$$rp = 1.645 \frac{cv}{\sqrt{n}} \sqrt{1 - \frac{n}{N}}$$

where *n* is the sample size, *N* is the population size, and the coefficient of variance is *cv* = standard deviation / estimate mean value. The square root expression at the end of the equation is the finite population correction factor, which becomes inconsequential and unnecessary for large populations.

RTF Proven

These are measures for which the RTF has determined that savings estimation methods are proven and reliable.

RTF Provisional

These are measures for which the RTF has determined that reliable baseline data is available, but that savings are not yet proven and additional research needs to be conducted. Each RTF Provisional measure has an RTF-approved research plan which outlines data collection activities necessary to improve the reliability of the savings estimation method.

Savings Estimation

The RTF Guidelines stipulate a range of recommended methods to quantify estimate savings, depending on the type of measure (UES, Standard Protocol or Custom) and the UES measure category (proven, provisional, small saver, or planning).

Savings Realization Rate (RR)

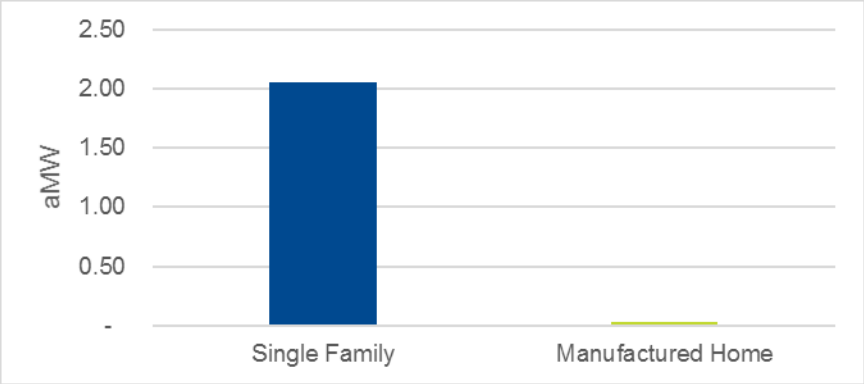
The ratio of the field of evaluation energy savings to the program's claimed savings. The RR represents the percentage of program-estimated savings that the impact evaluation team estimates as being actually achieved based on the results of the evaluation M&V analysis.

Appendix A: Residential HVAC DHP - Zonal

Savings

Figure 8 shows the breakdown of energy savings for the residential HVAC ductless heat pump (DHP) zonal evaluation measure group by house type.

Figure 8: Residential HVAC DHP – Zonal: Breakdown by House Type (FY2016)



Source: Summarized from 03/07/2017 IS2.0 data pull for FY2016 data.

Table 4 shows the breakdown of energy savings by measure status.

Table 4: Residential HVAC DHP – Zonal: Breakdown by House Type (FY2016)

Measure Status[24]	Savings (aMW)	Fraction of Measure Group
RTF Proven	2.05	98%
BPA Qualified[25]	0.03	2%

Source: Summarized from 03/07/2016 IS2.0 data pull for FY2016 data.

[24] *Measure Status from UES Deemed List Version 4.1*
[25] *Residential HVAC DHP Zonal measures for Manufactured Homes are categorized as "BPA Qualified" in the UES Deemed Measure List version 4.1.*

Sample Size

Table 5. Draft 2016 Sample Size for the Residential HVAC DHP - Zonal

Measure Group	Strata	Assumed CV	Number of Utilities	Target Number of Projects
Res HVAC DHP - Zonal	Large Contributors	0.3	5	~ 48
	Small Contributors	0.3	5	~ 50
	Subtotal		**10**	**~ 98**

Source: Navigant Analysis

Delivery Verification Requirements

Table 6 : Ductless Heat Pump replacing Zonal Electric Heat DV Requirement

DV Component	Specification	DV Requirement Checklist	Available in Utility Customer Files?
Measure Identifiers	Heating Zone	Check for heating zone	Can be derived
	Cooling Zone	Check cooling zone	Can be derived
Savings Baseline	Pre-Conditions	Check pre-conditions were electric resistance zonal system	Yes, checked in installation form
	Pre-Conditions	Check that house does not have a heat pump, ductless heat pump, or a whole house forced air heating system	Yes, checked in installation form
Implementation and Product Standards	HSPF Rating	Check inverter drive DHP with nominal 0.75 tons or more and HSPF rating of 9.0 or higher is installed	Size can be derived. HSPF rating collected in installation form.
	Installation Location	Check DHP is installed in main living area	No

