

4.7 AMI Assessment Budget

The total budget for all AMI assessment activities, deliverables, and milestones described in this plan, between Q3 2009 and Q3 2011 is \$12,619,500. *Table 28* provides an overview of the costs associated with each application group. The spreadsheet that accompanies this plan provides the details associated with the budget.

Application Group	Technology	Rate	Control	Total	Grand Total	
				Estimated Cost	O&M	Capital
Web +				3,640,000	3,600,000	40,000
F1		Flat		0	N/A	N/A
F2		Flat		0	N/A	N/A
F3		Flat		0	N/A	N/A
F4		Flat		0	N/A	N/A
F5		Flat		0	N/A	N/A
F6	Basic IHD	Flat		49,000	49,000	0
F7	Advanced IHD	Flat		307,000	307,000	0
E1	Web +	IBR		463,500	13,500	450,000
E2	Basic IHD	IBR		69,000	69,000	0
E3	Advanced IHD	IBR		327,000	327,000	0
D1	Web +	CPP/DA-RTP		442,500	17,500	425,000
D2	Basic IHD	CPP/DA-RTP		77,000	77,000	0
D3	Advanced IHD	CPP/DA-RTP		335,000	335,000	0
D4	PCT/IHD	CPP/DA-RTP	Tech	555,000	555,000	0
D5	Web +	PTR/DA-RTP		217,500	17,500	200,000
D6	Basic IHD	PTR/DA-RTP		69,000	69,000	0
D7	Advanced IHD	PTR/DA-RTP		327,000	327,000	0
D8	PCT/IHD	PTR/DA-RTP	Tech	547,000	547,000	0
L1	Web +	DA-RTP		488,500	13,500	475,000
L2	Basic IHD	DA-RTP		69,000	69,000	0
L3	Advanced IHD	DA-RTP		327,000	327,000	0
L4	Web +	TOU		388,500	13,500	375,000
L5	Basic IHD	TOU		69,000	69,000	0
L6	Advanced IHD	TOU		327,000	327,000	0
Fixed Costs				3,525,000	3,300,000	225,000
Total				\$12,619,500	\$10,429,500	\$2,190,000

Table 28: Application-based budget for the AMI assessment.

4.8 Project Communication, Monitoring, and Reporting

The AMI assessment project will be monitored on a regular basis, with data being collected daily for both project metrics and customer behavior metrics. As described in *Table 29*, this data will be migrated into several different types of briefings and reports.

Task	Description	Responsibility
Executive Briefings	At a frequency of at least once per quarter, the project team will report the progress of the AMI assessment to the ComEd executive team through a formal face-to-face presentation.	ComEd
Stakeholder Briefings	At a frequency of at least once per quarter, the project team will report the progress of the AMI assessment to internal and external stakeholders through a formal face-to-face presentation. This includes a preliminary evaluation report completed by March 31, 2011.	ComEd
Quarterly Analysis Report	During the actual AMI assessment (Q2, 2010 through Q2, 2011), a data analysis report will be prepared to report the statistical results associated with the customer applications.	Evaluation Vendor
Monthly Progress Report	During the project (Q2, 2009 through Q3, 2011), a monthly report will be prepared to report results and progress associated with project tasks and milestones, key project metrics, and consumer behavior metrics, including opt-out rates, enabling technology adoption, and so on.	ComEd
Weekly Email Briefings	Each week during the project (Q2, 2009 through Q3, 2011), a short email report will be emailed to an internal/external stakeholder distribution list. This report will summarize current work efforts and progress, successes, issues, resolutions to prior issues, and other information.	ComEd
Daily Notifications	When appropriate, reflecting issues of significant importance, daily notifications will be distributed to an internal stakeholder distribution list.	ComEd

Table 29: Monitoring tasks associated with the AMI assessment.

4.9 Project Post Mortem

At the conclusion of the AMI assessment project (Q3, 2011), internal and external stakeholders will conduct a project post mortem. The aim of this post mortem is to assess how well the stakeholders met the goals and objectives associated with the project, and elicit from team members the lessons learned associated with executing an AMI customer applications program. The benefit of this project post mortem is to capture knowledge that ComEd and other utilities can use for executing a full-scale implementation of an AMI system.

The format of the post mortem is as a facilitated meeting, similar to the stakeholder workshops conducted in Q1, 2009. Presentations by key team members will present results associated with the project, and group activities will collect the ideas and lessons learned from the various stakeholders in attendance. This content will be organized into a final project post mortem report.

5. Risks and Contingencies

The AMI assessment proposed in this plan is aggressive with inherent risks. ComEd’s strategy for mitigating risks centers around three key elements:

1. Processes. All efforts associated with this project are aligned with a logical, systematic processes to execute the AMI assessment. A well-defined process reduces risk.
2. Models. Ideas and designs are derived from evidence-based research and models. Using models to guide design decisions reduces risk.
3. Standards. Alignment with various standards, from project management standards to research validity standards. Alignment with these standards reduces risk.

