

By focusing on the identification of customer price elasticities, the results of the assessment can be generalized to estimate price response under a range of prices and conditions that are broader than the scope of the AMI assessment itself. The benefits of this approach serve to address one of the primary objectives of the assessment, which is the requirement that the assessment results be generalizable to ComEd's larger service territory. Through a focus on the quantification of customer elasticity, a model will be developed in the M&V phase of the AMI assessment to provide this flexibility.

There are a number of functional forms that can be used to quantify elasticities, each with its own advantages and disadvantages. Some of the most widely used forms are listed below, and a description of each is provided in Appendix B – Descriptions of Models for Estimating Price Elasticity.

- Constant Elasticity of Substitution (CES)
- Cobb-Douglas
- Trans-Logarithmic (Translog)
- Generalized Leontief (Diewert)
- Generalized McFadden

It is important to note that one cannot expect to find the “best” model for all purposes. The problem at hand and the context for that problem will usually determine which of these widely-used models are well-suited for the specific application. Important criteria to be taken into account when choosing between these models are listed below:

- Parsimony in parameters: The model should not have numerous parameters as this will increase the likelihood of the “multicollinearity problem.”<sup>25</sup> Moreover, when the sample size is small, excess parameters imply many lost degrees of freedom.
- Ease of interpretation: Excessively complex functional forms may contain irregularities which may not be easily detected in the richness of parameters. Also, complex transformations may make it computationally difficult to derive certain parameters of interest such as elasticities of substitution.
- Computational ease: Models linear in parameters have a computational cost advantage as well as a more developed statistical theory. The trade-off between the computational requirements versus statistical soundness must be carefully made.
- Interpolative robustness: Within the range of the observed sample, the chosen model should produce well-behaved and economically sound parameter estimates such as positive marginal products and negative own price elasticities.

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<sup>25</sup> The “multicollinearity” refers to a high correlation between several explanatory variables in an econometric model. Multicollinearity leads to incorrect statistical inferences on the parameters of the model.

- Extrapolative robustness: The model should lead to sound estimates consistent with the maintained hypothesis outside the range of observed data. This criterion is particularly important for forecasting exercises.

To illustrate how these models would be used in the context of the M&V phase of the AMI Assessment, a detailed description of the CES model is provided in the following sections.

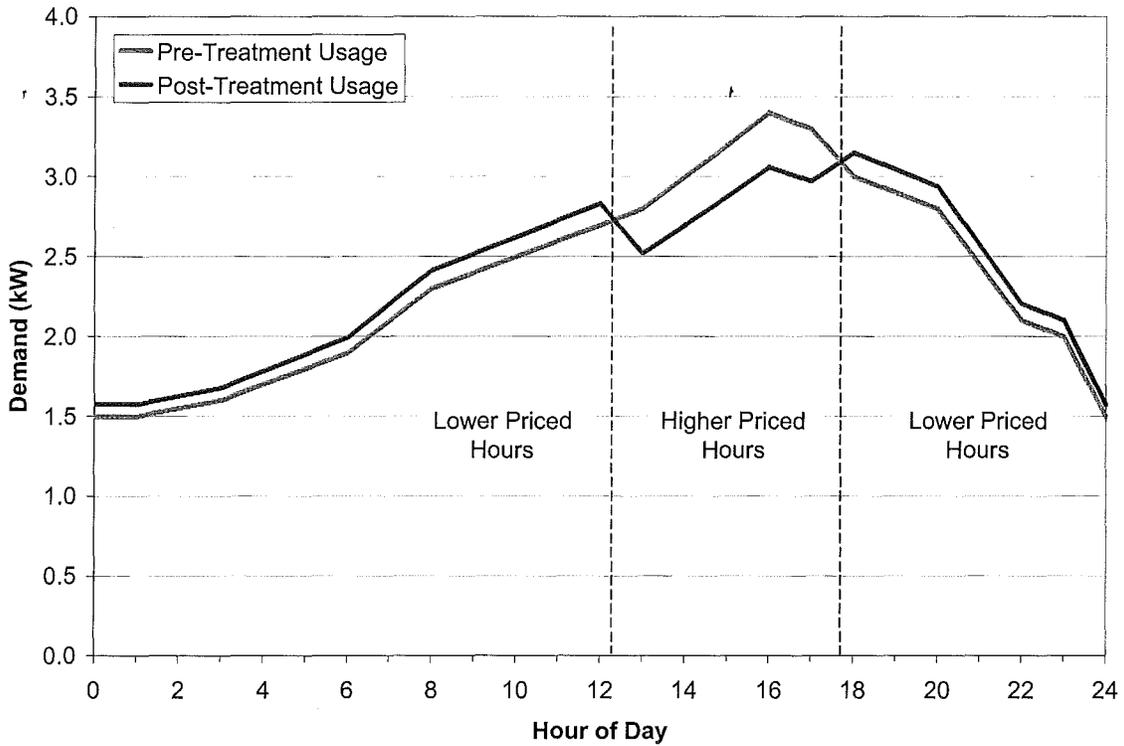
### 3.3.3 Description of the CES Model

One approach to a model for quantifying the impacts of the AMI Assessment would capture the effect of two different types of customer response. It will account for the substitution effect in which customers choose to shift consumption from higher priced hours of the day to lower priced hours of the day, and also it will also capture changes in total daily consumption. This model, referred to the constant elasticity-of-substitution (CES) demand model, has been used successfully in a number of previous assessments, including the California Statewide Pricing Pilot, GPU's dynamic pricing pilot in New Jersey, PSEG's dynamic pricing pilot in New Jersey and, more recently, in BGE's Smart Energy Pricing Pilot in Maryland.<sup>26</sup>

Representation of the substitution effect is sometimes overlooked in pilot M&V efforts but is critical to an accurate characterization of customer response. An illustration of the substitution effect is provided in *Figure 7*. It illustrates the general observation that, when customers face price changes over the course of the day that are higher during some hours and lower during other hours, they will view their consumption during those hours as substitutable and shift usage from the higher priced hours to the lower priced hours. The specific measurement for this type of response is the "elasticity of substitution."

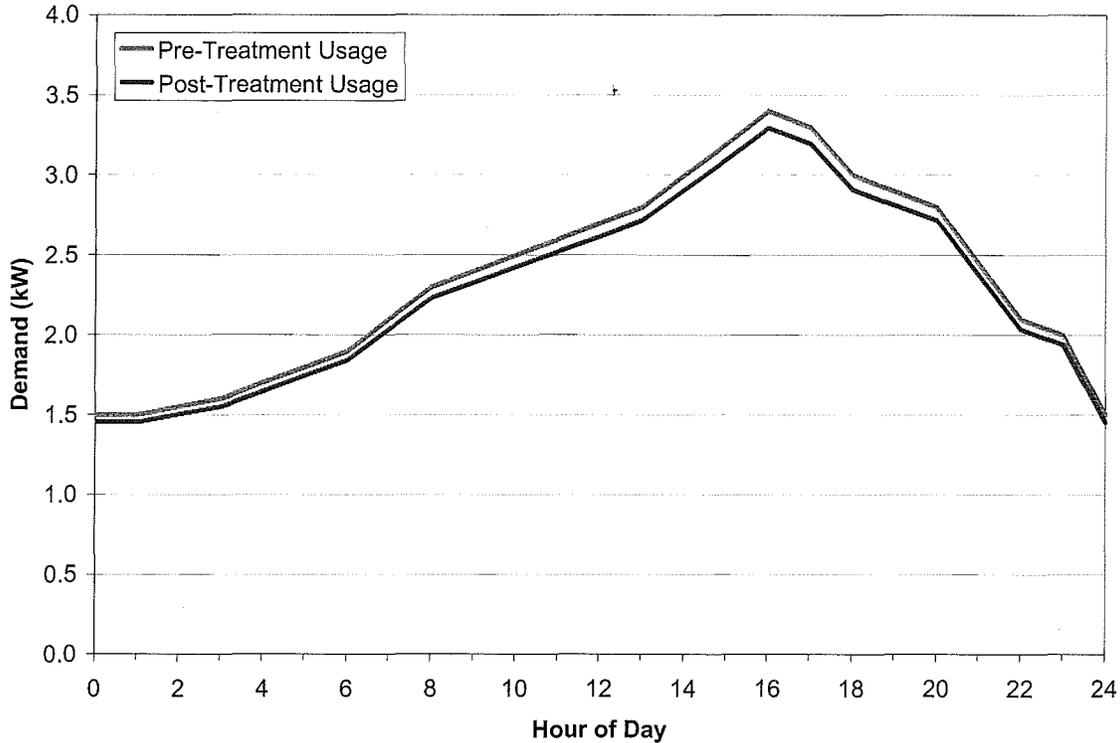
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<sup>26</sup> See Stephen S. George and Ahmad Faruqi. *Impact Evaluation of the California Statewide Pricing Pilot, Final Report*. Charles River Associates, Oakland, California. March 16, 2005. Also, see Ahmad Faruqi and Sanem Sergici. *BGE's Smart Energy Pricing Pilot Summer 2008 Impact Evaluation*, April 28, 2009.