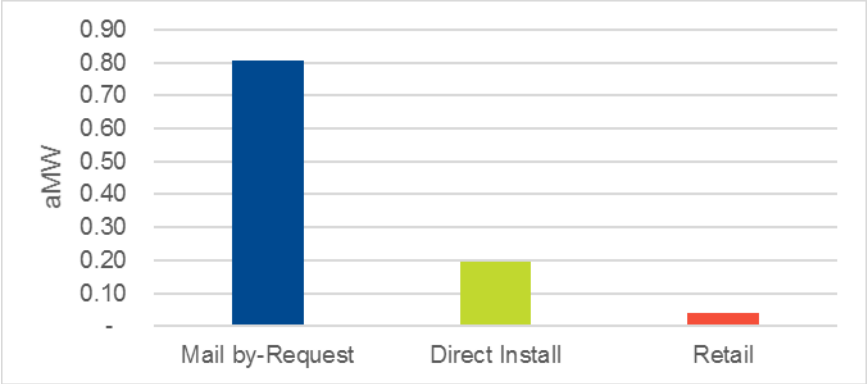
Source: RTF

Appendix B: Residential Power Strips

Savings

Figure 9 shows the breakdown of energy savings for the residential power strips evaluation measure group by delivery mechanism.

Figure 9: Residential Power Strips: Breakdown by Delivery Mechanism (FY2016)



Source: Summarized from 03/07/2017 IS2.0 data pull for FY2016 data.

Table 7 shows the breakdown of energy savings by measure status.

Table 7: Residential Power Strips: Breakdown by Measure Status (FY2016)

Measure Status[26]	Savings (aMW)	Fraction of Measure Group
Planning[27]	1.04	100%

Source: Summarized from 03/07/2017 IS2.0 data pull for FY2016 data.

Sample Size

Table 8. Draft 2016 Sample Size for the Residential Power Strips

Measure Group		Assumed CV	Target Number of Projects*
Res Power Strips	***Subtotal***	**0.3**	**~ 5**

Source: Navigant Analysis
**This measure group has comparatively smaller sample size because there is a one line-item in the population representing ~9000 units and >40% of total savings for this measure group.*

[26] *Measure Status from UES Deemed List Version 4.1*
[27] *Measure status for the Residential Power Strips is changed to "Provisional" on the RTF website as of May 15, 2016*

Delivery Verification Requirements

Table 9 : Residential Power Strips DV Requirement

DV Component	Specification	DV Requirement Checklist	Available in Utility Customer Files?
Measure Identifiers	None	IR-sensing ("Tier II") installed in home entertainment setting.	Yes
Savings Baseline	Pre-Conditions	N/A	
Implementation and Product Standards	IR-sensing APS, home-entertainment: APS shuts off power to controlled devices (including television) when no IR signal is detected for a set period of time regardless of the level of power draw (typically considered a "Tier II" technology). APS must control television.	- APS unit must control television. - Verification should take place approximately 6 to 9 months after the customer receives the APS.	Yes.*

