**Market Transformation: In-Home Smart Devices Pilot**

**SUMMARY OF 60-DAY NOTICE:**

Public Service is posting this 60-day notice to make some changes to the In-Home Smart Devices Pilot implementation. The changes that are being made to this plan are due to challenges experienced since the Pilot began in 2009 in certifying in-home smart devices that met our functional and security testing requirements as well as installation problems experienced in Boulder after an acceptable device was approved and certified in August 2011. More clarity has been added to the Pilot plan description regarding the type of devices that will be installed, the recruitment process, the spend forecast, and the evaluation plan. We expect that the final Pilot evaluation will be completed in 2013. The following are some of the major points of the plan for 2012 and 2013:

- In 2012, we will be installing 1,149 In-Home Smart Devices in the Greater Denver area. This is an increase from what was originally planned for this area and is due to a higher concentration of central air conditioning within this larger population and a more favorable permitting process. Thirty-five (35) units that were installed in Boulder in 2011 (outside of the SmartGridCity Pricing Pilot) will be used in this Pilot as well.

- A Control Group for analyzing energy reduction will be selected based on consumption data, geographical location, and customer segmentation information so that each member of the control group is “matched” to a participant.

- The demand reduction analysis during control events will be analyzed by dividing the in-home smart device recipients into two groups for alternating control events and analyzing the difference in interval metered data during events.

- Pilot Objectives will remain the same as originally filed in the 2012-2013 Colorado DSM Plan except that the analysis will only be for electric and not natural gas. Natural gas impacts should have been excluded from the Pilot write-up. We have not included natural gas in the budget or filed Evaluation, Measurement and Verification Plan. During the execution of Control Events, we will not control the participant’s thermostat while it is in the heat or off mode. As a result, there will not be any measurable gas savings.
Market Transformation: In-Home Smart Devices Pilot

A. Description

The In-Home Smart Device Pilot that began in late 2009 is designed to test how customers respond to various control strategies and energy consumption information delivered to their homes through in-home energy management devices.

Multiple device providers currently participate in the Pilot and it is Public Service Company of Colorado’s desire to test a variety of devices and load control strategies to determine which are most effective. Participants are expected to lower their energy consumption when provided with the in-home smart devices that allow them to monitor and track their energy usage. Participants will receive a combination of in-home devices (package) from the following list, depending upon the device provider and their meter type:

- Utility-controllable programmable thermostat, typically wireless
- Utility-controllable plug-load or hard wired appliance module
- Controller (Gateway) to communicate with thermostat and plug-load modules
- Encoder-Receiver-Transmitter (ERT) meter bridge capability (for customers outside the broadband over power line (BPL) footprint).

Participants will receive an in-home smart device system that includes the following described below:

- Utility-controllable Honeywell thermostat
- Two EnergyHub sockets
- The EnergyHub home base that wirelessly communicates with the CT sensor, the thermostat and sockets
- The EnergyHub wireless CT sensor which provides whole home energy usage information to the home base

Energy conservation through behavioral change is a large and untapped source of savings for both utilities and their customers. Customer behavior is a key determinant of residential energy use and studies show that energy use feedback and related strategies influence behavior by significantly reducing consumption. The intent of the Pilot is to quantify how various devices and feedback methods affect customer electricity and natural gas usage. After the results have been analyzed, Public Service will decide whether to discontinue the Pilot or offer it to a broader audience within its service territory. The utilization of technology in conjunction with customer control and choice has the potential to transform the market.

Since the Pilot began in 2009, we have experienced delays reaching the device installation phase due to several factors. Devices must first pass rigorous functional and security testing before they are certified by Public Service. Obtaining in-home smart devices that meet our functional requirements and pass our testing has been challenging.
and it is important for these devices to perform as required to ensure they provide the best customer experience and meet our evaluation objectives. Additionally, device providers have found it challenging to integrate their systems with the Company’s online account management system (OAM), which is needed in order for customers to access their in-home smart devices online at the Company’s My Account web portal.

