

## **AMI Use Case: C1**

# **Customer reduces their usage in response to pricing or voluntary load reduction events**

**June 26, 2006**

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## Document History

### Revision History

Revision Number	Revision Date	Revision / Reviewed By	Summary of Changes	Changes marked
1.0	060202	Ben Rankin	Original Document	N
1.1	060206	Ben Rankin	Replaced Narrative, Use Case Steps and Requirements based on C1W2 v1.2 document	N
1.2	060227	Ben Rankin	Updated Document based on content from C1W3 Session Notes	N
1.3	060314	Ben Rankin	Updated Document after discussing questions raised by Grant Watson and SAT	Y
1.4	060418	DTillman	Updated summary, narrative, actors, scenarios and requirements	Y
1.5	060626	MBaig	Updated corrections from Deborah Tillman. The following sections were changed. Narrative, Scenarios/Steps.	N

### Approvals

This document requires following approvals.

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## 1. Use Case Description

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### 1.1 Use Case Title

Customer reduces their usage in response to pricing or voluntary load reduction events

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### 1.2 Use Case Summary

A major benefit of the Advanced Metering Infrastructure (AMI) is that it supports customer awareness of their instantaneous kWhr electricity pricing and it can support the utilities in the achievement of its load reduction needs. As we see increased electricity demand on the grid, it may result in energy shortages, therefore triggering the need for utilities to reduce energy consumption in support of grid stability. The AMI will help facilitate load reduction at the customer's site by communicating instantaneous kWhr pricing and voluntary load reduction program events to the customer and to various enabling devices at the customer's site. Voluntary load reduction events may be scheduled with a large amount of advanced notice (24 hrs) or near real-time. For the utility to receive the desired customer response, we must provide them timely pricing, event and usage information.

Related to this scenario is the measurement of the response to financial incentives, energy price adjustments and other voluntary demand response programs. The customer responses will be used to determine how and/or if they have responded to a pricing event, if the utility needs to launch other demand response events to achieve the needed demand reduction and help the utility determine how to structure future voluntary load reduction programs, to ensure the utility receives the best customer response.

This scenario includes the actual mechanism to distribute price signals and voluntary load reduction events to customers (direct electronic delivery to the customer meter, display device within the home/business, automated telephone calls, e-mail, pager, commercial broadcast radio, newspapers, etc.). It includes the mechanism by which the AMI will display current pricing and voluntary load reduction event information within the customer's home/business. The AMI will initiate automatic load reduction at the customer's site by communicating event and pricing information to customer equipment and the customer equipment will take action based on the customer's predefined setting. The customer will be able to program their load control specifications and refuse utility load reduction requests with a device within their home/business. The customer will also be able to manually curtail load based upon informational messages communicated to them through the AMI.

#### 1.3 Use Case Detailed Narrative

The utility determines that the next day will be a Critical Peak Pricing (CPP) day (voluntary load reduction program). It notifies the customer of the impending event using a variety of methods which may include the AMI via the meter or customer display, newspaper, TV, website, email, etc. The utility customer representatives are also notified of the event so they can anticipate customer questions/concerns.

The AMI will transmit the event information to the meters in the affected area, providing advanced notification that an event is scheduled, the event date and start/end time and pricing information. The meter will log the event information, send a receipt to the AMI and forward the message to the customer's display device (if present and compatible with the utilities communication equipment).

When the event start time arrives, the AMI may send another event message to the affected meters that the event has started or the meter may launch the event autonomously. If the AMI sends another event message, the meter will receive the event message, log the action and send a receipt to the AMI. The meter will also send a message to the customer's display device (if available) and any load control devices previously configured to respond to the utilities event notification, indicating the event is in progress. The customer may take action to manually reduce their load or allow their load control device to respond to the request. The load control devices may be pre-programmed, either from the factory or by the customer, to take specific action based on the price or specific event. If the customer chooses, they can over-ride the automated load drop of their equipment. If the control device takes action, it will send a message to the meter and the meter will log the receipt and send a message to the AMI. The AMI will permanently log each message from the meter for future audit. Before and during the event, the customer will be able to view the CPP event information and start and end time for the event on their meter and/or display device. The customer will also be able to view their usage data for the most recent completed usage interval (e.g. kWh), instantaneous demand and hourly cost. If the customer is not at their home or business, they may also view their usage, pricing, cost and event information a utility website (e.g., sce.com).

If the utility determines more load reduction is needed, it may choose to initiate other voluntary and non-voluntary load reduction programs. The AMI requirements for utility initiated and controlled load reduction programs (e.g., rolling outages) is discussed in another use case (D1).

When the event end time arrives, the AMI may send another event message to the affected meters or the meter may terminate the event autonomously. The meters will display that the event has ended and log the action. The meter will send the message to the customer's display devices (if available) and configured load control equipment at the customer's site. The load control equipment will confirm the message was received, terminate the load control activity and log the transaction (if possible). The load control equipment will send a receipt to the meter (if possible) and the meter will log the receipt and send the message to the AMI. The AMI will permanently log each message from the meter for future audit and make the information available to other utility systems (e.g., billing system and utility website).