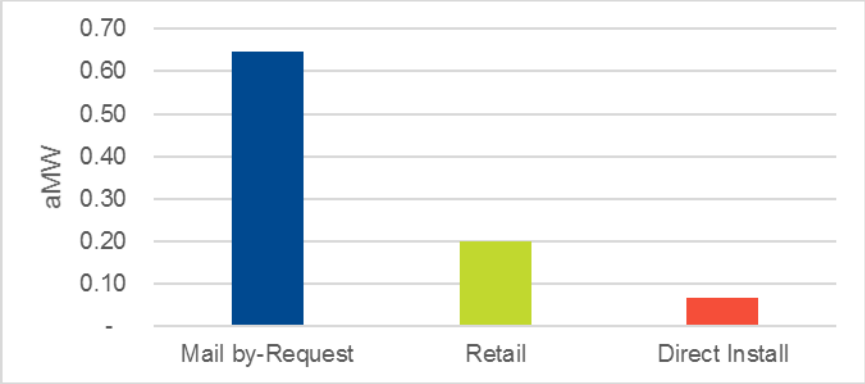
** The DV requirements can be satisfied from the customer survey that is required from the by-retail and DI customers within 30 days of receiving the power strip. In order to satisfy the 'after 6-9 months' requirement, the evaluation team will have to call the sampled sites in order to collect the data.*
Source: RTF

Appendix C: Residential Showerheads

Savings

Figure 10 shows the breakdown of energy savings for the residential showerheads evaluation measure group by delivery mechanism.

Figure 10: Residential Showerheads: Breakdown by Delivery mechanism (FY2016)



Source: Summarized from 03/07/2017 IS2.0 data pull for FY2016 data.

Table 10 shows the breakdown of energy savings by measure status.

Table 10: Residential Showerheads: Breakdown by Measure Status (FY2016)

Measure Status[28]	Savings (aMW)	Fraction of Measure Group
Planning[29]	0.91	100%

Source: Summarized from 03/07/2017 IS2.0 data pull for FY2016 data.

Sample Size

Table 11. Draft 2016 Sample Size for the Residential Showerheads

Measure Group		Assumed CV	Number of Utilities	Target Number of Projects*
Residential – Showerheads	***Subtotal***	**0.3**	**9**	**~ 10**

Source: Navigant Analysis

[28] *Measure Status from UES Deemed List Version 4.1*
[29] *Measure status for the Residential Showerheads is changed to "Planning" on the RTF website as of Aug 16, 2016*

Delivery Verification Requirements

Table 12 : Residential Showerheads DV Requirement

DV Component	Specification	DV Requirement Checklist	Available in Utility Customer Files?
Measure Identifiers	Delivery: {Retail, Mail-by-Request, Direct Install}	Check Delivery Mechanism	Yes
	Water Heating System Type: {Electric, Gas, Any}	Check the water heating system type	Yes*
	Rated Flow Rate: {2.0 gpm, 1.75 gpm, 1.5 gpm}	Check the flow rate	Can be derived.
Savings Baseline	Retail (Current Practice)	N/A	
	Mail-by-Request, Direct Install (Pre-Conditions)	N/A	
Implementation and Product Standards	N/A	N/A	

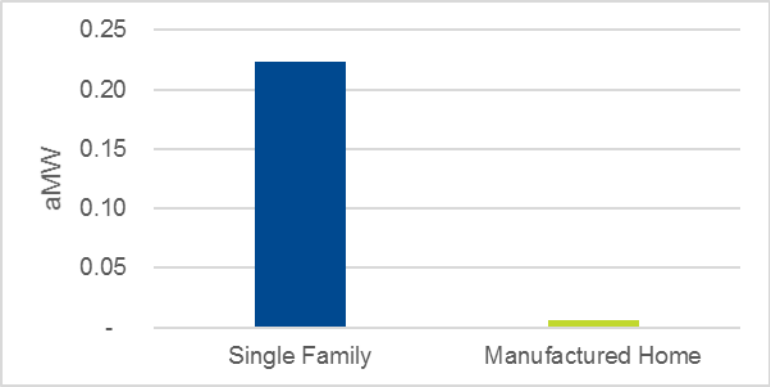
** For by-request and DI measures only.*
Source: RTF

Appendix D: Residential Heat Pump Water Heater (HPWH)

Savings

Figure 11 shows the breakdown of energy savings for the residential heat pump water heater (HPWH) evaluation measure group by house type.

Figure 11: Residential HPWH: Breakdown by House Type (FY2016)



Source: Summarized from 03/07/2017 IS2.0 data pull for FY2016 data.

Table 13 shows the breakdown of energy savings by measure status.