In early 2011 and in response to these challenges, the company re-evaluated its functional requirements for this Pilot. We determined integration with the Company’s OAM web portal would not be necessary if the device provider had an existing web portal that provides a similar experience as the Company’s OAM. When we removed this integration requirement for in 2011, several device providers submitted systems for testing and certification. In August 2011 Public Service approved and certified the EnergyHub in-home smart device system based on successfully meeting our functional and security requirements. As a result, we began are now targeting to start the installation phase in the summer fall of 2011 and complete a majority of these installations by the end of 2011 completed 35 customer installations in Boulder outside of the Smart Grid City Pricing Pilot. For 2012 we plan to install 1,149 systems outside Boulder for a total of 1,184 installations. We anticipate the remaining planned installations will occur in 2012. For this Pilot, we are targeting installation of 1,850 systems in homes within the Boulder area, also known as the SmartGridCity area, that have smart meters and 400 systems outside this area. Of those 1,850 systems in Boulder SmartGridCity area, 1,264 will be installed in homes of customers who are also participating in the Pricing Pilot. Because of the delays in installation and to enable comparison of price response with and without enabling technology for the same customers, in-home device systems will not be installed in homes of Pricing Pilot participants until after the summer of 2011. The initial focus is on installing device systems in homes of customers who are not Pricing Pilot participants.

Pilot activities for 2012 and 2013 will primarily involve: exercising control strategies, maintaining the devices that have been installed, supporting customers in their use and providing outreach and educational resources to ensure customers gain the maximum benefit. However, some in-home device systems are expected to be installed in early 2012 and this expense is reflected in the 2012 budget.

In 2012 we will be installing devices and the remaining Pilot activities for 2012 and 2013 will primarily involve: exercising control strategies, maintaining the devices that have been installed, supporting customers in their use and providing outreach and educational resources to ensure customers gain the maximum benefit and performing analysis of impacts of the devices.

This Pilot was implemented in late 2009 through the 60-Day Notice process and is currently being offered under the 2011 DSM Plan.

B. Goals, Participants and Budgets

Goals and Participants
Based on previous research and current Pilot projects by Xcel Energy and other utilities throughout the country, the company expects in-home smart devices and controls to produce first year reductions in electricity and natural gas use of two to ten percent. This Pilot is an indirect program that is intended to validate the proposed methods and technologies and determine if there is marketplace acceptance. As a result, Public Service is not claiming any energy and demand savings goals during the Pilot period and will use the Pilot as an opportunity to study and measure the savings generated by the In-Home Smart Device Pilot. Pilot results will be monitored, quantified, and reported upon Pilot completion. If the evaluation results of the Pilot indicate that in-home smart devices are a valuable and viable energy and demand savings opportunity, the company will consider offering a direct impact product in the future.

Pilot Objectives will remain the same as originally filed in the 2012-2013 Colorado DSM Plan except that the analysis will only be for electric and not natural gas. Natural gas impacts should have been excluded from the Pilot write-up. We have not included natural gas in the budget or filed Evaluation, Measurement and Verification Plan. During the execution of Control Events, we will not control the participant’s thermostat while it is in the heat or off mode. As a result, there will not be any measurable gas savings.

Budgets
The expected budget requirements for 2012-13 are primarily related to ongoing maintenance of devices already deployed, customer education and outreach, evaluation costs and possible incentives that may be needed to encourage participation in market research activities. However, some in home device systems are expected to be installed in early 2012 and this expense is reflected in the 2012 budget.

The overall budget for 2012-2013 is to remain the same as filed in the 2012-2013 Colorado Biennial Plan. However, we plan to accelerate spending to complete the installation of all 1,149 devices in 2012. This is reflected in the 2012 forecasted spend in the table below. The remaining amount of the filed and approved budget for 2012-2013 will be spent on ongoing maintenance of devices already deployed, customer education and outreach, evaluation costs and possible incentives that may be needed to encourage participation in market research activities.

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
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<td>Filed and Approved Budget</td>
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<tr>
<td>Variance</td>
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C. Application Process

Public Service residential customers with electric service are able to participate in the Pilot. To participate, customers must have central air conditioning. Customers will be recruited using a number of marketing tactics. Qualifying customers will be enrolled if
they agree to the terms and conditions of the program contained in the customer agreement. The customer agreement describes how their data will be used for the Pilot and what is required of their participation. Once the customer agrees to the terms and conditions, their installation will be scheduled. Customers will be notified of this Pilot through a consumer education campaign, and marketing done during enrollment. Communication methodologies may include e-mail, direct mail, telemarketing, and community outreach activities such as community workshops.

Current Saver’s Switch customers will be targeted for participation given we already know that they are willing to participate in a utility program that controls their use of electricity. Saver’s Switch customers choosing to participate in the In-Home Smart Device Pilot will have their Saver’s Switch deactivated during the Pilot but will continue to receive their annual bill credit and will be controlled via the In-Home Smart Device on the same days as Saver’s Switch participants. Double counting of savings will not occur between the two programs since the In-Home Smart Device Pilot is indirect and does not claim savings during the pilot.