Throughout this plan ComEd uses generally-accepted processes, models, and standards as the foundation for the plan’s content. The following sub-sections discuss the key risks and contingencies associated with five risk categories: threats to validity, project, customer experience, and technology.

5.1 Threats to Validity Risks

Table 30 lists the key threats to validity risks³² associated with the AMI assessment project and the contingencies ComEd is planning to mitigate those risks.

Risk	Contingency
1 Threats to Validity	
1.1 Opt-out/drop-out initially or during the assessment reduces sample size below desired confidence levels.	<ul style="list-style-type: none"> • Set desired sample size for highest confidence level (99%). • Proposing, on an expedited basis, tariff amendments that would allow for enlargement of the customer groups. • Over sample each application to account for estimated drop-out rates. Estimated subject drop-out rate is 1% to 3% per month, or 24 to 72 subjects per application. • Accept minimum confidence level of 95% (requires 116 customers per control/application). • Use opt-out as a primary measure of customer dissatisfaction with the AMI program. • Hold a portion of customers in reserve (not assigned to a control or application) and develop a plan for a less than one year (e.g., six month or three month) parallel assessment if numbers in the primary assessment fall below minimum confidence levels.

³² See Cook, T.D. and Campbell, D.T. (1979). *Quasi-Experimentation: Design and Analysis Issues for Field Settings*. Belmont, CA: Wadsworth Publishing. A summary of threats is available at: <http://horan.asu.edu/cook&campbell.htm>

Risk	Contingency
1.2 Applications are not administered in a standard fashion to customers, creating confounding variables.	<ul style="list-style-type: none"> • Each control and application will have one or more service scripts that define how customers will receive services associated with the AMI assessment. • Each application will be designed using generally-accepted, customer-centered models, methods, and processes. • All customer education and communications will be based upon the content in the Smart Meter User Manual; Unique versions of the SMUM containing additive content will be created for each application group. • Front-line ComEd employees (such as field technicians and customer care center staff) will receive training in how to execute service scripts to increase standardization.
1.3 Variables associated with the customer's setting may impact the effects associated with applications.	<ul style="list-style-type: none"> • Surveys during the AMI assessment will include questions to assess the effects of customer setting. Steps would be taken to ensure these surveys do not adversely affect customer behavior. • The post-assessment survey will include questions that assess the effects of customer setting.
1.4 Events between the pre and post surveys may impact effects.	<ul style="list-style-type: none"> • Measures that can be used to assess events and filter data will be included in the study. This includes: <ul style="list-style-type: none"> ○ Dummy variables to account for such things as seasons, days, and so on. ○ Weather data. ○ Significant events that occur during the assessment period.
1.5 Opt-out/drop-out rates are different between applications, which influences effects.	<ul style="list-style-type: none"> • Collect data during opt-out/drop-out to assess effects on the application group. • Offer cash incentives for participation (\$15 for pre-survey; \$35 for post-survey). • Offer multiple channels/touchpoints for survey completion (paper, web, phone, and field). • Pre-notify customers through mail, email, and phone to remind them to complete a forthcoming survey. • Follow-up with phone interview for paper/web survey non-respondents.
1.6 Communication between customers in different control and application groups about their respective applications which influences behavior.	<ul style="list-style-type: none"> • Surveys during the AMI assessment will include questions to assess the effects of inter-customer communication. • The post-assessment survey will include questions that assess the effects of inter-customer communication.
1.7 Control customers learn of their underdog or deprived status, which erodes energy behavior effects.	<ul style="list-style-type: none"> • Recruit the control groups, specific group F1, from a region outside the I-290 Corridor and city of Chicago. • Do not let control group customers know that they are in a control group. Frame control group customers receiving AMI meters that they are participating in a "technology test" only.
1.8 Customers attempt to conform to the hypotheses associated with the AMI assessment.	<ul style="list-style-type: none"> • Keep customers, ComEd employees (especially front-line employees), vendors, the press, and other potential touchpoints blind to the hypotheses associated with the AMI assessment.
1.9 ComEd or stakeholder expectations about desired outcomes may bias the data.	<ul style="list-style-type: none"> • Retain a third-party evaluation vendor to collect data and analyze the results.

Risk	Contingency
1.10 Customers who refused to participate in the AMI assessment may limit generalizability of the results.	<ul style="list-style-type: none"> • Use an opt-out strategy. • Use customer retention and recovery strategies to keep customers in the AMI assessment.
1.11 Results obtained in the I-290 Corridor and city of Chicago regions may not apply to other regions.	<ul style="list-style-type: none"> • Select the I-290 Corridor and city of Chicago with this threat in mind. • Include a comparison of the I-290 Corridor results with the city of Chicago results to assess differences.