*Figure 7: Illustration of Substitution Effect*

In addition, to account for the substitution effect, the proposed modeling approach will also account for overall changes in a customer's total daily consumption given a change in the average price of electricity for that day. Recent pilots have found that if the rate being tested through the pilot is higher than the otherwise applicable rate on a given day, total consumption on that day will generally be lower. This specific relationship is illustrated in Figure 8. The opposite would be true on a day when the average daily pilot rate is lower than the otherwise applicable rate.



*Figure 8: Illustration of Daily Price Effect*

The model is designed to produce estimates of elasticity for each application group. This will allow for a relative comparison of the impacts of different rates, technologies, and information. Additionally, the model will identify the effect of other socio-demographic variables (such as CAC ownership, income, or education) on elasticity.<sup>27</sup> With the elasticity for each application cell and customer segment identified, they can then be converted into an estimate of “price response,” which is the percentage change in demand during each hour of the day. This percentage change in demand is a function of the change in price that the customer faces, and the relationship between change in demand and change in price is not necessarily linear. In fact, the findings of recent pilots have suggested that as the price change increases, customer response grows, but at an incrementally smaller rate. This is illustrated in *Figure 9*, based on the results of the California Statewide Pricing Pilot (SPP).<sup>28</sup> Note that in the SPP it was possible to estimate elasticities separately for residential customers with and without CAC, as well as for customers with a PCT. The AMI Pilot will produce estimates that are specific to ComEd’s service territory and will span an even broader range of technology options, rates, and levels of customer education efforts.

<sup>27</sup> The specific variables that are significant in describing price elasticity have varied in recent pricing pilots, depending on the characteristics of customers in each given service territory.

<sup>28</sup> The figure expresses price response as a function of the ratio of the peak rate being tested in the pilot to the otherwise applicable rate. The rate tested through the California SPP was a CPP, so the peak rate was always higher than the existing rate. However, the relationship would still hold in a case where the customer faces a new rate that is lower than the otherwise applicable rate. In other words, a 1-to-4 price ratio would be expected to produce a response that is the absolute value of the price response associated with the 4-to-1 ratio as depicted in the figure.

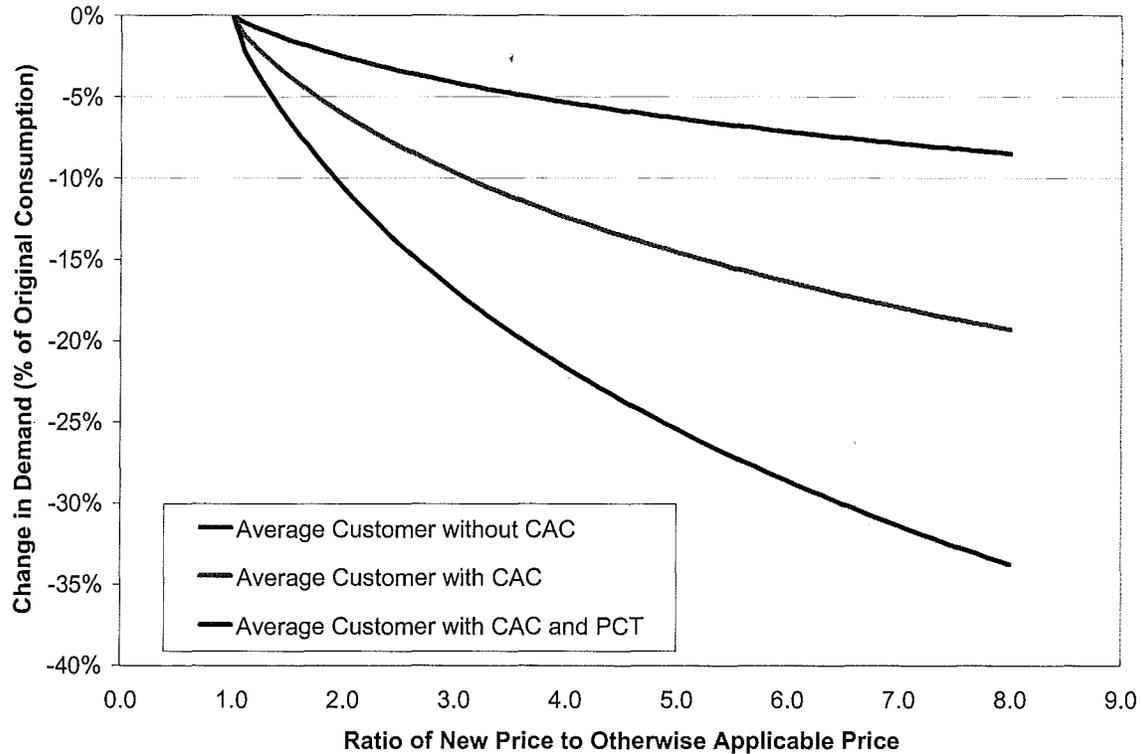


Figure 9: Illustration of Residential Price Response Curves from the California SPP

### 3.3.4 CES Model Details

At a more detailed level, the CES demand system consists of 24 equations. The first equation models daily electricity consumption, expressed in logs, as a function of the daily price of electricity, also expressed in logs, and other factors such as weather. Each of the remaining 23 equations model the ratio of a given hour's consumption to a predetermined base hour consumption (in logs) as a function of the ratio of the same hour's price to the price of the base hour (in logs) weather and other variables. The 24 equations constitute a system for predicting electricity consumption by hour and they will be estimated jointly through advanced econometrics methods to obtain the most precise parameter estimates.

It is likely that a "fixed effects" estimation routine will be used to predict the 24-equation CES demand system. This effectively controls for all customer specific characteristics that don't vary over time and allows for stable estimation of price elasticities. It will also be necessary to correct for problems that are commonly encountered in the analysis of panel data sets (consisting of repeated time series observations of a group of individuals), such as heteroskedasticity and autocorrelation of the error term.

The model could have the following general algebraic structure, although this is simply provided as an example of one of many possible model specifications.