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#### 1.4 Business Rules and Assumptions

*Describe any business rules, assumptions and regulatory or policy constraints that apply to this use case*

Assumptions

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- The AMI project requirements apply to customers under 200kW in demand
- The ISO and utility have determined that demand response programs and events (e.g., Critical Peak Pricing) will be necessary for grid management
- Load control device(s) at the customer site will take action based on price or specific event (dependent on presence of the control devices and compliance with SCE requirements)
- The meter may serve as the interface between the utility and the customer's load control equipment (as opposed to using a separate gateway).
- The customer shall have the ability to pre-program the load control device at their site to respond to event messages and/or pricing
- The customer shall have the ability to "over-ride" the automated load reduction event response at their site
- Customers must be enrolled in a demand response program to enable communications between the utility and the customer's control devices

## 2. Actors

*Describe the primary and secondary actors involved in the use case. This might include all the people (their job), systems, databases, organizations, and devices involved in or affected by the Function (e.g. operators, system administrators, customer, end users, service personnel, executives, meter, real-time database, ISO, power system). Actors listed for this use case should be copied from the global actors list to ensure consistency across all use cases.*

<b>Actor Name</b>	<b>Actor Type (person, device, system etc.)</b>	<b>Actor Description</b>
Customer	Person	Receives pricing and event information from the AMI. Pre-programs responses to events into their load controller(s). Needs to reduce their load throughout the event to reduce energy costs or receive financial benefit.
Customer Control Equipment	Device(s)	Switches loads on or off or reduces load in response to events communicated by the AMI system (Meter). Needs to follow the preprogrammed rules. E.g. smart thermostat.
Customer Display Device	Device(s)	Display device that receives energy and event information from the AMI and presents it to the customer.
AMI	System	The AMI system is made up of systems that are required to enable remote two-way communications with meters and data storage (e.g. MDMS and ADCS).
Meter Data Management System (MDMS)	System	System that stores meter data (e.g. usage, generation, meter logs) and makes data available to authorized systems. This system is a component of the AMI
Automated Data Collection System (ADCS)	System	System that can communicate with AMI meters remotely (e.g. program meters, test meters, retrieve data). This system is a component of the AMI.
AMI Meter	Device	Serves as a gateway between the utility, customer site and the customer's load controller(s). Provides confirmation to the Customer that an event is pending or underway. Records transactions between the customer's load controller(s) and AMI. Needs to continue reporting data throughout the demand response process.
Customer Service System (CSS)	System	System that provides SCE employees ability to view customer specific information regarding billing, tariffs, programs, metering, interval usage, etc. (e.g. system used



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<i>Actor Name</i>	<i>Actor Type (person, device, system etc.)</i>	<i>Actor Description</i>
		by the call center)

### 3. Step by Step analysis of each Scenario

*Describe steps that implement the scenario. The first scenario should be classified as either a “Primary” Scenario or an “Alternate” Scenario by starting the title of the scenario with either the work “Primary” or “Alternate”. A scenario that successfully completes without exception or relying heavily on steps from another scenario should be classified as Primary; all other scenarios should be classified as “Alternate”. If there is more than one scenario (set of steps) that is relevant, make a copy of the following section (all of 3.1, including 3.1.1 and tables) and fill out the additional scenarios.*

#### 3.1 Utility initiates a voluntary demand response event (e.g. Critical Peak Pricing Event)

*Provide a scenario name that indicates whether the scenario is classified as “Primary” or “Alternate” (for example, “Primary Scenario: Distributed Generation Metering” or “Alternate Scenario: Customer unexpectedly connects DG”) and an overview of the scenario.*

Primary Scenario: Utility initiates a voluntary demand response event (e.g. Critical Peak Pricing Event)

<b>Triggering Event</b>	<b>Primary Actor</b>	<b>Pre-Condition</b>	<b>Post-Condition</b>
<i>(Identify the name of the event that start the scenario)</i>	<i>(Identify the actor whose point-of-view is primarily used to describe the steps)</i>	<i>(Identify any pre-conditions or actor states necessary for the scenario to start)</i>	<i>(Identify the post-conditions or significant results required to consider the scenario complete)</i>
The utility determines the need for a demand response event.	AMI Meter	The AMI meter is installed and provisioned. The customer has enrolled in a voluntary demand response program or tariff and the ADCS is receiving interval data (e.g. hourly or 15 min interval) each day by 6AM, for the previous day’s usage, as scheduled from the AMI meter.	The customer will have been notified of an event, the event will have been autonomously launched by the AMI meter, the customer control equipment will have taken action and the event will have ended and the customer equipment returned to its original state.

##### 3.1.1 Steps for this scenario

*Describe the normal sequence of events that is required to complete the scenario.*

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<b>Step #</b>	<b>Actor</b>	<b>Description of the Step</b>	<b>Additional Notes</b>
<i>#</i>	<i>What actor, either primary or secondary is responsible for the activity in this step?</i>	<i>Describe the actions that take place in this step. The step should be described in active, present tense.</i>	<i>Elaborate on any additional description or value of the step to help support the descriptions. Short notes on architecture challenges, etc. may also be noted in this column..</i>
1	ADCS	The ADCS sends an event message to the meter of the pending pricing event, including the event type, event date and start/end time and hourly pricing.	Notification contains event type, event date, event start and end time and pricing.
2	AMI Meter	The meter receives the message and logs it with the meter's internal meter time and date stamp.	
3	AMI Meter	The meter displays the event type, event status (e.g. pending), scheduled event date/time (start/end) and hourly event pricing for customer viewing.	
4	AMI Meter	The meter sends confirmation to the ADCS that it received the message and the ADCS will send the confirmation to the MDMS.	
5	MDMS	The MDMS will receive the confirmation for the ADCS and send a message to the CSS that the appropriate AMI meter (customer) has been notified.	
6	AMI Meter	Meter sends the event message to the customer's display device and control equipment (if available and it meets SCE requirements) for customer viewing and logs the action.	This activity will occur nearly simultaneously with the receipt sent back to the ADCS.
7	Customer Display Device/Customer Control Equipment	The display device and/or control equipment will receive and display the event message (if present and dependent on type of customer equipment).	