Table 30: Threats to validity risks and contingencies.

5.2 Project Risks

Table 31 lists the key project risks associated with the AMI assessment project and the contingencies ComEd is planning to mitigate those risks.

Risk	Contingency
2 Project Risks	
2.1 Implementation of the AMI assessment in May, 2010 is delayed.	<ul style="list-style-type: none"> • Begin work on the project tasks in June, 2009, prior to receiving regulatory approval. • Use established project management practices to manage scope, time, and costs.
2.2 Scope of the AMI assessment is increased due to regulatory additions, unforeseen tasks, and quality enhancements, and so on.	<ul style="list-style-type: none"> • Use established project management practices, such as a work breakdown structure, to systematically analyze all possible tasks. •

Table 31: Project risks and contingencies.

5.3 Customer Experience Risks

Table 32 lists the key customer experience risks associated with the AMI assessment project and the contingencies ComEd is planning to mitigate those risks.

Risk	Contingency
3 Customer Experience Risks	
3.1 Service scripts and materials result in significant customer dissatisfaction.	<ul style="list-style-type: none"> • Test through focus groups or similar methods all service scripts and materials prior to customer delivery. • Use action research methodologies to assess the impact of service scripts and materials, and allow for modification of scripts and materials that aren't working. • Uniquely version all service scripts and materials so that updates can be deployed and the M&V analysis can assess a version's impact on results.
3.2 Customer response rate to pre-AMI survey is low.	<ul style="list-style-type: none"> • Conduct survey through multiple channels (paper, web, and phone). • Follow-up non-respondents with telephone calls.
3.3 Customers assigned to free Advanced IHD and IHD+PCT applications do not respond to the offer to have those devices installed.	<ul style="list-style-type: none"> • Conduct outbound phone call follow-up to schedule appointments for installation. • Allow customers to acquire/install enabling technology throughout the assessment.

Risk	Contingency
3.4 Customers revolt, complain, backlash, and so on regarding being put on a different rate.	<ul style="list-style-type: none"> • Proactively address potential explosive issues, such as high bills, by contacting customers prior to them receiving the bill and/or including information in the bill that explains the increase and strategies for reducing it. • Provide customers an easy process to opt-out. • Provide impeccable customer service. • Offer to place customers back on the flat rate retroactive to the start date of the experimental rate.
3.5 Customers calling the opt-out number note their plans to switch to another energy supplier.	<ul style="list-style-type: none"> • As soon as a customer mentions this, all retention/ recovery strategies must stop. Use existing call center process for appropriate customer communications. ComEd staff will follow ICC rules regarding this issue.

Table 32: Customer experience risks and contingencies.

5.4 Technology Risks

Table 33 lists the key technology risk associated with the AMI assessment project and the contingencies ComEd is planning to mitigate those risks.

Risk	Contingency
4 Technology Risks	
4.1 Enabling technology systems do not pass quality tests and gates by May, 2010.	<ul style="list-style-type: none"> • Begin the enabling technology RFP process as early as possible. • Include quality assurance criteria in RFP. • Include a financial disincentive for vendors whose products do not pass quality tests and gates by the deadline.
4.2 Back-office support systems do not pass quality tests and gates by May, 2010.	<ul style="list-style-type: none"> • Begin the development of back-office support systems as early as possible. • Include a financial disincentive for vendors whose work does not pass quality tests and gates by the deadline.
4.3 Customer data for the M&V analysis is lost, corrupted, or destroyed.	<ul style="list-style-type: none"> • Ensure that customer data is backed-up on a daily basis and copies are stored in multiple off-site locations. • Have a data recovery plan in place to restore any data within a specified timeframe.
4.4 Customer-side enabling technology components fail during the pilot.	<ul style="list-style-type: none"> • Provide warranty for enabling technology. • Develop a service script for rapid replacement of enabling technology.

Table 33: Technology risks and contingencies.

Appendix

Appendix A – Detailed Description of Residential Application Cells

The following sub-sections explain what customers will experience in each of the control and application cells. For each cell in *Figure 4*, we describe:

- The objective for that cell.
- The customer’s experience before installation of the AMI meter and enabling technology.
- The customer’s experience during installation of the AMI meter and enabling technology.
- The customer’s experience after installation of the AMI meter and enabling technology.
- The customer’s experience at the conclusion of the assessment.