Daily Equation

$$\ln(Q_{i,d}) = \alpha_0 + \alpha_1 \ln(P_{i,d}) + \alpha_2 \ln(THI_{i,d}) + \delta X_{i,d} + v_i + u_{i,d} \quad \text{where:}$$

- $\ln(Q_{i,d})$  : Natural logarithm of the daily average of hourly consumption for customer i on day d  
 $\ln(P_{i,d})$  : Natural logarithm of the daily average of hourly prices for customer i on day d  
 $\ln(THI_{i,d})$  : Natural logarithm of the daily average of hourly THIs<sup>29</sup> for customer i on day d  
 $X_{i,d}$  : Vector of control variables (will be discussed later)  
 $\alpha_1$  : Daily price elasticity  
 $v_i$  : Customer-specific fixed effects  
 $u_{i,d}$  : Regression error term

Substitution Equations

$$\ln\left(\frac{Q_{i,1}}{Q_{i,base}}\right) = \beta_{0,1} + \beta_{1,1}\left(\frac{P_{i,1}}{P_{i,base}}\right) + \beta_{2,1}\left(\frac{THI_{i,1}}{THI_{i,base}}\right) + \phi Y_{i,1} + v_i + u_{i,1} \quad \text{for hour=1}$$

$$\vdots$$

$$\ln\left(\frac{Q_{i,24}}{Q_{i,base}}\right) = \beta_{0,24} + \beta_{1,24}\left(\frac{P_{i,24}}{P_{i,base}}\right) + \beta_{2,24}\left(\frac{THI_{i,24}}{THI_{i,base}}\right) + \phi Y_{i,24} + v_i + u_{i,24} \quad \text{for hour=24}$$

One of the 24 hourly equations is omitted from the system, as one of the 24 hours will be used as the base or *numeraire*.

- $\ln\left(\frac{Q_{i,h}}{Q_{i,base}}\right)$  : Natural logarithm of the ratio of consumption in hour h to consumption in the base hour  
 $\ln\left(\frac{P_{i,h}}{P_{i,base}}\right)$  : Natural logarithm of the ratio of price in hour h to price in the base hour  
 $\ln\left(\frac{THI_{i,h}}{THI_{i,base}}\right)$  : Natural logarithm of the ratio of THI in hour h to THI in the base hour  
 $Y_{i,h}$  : Vector of control variables (will be discussed later)  
 $\beta_{1,h}$  : Elasticity of substitution between hour h and the base hour  
 $v_i$  : Customer-specific fixed effects  
 $u_{i,h}$  : Regression error term

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<sup>29</sup> THI refers to the temperature-humidity index and can be calculated using the following equation:  
 THI = 0.55 x Drybulb Temperature + 0.20 x Dewpoint + 17.5

### 3.3.5 Data Collection

Analysis of the assessment results, whether through ANOVA and ANCOVA tests, through estimation of the CES model, or through one of the other previously identified modeling options, requires several specific data elements. These can be split into three general types: usage data, socio-demographic data, and basic dummy variables. Comprehensive data collection will be a key input to the M&V phase of the assessment.

#### Usage Data

Usage data will be collected for all participants in each of the application groups as well as for participants in the control group. The time interval of the usage data will be hourly, expressed as an average over that hour (i.e., kWh per hour). Further, for both the application group and the control group, usage data should be collected both before (at least one month, and preferably a season) and during the experiment. This is valuable, because a pre-application comparison of the load shapes of the application and control group customers serves as a means for isolating any changes in their consumption existed before the application period that would otherwise be incorrectly attributed to the application affect.

#### Socio-demographic Data

Socio-demographic data would be collected through a survey of assessment participants when the sign up for the assessment. The following are data items that have been proven to be valuable in past pilots or could otherwise be tested through the AMI Assessment:

- CAC ownership
- Other appliance ownership
- Income level
- Education level
- Level of environmental awareness
- Favorability toward the utility
- Housing type
- Persons per household

#### Binary (Dummy) Variables

Binary variables (or “flags”) will also be included in the model. These include:

- Dummy variables for seasons, days, weekdays/weekends, and holidays
- Dummy variables identifying each participant with its application group

In addition to the data that will be collected for development of the econometric models, other useful data elements will also become available through the assessment. These include:

- Percent of customers acquiring various technologies, both free and purchased
- Percent of customers signing up for free web-based usage information
- Frequency with which the web-based tool is viewed or used
- Changes in customer bills when enrolled in new rates

- Percent of customers remaining enrolled in new rates
- Overall assessment retention rate

### 3.3.6 Applying the Models

As described previously, ANOVA and ANCOVA tests will be conducted for all applications, while price elasticities will be estimated for those application groups that are exposed to a change in rate structure. ANOVA and ANCOVA tests will also be conducted for those control groups that are exposed to varying levels of education, to isolate the impact of this aspect of the assessment. *Table 10* identifies the specific type of econometric analysis that will be applied to each of the assessment application groups.

Control/Application Cell	Rate	Technology	Education	ANOVA?	ANCOVA?	Demand Models?
Control F1	Flat	None	None			
Control F2	Flat	None	Comprehensive	√	√	
Control F3	Flat	None	Basic	√	√	
Application F4	Flat	None	Comprehensive	√	√	
Application F5	Flat	Web	Comprehensive	√	√	
Application F6	Flat	Web + Basic IHD	Comprehensive	√	√	
Application F7	Flat	Web + Adv. IHD	Comprehensive	√	√	
Application E1	IBR	Web	Comprehensive	√	√	√
Application E2	IBR	Web + Basic IHD	Comprehensive	√	√	√
Application E3	IBR	Web + Adv. IHD	Comprehensive	√	√	√
Application D1	CPP/DA-RTP	Web	Comprehensive	√	√	√
Application D2	CPP/DA-RTP	Web + Basic IHD	Comprehensive	√	√	√
Application D3	CPP/DA-RTP	Web + Adv. IHD.	Comprehensive	√	√	√
Application D4	CPP/DA-RTP	Web + PCT/IHD	Comprehensive	√	√	√
Application D5	PTR/DA-RTP	Web	Comprehensive	√	√	√
Application D6	PTR/DA-RTP	Web + Basic IHD	Comprehensive	√	√	√
Application D7	PTR/DA-RTP	Web + Adv. IHD	Comprehensive	√	√	√
Application D8	PTR/DA-RTP	Web + PCT/IHD	Comprehensive	√	√	√
Application L1	DA-RTP	Web	Comprehensive	√	√	√
Application L2	DA-RTP	Web + Basic IHD	Comprehensive	√	√	√
Application L3	DA-RTP	Web + Adv. IHD	Comprehensive	√	√	√
Application L4	TOU	Web	Comprehensive	√	√	√
Application L5	TOU	Web + Basic IHD	Comprehensive	√	√	√
Application L6	TOU	Web + Adv. IHD	Comprehensive	√	√	√

*Table 10: Summary of econometric analysis by application group.*

With the models developed, it will be possible to estimate customer response under a wide range of combinations of prices, technologies, and information. In other words, given a customer who is exposed to a certain rate design, is equipped with a specific enabling technology, has been exposed to a given level of AMI-related education, and embodies a certain set of socio-

demographic characteristics, the previously described models will simulate that customer's response based on the results of the assessment.

With this powerful information, it will be possible to predict system-wide impacts of the various options under consideration in the assessment. To do so, the customer-level impacts predicted by the econometric model must be multiplied into an assumption about the number of customers who will ultimately be enrolled in the various rate designs and equipped with the chosen enabling technologies. These participation rates will be determined by whether the rate options are offered on a voluntary (opt-in) or default (opt-out) basis. A similar concept applies to the enabling technologies, which could be provided to customers for free or sold to them. To some extent, information on these participation rates will be determined through the assessment or could otherwise be assessed through focus groups or surveys. Ultimately, it is this system-level analysis that will serve as the starting point for assessing the costs and benefits of the various options. Figure 10 provides a high-level summary of the entire M&V process.