Table 13: Residential HPWH: Breakdown by Measure Status (FY2016)

Measure Status[30]	Savings (aMW)	Fraction of Measure Group
Provisional[31]	0.23	100%

Source: Summarized from 03/07/2017 IS2.0 data pull for FY2016 data.

Sample Size

Table 14. Draft 2016 Sample Size for the Residential HPWH

Measure Group	Strata	Assumed CV	Number of Utilities	Target Number of Projects*
Residential – HPWH	Large Contributors	0.3	5	~ 9
	Small Contributors	0.3	3	~ 22
	Subtotal		**8**	**~ 31**

** This value represents the target number of projects for which the evaluation team requires usable data. In order to reach this number, the team will need to request billing data for roughly twice as many projects.*

[30] *Measure Status from UES Deemed List Version 4.1*
[31] *Measure status for the Residential HPWH is changed to "Provisional" on the RTF website as of Nov 9, 2016*

Source: Navigant Analysis

Delivery Verification Requirements

Table 15 : Residential HPWH DV Requirement

DV Component	Specification	DV Requirement Checklist	Available in Utility Customer Files?
Measure Identifiers	Efficiency Tier	Check Efficiency Tier	Can be derived
	Install Location	Check whether unit is installed in an unconditioned garage/basement or a conditioned interior space.	Yes
	HVAC Type	If unit is installed in conditioned interior space, check whether heating system is a gas furnace, resistance type (electric furnace or electric zonal) or a heat pump.	Yes
	Exhaust ducting	Check whether exhaust air is ducted to the outside.	Yes
	Heating Climate Zone	Check the heating zone.	Can be derived
Savings Baseline	Current Practice	N/A	
Implementation and Product Standards	NEEA Northern Climate Heat Pump Water Heater Specification	- Check that unit is listed on the Northern Climate Specification QPL for the claimed efficiency tier or the unit meets all efficiency requirements of the Northern Climate specification for the claimed tier. - If tier qualification is dependent on operation mode, check that operation mode is set to the one required by the claimed tier.*	Yes

** The PTCS Installation Form does not cover this conditional requirement. The evaluation team will contact the sampled sites if any such heat pump is selected in the evaluation sample.*
Source: RTF

Appendix E: Agricultural De-energization

Savings

Table 16 shows the breakdown of energy savings for the agricultural de-energization evaluation measure group by measure status.

Table 16: Agricultural De-energization: Breakdown by Measure Status (FY2016)

Measure Status[32]	Savings (aMW)	Fraction of Measure Group
Small Saver	0.20	100%

Source: Summarized from 03/07/2017 IS2.0 data pull for FY2016 data.

Sample Size

Table 17. Draft 2016 Sample Size for the Agricultural De-energization

Measure Group	Strata	Assumed CV	Number of Utilities	Target Number of Projects*
Agricultural – De-energization	N/A	N/A	**3**	**~ 3**

** Agricultural – De-energization measure group has only three projects in the FY2016 IS2.0 data. The evaluation team will be reviewing all three projects for the 2017 evaluation.*
Source: Navigant Analysis

Delivery Verification Requirements

There is currently no RTF measure workbook or RTF defined delivery verification requirements for the de-energization measure. BPA's IM describes "Transformer De-energization Worksheet" as a documentation requirement. The evaluation team will request these worksheets for the sampled three projects for the evaluation.

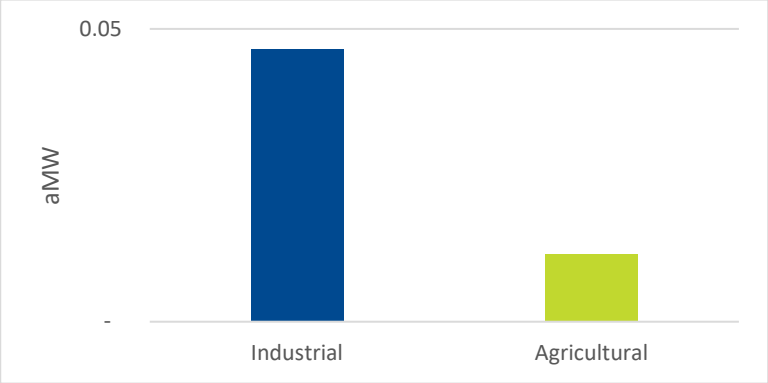
[32] *Measure Status from the RTF website. The UES Deemed Measure List Version 4.1 does not have any measure status assigned to the Agricultural De-energization measure.*

Appendix F: BPA Green Motors (Agricultural/Industrial)

Savings[33]

Figure 12 shows the breakdown of energy savings for the BPA Green Motors program by sector.