Flat Rate Controls/Applications - Cell Details

CONTROL F1	Existing Meter Flat Rate No Enabling Technology No Education
Objective	Control for any non-experimental effects by collecting data from existing non-AMI customers outside the assessment area.
Before Installation	<ul style="list-style-type: none"> • Survey (demographic and behavioral intention); includes link to web-based version of survey. \$15 bill credit for completing survey.
During Installation	<ul style="list-style-type: none"> • Not applicable.
After Installation	<ul style="list-style-type: none"> • Throughout assessment: Phone or email survey of random sample of subjects to assess demographics, energy change behaviors and potential threats to validity. • At one year: Survey (demographic and behavioral intention); includes link to web-based version of survey. \$15 bill credit for completing survey; \$35 bill credit if pre-survey was completed.
Assessment Conclusion	<ul style="list-style-type: none"> • Not applicable.
APPLICATION F2	Existing Meter Flat Rate No Enabling Technology Education
Objective	Assess the effects of customer education on subjects from outside the assessment area.
Before Installation	<ul style="list-style-type: none"> • Survey (demographic and behavioral intention); includes link to web-based version of survey. \$15 bill credit for completing survey.
During Installation	<ul style="list-style-type: none"> • Customer receives Smart Meter User Manual F2 (PP + TT + FR) • Customer receives offer to sign up for demand response notifications.

After Installation	<ul style="list-style-type: none"> • Additional customer education associated with the specific Smart Meter User Manual disseminated throughout the assessment period. • Six to nine demand response events called during the assessment period. • Electrical usage data collected on a monthly basis for duration of the assessment. • Throughout assessment: Phone or email survey of random sample of subjects to assess demographics, energy change behaviors and potential threats to validity. • At one year: Survey (demographic and behavioral intention); includes link to web-based survey. \$15 bill credit for completing survey; \$35 bill credit if pre-survey was completed.
Assessment Conclusion	<ul style="list-style-type: none"> • Notification letter that AMI assessment is concluded. It explains: <ul style="list-style-type: none"> ○ The various study applications and results. ○ URL or phone number for providing open-ended comments and suggestions.
CONTROL F3	AMI Meter Flat Rate No Enabling Technology SM Education
Objective	Control for effects of the AMI installation event by collecting data from customers within the assessment area.
Before Installation	<ul style="list-style-type: none"> • One month prior to installation, customer receives notification letter. • Notification letter includes <ul style="list-style-type: none"> ○ Basic program awareness information, informed consent, and URL for further information. AMI meter installation is framed as a “technology test”. ○ Rate information. ○ Pre-installation survey (demographic and behavioral intention); includes link to web-based version of survey. \$15 bill credit for completing survey.
During Installation	<ul style="list-style-type: none"> • AMI meter installed. • Customer receives Smart Meter User Manual F3 (SM). • Phone survey of random sample of customers to assess demographics, installation quality and behavioral intention.
After Installation	<ul style="list-style-type: none"> • Electrical usage data collected on an hourly basis for duration of the assessment. • Throughout assessment: Phone or email survey of random sample of subjects to assess demographics energy change behaviors and potential threats to validity. • At one year: Survey (demographic and behavioral intention); includes link to web-based survey. \$15 bill credit for completing survey; \$35 bill credit if pre-survey was completed.
Assessment Conclusion	<ul style="list-style-type: none"> • Notification letter that AMI assessment is concluded. It explains: <ul style="list-style-type: none"> ○ The various study applications and results. ○ Options for acquiring other enabling technology. ○ URL or phone number for providing open-ended comments and suggestions.

APPLICATION F4	AMI Meter Flat Rate No Enabling Technology Education
Objective	Assess the effects of customer education on subjects from inside the assessment area.
Before Installation	<ul style="list-style-type: none"> • One month prior to installation, customer receives notification letter. • Notification letter includes <ul style="list-style-type: none"> ○ Basic program awareness information, informed consent, and URL for further information. ○ Invitation to sign up for demand response notifications ○ "Rate information. ○ Pre-installation survey (demographic and behavioral intention); includes link to web-based version of survey. \$15 bill credit for completing survey.
During Installation	<ul style="list-style-type: none"> • AMI meter installed. • Customer receives Smart Meter User Manual F4 (SM+PP+TT+FR). • Invitation to sign up for demand response notifications. • Phone survey of random sample of customers to assess installation quality and behavioral intention.
After Installation	<p>Same as F3, plus:</p> <ul style="list-style-type: none"> • Six to nine simulated demand response events called during the assessment period. • Additional customer education associated with the specified Smart Meter User Manual disseminated throughout the assessment period.
Assessment Conclusion	Same as F3.
APPLICATION F5	AMI Meter Flat Rate Web Only Education
Objective	Assess the effects of web-only feedback on energy behaviors, such as reducing kWh or signing up for EE programs.
Before Installation	<p>Same as F4, with this addition:</p> <ul style="list-style-type: none"> • Web presentment information and My Account sign-up URL.
During Installation	<p>Same as F4, with this change:</p> <ul style="list-style-type: none"> • Customer receives Smart Meter User Manual F4 (SM+PP+TT+FR+WEB).
After Installation	<p>Same as F4, with this change:</p> <ul style="list-style-type: none"> • Throughout assessment: Phone or email survey of random sample of subjects to assess energy change behaviors, web usage, and potential threats to validity.
Assessment Conclusion	Same as F3.
APPLICATION F6a	AMI Meter Flat Rate Basic IHD - FREE Education
Objective	Assess the effects of web and basic IHD feedback on energy behaviors when the IHD is offered to customers for free.