Participants are accepted on a first-come, first-served basis. To participate, customers must have a smart meter within the SmartGridCity footprint (or an Itron ERT meter outside SGC) and central air conditioning that is not controlled via the Saver’s Switch Product. Saver’s Switch customers wishing to participate will have their Saver’s Switch deactivated during the Pilot. Customers must complete an online qualification survey and if qualified, they will be asked to sign an online customer agreement. The customer agreement describes how their data will be used for the Pilot and what is required of their participation. Once the customer has signed the agreement, they are contacted by a device provider to schedule their installation. Customers will be notified of this Pilot through a consumer education campaign, the SGC web portal and marketing done during enrollment for the Pricing Pilot. Communication methodologies may include e-mail, direct mail, telemarketing, and community outreach activities such as community workshops. Customers outside the SGC footprint will likely be acquired using a targeted telemarketing campaign. The telemarketing firm will be given a randomized list of qualified customers from the Denver Metro area.

D. Marketing Objectives, Goals, & Strategy

The In-Home Smart Device Pilot will offer customers the information and functionality to make behavioral decisions with the potential for year-round energy savings. For 2012 we will target customers in the Denver Metro area that have a central air conditioning system. When recruiting participants within the SGC footprint, the target audience is homes already equipped with a smart meter that also have a working central air conditioning system in the home. Within this target group there are homes that have already qualified for the in-home Pilot either by enrolling online or during the enrollment phase for the Pricing Pilot. Outside of the SGC footprint, we will target customers in the Denver Metro area whose energy characteristics indicate they have and use a central air conditioning system.
Once participants have received their in-home smart devices and in order to positively impact behavior, it is critical they understand what has been installed and to how to use them in a manner that benefits them. Education and outreach activities will be ongoing throughout the duration of the Pilot.

Public Service will use the following marketing strategies to solicit and educate customers in the Pilot:

- Direct mail and e-mail
- Telemarketing participation drive
- Installation leave behind materials designed to educate participants regarding the portal and device capabilities and options
- XE.com A web site or web page designed specifically for participants with in-home smart devices
- In-Home Device users newsletter
- Community outreach through the onsite mobile experience and information workshops
- Possible incentive for research engagement or participation

The In-Home Smart Device Pilot hopes to address the following questions during the pilot period:

- How much will customers reduce their residential electricity and natural gas use when provided with energy consumption feedback coupled with behavior change techniques?
- How much will customers reduce residential electricity and natural gas demand and energy usage when Public Service is allowed to control the temperature setting on their thermostats?
- What are the technical assumptions per participant (i.e., energy and demand, and natural gas savings per participant, number of hours controlled equipment is operated per year, equipment operation coincidence with peak, etc.)?
- Does the Pilot produce sufficient energy and demand savings to make it cost-effective?
- What is the expected lifetime savings from smart device installations and behavioral changes?
- How do customers perceive the various types of feedback, and what actions account for their savings?
- Who is the preferred device manufacturer and what components are most appealing?
- How do customers choose to manage home energy usage via in-home smart devices?
- Are there comfort issues associated with various load management strategies?
- What level of energy and/or financial savings makes behavioral persistence worthwhile for the customer?
If this Pilot shows substantial energy and demand savings, future projects may test additional strategies that complement feedback, such as community-based social marketing, energy workshops, energy use counseling, home performance audits, and/or alternative rate structures. Results of this test will determine if a future DSM product will be offered.

E. **Product Specific Policies**

Customers interested in participation will be required to read, agree to, and sign an equipment installation and energy management agreement (Customer Agreement). The Customer Agreement and equipment installation agreement will be administered by the device installer and provided to Public Service along with other required documentation after the installation has been completed. Each participant is allowed one device package per household. By participating in the In-Home Smart Device Pilot, customers agree to allow the Company to test various load control options and strategies. The controls will be limited in time, frequency, duration, and temperature according to the following restrictions:

- Customer loads will be controlled only on weekdays between the hours of 10:00 AM and 8:00 PM.
- Customer loads will be controlled no more than twice per day and no more than three days per week (Monday through Friday).
- Customer loads will be controlled for no more than six consecutive hours per Control Period.
- Customers’ thermostats only in COOL mode will be adjusted by no more than plus or minus five degrees Fahrenheit during a Control Period.