Figure 12: BPA Green Motors: Breakdown by Sector (FY2016)



Source: Summarized from EEDB for FY2016, provided by BPA on 12/30/2016

Table 18 shows the breakdown of energy savings by measure status.

Table 18: BPA Green Motors: Breakdown by Measure Status (FY2015)

Measure Status[34]	Savings (aMW)	Fraction of Measure Group
Small Saver	0.06	100%

Source: Summarized from EEDB for FY2016, provided by BPA on 12/30/2016

[33] *Savings for BPA Green Motors evaluation measure group are summarized from Energy Efficiency Data Base (EEDB) for FY2015 provided by BPA on October 31st 2016. These savings will be revised once Navigant receives data for FY2016.*
[34] *Measure Status from the RTF website. The UES Deemed Measure List Version 4.1 has "Proven" as a measure status for these measures.*

Sample Size

Table 19. Draft 2016 Sample Size for the BPA Green Motors[35]

Measure Group		Assumed CV	Target Number of Projects
BPA Green Motors	***Subtotal***	***0.3***	**~ 9**

Source: Navigant Analysis

Delivery Verification Requirements

Table 20 : BPA Green Motors DV Requirement

DV Component	Specification	DV Requirement Checklist	Available in Third Party Database?
Measure Identifiers	Measure Type	Check measure type and match with specification	Yes
	Horsepower (HP) Rating	Check motor HP rating	Yes
Savings Baseline	Pre-Conditions	N/A	
Implementation and Product Standards - Continued	Motors are rewound by Green Motors Practices Group (GMPG) program participants to the GMPG specifications. Measures are identified by motor horsepower ratings that range from 15 to 5,000.	- Check motors rewound by Green Motors Practices Group (GMPG) certified shop	Yes*

** BPA has a list of the GMPG Certified Shops which will be used to verify this requirement.*
Source: RTF

[35] *The draft sample for BPA Green Motors evaluation measure group is calculated from Energy Efficiency Data Base (EEDB) for FY2015 provided by BPA on October 31st 2016. This sample will be revised once Navigant receives data for FY2016.*

Appendix G: Utility Customer Contact Protocols & Supporting Documents

Contact Protocols

The Navigant team will adhere to the following end user and utility contact protocol for each evaluation cycle that includes approaches which require the team to contact end users and utility representatives:

1. **Utility Pre-Notification and Overview Brown Bag**
    a. Once the evaluation plan and sample are almost final, BPA will notify utilities via email that at least one project in their territory may be selected in the evaluation sample. This initial email will request the primary utility contact for the evaluation and provide information summarizing the measure groups and approaches for which the utility may be sampled. This email will also include an invite to an overview brown bag and the draft evaluation plan.
    b. Utilities will provide their primary utility contact for the evaluation and have two weeks to review and comment on the plan. Utilities can choose to attend the 1-hour brown bag that will provide an overview of the evaluation plan.
2. **Utility Notification of Sample and Detailed Brown bags**
    a. Once the evaluation plan and sample are final, the evaluation team will provide detailed information to each utility about their sampled sites (address, completion date, number of units, invoice number) through a secured file transfer protocol (FTP) and provide detailed information on what information is needed, as well as any data templates to be completed.
    b. BPA will host a kickoff meeting on April 11th, 2017 to provide detailed information about the evaluation, its general process, and the contact protocols. BPA will schedule time with utilities individually, if requested.
    c. Any utility submitting data directly to the evaluation team may negotiate and execute with the evaluation team a non-disclosure agreement that meets the utility's requirements for protecting end user information.[36] BPA's contract with the Contractor protects data under the language of BPA's existing contract with the evaluation firm.
3. **Project Documentation Requests**
    a. If BPA cannot provide the project documentation for sampled projects, the utility will be contacted by the evaluation team and the needed files will be included on the