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<i>Step #</i>	<i>Actor</i>	<i>Description of the Step</i>	<i>Additional Notes</i>
8	Customer Display Device/Customer Control Equipment	The display device and/or control equipment sends a receipt to the meter (if present and dependent on type of customer equipment) If a message is sent to the AMI meter (or AMI system) by the display/control equipment, the message shall include the device ID, message received date/time (in local time) by the display/control equipment and action taken (e.g. received event info, raised thermostat by 4 degrees, A/C off) and date/time action taken.	
9	AMI Meter	The meter will receive and log the message receipt from the display device and/or control equipment (if sent).	
10	AMI Meter	The meter will send the receipt message from the display/control device to the ADCS and the ADCS will send the receipt to the MDMS.	
11	MDMS	The MDMS will receive and log that the event message was received by the customer's display/control device.	
12	ADCS	Prior to the event start time the ADCS begins collecting interval data more frequently until the event is terminated (frequency should be the same as the customer's interval length) and transmits the data to the MDMS.	The AMI meter may push the usage data to the ADCS or the ADCS may request the data from the AMI meter according to a schedule.
13	AMI Meter	The event date and start time arrives/is reached within the AMI meter.	
14	AMI Meter	The meter displays the event type, event status (active), scheduled event date/time (start and end) and hourly event pricing and customer's cost for customer viewing.	

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<i>Step #</i>	<i>Actor</i>	<i>Description of the Step</i>	<i>Additional Notes</i>
15	AMI Meter	The meter sends another message to the customer's display device and/or control equipment for customer viewing, that the event start time has arrived and the meter will log action.	
16	Customer Display Device/Customer Control Equipment	The customer's display device and/or control equipment shall receive the message, update the event status (e.g. to active) and the control equipment will take customer preprogrammed action (e.g. raise thermostat by 4 degrees) reacting to pricing and/or event type.	
17	Customer Display Device/Customer Control Equipment	The customer's display device and/or control equipment may/may not send a receipt that it received the event message to the meter (dependent on type of customer equipment) If a message is sent to the AMI meter by the display/control equipment, the message shall include the device ID, message received date/time (in local time) by the display/control equipment and action taken (e.g. receive event info, raised thermostat by 4 degrees, A/C off) and date/time action taken.	The information from the customer equipment (e.g. raised the thermostat 4 degrees) is dependent on the programmable communicating thermostat (PCT) having two-way communication.
18	AMI Meter	The AMI meter will receive and log the receipt from the customer display/control equipment and send the message to the ADCS.	
19	ADCS	The ADCS will receive the message and send it to the MDMS.	
20	MDMS	The MDMS will receive the message and send the message to other utility systems (e.g., CSS) that the event is in progress.	
21	N/A	The event ends.	

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<i>Step #</i>	<i>Actor</i>	<i>Description of the Step</i>	<i>Additional Notes</i>
22	AMI Meter	The meter displays the event type, event status (e.g. ended), scheduled event date/time (start/end) and customer's hourly/time-of-use pricing and cost returns to regular pricing for customer viewing.	
23	AMI Meter	The meter sends an event message to the customer's display device and/or control equipment for customer viewing.	
24	Customer Display Device/Customer Control Equipment	The display device and/or control equipment will receive the event message (if present and dependent on type of customer equipment) and take appropriate action (e.g. return A/C thermostat back to regular customer programming).	
25	Customer Display Device/Customer Control Equipment	The display device and/or control equipment sends a receipt to the meter (if present and dependent on type of customer equipment) If a message is sent to the AMI meter by the display/control equipment, the message shall include the device ID, message received date/time (in local time) by the display/control equipment and action taken (e.g. returned customer A/C to original state, A/C on).	
26	AMI Meter	The meter will receive and log the message receipt from the display device and/or control equipment (if sent).	
27	AMI Meter	The meter will send the receipt message to the ADCS and the ADCS will send the confirmation to the MDMS.	
28	MDMS	The MDMS will log the message receipt and make it available to other utility systems.	

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<i>Step #</i>	<i>Actor</i>	<i>Description of the Step</i>	<i>Additional Notes</i>
29	ADCS	The ADCS changes the interval data collection frequency back to the meter's regular schedule.	This action may occur autonomously within the meter
30	MDMS	The MDMS notifies other utility systems (e.g., CSS) or makes the data available that event is completed for the customer.	
31	AMI Meter	The meter display returns to its normal state prior to the event for customer viewing.	

### 3.2 The AMI meter does not response to a voluntary demand response event notification

*Provide a scenario name that indicates whether the scenario is classified as "Primary" or "Alternate" (for example, "Primary Scenario: Distributed Generation Metering" or "Alternate Scenario: Customer unexpectedly connects DG") and an overview of the scenario.*

Primary Scenario: The AMI meter does not response to a voluntary demand response event notification

<i>Triggering Event</i>	<i>Primary Actor</i>	<i>Pre-Condition</i>	<i>Post-Condition</i>
<i>(Identify the name of the event that start the scenario)</i>	<i>(Identify the actor whose point-of-view is primarily used to describe the steps)</i>	<i>(Identify any pre-conditions or actor states necessary for the scenario to start)</i>	<i>(Identify the post-conditions or significant results required to consider the scenario complete)</i>
Utility sends a voluntary demand response event message to the AMI meter using the ADCS	ADCS	The AMI meter is installed and provisioned. The customer is enrolled in a voluntary demand response program or tariff.	The ADCS will have notified the MDMS of the failure to communicate the event to the meter and the MDMS will make the information available to other utility systems.