F. **Stakeholder Involvement**

The Company has worked closely with device providers, who will provide the following services:

- A PSCo approved certified device system or package that has met the company’s established functional and security test requirements.
- Qualifying and enrolling customer, scheduling their appointments, and professionally installing the devices.
- Fulfillment of each request by making arrangements and installing the device package (targeted completion for all devices is early 2012);
- Management of customer inquiries via toll-free telephone number and link to provider’s website; and
- Recording of installation data and signed Customer and installation agreements for each participant receiving a device and report monthly to the Company.
- For those device providers who choose not to integrate their systems with the company’s OAM web portal, they will provide their own customer facing web portal with similar characteristics and features similar to the company’s OAM web portal.
• Providing their own customer facing web portal with similar characteristics and features to the company’s OAM web portal.

G. Rebate Levels

The In-Home Smart Device Pilot provides the devices and installation services to participants at no cost and does not provide a rebate.

H. Evaluation, Measurement & Verification Plan

Because this is a Pilot without claimed savings, it does not yet have Technical Assumptions developed for the control group and proposed pricing structures. Instead, Public Service has contracted with MetaVu and Global Energy Partners to collaboratively measure impacts. Global will be responsible for the analysis and impact estimation, and MetaVu will be responsible for project management and reporting. The following specifies in more detail the approach and tasks that will be performed as part of the impact estimation for the IHSD pilot:

Preliminary Evaluation

The preliminary evaluation will provide initial estimates for the impact of the In-Home Smart Device Pilot based on the first summer of the Pilot, to the extent possible based on the number of installed sites, using a difference of differences approach. This task consists of the following subtasks:

• Transfer load and survey data from Public Service to Global, then validate and cross-check the data. This will include any available survey or demographic information, the date that participants became active in the Pilot, billing data for all participants and control group members, and 15 minute kWh data for all participants collected from their in-home smart device, and hourly load data for all customers. Global will then verify that data are available for all customers in the pilot (both control group and participants), and that the data are present for all hours and are internally consistent. Before transferring the data to Global, Public Service will complete their standard load data validation checks and data editing, so that the data are complete, correct, and are consistent with monthly billing data. As part of this subtask, Global will also tie the data from different sources together to ensure consistency and enable the analysis for the remainder of the project.

• Estimate impacts using a difference of differences approach. This approach estimates the impact of the Pilot as the difference between the average load shape of the participant group and the control group, corrected for any pre-pilot differences between the two groups.

If there are not a sufficient number of systems installed by the beginning of the summer of 2012, the preliminary analysis will cover a portion of the summer and some of the fall.
To determine the overall impact on consumption a matched control group will be used. Once all 1,149 participants have been determined, a control group will be selected based on consumption data, geographic location and customer segmentation information so that each member of the control group is “matched” to a participant. Electric usage data (kWh) will be collected for each participant and control group member from billing data. This will be used to determine overall energy savings.

For analyzing event day demand participants will be assigned to either Group A (592 participants) or Group B (592 participants) allowing control events to be called for Group A participants only, Group B participants only, or both groups simultaneously. By calling events in this manner Group B can be used as a control group to determine Group A’s response to control events and vice versa. Impact will be determined by evaluating 15 minute interval energy usage data (kWh) collected from the participant’s in home devices.

Final Evaluation
Using data from both 2011 2012 and 2012 2013, Global will refine the estimates for summer 2011 2012 from the preliminary evaluation, and will estimate the impacts for fall/winter 2011/2012 2012/2013 and summer 2012 2013. This task consists of the following subtasks:

- Estimate impacts using a difference of differences approach for the entire time period. Global and MetaVu will calculate impacts for winter 2011/2012 2012/2013 and the summers of 2011 2012 and 2012 2013 to check consistency between the summers. Global will calculate both the impacts and the related confidence intervals.

- Estimate impacts using a regression approach for the entire time period. A regression approach, such as what was used in Public Service’s earlier residential pricing pilot, accounts for the specific characteristics and appliances of each customer, includes the information about the specific weather on each day, and quantifies how these factors interact to influence the load impact of the pilot. Using a regression model to estimate the impacts will allow Public Service to define the range of impacts that they will see across different customer types and different weather.

Prepare final report with results for fall/winter 2011 2012/2012 2013, and the summers of 2011 2012 and 2012 2013. Global will provide the final results and descriptions of the methods used to MetaVu for inclusion in the preliminary evaluation report that they will deliver to Public Service.