[36] *BPA has a contract with the evaluation firm that requires data protection of the data. Therefore, this NDA may be most useful to utilities that provide data directly to the evaluation team.*

sample list. While the focus will be on the required documentation, utilities may provide whatever additional data they collect to the evaluation team.

b. The evaluation team will provide a timeline for file delivery, which will provide a minimum of 6 weeks. The utility (or BPA, if requested by the utility) will upload required files to a secure website. The evaluation team will work with utilities individually to support their data request as much as feasible, including providing support staff to collect (scan and upload) paper files, etc. An extended delivery date may be requested and will be accommodated, if possible.

c. If a utility encounters with any issues through secure FTP, evaluation team will mail an encrypted thumb drive and request utility representative to upload project documentation to the encrypted thumb drive and send the thumb drive back to the evaluation team.

d. In order to strive to provide timely and actionable evaluation results, the team has created an escalation protocol to be initiated should data collection efforts become significantly delayed and pose an impact to the schedule. The protocol is:
    i. Initial sample emails sent by evaluation EER with copy to utility EER and utility COTR.
    ii. If a utility requests more time, within the agreed-upon time limit, utility EER and utility COTR are notified
    iii. If a utility misses deadline, then evaluation EER, utility EER, COTR and AE are notified of the missed deadline. The utility EER and the utility AE will discuss an approach to the data collection, including potential escalation to utility management.

4. Billing Data Requests

a. Billing data refers to energy consumption data by customer and premise for relevant participants. Depending on the measure being evaluated, the template may also include additional data fields to fill out on an "if available" basis, such as existing primary heating system.

b. This data will be collected using a data template excel workbook. This workbook will include instructions, an example, the data template to fill out, and contact information for any questions that arise. For example, Navigant will ask utilities how they define completion data in data request stage. This workbook will provide a list of all unique projects for each utility as well as a list of all consolidated sampled sites. The list of unique projects for each utility will provide the information on full sample for each utility. Any potential duplicate projects discovered on the list of unique projects due to invoice errors or other similar issues will be removed from the list of consolidated sampled sites to clarify utilities on the actual billing data required for the evaluation. This list of consolidated samples sites will help evaluation team to identify the combination of the sampled end user and the site at which the measures were installed.

c. The evaluation team will provide a timeline for file delivery, which will provide a minimum of 6 weeks. The utility (or BPA if requested by the utility) will upload

required files to the secure website. The evaluation team will work with utilities individually to support their data request as much as feasible, including providing support staff to collect (scan and upload) paper files, etc. An extended delivery date may be requested and will be accommodated, if possible.

d. Following an initial analysis of the billing data, the evaluation team may request additional data for a select number of sites where the evaluation team finds unexpected results. The evaluation team will work with utilities to facilitate the data transfer with the least burden on the utilities. The evaluation team will be prepared to collect this data through a data template filled out by the utility, enabling the utility to transfer information as it exists using secure FTP or encrypted thumb drive, sending evaluation staff to the utility site or other method as preferred by the utility.

5. Web/Phone Surveys of End-Users

a. Utilities will be notified at least 4 weeks prior to any end-user contact via the web or phone surveys. They will be provided the survey instrument and materials to support any contact they'd like to make with end-users, including:

   i. **Advance letters:** Sending letters to primary site contacts prior to a recruitment call has been found to increase the success of end-user recruitment. The letter notifies the end-user that the site has been selected for evaluation and that the evaluation team will be calling to conduct a phone survey. It provides a brief idea of what impact evaluation means and why the site is being evaluated. The letter will also detail incentives and site activities to be performed by the impact evaluation team, where relevant. Please see below.

   ii. Evaluation team will support utility account representatives and provide a set of potential **call center talking points** to minimize any potential concerns by the end users. Please see Appendix H sample set of potential frequently asked questions that would be provided to utility account representatives.

b. For phone surveys: Recruiters on the evaluation team will call approved end users to identify their availability and interest in participating in the study. The program evaluation will strive for high rates of end-user participation to ensure unbiased results. The recruitment methods will include the following techniques:

Sample Letter for Primary Site Contacts

INSERT Example Utility Logo

2017

Dear [Utility Name] Customer:

Our records show that you have participated in the [Utility Program Name] Program in [Year of Participation]. Thank you for your participation.