#### 3.2.1 Steps for this scenario

*Describe the normal sequence of events that is required to complete the scenario.*

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<b>Step #</b>	<b>Actor</b>	<b>Description of the Step</b>	<b>Additional Notes</b>
<i>#</i>	<i>What actor, either primary or secondary is responsible for the activity in this step?</i>	<i>Describe the actions that take place in this step. The step should be described in active, present tense.</i>	<i>Elaborate on any additional description or value of the step to help support the descriptions. Short notes on architecture challenges, etc. may also be noted in this column..</i>
1	ADCS	The ADCS sends an event message to the meter of the pending pricing event, including the event type, event date and start/end time and hourly pricing.	
2	ADCS	The ADCS is does not receive a confirmation from the meter that the event message was received within 60 seconds.	
3	ADCS	The ADCS tries to resend the event message 3 additional times.	
4	ADCS	If the ADCS cannot successfully communicate the event message to the meter and receive confirmation from the meter, the condition is logged in the ADCS.	
5	ADCS	The ADCS will send a message to the MDMS containing the targeted meter ID, event ID, date/times of transmission attempts.	
6	MDMS	The MDMS receives and logs the message and makes information available to other utility systems and/or sends a message to the appropriate authorized systems (e.g. CSS, trouble reporting system, program management, etc.)	



### 3.3 The AMI meter does not autonomously launch or terminate a voluntary demand response event

*Provide a scenario name that indicates whether the scenario is classified as “Primary” or “Alternate” (for example, “Primary Scenario: Distributed Generation Metering” or “Alternate Scenario: Customer unexpectedly connects DG”) and an overview of the scenario.*

Primary Scenario: The AMI meter does not autonomously launch or terminate a voluntary demand response event

<b>Triggering Event</b>	<b>Primary Actor</b>	<b>Pre-Condition</b>	<b>Post-Condition</b>
<i>(Identify the name of the event that start the scenario)</i>	<i>(Identify the actor whose point-of-view is primarily used to describe the steps)</i>	<i>(Identify any pre-conditions or actor states necessary for the scenario to start)</i>	<i>(Identify the post-conditions or significant results required to consider the scenario complete)</i>
The meter does not take the correct action at the start or end of an event	AMI Meter	The AMI meter is installed and provisioned and the customer is enrolled in a voluntary demand response program or tariff.	AMI will have enabled a remote on-demand meter test and provided results to the utility.

#### 3.3.1 Steps for this scenario

*Describe the normal sequence of events that is required to complete the scenario.*

<b>Step #</b>	<b>Actor</b>	<b>Description of the Step</b>	<b>Additional Notes</b>
<i>#</i>	<i>What actor, either primary or secondary is responsible for the activity in this step?</i>	<i>Describe the actions that take place in this step. The step should be described in active, present tense.</i>	<i>Elaborate on any additional description or value of the step to help support the descriptions. Short notes on architecture challenges, etc. may also be noted in this column..</i>
1	N/A	The event start time arrives or ends	
2	AMI Meter	The meter displays the event type, scheduled event date/time (start and end) and hourly event pricing for customer viewing, but DOES NOT change the event status to “active or ended”	

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<i>Step #</i>	<i>Actor</i>	<i>Description of the Step</i>	<i>Additional Notes</i>
3	AMI Meter	The meter does not send a message to the customer's display device and/or control equipment for customer viewing and the customer's display device and/or control equipment does not take appropriate action.	
4	Customer	The customer notices that the event time has arrived or ended, but the event status did not change.	
5	Customer	The customer calls the utility.	
6	Customer Representative	A Customer Representative answers the customer call and accesses the account information in CSS.	
7	Customer Representative	The Customer Representative views the event status for the customer in the CSS.	
8	ADCS	The Customer Representative uses CSS to issue a remote meter test, which is transmitted to the meter by the ADCS.	
9	AMI Meter	The meter receives the meter test request from the ADCS, processes the request, logs the transaction and sends test results to the ADCS. Test results shall include but are not limited to meter ID, date/time of test (internal meter clock), test results, connectivity to AMI and customer devices (if previously provisioned), internal diagnostics related to data recording and communication ability.	The I Use Cases shall have a more detailed description of the meter test and result requirements.
10	ADCS	The ADCS receives the meter test results, logs the receipt and sends a message to the MDMS.	
11	MDMS	The MDMS receives the message, logs the receipt and makes the information available to other utility systems (e.g., CSS, trouble reporting system).	

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<i>Step #</i>	<i>Actor</i>	<i>Description of the Step</i>	<i>Additional Notes</i>
11.1	MDMS	If the meter test failed, the MDMS will notified other appropriate authorized systems (e.g. program management, trouble reporting system).	
12	Customer Representative	The customer representative views the test results in CSS and provides the customer the results.	