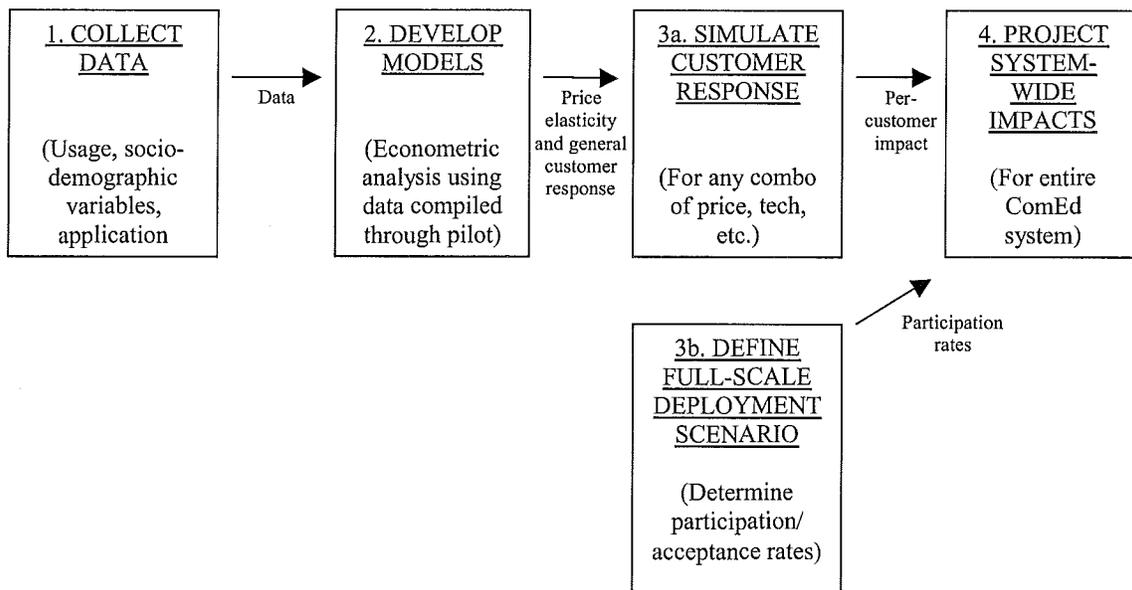


Figure 10: Flow Chart of Measurement and Validation Process

### 3.3.7 Process Evaluation

In addition to quantifying the usage impacts of the AMI Assessment, a process evaluation is needed. Process evaluation documents and analyzes the early development and actual implementation of the program, and assesses whether strategies were implemented as planned and whether expected output was actually produced. Ongoing process evaluation is valuable for ensuring that the assessment is being implemented at a level that will produce meaningful and insightful results that meet the assessment's overall objectives. To the extent that implementation is underperforming in some areas, a well-conducted process evaluation provides information that is useful to correct for that underperformance before it is too late.

General questions to be answered through the process evaluation could include:

- Has the assessment as implemented changed from the original plan? If so, how, why, and was this an advantageous change?
- What are key barriers to participation in the program, and how can they be addressed?
- What is the effectiveness of the program's marketing efforts?
- Are program incentive levels appropriate to encourage and maintain participation?
- What challenges have occurred in implementation and how were they handled?
- Are program costs higher or lower than expected?
- How has customer perception of ComEd changed through participation in the program?

Some of these questions, particularly those dealing with program implementation, would be answered and documented throughout the course of the assessment directly through interviews with involved ComEd staff.

The information necessary to answer questions dealing with customer perception would be collected through customer surveys conducted before, during, and after the assessment. The basis for these surveys could be derived from current customer research that is being conducted by ComEd, allowing the results of the AMI assessment to be benchmarked against historical survey results.

It is important to emphasize that customer surveys would be taken not only before and after the assessment, but *during* the assessment as well. A valuable aspect of the process evaluation is that it provides the opportunity to identify potential problems and correct them mid-course if necessary. Thus, for at least a subset of the assessment participants, surveys or interviews would be used to identify any potential threats to the validity of the results. For example, this effort would be used to determine whether members of some application groups were comparing notes with members of other application groups, and as a result influencing their behavior in a way that would not necessarily happen during full-scale implementation.

Post-assessment interviews or surveys with a subset of the participants would also be helpful to develop anecdotal information on customers' reasoning behind their actions. Asking customers to explain why they did what they did would provide the "story" behind the aggregate impacts that are observed at the assessment's conclusion. Which appliances did they adjust? How often did they use their enabling technology? Did they find the enabling technology easier or more difficult to use than they had anticipated? Answers to questions such as these would provide valuable context to observations about aggregate customer behavior.<sup>30</sup>

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<sup>30</sup> It is recommended that questions of this nature be asked after the pilot is complete to avoid influencing customer behavior while the pilot is in progress.

## 4. Project Plan

This section of the document describes the project plan. The purpose of the project plan is to guide readers in assessing ComEd's approach and capabilities for executing the AMI assessment.

### 4.1 Project Goal

Between the June, 2010 and May, 2011 billing cycles, ComEd will have the opportunity to gather and study experimental and empirical evidence by conducting an AMI customer applications assessment. This assessment will attempt to determine the relative benefits of various combinations of rate, enabling technology, customer education, and customer experience. This, in turn, will allow ComEd to enhance the assessment of its AMI options. ComEd will seek the approval of the Commission to conduct this study and recover its costs.

- The study will include approximately 129,000 residential and non-residential AMI customers, plus approximately 5,000 customers outside the AMI footprint.
- Residential customers will be randomly assigned to 24 different combinations of control and experimental groups. Each group will have a different rate and/or enabling technology applications.
- Non-residential customers **will not** be randomly assigned to control and application groups. Instead, there will be one non-residential customer group. This group receives an AMI meter, remains on its existing rate, and receives AMI web and data services.
- Observation and measurement of energy behavior will occur over a one-year period, including all energy use seasons.

### 4.2 Project Objectives

To achieve the project goal, the AMI assessment project focuses on accomplishing the key objectives shown in *Table 11*:

Project Objective	Description/Scope
<p>1. Design the AMI customer experience and customer education.</p>	<p>The customer experience involves all of the events, processes, and touchpoints associated with a customer's interaction with the AMI assessment. Customer education involves the process, content, and media used to enhance the customer's knowledge, skills, and attitudes regarding rates, enabling technologies, energy efficiency, demand response, and load shifting. Customer experience and customer education must be ready for implementation by Q2, 2010 and must align with these principles and standards:</p> <ul style="list-style-type: none"> <li>• Embrace customer-centered design practices</li> <li>• Blend rational and emotional experiences</li> <li>• Engage customers in small, observable steps of adoption</li> </ul>
<p>2. Select enabling technologies offering the greatest value.</p>	<p>The AMI assessment aims to test four different types of enabling technology:</p> <ul style="list-style-type: none"> <li>• Online web presentation</li> <li>• Basic in-home display (IHD)</li> <li>• Advanced in-home display (IHD)</li> <li>• Programmable communicating thermostat (PCT)</li> </ul> <p>The RFP process selects the technology that ComEd will use in the assessment. The RFP shall follow approved regulatory guidelines and achieve these milestones:</p> <ul style="list-style-type: none"> <li>• Vendors identified by Q2, 2009</li> <li>• Vendors evaluated by Q3, 2009</li> <li>• Vendors selected by Q3, 2009</li> </ul>
<p>3. Secure any necessary approval to use six types of rates on a trial basis.</p>	<p>The AMI assessment aims to test six different types of rates:</p> <ul style="list-style-type: none"> <li>• Flat rate</li> <li>• Increasing block rate (IBR)</li> <li>• Critical peak price (CPP) rate (overlays on an DA-RTP)</li> <li>• Peak time rebate (PTR) rate (overlays on an DA-RTP)</li> <li>• Day-ahead real-time pricing (DA-RTP) rate</li> <li>• Time of use (TOU) rate</li> </ul> <p>Rates must be able to be effective no later than Q4, 2009.</p>
<p>4. Test the impact of a wide spectrum of dynamic pricing options in conjunction with a wide range of enabling technologies on system peak demand, energy consumption and reliability</p>	<p>This test will commence in the June, 2010 billing cycle and conclude in May, 2011 billing cycle. It will inform a number of questions that are central to the development of an AMI strategy. The purpose of this test is to answer the following questions:</p> <ul style="list-style-type: none"> <li>• What is the potential scale and scope of AMI benefits?</li> <li>• Can basic education and cost alerts, non-TOU rate designs, and direct-load control achieve the same results?</li> <li>• Does AMI enhance the customer experience and make it more likely that they will provide demand response?</li> <li>• What is the best way to get customers to adopt rate and technology options?</li> <li>• How do customer preferences interact with the magnitude of their demand response?</li> <li>• Will basic education about the capabilities of the AMI system stimulate customer interest in energy efficiency and alternative rate designs?</li> <li>• What additional value can be gained by extensively educating customers?</li> </ul>

Project Objective	Description/Scope
5. Deliver the AMI Customer Applications Assessment Evaluation Report:	<p>The report will be delivered no later than Q3, 2011, and will recommend the most valuable residential application that validates the business case. The report will include these sections: †</p> <ul style="list-style-type: none"> <li>• Executive Summary</li> <li>• Introduction</li> <li>• Evaluation Questions and Hypotheses</li> <li>• Method</li> <li>• Results</li> <li>• Discussion</li> <li>• Recommendation</li> </ul>

*Table 11: Project objectives associated with the AMI assessment.*

### **4.3 Measures of Project Success**

The overall success of the AMI assessment is whether it produces statistically significant findings regarding changes in energy use behavior among customers relative to other application groups and relative to the control group. In other words, success is when stakeholders learn something about AMI that ultimately benefits customers and stakeholders in the future. Other subordinate measures of project success include:

- Customer savings on their electric bills.
- Customer satisfaction with the AMI customer experience.
- Customer favorability toward the AMI program and ComEd.
- Customer participation in other energy efficiency programs.
- Stakeholder satisfaction with the AMI program.
- Completing the project at or under budget.
- Completing the AMI assessment evaluation report by Q3, 2011.

### **4.4 Project Tasks – Back Office Systems Supporting Customer Applications**

This sub-section describes the high-level project tasks and milestones associated the back-office systems and processes that must be in place to implement customer applications and the AMI assessment.

#### **4.4.1 Evaluation Data Model and Datastore**

##### **Objective Alignment: #4 – Test the Impact**

This task reflects the need to collect and store customer data collected from meter reads, billing, surveys, enabling technology acquisition and usage, and customer touchpoint records in a way that it can be exported to statistical analysis packages.

Through an RFP process, ComEd will contract with an evaluation vendor to develop the evaluation data model and datastore. The expectation is that this system will be the central repository for all data collected in conjunction with the AMI assessment. During the AMI assessment, all data collected from customers for the AMI assessment will be channeled into this system on a regular basis. This will allow not only the generation of monthly reports of interim results for both ComEd and external stakeholders, but final results as well. ComEd expects

commence this work in Q3, 2009, with completion expected by Q1, 2010. Key milestones and responsibilities for this task are as follows:

Milestone	Responsible	Consulted
Complete evaluation data requirements and RFP.	ComEd	
Select evaluation data vendor.	ComEd	
Design evaluation data model.	Eval Vendor	ComEd
Develop database.	Eval Vendor	ComEd
Specify data transfer protocols and formats	Eval Vendor	ComEd
Test data transfer protocols and formats.	ComEd	
Implement and populate datastore with data during the AMI assessment.	Eval Vendor	ComEd

*Table 12: Evaluation model and datastore milestones.*

#### 4.4.2 IT-Billing Integration

##### **Objective Alignment: #4 – Test the Impact**

This task reflects the need to provide customers in the AMI assessment an accurate bill associated with the rate type to which ComEd assigned them.

During the proceeding, the rate design will be finalized and approved. Based upon the ICC’s decision regarding the experimental rates, ComEd must integrate those rates into its billing systems. Since ComEd already offers real-time rates to customers, the scope of this task reflects designing, developing, and testing extensions to the existing billing system infrastructure. ComEd expects commence this work in Q1, 2010, with completion expected by Q2, 2010. ComEd shall contract with an external IT vendor to complete this scope of work. Key milestones for this task include:

Milestone	Responsible	Consulted
Design billing system extensions.	IT Vendor	ComEd
Develop of billing system extensions.	IT Vendor	ComEd
Test billing system extensions.	ComEd	
Implement billing system extensions.	ComEd	

Table 13: Billing/IT integration milestones.

#### 4.4.3 Enabling Technology Selection/IT Integration

##### Objective Alignment: #2 – Select Enabling Technology Vendors

This task reflects the need to provide customers in certain application groups enabling technology, in the form of web presentment, in-home displays (IHDs), and programable communicating thermostats (PCTs).

**Enabling Technology Selection.** The first part of this task is to select the vendors who will provide enabling technology for the AMI assessment. ComEd will need up to four vendors who will provide the web presentment, basic IHD, advanced IHD, and PCT/IHD solutions. ComEd expects commence this work in Q3, 2009, with completion expected by Q4, 2009. Key milestones for this task include:

Milestone	Responsible	Consulted
Complete web presentment requirements and RFP.	ComEd	
Complete basic IHD requirements and RFP.	ComEd	
Complete advanced IHD requirements and RFP.	ComEd	
Complete PCT/IHD requirements and RFP.	ComEd	
Select vendor for each enabling technology component.	ComEd	

Table 14: Enabling technology selection milestones.

**Enabling Technology IT Integration.** The second part of this task is IT integration. All of the enabling technologies require some integration with ComEd’s IT systems. For example:

- Web presentment must be integrated into ComEd’s My Account portal and connected to ComEd’s meter data management system (MDMS) and billing system.
- Basic IHDs must be configured to securely connect to the customer’s smart meter HAN interface.
- Advanced IHDs must be configured to securely connect through an internet connection to ComEd’s systems.
- PCT/IHDs must be configured and integrated with ComEd’s demand response systems.

ComEd expects commence this work in Q4, 2009, with completion expected by Q1, 2010. Key milestones for this task include:

Milestone	Responsible	Consulted
<b>Web Presentment</b>		
Design web presentment integration.	IT Vendor	ComEd
Develop web presentment solution.	IT Vendor	ComEd
Test web presentment solution.	ComEd	
Release web presentment solution.	ComEd	
<b>Basic IHD</b>		
Configure basic IHD for smart meter connection.	IT Vendor	ComEd
Test basic IHD solution.	ComEd	
Implement basic IHD solution.	ComEd	
<b>Advanced IHD</b>		
Configure advanced IHD for smart meter and broadband connection.	IT Vendor	ComEd
Test advanced IHD solution.	ComEd	
Implement advanced IHD solution.	ComEd	
<b>PCT/IHD</b>		
Configure PCT/IHD for smart meter connection.	IT Vendor	ComEd
Test PCT/IHD solution.	ComEd	
Implement PCT/IHD solution.	ComEd	

Table 15: Enabling technology IT integration milestones.