The purpose of this letter is to inform you that you have been selected at random to participate in a research study of the effectiveness of [Utility Name & Utility Program Name] Program, and you may be contacted soon by telephone with a request for your participation in a short phone survey to gather information about your program equipment. [Utility Name] has contracted Navigant Consulting to conduct this study.

We appreciate your support of [Utility Name]'s energy efficiency efforts and we are grateful for your participation in this research. The information you provide will help determine the effectiveness of existing efficiency programs and assist in the design of future programs. Your participation in this study will not affect your bill through [Utility Name].

All data collected during this research will remain confidential. If you have any questions, please contact [Utility Name].

Sincerely,

[Utility Representatives' Names, Signatures and Contact Information]

Sample Call Center Talking Points

[Utility Name] is currently employing Navigant Consulting (NCI) to conduct an evaluation of its energy efficiency programs. This fall, the evaluation team is conducting phone surveys for [Utility Name] customers for its [Utility Program Name] Programs.

Between [Start date of site visits] and [End date of site visits], the evaluation team is fielding a phone survey to [Utility Program Name] participants. Table 21 provides key contact information by role.

Table 21. Evaluation Team Contact Information

Who	Role	Contact	What	When
Navigant [Evaluation Team Member's Name]	[Utility Program Name] [Role]	TBD	Site visits	TBD

Source: Navigant

Table 22 summarizes the evaluation efforts, including duration and target number of completed surveys.

Table 22. Evaluation Information

Evaluation Effort	Estimated Number of Completes	Estimated Duration
Site visits [Utility Program Name]	TBD	TBD

Source: Navigant

If the customer has any further questions, please direct them to [Utility Representative Name and Contact Information].

Appendix H: Sample List of FAQs for Sampled End Users

Q: What is the purpose of the study?

This study is being conducted to determine energy savings associated with [Utility Program Name]. In order for utilities to offer reliable and cost-effective [Utility Program Name] program, we need data to prove [Utility Program Name] practices save energy. Studies like this one allow Northwest utilities to continue to provide energy-saving programs.

Q: Who is sponsoring this study?

A: This study is sponsored by Bonneville Power Administration in partnership with your local utility.
Bonneville Power Administration conducts studies like this every few years to evaluate energy efficiency program opportunities. Past studies are available on the Bonneville Power Administration website located at http://www.bpa.gov/ .

Q. Is there a cost to participate?

A: No. Participants will not be responsible for any costs associated with participating in this study. Any equipment used on site will be provided by Bonneville Power Administration or participating study partners.

Q: How are participants selected for this study?

A: All participants were selected randomly.

Q: How will my information be kept secure?

A: During the course of this study, all personal information, energy use, and other provided information will be protected on a secured website. All research data will be presented in aggregate, and no reports published internally or externally will contain any personally identifiable information.

Q: Who is the primary contact for this study?

A: The primary contact throughout the study period will be your utility account representative.

Q: What are the benefits of participating?

A: Participants will be assisting in a very important study that will ensure that energy efficiency strategies are effective and delivering value to customers. At the end of the study period, a report will be published identifying the results for the [Utility Program Name]. This report may provide guidance for future participants of the [Utility Program Name].

Q: Can I volunteer to participate if I was not selected for the study?

A: Unfortunately, no. Since this is a randomized study, only participants of the [Utility Program Name] who was randomly selected will be invited to participate.