### 3.4 The customer views usage and Critical Peak Pricing Voluntary Demand Response Event information online

*Provide a scenario name that indicates whether the scenario is classified as “Primary” or “Alternate” (for example, “Primary Scenario: Distributed Generation Metering” or “Alternate Scenario: Customer unexpectedly connects DG”) and an overview of the scenario.*

Primary Scenario: The customer views usage and Critical Peak Pricing Voluntary Demand Response Event information online

<i>Triggering Event</i>	<i>Primary Actor</i>	<i>Pre-Condition</i>	<i>Post-Condition</i>
<i>(Identify the name of the event that start the scenario)</i>	<i>(Identify the actor whose point-of-view is primarily used to describe the steps)</i>	<i>(Identify any pre-conditions or actor states necessary for the scenario to start)</i>	<i>(Identify the post-conditions or significant results required to consider the scenario complete)</i>
MDMS makes usage and event information available to other utility systems	Customer	AMI meter is installed and provisioned. The customer is enrolled in a voluntary demand response program or tariff and the customer has been given a website ID and password.	Customer will have view their event information, most recent usage information and determined load control equipment took action.

#### 3.4.1 Steps for this scenario

*Describe the normal sequence of events that is required to complete the scenario.*

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<b>Step #</b>	<b>Actor</b>	<b>Description of the Step</b>	<b>Additional Notes</b>
<i>#</i>	<i>What actor, either primary or secondary is responsible for the activity in this step?</i>	<i>Describe the actions that take place in this step. The step should be described in active, present tense.</i>	<i>Elaborate on any additional description or value of the step to help support the descriptions. Short notes on architecture challenges, etc. may also be noted in this column..</i>
1	MDMS	The MDMS makes usage and event information available to authorized systems (e.g. utility website, CSS, etc.).	
2	Utility	The customer is advised that an event has been scheduled by various methods, including but not limited to AMI, pager and phone.	
3	Customer	The customer logs onto utility website (e.g. sce.com) to access their usage and event information (e.g. interval usage data for previous day, event type, date/time (start and end), hourly pricing).	
4	MDMS	The MDMS makes data available to the utility website (e.g. sce.com) and the website presents the customer's interval usage for the previous day, past event information and pending event information (e.g. event type, start/end date/time, hourly pricing) for the following day.	
5	N/A	The event date and start time arrives.	
6	Customer	The customer logs onto the utility website (e.g. sce.com).	

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<i>Step #</i>	<i>Actor</i>	<i>Description of the Step</i>	<i>Additional Notes</i>
7	Customer	The customer is able to view their historical usage data and more current usage data that has posted during the event period, event status (e.g. active) and their hourly pricing. The website will continue to refresh the customer usage data after each completed interval during the event.	
8	Customer	The customer is able to view their historical usage data compared to their most recent usage and determine that their control equipment has taken action.	
9	Customer	The customer logs off the utility website (e.g. sce.com)	

## 4. Requirements

*Detail the Functional, Non-functional and Business Requirements generated from the workshop in the tables below. If applicable list the associated use case scenario and step.*

### 4.1 Functional Requirements

<i>Functional Requirements</i>	<i>Associated Scenario # (if applicable)</i>	<i>Associated Step # (if applicable)</i>
(C1FR1) The ADCS shall be able to store and communicate multiple event type notifications according the program types (e.g. CPP, Demand Bidding) and schedules to other utility systems and AMI meter.	1 2 3	0 0 0
(C1FR2) The meter logs shall be retrieved once per day by the ADCS at the regular scheduled read time (daily)	1 2 3	2 0 0
(C1FR3) The meter logs shall be able to be retrieved on demand by the ADCS	1 2 3	0 0 0
(C1FR4) The ADCS shall be able to store and send multiple event type messages (informational and functional) to the meter, customer's display device and control equipment (if the customer equipment meets SCE standards)	1 2	1 1
(C1FR5) The ADCS shall log all event messages sent and received with the date and time and event identifier (e.g. code)	1 2	1, 4, 10, 24, 27 1
(C1FR6) The ADCS shall be able to remotely resend event messages automatically, if it does not receive a receipt from the meter, display device or control equipment. The functionality will be configurable, dependent on the event message type and device target.	2	3

## Advanced Metering Infrastructure (AMI) Program

### Use Case C1 - Customer reduces their Usage in response to Pricing or Voluntary Load Reduction events

<i>Functional Requirements</i>	<i>Associated Scenario # (if applicable)</i>	<i>Associated Step # (if applicable)</i>
(C1FR7) The users of ADCS shall be able to prioritize voluntary load reduction event messages (configurable to SCE requirements).	1 2	0 0
(C1FR9) The ADCS shall be able to transmit event messages to the meter, display device and control equipment containing the current date/time, event code, event schedule date/time (start and end), priority and hourly or time-of-use pricing.	1 2	1, 6, 23 1
(C1FR10) The ADCS shall be able to transmit all data received from the meter, display device and control equipment (e.g. usage, logs, alerts, receipts) to the MDMS.	1 2 3	4, 10, 27 5 10
(C1FR11) The meters internal clock will be synchronized by the ADCS at least once per day and the difference between the meter and ADCS shall not exceed the billing system tolerance.	1 2 3	0 0 0
(C1FR12) The ADCS shall be able to issue a remote meter test (e.g. remote communications, interval recording) and make the results available to other utility systems (e.g., trouble reporting system, CSS).	1 2 3	0 2 8
(C1FR13) The ADCS shall be able to remotely configure the meters recording interval length to between 5 and 60 minutes. (The 5 minute interval is related to ancillary services)	1 2 4	0 0 0
(C1FR14) The ADCS shall be able to schedule event messages to be delivered to the meter, display device or control equipment to ensure the utility meets regulatory requirements (e.g. day ahead event by 3:00 pm of the previous day, day of event by 10am of day and real-time events on-demand).	1 2	0 0
(C1FR15) The MDMS system shall make event and log information (e.g., event type, start/end date/time, hourly pricing, event customers notified (successful/not successful, time event notification received at AMI meter, event information receive from the customer display/control equipment such as date/time received, action taken, equipment status (on/off), etc.) available to	1 2 3	0 0 0