#### 4.4.4 Modify Customer Care Center System

##### Objective Alignment: #4 – Test the Impact

This task reflects the need to display information about customers in the AMI assessment to guide ComEd customer care center employees in providing customers information that is consistent with their application group, and collecting information from customers for use in the assessment analysis.

ComEd will contract with an IT vendor to make modifications to the customer care system. The expectation is that these modifications will enable not only the cueing of customer care employees that the customer is part of the AMI assessment, but also enable customer care employees to record data about the customer interaction (such as opt-out). ComEd expects commence this work in Q4, 2009, with completion expected by Q1, 2010. Key milestones and responsibilities for this task are as follows:

Milestone	Responsible	Consulted
Complete customer care data requirements.	ComEd	
Select IT data vendor.	ComEd	
Make modifications to the customer care system.	IT Vendor	ComEd
Specify data transfer protocols and formats to Evaluation Datastore	IT Vendor Evaluation Vendor	ComEd
Test customer care system and data transfer protocols and formats.	ComEd	IT Vendor Evaluation Vendor
Implement new version of the customer care system.	IT Vendor	ComEd

Table 16: Modification of customer care system milestones.

#### 4.5 Project Tasks – Customer Touchpoints/Experience

This sub-section describes the high-level project tasks and milestones associated with the customer touchpoints and experience that must be in place to implement the AMI assessment.

For all tasks in this section, ComEd will use generally-accepted, customer-centered design and customer experience design methodologies drawn from the service design, communication design, and instructional design literature.<sup>31</sup> As you’ll see in most of these tasks, the process starts with involving customers in the design of service scripts and customer requirements. Based upon these designs, ComEd or its vendors develop the communications and technologies called for in the service scripts and test them through customer focus groups. Final versions of materials are then developed and undergo functional testing before implementation. After implementation, we assess the impact of the materials on customer behavior and response, and modify as required, using action research methodologies.

##### 4.5.1 Public Information/Communications Strategy

###### Objective Alignment: #1 – Design the AMI Customer Experience

This task reflects the need to keep internal stakeholders, external stakeholders, and customers informed of the AMI assessment before, during, and after, while minimizing potential threats to validity.

ComEd expects commence this work in Q3, 2009, with completion expected by Q4, 2009. Key milestones for this task include:

Milestone	Responsible	Consulted
Gather stakeholder requirements and content for the public information/communications strategy.	Communications Vendor	ComEd Customers
Design the overall public information/communications strategy.	Communications Vendor	ComEd

Table 17: PR/Communication strategy milestones.

##### 4.5.2 Smart Meter User Manual (SMUM)

###### Objective Alignment: #1 – Design the AMI Customer Experience

This task reflects the need to have a single source (for each control and application group) of all educational content that ComEd and its partners will use for customer education.

ComEd expects commence this work in Q4, 2009, with completion expected by Q1, 2010. Key milestones for this task include:

<sup>31</sup> For example, see Honebein, P.C., Cammarano, R.F., (in press), “Will Smart Meters Ripen or Rot? Five First Principles for Embracing Customers as Co-creators of Value,” *The Electricity Journal*, June/July 2009; Bitner, M., Ostrom, A.L., and Morgan, F.M. (2007), “Service Blueprinting: A Practical Technique for Service Innovation.” <http://people.ischool.berkeley.edu/~glushko/IS243Readings/ServiceBlueprinting.pdf>; Honebein, P.C. (1997). *Strategies for Effective Customer Education*. Chicago: NTC Books.; Pine & Gilmore (1999). *The Experience Economy*. Boston: Harvard University Press; Honebein, P.C. and Cammarano, R.F. (2005). *Creating Do-it-Yourself Customers*. Natorp, OH: Texere.

Milestone	Responsible	Consulted
Gather customer requirements and content for the Smart Meter user manual.	Communications Vendor	ComEd Customers
Design/write the Smart Meter User Manual.	Communications Vendor	ComEd
Develop versions of the Smart Meter User Manual for all control and application groups.	Communications Vendor	ComEd
Focus group test Smart Meter User Manual	Focus Group Vendor	ComEd
Develop final versions of the Smart Meter User Manual for all control and application groups.	Communications Vendor	ComEd
Implement Smart Meter User Manual	ComEd	
Assess Smart Meter User Manual and modify as necessary.	ComEd Communication Vendor	

Table 18: Smart Meter User Manual milestones.

### 4.5.3 AMI Assessment Notification

#### Objective Alignment: #1 – Design the AMI Customer Experience

This task reflects the need to notify customers in the AMI assessment region that they will be receiving a smart meter, that their rate is changing (if applicable), and that they will receive other services that are available (dependent on their assigned application group).

ComEd expects commence this work in Q3, 2009, with completion expected by Q2, 2010. Key milestones for this task include:

Milestone	Responsible	Consulted
Design the service script for AMI assessment notification for specified control and application groups.	ComEd	Customers
Design the service policies associated with AMI notification: <ul style="list-style-type: none"> <li>Enabling technology pricing.</li> <li>Opt out conditions and process.</li> <li>Hold harmless provisions.</li> </ul>	ComEd	ComEd Customers
Design the customer education and communications for specified control and application groups.	Communications Vendor	ComEd Customers SMUM
Design pre-assessment customer survey. <ul style="list-style-type: none"> <li>Web form</li> <li>Paper form</li> <li>Telephone interview</li> </ul>	Evaluation Vendor	ComEd
Focus group test of script, communication materials, and survey materials.	Focus Group Vendor	ComEd
Develop final version of customer education and communication for each control and application group.	Communication Vendor	ComEd SMUM
Develop final version of pre-assessment customer survey.	Evaluation Vendor	ComEd
Generate mailing list of customers in each control and application group.	ComEd	Fulfillment Vendor
Test mail merge to assure correct notification is sent to the correct control or application group.	Fulfillment Vendor	ComEd
Develop Opt-Out web page/form.	ComEd	

Milestone	Responsible	Consulted
Train call center in opt-out script.	ComEd	
Mail AMI assessment notifications.	Fulfillment Vendor	ComEd
Assess opt-out rates, survey response rates; modify AMI assessment notification as necessary.	ComEd	Communication Vendor Fulfillment Vendor Evaluation Vendor

Table 19: AMI assessment notification milestones.

#### 4.5.4 Web Presentment Sign-Up

##### Objective Alignment: #1 – Design the AMI Customer Experience

This task reflects the need to allow customers in the appropriate application groups to sign-up and access their AMI energy usage information through a secure web page.

ComEd expects commence this work in Q3, 2009, with completion expected by Q2, 2010. Key milestones for this task include:

Milestone	Responsible	Consulted
Design service script for web presentment sign-up.	ComEd	Customers
Design the service policies associated with web presentment.	ComEd	ComEd Customers
Develop customer education and communications for web presentment sign-up for specified control and application groups.	Web Vendor	ComEd Customers SMUM
Develop user interface for web presentment sign-up.	Web Vendor	ComEd
Focus group test the web presentment sign-up and data display interface.	Focus Group Vendor	ComEd
Develop final version of web user interface for web presentment sign-up.	Web Vendor	ComEd
Define user access privileges for web presentment sign-up.	ComEd	
Implement web user interface for web presentment sign-up.	ComEd	
Assess sign-up rates, abandonment, and customer complaints, and modify sign-up process as necessary.	ComEd	Web Vendor

Table 20: Web presentment sign-up milestones.

#### 4.5.5 Enabling Technology Ordering and Fulfillment

##### Objective Alignment: #1 – Design the AMI Customer Experience

This task reflects the need to allow customers to acquire enabling technology, either for free or purchase, and to schedule appointments for the installation of enabling technology.