Appendix I: Sources of Error & Mitigation Strategies

The Navigant team's evaluation approach will include a reliability assessment to reduce threats, bias, and uncertainty in the evaluation activities. Potential sources of errors and mitigation approaches for these evaluations might include the following:

1. **Non-Response Bias:** Non-response bias is always an issue when conducting surveys of voluntary participants. If phone surveys are utilized in 2017, the evaluation team will employ industry standard techniques for mitigating the impact of non-response. These include stratifying the sample, making phone survey calls at varying times of day and evening, and calling sampled participants at least seven times before removing them from consideration. The evaluation team will enlist BPA staff to make initial utility contacts and follow up to ensure participation of sampled utilities.

2. **Sample Bias:** The sample will be drawn with representativeness targets as described above. Quotas for representativeness reduce the likelihood that a random sample will misrepresent the population, by ensuring that the sample population represents the participant population with respect to whichever parameters, if any, exist that correlate to savings.

3. **Self-report bias:** When end-users are asked questions as part of a survey, the accuracy of their responses are subject to biases and errors in their memories or in their interpretation of past events. While meaning to provide truthful answers, end-users may give responses that contain information that is different than would have been collected on-site, leading to biased data. Navigant will mitigate this bias by asking specific questions that may help the respondent to recall their experiences with the program. The Navigant team will utilize its best practices developed from its previous experiences with end-user surveys to ensure the correct questions are asked in the proper method.

4. **Methodological Error:** The evaluation work conducted will include careful analysis and quality control to ensure that results have real meaning and do not overstate the conclusions that can be derived from the available data. In some cases, the evaluation team will conduct method review sessions with outside experts, including utility and RTF staff.

Appendix J: Billing Data Collection Template

The following figures are excerpt from the 2017 data collection template. As mentioned in Section 4.3, the evaluation team will work together with BPA and regional stakeholders to ensure data requests are as similarly and streamlined as possible to reduce customer utility burden and improve evaluation efficiency in the region.

Figure 13. Billing Data Collection Template – Required Fields

DHP eFAF Projects

	REQUIRED											REQUIRED if NET or MASTER Metered
	Parameter that represents a **Unique Customer Account**	Parameter that represents a **Unique Address** (e.g. Premise ID)	**State**	**City**	**Zip**	**Street Address**	**Additional Address Info** (e.g. unit)	**Meter Number**	**Meter Read Date**	**Read Code** Help us understand your Read Codes (Actual, Estimated, Re-)	**Days in Read Cycle**	**kWh Usage**	**Rate Class** As defined on 'Add'l Info' tab
Example:	99999	100010	WA	Odessa	99159	123 Anonymou	2D	12345	5/20/16	Actual	30	1153	R-01
	99999	100010	WA	Odessa	99159	123 Anonymou	2D	12345	6/20/16	Actual	31	807	R-01

Source: Navigant

Figure 14. Billing Data Collection Template – Data Clarifications

Please Provide the Following Clarifications of Your Data
This will help reduce our clarifying questions and improve our analysis of your data!

	User Input Requested

Rate Class	Can you please describe the rate classes are included in the data you provided? We've identified some common classes, to get you started.
Residential Rate	Standard residential rate for service territory.
Net Metering	Energy generation occurs on customer side of the meter.
Pre-Pay	Customers pay for energy before they use it.
Time of Use	Energy rates based on time of energy consumption.
Master Metering	A single meter tracks consumption for multiple dwellings.
Other - FILL IN	
Other - FILL IN	
Other - FILL IN	

Are there any bill corrections in this data and how can we identify them?
FILL IN:

Have there been any major rate schedule changes over this time frame? (e.g., push for pre-pay or TOU rates)
FILL IN:

Read Code	Can you please describe the read codes included in the data you provided? We've identified some common codes, to get you started.
Actual	Actual meter read.
Estimated	Estimated meter read (either computer or manual estimate).
Notation	Identifies re-billing for bills past-due.
Other - FILL IN	
Other - FILL IN	
Other - FILL IN	
Other - FILL IN	

Anything else we should know about your data?
Example: It typically takes us ~30 days between the end of installation and getting everything ready to pay the invoice.
Example: We see a lot of vacant sites getting energy upgrades and then getting filled.
FILL IN:
FILL IN:
FILL IN:
FILL IN:
FILL IN:

Source: Navigant