Before Installation	Same as F5, with this addition <ul style="list-style-type: none"> Notification letter includes information that customer will receive a basic IHD for free.
During Installation	Same as F4, with these additions/changes: <ul style="list-style-type: none"> Customer receives basic IHD (this is customer-installable) Customer receives Smart Meter User Manual F6 (SM+PP+TT+FR+ BIHD).
After Installation	Same as F5, with these additions/changes: <ul style="list-style-type: none"> Customers may purchase additional IHDs at any time. Throughout assessment: Phone or email survey of random sample of subjects to assess energy change behaviors, web usage, IHD usage, and potential threats to validity.
Assessment Conclusion	Same as F3.
APPLICATION F6b	
Objective	AMI Meter Flat Rate Basic IHD - PURCHASE Education Assess the effects of web and basic IHD feedback on energy behaviors when the IHD is offered to customers for purchase.
Before Installation	Same as F5, with this addition <ul style="list-style-type: none"> Notification letter includes offer to purchase basic IHD.
During Installation	Same as F4, with these additions/changes: <ul style="list-style-type: none"> If IHD not yet purchased, provide second offer to purchase IHD. If purchased, customer receives basic IHD. Customer receives Smart Meter User Manual F6 (SM+PP+TT+FR+BIHD).
After Installation	Same as F6a.
Assessment Conclusion	Same as F3.
APPLICATION F7a	
Objective	AMI Meter Flat Rate Advanced IHD - FREE Education Assess the effects of web and advanced IHD feedback on energy behaviors when the IHD is offered to customers for free.
Before Installation	Same as F5, with this addition <ul style="list-style-type: none"> Notification letter includes information that customer will receive an advanced IHD for free.
During Installation	Same as F4, with these additions/changes: <ul style="list-style-type: none"> Customer receives advanced IHD (field service must install). Customer receives Smart Meter User Manual F7 (SM+PP+TT+FR+AIHD).
After Installation	Same as F6a.
Assessment Conclusion	Same as F3.

APPLICATION F7b	AMI Meter Flat Rate Advanced IHD - PURCHASE Education
Objective	Assess the effects of advanced IHD acquisition, as well as web and advanced IHD feedback on energy behaviors when the IHD is offered to customers for purchase. ¹
Before Installation	Same as F5, with this addition <ul style="list-style-type: none"> Notification letter includes offer to purchase advanced IHD.
During Installation	Same as F4, with these additions/changes: <ul style="list-style-type: none"> If IHD not yet purchased, provide second offer to purchase IHD. If purchased, customer receives advanced IHD (field service must install). Customer receives Smart Meter User Manual F7 (SM+PP+TT+FR+AIHD).
After Installation	Same as F6a.
Assessment Conclusion	Same as F3.

Energy Efficiency Applications - Cell Details

APPLICATION E1	AMI Meter IBR Rate Web Only Education
Objective	Assess the effects of web-only feedback and an increasing block rate on energy behaviors, such as reducing kWh or signing up for EE programs.
Before Installation	Same as F5.
During Installation	Same as F4, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual E1 (SM+PP+TT+IBR+WEB).
After Installation	Same as F5.
Assessment Conclusion	Same as F3, with this addition: <ul style="list-style-type: none"> Transition back to flat rate.
APPLICATION E2a	AMI Meter IBR Rate Basic IHD - FREE Education
Objective	Assess the effects of an increasing block rate, as well as web and basic IHD feedback on energy behaviors when the IHD is offered to customers for free.
Before Installation	Same as F6a.
During Installation	Same as F6a, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual E2 (SM+PP+TT+IBR+ BIHD).
After Installation	Same as F6a.
Assessment Conclusion	Same as E1.

APPLICATION E2b	AMI Meter IBR Rate Basic IHD - PURCHASE Education
Objective	Assess the effects of an increasing block rate, as well as well as web and basic IHD feedback on energy behaviors when the IHD is offered to customers for purchase.
Before Installation	Same as F6b.
During Installation	Same as F6b, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual E2 (SM+PP+TT+IBR+BIHD).
After Installation	Same as F6b.
Assessment Conclusion	Same as E1.
APPLICATION E3a	AMI Meter IBR Rate Advanced IHD - FREE Education
Objective	Assess the effects of an increasing block rate, as well as well as web and advanced IHD feedback on energy efficiency behaviors when the IHD is offered to customers for free.
Before Installation	Same as F7a.
During Installation	Same as F7a, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual E3 (SM+PP+TT+IBR+AIHD).
After Installation	Same as F7a.
Assessment Conclusion	Same as E1.
APPLICATION E3b	AMI Meter IBR Rate Advanced IHD - PURCHASE Education
Objective	Assess the effects of an increasing block rate, as well as well as web and advanced IHD feedback on energy behaviors when the IHD is offered to customers for purchase.
Before Installation	Same as F7b.
During Installation	Same as F7b, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual E3 (SM+PP+TT+IBR+AIHD).
After Installation	Same as F7b.
Assessment Conclusion	Same as E1.