## Advanced Metering Infrastructure (AMI) Program

### Use Case C1 - Customer reduces their Usage in response to Pricing or Voluntary Load Reduction events

<i>Functional Requirements</i>	<i>Associated Scenario # (if applicable)</i>	<i>Associated Step # (if applicable)</i>
authorized systems (e.g. CSS) upon MDMS receipt.	4	0
(C1FR16) The MDMS shall be able to provide aggregate data (e.g. usage, generation) to authorized systems.	1 4	0 4 7 8
(C1FR17) The MDMS shall stored and make data available to authorized systems (e.g. Customer Service Database, utility website, etc). Availability of data shall be configurable.	1 2 3 4	5 0 0 4, 7, 8
(C1FR18) The MDMS shall receive, log and store all data (e.g. usage, logs, event information such as event type, start/end date/time, customer control device action taken, etc.) received from the ADCS.	1 2 3	4, 10, 27 5 10
(C1FR19) The MDMS shall have the ability to store usage type data at the meter and account level (e.g. sub-totalized).	1 4	0 4, 7, 8
(C1FR20) The meter shall be able to store, log and process multiple types of event messages.	1 2	1 1
(C1FR21) The tolerance between the meter's internal clock and the ADCS shall be remotely configurable.	1 2 3	0 0 0
(C1FR22) The meter shall be able to receive, store and log the date/time (internal meter clock) the event message is received, the ADCS time, event type, event schedule date/time (start and end), hourly and time-of-use pricing (if applicable for the event type)	1	2
(C1FR23) The meter shall send event message receipts back to the ADCS. The timeliness of	1	4



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<i>Functional Requirements</i>	<i>Associated Scenario # (if applicable)</i>	<i>Associated Step # (if applicable)</i>
the receipt requirement shall be configurable, but as quickly as 60 seconds.	4	0
(C1FR24) The meter shall be able to display pending, active and ended event information including the event type, event schedule date/time (start and end), hourly/time-of-use pricing and customer cost.	1	3, 14, 22, 30
(C1FR25) The meter shall be able to transmit to, log and receive event messages from the customer's display devices and/or load control equipment (if the equipment meets SCE requirements).	1	6, 9, 15, 17, 23, 26
(C1FR26) The meter shall display the customer's instantaneous demand (e.g. kW), refreshed every 3 seconds and last completed recording interval value in kWh.	1	0
	2	0
	3	0
(C1FR27) The meter shall be able to prioritize event messages received from SCE and 3 <sup>rd</sup> parties. The prioritization shall be configurable by the utility.	1	0
	2	0
	3	0
(C1FR28) The meter shall be able to display the date and time (local time) when the meter display information was last updated (e.g. CPP event notification received mm/dd/yy, 10:00 am).	1	3, 14, 22, 30
	3	0
(C1FR29) The meter shall be able to autonomously launch and terminate demand response events, once it has received the initial message from the ADCS system.	1	14
(C1FR30) The meter shall be able to receive event cancellations or reschedule messages, process the cancellation or reschedule, log the processing and send a receipt back to the ADCS.	1	0
ADCS shall log each instance when a event message has been sent to the AMI meter, but no receipt is receive within the configured time frame.	2	2
The ADCS shall have the ability to remotely configure the AMI meters interval reporting frequency.	1	0
The AMI meter shall be able receive and process changes in its interval reporting frequency to the ADCS.	1	0

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Use Case C1 - Customer reduces their Usage in response to Pricing or Voluntary Load Reduction events

<i>Functional Requirements</i>	<i>Associated Scenario # (if applicable)</i>	<i>Associated Step # (if applicable)</i>
The AMI meter shall be able to receive and process changes to the meters recording interval length and the change shall only occur at the top of the hour.	1	0

### 4.2 Non-functional Requirements

<i>Non-Functional Requirements</i>	<i>Associated Scenario # (if applicable)</i>	<i>Associated Step # (if applicable)</i>
(C1NFR1) The ADCS shall successfully collect interval data for previous day (midnight to midnight) from all AMI meters, each day by 6 a.m. for 99% of the meters.	1 2	0 0
(C1NFR2) The ADCS shall begin collecting interval data in the same frequency as the meters recording interval length prior to and after an event (configurable) and return the data collection back the meters regular read schedule when the event is completed.	1	12, 29
(C1NFR3) The ADCS shall be able to automatically retry to transmit event messages to the meter, display device and control equipment within 60 seconds. The frequency and timing shall be configurable.	2	3
(C1NFR4) The ADCS shall be able to remotely perform a meter test (testing parameters shall be configurable) and receive results within 60 seconds	2 3	0 8
(C1NFR5) The ADCS shall be able to transmit specific event and account information to authorized systems (e.g. Customer Service Database) within 60 seconds of the ADCS transmission or ADCS receipt from the meter, display device or control equipment	1 2 3	5, 20 ,30 6 11
(C1NFR6) The ADCS must have the capacity to transmit up to 48 utility “voluntary” load	1	0