ComEd expects commence this work in Q4, 2009, with completion expected by Q2, 2010. Key milestones for this task include:

Milestone	Responsible	Consulted
Design service script and customer requirements for enabling technology ordering. <ul style="list-style-type: none"> <li>• Web self-service script</li> <li>• Customer contact center script</li> <li>• Paper form script</li> </ul>	ComEd	Customers
Design service script and customer requirements for enabling technology fulfillment. <ul style="list-style-type: none"> <li>• Customer-installable script</li> <li>• Professional install script</li> </ul>	ComEd	Enabling Technology Vendor Customers
Design the service policies associated with enabling technology ordering and fulfillment	ComEd	Customers
Complete professional installation requirements and RFP.	ComEd	
Select professional installation vendor.	ComEd	
Design customer education and communication for each application group.	Communication Vendor	ComEd SMUM
Design web user interface for enabling technology ordering.	Web Vendor	ComEd Customers
Focus group test scripts, communication materials, and user interfaces	Focus Group Vendor	ComEd
Develop final version of user interface for web ordering.	Web Vendor	ComEd
Develop final customer education and communication for each application group.	Communication Vendor	ComEd SMUM
Develop payment processing process.	ComEd	
Develop installation process.	Installation Vendor	ComEd
Develop product support, return, and replacement process.	ComEd Enabling Technology Vendor	ComEd
Train customer contact center personnel in service processes.	ComEd	
Train installers in installation process.	ComEd Installation Vendor	
Test ordering process.	ComEd	
Test installation process.	ComEd	
Test product support, return, and replacement process.	ComEd	
Implement enabling technology ordering and fulfillment.	ComEd	
Assess ordering rates, abandonment, installation, and customer complaints, and modify processes as necessary.	ComEd	Web Vendor Communication Vendor Installation Vendor Enabling Technology Vendor

Table 21: Enabling technology ordering and fulfillment milestones.

#### 4.5.6 AMI Installation

##### Objective Alignment: #1 – Design the AMI Customer Experience

This task reflects the need to install AMI meters at customer residences and businesses.

Selection of the installation process and vendor is owned by the AMI technology side of the project and is not addressed in this plan. ComEd expects commence this work in Q3, 2009, with completion expected by Q2, 2010. Key milestones for this task include:

Milestone	Responsible	Consulted
Design service script and customer requirements for AMI installation. <ul style="list-style-type: none"> <li>Physical installation</li> <li>Collateral distribution</li> </ul>	ComEd	AMI Installation Vendor Customers
Design the service policies associated with AMI installation.	ComEd	Customers
Design customer education and communication for each application group.	Communication Vendor	SMUM
Focus group test scripts and education/communication materials.	Focus Group Vendor	ComEd
Develop final customer education and communication for each application group.	Communication Vendor	ComEd SMUM
Recruit, select, and train ComEd field representatives (troubleshoot customer service problems and educate customers during AMI installation).	ComEd	
Train AMI installation vendor in service script.	ComEd	
Test AMI installation process.	ComEd	
Implement AMI installation process.	ComEd	
Assess AMI installation and modify processes as necessary.	ComEd	AMI Installation Vendor Communicatins Vendor

Table 22: AMI installation milestones.

#### 4.5.7 Ongoing Customer Support and Education/Communication

##### Objective Alignment: #1 – Design the AMI Customer Experience

This task reflects the need to provide support (including information and education) to customers throughout the AMI assessment via print, web, email, and phone channels.

ComEd expects commence this work in Q4, 2009, with completion expected by Q2, 2011. Key milestones for this task include:

Milestone	Responsible	Consulted
Design service script and customer requirements for customer support for specific control and application groups. <ul style="list-style-type: none"> <li>• Phone</li> <li>• Email</li> <li>• Web</li> <li>• Face-to-face (field service)</li> </ul>	ComEd	Customers
Design service script and customer requirements for customer education/communication for specific control and application groups.	ComEd	Customers
Design the service policies associated with customer support and customer education/communication.	ComEd	Customers
Design customer education/communication materials and distribution schedule.	Communication Vendor	ComEd SMUM
Focus group test customer education/communication materials.	Focus Group Vendor	ComEd
Develop final customer education/communication materials.	Communication Vendor	ComEd SMUM
Develop knowledge base of AMI support issues, FAQs, and so on.	ComEd	
Train customer care employees in ongoing support skills.	ComEd	
Train field service employees in ongoing support skills.	ComEd	
Test customer support channels. <ul style="list-style-type: none"> <li>• Phone</li> <li>• Email</li> <li>• Web</li> <li>• Face-to-face</li> </ul>	ComEd	
Implement ongoing customer support and education/communication process.	ComEd	
Assess customer support and education/communication process and modify processes as necessary.	ComEd	Communication Vendor

*Table 23: Customer support and education/communications milestones.*

#### 4.5.8 Ongoing Customer Survey, and Analysis

**Objective Alignment: #1 – Design the AMI Customer Experience; #4 – Test the Impact**

This task reflects the need to survey customers and analyze the quantitative and qualitative data throughout the AMI assessment to assess involvement and issues with AMI.

ComEd expects commence this work in Q1, 2010, with completion expected by Q2, 2011. Key milestones for this task include:

Milestone	Responsible	Consulted
Design service script and customer requirements for customer sampling and survey.	ComEd	Customers
Design the service policies associated with customer sampling and survey.	ComEd	Customers
Design survey and qualitative research approaches.	Evaluation Vendor	ComEd
Schedule surveys and qualitative research approaches.	Evaluation Vendor	ComEd
Develop survey and qualitative research approaches.	Evaluation Vendor	ComEd
Test survey and qualitative research approaches.	ComEd	Evaluation Vendor
Implement surveys and qualitative research.	Evaluation Vendor	ComEd
Integrate results into evaluation datastore	Evaluation Vendor	ComEd
Analyze quantitative and qualitative data collected monthly.	Evaluation Vendor	ComEd
Produce monthly reports.	Evaluation Vendor	ComEd

Table 24: Customer sampling, survey, and analysis milestones.

#### 4.5.9 Simulated/Actual Demand Response Events

**Objective Alignment: #1 – Design the AMI Customer Experience; #4 – Test the Impact**

This task reflects the need to simulate different types of events, such as demand response events, and assess customer response to those events.

ComEd expects commence this work in Q4, 2009, with completion expected by Q2, 2011. Key milestones for this task include:

Milestone	Responsible	Consulted
Design service script and customer requirements for demand response events.	ComEd	Customers
Design the service policies associated with demand response events.	ComEd	Customers
Design customer notification system and messaging for demand response events.	Notification Vendor	ComEd
Design sign-up system for customer notifications.	Notification Vendor	ComEd
Focus group test notification sign-up, notification system, and messaging.	Focus Group Vendor	ComEd
Develop final notification system and messaging.	Notification Vendor	ComEd
Develop final sign-up system.	Notification Vendor	ComEd
Test notification sign-up.	ComEd	Notification Vendor
Test demand response notification system.	ComEd	Notification Vendor
Schedule actual/simulated events	ComEd	
Implement notification system	ComEd	Notification Vendor
Assess notification system and modify processes as necessary.	ComEd	Notification Vendor

Table 25: Simulated/actual demand response events milestones.

#### 4.5.10 AMI Assessment Exit and Debrief

**Objective Alignment: #1 – Design the AMI Customer Experience; #4 – Test the Impact**

This task reflects the need to end the AMI assessment and gracefully exit and debrief customers as they transition back to their previous rate.