Demand Response Applications - Cell Details

APPLICATION D1	AMI Meter CPP Rate Web Only Education
Objective	Assess the effects of web-only feedback and a CPP rate on energy behaviors, such as reducing kWh or signing up for EE programs.
Before Installation	Same as F5.
During Installation	Same as F4, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual D1 (SM+PP+TT+ CPP+WEB).
After Installation	<ul style="list-style-type: none"> Same as F5.
Assessment Conclusion	<ul style="list-style-type: none"> Same as E1.
APPLICATION D2a	AMI Meter CPP Rate Basic IHD - FREE Education
Objective	Assess the effects of a CPP rate, as well as web and basic IHD feedback on energy behaviors when the IHD is offered to customers for free.
Before Installation	Same as F6a.
During Installation	Same as F6a, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual D2 (SM+PP+TT+ CPP+ BIHD).
After Installation	Same as F6a.
Assessment Conclusion	Same as E1.
APPLICATION D2b	AMI Meter CPP Rate Basic IHD - PURCHASE Education
Objective	Assess the effects of a CPP rate, as well as well as web and basic IHD feedback on energy behaviors when the IHD is offered to customers for purchase.
Before Installation	Same as F6b.
During Installation	Same as F6b, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual D2 (SM+PP+TT+ CPP+BIHD).
After Installation	Same as F6b.
Assessment Conclusion	Same as E1.
APPLICATION D3a	AMI Meter CPP Rate Advanced IHD - FREE Education
Objective	Assess the effects of a CPP rate, as well as well as web and advanced IHD feedback on energy efficiency behaviors when the IHD is offered to customers for free.

Before Installation	Same as F7a.
During Installation	Same as F7a, with this change: <ul style="list-style-type: none"> • Customer receives Smart Meter User Manual D3 (SM+PP+TT+ CPP+AIHD).
After Installation	Same as F7a.
Assessment Conclusion	Same as E1.
APPLICATION D3b	
Objective	Assess the effects of a CPP rate, as well as well as web and advanced IHD feedback on energy behaviors when the IHD is offered to customers for purchase.
Before Installation	Same as F7b.
During Installation	Same as F7b, with this change: <ul style="list-style-type: none"> • Customer receives Smart Meter User Manual D3 (SM+PP+TT+CPP+AIHD).
After Installation	Same as F7b.
Assessment Conclusion	Same as E1.
APPLICATION D4a	
Objective	Assess the effects of a CPP rate, web and IHD feedback, and PCT automation on energy behaviors when the IHD is offered to customers for free.
Before Installation	Same as F5, with this addition <ul style="list-style-type: none"> • Notification letter includes information that customer will receive a PCT/IHD for free.
During Installation	Same as F5, with these changes: <ul style="list-style-type: none"> • Customer receives PCT/IHD (professionally installed). • Customer receives Smart Meter User Manual D4 (SM+PP+TT+ CPP+PCT).
After Installation	Same as F5, with this change: <ul style="list-style-type: none"> • Throughout assessment: Phone or email survey of random sample of subjects to assess energy change behaviors, web usage, IHD usage, PCT usage, and potential threats to validity.
Assessment Conclusion	Same as E1.
APPLICATION D4b	
Objective	Assess the effects of a CPP rate, web and IHD feedback, and PCT automation on energy behaviors when the IHD is offered to customers for purchase.
Before Installation	Same as F5, with this addition <ul style="list-style-type: none"> • Notification letter includes offer to purchase PCT/IHD.

During Installation	Same as F5, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual D4 (SM+PP+TT+ CPP+PCT).
After Installation	Same as D4a.
Assessment Conclusion	Same as E1.
APPLICATION D5 AMI Meter PTR Rate Web Only Education	
Objective	Assess the effects of web-only feedback and a PTR rate on energy behaviors, such as reducing kWh or signing up for EE programs.
Before Installation	Same as F5.
During Installation	Same as F4, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual D5 (SM+PP+TT+ PTR+WEB).
After Installation	Same as F5.
Assessment Conclusion	Same as E1.
APPLICATION D6a AMI Meter PTR Rate Basic IHD - FREE Education	
Objective	Assess the effects of a PTR rate, as well as web and basic IHD feedback on energy behaviors when the IHD is offered to customers for free.
Before Installation	Same as F6a.
During Installation	Same as F6a, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual D6 (SM+PP+TT+ PTR+ BIHD).
After Installation	Same as F6a.
Assessment Conclusion	Same as E1.
APPLICATION D6b AMI Meter PTR Rate Basic IHD - PURCHASE Education	
Objective	Assess the effects of a PTR rate, as well as well as web and basic IHD feedback on energy behaviors when the IHD is offered to customers for purchase.
Before Installation	Same as F6b.
During Installation	Same as F6b, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual D6 (SM+PP+TT+ PTR+BIHD).
After Installation	Same as F6b.
Assessment Conclusion	Same as E1.