## Advanced Metering Infrastructure (AMI) Program

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<i>Non-Functional Requirements</i>	<i>Associated Scenario # (if applicable)</i>	<i>Associated Step # (if applicable)</i>
event messages per day, per account (two each hour of the day, one to initiate and one to terminate).	2	0
(C1NFR7) The ADCS shall transmit all data (e.g. usage, logs, alerts, receipts) received, to the MDMS within 3 seconds.	1 2 3 4	4, 10, 30 5 10 0
(C1NFR8) The overall reliability of the AMI system shall be greater than 99% (This is based on the current performance of SCE's existing communication systems and number of enrolled customers in demand response programs).	1 2 3	0 0 0
(C1NFR9) The MDMS shall be able to provide individual and aggregated data to authorized systems before the ending of the meter's next recording interval.	1 2 3	4, 10, 30 5 10
(C1NFR10) The meter shall log a message and send it to the ADCS if the difference between internal meter clock and ADCS clock is not within tolerance (billing system tolerance).	1 2 3	0 0 0
(C1NFR11) The meter shall be able to store, log and process up to 48 utility "voluntary" load reduction event messages per day and make them available for customer viewing on the meter display.	1 2 3	1 0 0
(C1NFR12) The meter shall transmit event messages and/or energy information to a display device and/or control equipment within 1 seconds of the meter receipt or recording.	1	6, 9, 15, 17, 23, 26
The ADCS shall be able to communication event messages to 500,000 AMI meters within 3 seconds for 99% of the meters and within 10 seconds for 1% of the meters.	1, 2	0, 0

### 4.3 Business Requirements

<i>Business Requirement</i>	<i>Associated Scenario # (if applicable)</i>	<i>Associated Step # (if applicable)</i>

### 5. Use Case Models (optional)

*This section is used by the architecture team to detail information exchange, actor interactions and sequence diagrams*

#### 5.1 Information Exchange

*For each scenario detail the information exchanged in each step*

<b>Scenario #</b>	<b>Step #, Step Name</b>	<b>Information Producer</b>	<b>Information Receiver</b>	<b>Name of information exchanged</b>
<i>#</i>	<i>Name of the step for this scenario.</i>	<i>What actors are primarily responsible for Producing the information?</i>	<i>What actors are primarily responsible for Receiving the information?</i>	<i>Describe the information being exchanged</i>
1	1 The ADCS sends an event message to the meter of the pending pricing event, including the event type, event date and start/end time and hourly pricing	ADCS	AMI Meter	Pricing event message including: <ul style="list-style-type: none"> <li>- event type</li> <li>- event date</li> <li>- start time</li> <li>- end time</li> <li>- hourly pricing</li> </ul>
	4 The meter sends confirmation to the ADCS that it received the message and the ADCS will send the confirmation to the MDMS.	AMI Meter	ADCS	Receipt notification that pricing event message has been received by the AMI Meter
	4 The meter sends confirmation to the ADCS that it received the message and the ADCS will send the confirmation to the MDMS.	ADCS	MDMS	Receipt notification that pricing event message has been received by the AMI Meter
	5 The MDMS sends a message to the Customer Service System that the customer has been notified.	MDMS	Customer Service System (CSS)	Customer has been notified message

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<i>Scenario #</i>	<i>Step #, Step Name</i>	<i>Information Producer</i>	<i>Information Receiver</i>	<i>Name of information exchanged</i>
	6 Meter sends the event message to the customer's display device and control equipment (if available and it meets SCE requirements) for customer viewing.	AMI Meter	Customer Display Device Customer Control Equipment	Pricing event message including: <ul style="list-style-type: none"> <li>- event type</li> <li>- event status</li> <li>- event date</li> <li>- start time</li> <li>- end time</li> <li>- hourly pricing</li> </ul>
	8 The display device and/or control equipment sends a receipt to the meter (if present and dependent on type of customer equipment)	Customer Display Device Customer Control Equipment	AMI Meter	Receipt notification that pricing event message has been received by customer display device and control equipment
	10 The meter will send the receipt message from the display/control device to the ADCS and the ADCS will send the receipt to the MDMS.	AMI Meter	ADCS	Receipt notification that pricing event message has been received by customer display device and control equipment
	10 The meter will send the receipt message to the ADCS and the ADCS will send the receipt to the MDMS.	ADCS	MDMS	Receipt notification that pricing event message has been received by customer display device and control equipment
	12 Prior to the event start time the ADCS begins collecting interval data more frequently until the event is terminated (frequency should be the same as the customer's interval length) and transmits the data to the MDMS	ADCS	AMI Meter	Request interval data at the same rate as the customer interval length
	12 Prior to the event start time the ADCS begins collecting interval data more frequently until the event is terminated (frequency should be the same as the customer's interval length) and transmits the data to the MDMS	AMI Meter	ADCS	Interval Data

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<i>Scenario #</i>	<i>Step #, Step Name</i>	<i>Information Producer</i>	<i>Information Receiver</i>	<i>Name of information exchanged</i>
	12 Prior to the event start time the ADCS begins collecting interval data more frequently until the event is terminated (frequency should be the same as the customer's interval length) and transmits the data to the MDMS	ADCS	MDMS	Interval Data
	13 The event date and start time coming from the ADCS arrives at the meter.	ADCS	AMI Meter	Event Date Start Time
	15 The meter sends a message to the customer's display device and control equipment for customer viewing.	AMI Meter	Customer Display Device Customer Control Equipment	Pricing event message including: <ul style="list-style-type: none"> <li>- event type</li> <li>- event status - active</li> <li>- event date</li> <li>- start time</li> <li>- end time</li> <li>- hourly pricing</li> </ul>
	17 The customer's display device and/or control equipment may/may not send a receipt that it received the event message to the meter (dependent on type of customer equipment)	Customer Display Device Customer Control Equipment	AMI Meter	Receipt notification of pricing event message
	18 The MDMS sends a message to the Customer Service System that the event is in progress.	MDMS	Customer Service System (CSS)	Pricing event in progress message
	21 The meter sends an event message to the customer's display device and/or control equipment for customer viewing.	AMI Meter	Customer Display Device Customer Control Equipment	Pricing event message including: <ul style="list-style-type: none"> <li>- event type</li> <li>- event status - ended</li> <li>- event date</li> <li>- start time</li> <li>- end time</li> <li>- hourly / time of use pricing</li> <li>- cost</li> </ul>