ComEd expects commence this work in January, 2010, with completion expected by May, 2011. Key milestones for this task include:

Milestone	Responsible	Consulted
Design service script and customer requirements for AMI exit and debrief.	ComEd	AMI Installation Vendor Customers
Design the service policies associated with AMI exit and debrief.	ComEd	Customers
Design post-AMI assessment survey.	Evaluation Vendor	ComEd
Design post-AMI customer education and communications.	Communication Vendor	ComEd
Focus group test scripts and education/communication materials.	Focus Group Vendor	ComEd
Develop final post-AMI assessment survey..	Communication Vendor	ComEd SMUM
Develop final customer education and communication..	Communication Vendor	ComEd SMUM
Train customer care staff in AMI exit and debrief.	ComEd	
Implement AMI exit and debrief process.	ComEd	
Assess AMI exit and debrief process.	ComEd	Evaluation Vendor Communicatins Vendor

*Table 26: AMI assessment exit and debrief milestones.*

#### 4.5.11 AMI Assessment Analysis and Evaluation Report

**Objective Alignment: #4 – Test the Impact**

This task reflects the need to generate an evaluation report that presents and discusses the results of the AMI assessment.

ComEd expects commence this work in Q2, 2011, with completion expected by Q3, 2011. Key milestones for this task include:

Milestone	Responsible	Consulted
Analyze quantitative and qualitative data.	Evaluation Vendor	ComEd
Produce final report	Evaluation Vendor	ComEd

*Table 27: AMI assessment analysis and evaluation report milestones.*

### 4.6 Schedule

Figure 11 summarizes the various dates listed in the project tasks into a GANTT chart schedule.

Tasks	Q2 2009	Q3 2009	Q4 2009	Q1 2010	Q2 2010	Q3 2010	Q4 2010	Q1 2011	Q2 2011	Q3 2011	Q4 2011
<b>AMI Assessment</b>											
<b>Back-Office Systems Tasks</b>											
Evaluation Data Model and Datastore											
IT-Billing Integration											
Enabling Technology Selection											
Enabling Technology IT Integration											
Modify Customer Care Center System											
<b>Customer Experience Tasks</b>											
PR/Communications Strategy											
Smart Meter User Manual											
AMI Assessment Notification											
Web Presentment Sign-up											
Enabling Technology Order/Fulfillment											
AMI Installation											
Ongoing Customer Support/Education											
Ongoing Customer Survey, and Analysis											
Demand Response Events											
AMI Assessment Exit and Debrief											
AMI Assessment Evaluation Report											
<b>Other Tasks</b>											
Preliminary Evaluation Report											
Project Post Mortem											

Figure 11: AMI assessment 2009-2011 quarterly schedule.

#### 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
<b>Total</b>				<b>\$12,619,500</b>	<b>\$10,429,500</b>	<b>\$2,190,000</b>

*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 risks<sup>32</sup> associated with the AMI assessment project and the contingencies ComEd is planning to mitigate those risks.

Risk	Contingency
<b>1 Threats to Validity</b>	
1.1 Opt-out/drop-out initially or during the assessment reduces sample size below desired confidence levels.	<ul style="list-style-type: none"> <li>• Set desired sample size for highest confidence level (99%).</li> <li>• Proposing, on an expedited basis, tariff amendments that would allow for enlargement of the customer groups.</li> <li>• 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.</li> <li>• Accept minimum confidence level of 95% (requires 116 customers per control/application).</li> <li>• Use opt-out as a primary measure of customer dissatisfaction with the AMI program.</li> <li>• 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.</li> </ul>

<sup>32</sup> 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"> <li>• Each control and application will have one or more service scripts that define how customers will receive services associated with the AMI assessment.</li> <li>• Each application will be designed using generally-accepted, customer-centered models, methods, and processes.</li> <li>• 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.</li> <li>• 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.</li> </ul>
1.3 Variables associated with the customer's setting may impact the effects associated with applications.	<ul style="list-style-type: none"> <li>• 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.</li> <li>• The post-assessment survey will include questions that assess the effects of customer setting.</li> </ul>
1.4 Events between the pre and post surveys may impact effects.	<ul style="list-style-type: none"> <li>• 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"> <li>○ Dummy variables to account for such things as seasons, days, and so on.</li> <li>○ Weather data.</li> <li>○ Significant events that occur during the assessment period.</li> </ul> </li> </ul>
1.5 Opt-out/drop-out rates are different between applications, which influences effects.	<ul style="list-style-type: none"> <li>• Collect data during opt-out/drop-out to assess effects on the application group.</li> <li>• Offer cash incentives for participation (\$15 for pre-survey; \$35 for post-survey).</li> <li>• Offer multiple channels/touchpoints for survey completion (paper, web, phone, and field).</li> <li>• Pre-notify customers through mail, email, and phone to remind them to complete a forthcoming survey.</li> <li>• Follow-up with phone interview for paper/web survey non-respondents.</li> </ul>
1.6 Communication between customers in different control and application groups about their respective applications which influences behavior.	<ul style="list-style-type: none"> <li>• Surveys during the AMI assessment will include questions to assess the effects of inter-customer communication.</li> <li>• The post-assessment survey will include questions that assess the effects of inter-customer communication.</li> </ul>
1.7 Control customers learn of their underdog or deprived status, which erodes energy behavior effects.	<ul style="list-style-type: none"> <li>• Recruit the control groups, specific group F1, from a region outside the I-290 Corridor and city of Chicago.</li> <li>• 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.</li> </ul>
1.8 Customers attempt to conform to the hypotheses associated with the AMI assessment.	<ul style="list-style-type: none"> <li>• Keep customers, ComEd employees (especially front-line employees), vendors, the press, and other potential touchpoints blind to the hypotheses associated with the AMI assessment.</li> </ul>
1.9 ComEd or stakeholder expectations about desired outcomes may bias the data.	<ul style="list-style-type: none"> <li>• Retain a third-party evaluation vendor to collect data and analyze the results.</li> </ul>

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"> <li>• Use an opt-out strategy.</li> <li>• Use customer retention and recovery strategies to keep customers in the AMI assessment.</li> </ul>
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"> <li>• Select the I-290 Corridor and city of Chicago with this threat in mind.</li> <li>• Include a comparison of the I-290 Corridor results with the city of Chicago results to assess differences.</li> </ul>

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

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
<b>3 Customer Experience Risks</b>	
3.1 Service scripts and materials result in significant customer dissatisfaction.	<ul style="list-style-type: none"> <li>• Test through focus groups or similar methods all service scripts and materials prior to customer delivery.</li> <li>• 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.</li> <li>• Uniquely version all service scripts and materials so that updates can be deployed and the M&amp;V analysis can assess a version's impact on results.</li> </ul>
3.2 Customer response rate to pre-AMI survey is low.	<ul style="list-style-type: none"> <li>• Conduct survey through multiple channels (paper, web, and phone).</li> <li>• Follow-up non-respondents with telephone calls.</li> </ul>
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"> <li>• Conduct outbound phone call follow-up to schedule appointments for installation.</li> <li>• Allow customers to acquire/install enabling technology throughout the assessment.</li> </ul>

Risk	Contingency
3.4 Customers revolt, complain, backlash, and so on regarding being put on a different rate.	<ul style="list-style-type: none"> <li>• 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.</li> <li>• Provide customers an easy process to opt-out.</li> <li>• Provide impeccable customer service.</li> <li>• Offer to place customers back on the flat rate retroactive to the start date of the experimental rate.</li> </ul>
3.5 Customers calling the opt-out number note their plans to switch to another energy supplier.	<ul style="list-style-type: none"> <li>• 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.</li> </ul>

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

*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

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