APPLICATION D7a	AMI Meter PTR Rate Advanced IHD - FREE Education
Objective	Assess the effects of a PTR rate, as well as well as web and advanced IHD feedback on energy efficiency behaviors when the IHD is offered to customers for free.
Before Installation	Same as F7a.
During Installation	Same as F7a, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual D7 (SM+PP+TT+ PTR+AIHD).
After Installation	Same as F7a.
Assessment Conclusion	Same as E1.
<hr/>	
APPLICATION D7b	AMI Meter PTR Rate Advanced IHD - PURCHASE Education
Objective	Assess the effects of a PTR rate, as well as well as web and advanced IHD feedback on energy behaviors when the IHD is offered to customers for purchase.
Before Installation	Same as F7b.
During Installation	Same as F7b, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual D7 (SM+PP+TT+PTR+AIHD).
After Installation	Same as F7b.
Assessment Conclusion	Same as E1.
<hr/>	
APPLICATION D8a	AMI Meter PTR Rate PCT - FREE Education
Objective	Assess the effects of a PTR rate, web and IHD feedback, and PCT automation on energy behaviors when the IHD is offered to customers for free.
Before Installation	Same as D4.
During Installation	Same as D4, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual D8 (SM+PP+TT+ PTR+PCT).
After Installation	Same as D4a.
Assessment Conclusion	Same as E1.
<hr/>	
APPLICATION D8b	AMI Meter PTR Rate PCT - PURCHASE Education
Objective	Assess the effects of a PTR rate, web and IHD feedback, and PCT automation on energy behaviors when the IHD is offered to customers for purchase.
Before Installation	Same as F5, with this addition <ul style="list-style-type: none"> Notification letter includes offer to purchase PCT/IHD.

During Installation	Same as F5, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual D8 (SM+PP+TT+ PTR+PCT).
After Installation	Same as D4b.
Assessment Conclusion	Same as E1.

Load Shifting Applications - Cell Details

APPLICATION L1	AMI Meter DA-RTP Rate Web Only Education
Objective	Assess the effects of web-only feedback and a DA-RTP rate on energy behaviors, such as reducing kWh or signing up for EE programs.
Before Installation	Same as F5.
During Installation	Same as F5, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual L1 (SM+PP+TT+ DA-RTP+WEB).
After Installation	Same as F5.
Assessment Conclusion	Same as E1.
APPLICATION L2a	AMI Meter DA-RTP Rate Basic IHD - FREE Education
Objective	Assess the effects of a DA-RTP rate, as well as web and basic IHD feedback on energy behaviors when the IHD is offered to customers for free.
Before Installation	Same as F6a.
During Installation	Same as F6a, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual L2 (SM+PP+TT+ DA-RTP+ BIHD).
After Installation	Same as F6a.
Assessment Conclusion	Same as E1.
APPLICATION L2b	AMI Meter DA-RTP Rate Basic IHD - PURCHASE Education
Objective	Assess the effects of a DA-RTP rate, as well as well as web and basic IHD feedback on energy behaviors when the IHD is offered to customers for purchase.
Before Installation	Same as F6b.
During Installation	Same as F6b, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual L2 (SM+PP+TT+ DA-RTP+BIHD).
After Installation	Same as F6b.

Assessment Conclusion	Same as E1.
APPLICATION L3a	AMI Meter DA-RTP Rate Advanced IHD - FREE Education
Objective	Assess the effects of a DA-RTP rate, as well as well as web and advanced IHD feedback on energy efficiency behaviors when the IHD is offered to customers for free.
Before Installation	Same as F7a.
During Installation	Same as F7a, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual L3 (SM+PP+TT+ DA-RTP+AIHD).
After Installation	Same as F7a.
Assessment Conclusion	Same as E1.
APPLICATION L3b	AMI Meter DA-RTP Rate Advanced IHD - PURCHASE Education
Objective	Assess the effects of a DA-RTP rate, as well as well as web and advanced IHD feedback on energy behaviors when the IHD is offered to customers for purchase.
Before Installation	Same as F7b.
During Installation	Same as F7b, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual L3 (SM+PP+TT+DA-RTP+AIHD).
After Installation	Same as F7b.
Assessment Conclusion	Same as E1.
APPLICATION L4	AMI Meter TOU Rate Web Only Education
Objective	Assess the effects of web-only feedback and a TOU rate on energy behaviors, such as reducing kWh or signing up for EE programs.
Before Installation	Same as F5.
During Installation	Same as F5, with this change: <ul style="list-style-type: none"> Customer receives Smart Meter User Manual L4 (SM+PP+TT+ TOU+WEB).
After Installation	Same as F5.
Assessment Conclusion	Same as E1.
APPLICATION L5a	AMI Meter TOU Rate Basic IHD - FREE Education
Objective	Assess the effects of a TOU rate, as well as web and basic IHD feedback on energy behaviors when the IHD is offered to customers for free.