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<i>Scenario #</i>	<i>Step #, Step Name</i>	<i>Information Producer</i>	<i>Information Receiver</i>	<i>Name of information exchanged</i>
	23 The display device and/or control equipment sends a receipt to the meter (if present and dependent on type of customer equipment)	Customer Display Device Customer Control Equipment	AMI Meter	Receipt notification of pricing event ended message
	25 The meter will send the receipt message to the ADCS and the ADCS will send the confirmation to the MDMS.	AMI Meter	ADCS	Receipt notification of pricing event ended message
	25 The meter will send the receipt message to the ADCS and the ADCS will send the confirmation to the MDMS.	ADCS	MDMS	Receipt notification of pricing event ended message
	28 The MDMS notifies the Customer Service System that event is completed for the customer.	MDMS	Customer Service System (CSS)	Event completed for the customer message
2	1 The ADCS sends an event message to the meter of the pending pricing event, including the event type, event date and start/end time and hourly pricing.	ADCS	AMI Meter	Voluntary demand response event message
	2 The ADCS is does not receive a confirmation from the meter that the event message was received within 60 seconds.			
	3 The ADCS tries to resend the event message 3 additional times.	ADCS	AMI Meter	Voluntary demand response event message (3 x)



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<i>Scenario #</i>	<i>Step #, Step Name</i>	<i>Information Producer</i>	<i>Information Receiver</i>	<i>Name of information exchanged</i>
	5 The ADCS will send a message to the MDMS containing the targeted meter ID, event ID, date/times of transmission attempts	ADCS	MDMS	Error message that voluntary demand response message could not be delivered
	6 The MDMS receives and logs the message and makes the information available to other utility systems and/or sends a message to the appropriate authorized systems (e.g. CSS, program management, etc.)	MDMS	Customer Service System Program Management Etc.	Error message that voluntary demand response message could not be delivered
3	6 A customer representative answers the customer call and accesses the account information in the CSS	Customer Representative		
	8 The customer representative uses CSS to remotely issue a meter test to the meter using the ADCS	Customer representative	ADCS	Meter test command
	8 The customer representative remotely issues a meter test to the meter using the ADCS	ADCS	AMI Meter	Meter test command

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Use Case C1 - Customer reduces their Usage in response to Pricing or Voluntary Load Reduction events

<i>Scenario</i>	<i>Step #, Step Name</i>	<i>Information Producer</i>	<i>Information Receiver</i>	<i>Name of information exchanged</i>
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## Advanced Metering Infrastructure (AMI) Program

### Use Case C1 - Customer reduces their Usage in response to Pricing or Voluntary Load Reduction events

<i>Scenario #</i>	<i>Step #, Step Name</i>	<i>Information Producer</i>	<i>Information Receiver</i>	<i>Name of information exchanged</i>
	11.1 If the meter test failed, the MDMS will notified other appropriate authorized systems (e.g. program management, trouble reporting system, CSS)	MDMS	To Be Defined	
	12 The customer representative views the test results in CSS and provides the customer the results			
4	1 The MDMS makes usage and event information available to authorized systems (e.g. utility website, CSS, etc.).	MDMS	Utility Website (e.g. sce.com)	Usage information Pricing event message
	2 The customer is advised through various methods (e.g. AMI meter, pager and phone) that a event has been scheduled	AMI Meter	Customer	Event has been scheduled message (Message content defined in Scenario 1)
	4 The MDMS makes data available to the utility website (e.g. sce.com) and the website presents the customer's interval usage for the previous day, past event information and pending event information (e.g. event type, start/end date/time, hourly pricing) for the following day_	MDMS	Utility Website (e.g. sce.com)	Previous day usage Pricing event information for the following day

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<i>Scenario #</i>	<i>Step #, Step Name</i>	<i>Information Producer</i>	<i>Information Receiver</i>	<i>Name of information exchanged</i>
	4 The MDMS makes data available to the utility website (e.g. sce.com) and the website presents the customer's interval usage for the previous day, past event information and pending event information (e.g. event type, start/end date/time, hourly pricing) for the following day	Website sce.com	Customer	Previous day usage Pricing event information for the following day

## 5.2 Diagrams

*The architecture team shall use this section to develop an interaction diagram that graphically describes the step-by-step actor-system interactions for all scenarios. The diagrams shall use standard UML notation. Additionally, sequence diagrams may be developed to help describe complex event flows.*

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## 6. Use Case Issues

*Capture any issues with the use case. Specifically, these are issues that are not resolved and help the use case reader understand the constraints or unresolved factors that have an impact of the use case scenarios and their realization.*

<i>Issue</i>
<i>Describe the issue as well as any potential impacts to the use case.</i>

## 7. Glossary

*Insert the terms and definitions relevant to this use case. Please ensure that any glossary item added to this list should be included in the global glossary to ensure consistency between use cases.*

Glossary	
Term	Definition

## 8. References

*Reference any prior work (intellectual property of companies or individuals) used in the preparation of this use case.*

### 9. Bibliography (optional)

*Provide a list of related reading, standards, etc. that the use case reader may find helpful.*