Before Installation	Same as F6a.
During Installation	Same as F6a, with this change: <ul style="list-style-type: none"> • Customer receives Smart Meter User Manual L5 (SM+PP+TT+ TOU+ BIHD).
After Installation	Same as F6a.
Assessment Conclusion	Same as E1.
APPLICATION L5b	
Objective	Assess the effects of a TOU rate, as well as well as web and basic IHD feedback on energy behaviors when the IHD is offered to customers for purchase.
Before Installation	Same as F6b.
During Installation	Same as F6b, with this change: <ul style="list-style-type: none"> • Customer receives Smart Meter User Manual L5 (SM+PP+TT+ TOU+BIHD).
After Installation	Same as F6b.
Assessment Conclusion	Same as E1.
APPLICATION L6a	
Objective	Assess the effects of a DA-RTP rate, as well as well as web and advanced IHD feedback on energy efficiency behaviors when the IHD is offered to customers for free.
Before Installation	Same as F7a.
During Installation	Same as F7a, with this change: <ul style="list-style-type: none"> • Customer receives Smart Meter User Manual L6 (SM+PP+TT+ TOU+AIHD).
After Installation	Same as F7a.
Assessment Conclusion	Same as E1.
APPLICATION L6b	
Objective	Assess the effects of a TOU rate, as well as well as web and advanced IHD feedback on energy behaviors when the IHD is offered to customers for purchase.
Before Installation	Same as F7b.
During Installation	Same as F7b, with this change: <ul style="list-style-type: none"> • Customer receives Smart Meter User Manual L6 (SM+PP+TT+TOU+AIHD).
After Installation	Same as F7b.

Assessment Conclusion	Same as E1.
----------------------------------	-------------

Appendix B – Descriptions of Models for Estimating Price Elasticity

1. Cobb-Douglas Functional Form

The Cobb-Douglas functional form is widely used in the literature mostly due to its ease of implementation and interpretation. This form has the benefit of directly yielding the own price elasticity of demand and also the associated cross-price elasticities. However, the elasticity of substitution between the hourly consumption values is fixed at unity which is a strong restriction. The functional form for Cobb-Douglas is as follows:

$$\log y = b_0 + \sum_{i=1}^n b_i \log x_i$$

2. Trans-log Functional Form

The trans-log function is a generalization of the Cobb-Douglas function. One improvement over the double-log function is that elasticities of substitution between the hourly consumption values are not fixed at unity and can acquire any value. For that reason, the function comes from a class of flexible functional forms. One drawback of the trans-log function is the susceptibility to multicollinearity due to the inclusion of the inputs as well as their interactions with other inputs. Another drawback is that the estimated demand functions may not satisfy the “concavity” restrictions and be unstable. The functional form for trans-log is as follows:

$$\log y = b_0 + \sum_{i=1}^n b_i \log x_i + \sum_{i=1}^n \sum_{j=1}^n b_{ij} \log x_i \log x_j$$

3. Generalized Leontief (Diewert) Functional Form

The Generalized Leontief (Diewert) function can accommodate numerous inputs in the production function and allows the elasticities of substitution vary between the inputs. Generalized functional form for Generalized Leontief is as follows:

$$y = b_0 + \sum_{i=1}^n a_i \sqrt{x_i} + \sum_{i=1}^n \sum_{j=1}^n a_{ij} \sqrt{x_i x_j}$$

4. Generalized McFadden Functional Form³³

The Generalized McFadden function can also accommodate numerous hourly consumption values inputs in the utility function as well as allowing the elasticities of substitution to vary between the hourly consumption values. The functional form for the Generalized McFadden is as follows:

$$y = \sum_{i=1}^n \sum_{j=1}^n x_j \phi^{ij} \left(\frac{x_i}{x_j} \right) b_{ij} \quad \text{where } \phi^{ij} \text{ is a known concave function.}$$

³³ For more information, see W.E. Diewert and T.J. Wales (1987), “Flexible Functional Forms and Global Curvature Conditions,” *Econometrica*, Vol. 55, No.1, 43-68.