AMI Use Case:

B2 - Utility remotely limits usage and/or connects and disconnects customer

February 1, 2006

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Document History

Revision History

Date of this revision: 01-26-06

Revision Number	Revision Date	Revision / Reviewed By	Summary of Changes	Changes marked
1.0	060201	JGoacher	Inserted use case information into template	N
1.1	060201	BLambird	Minor edits to format and content	N
1.2	060324	SGarcia	Merge workshop output with Use Case Doc	Y
1.3	060324	SGarcia	Use Case updated with workshop output, changes accepted	N

Approvals

This document requires following approvals.

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Contents

1. Use Case Description

1.1 Use Case Title

Utility remotely limits usage and/or connects and disconnects customer.

1.2 Use Case Summary

The AMI system can be used to control the connectivity of individual customers. This function can be accomplished by controlling a "switch" between the customer load and the distribution supply system. The utility can base connect/disconnect decisions on a variety of criteria. Examples include:

- Routine move-in/move-out.
- Disconnect upon lack of customer payment or via confirmed customer request
- Reconnect upon resumption of payment
- Disconnect upon load greater than customer allowance

Related to this scenario is the possibility of the meter autonomously making the disconnect decision based upon criteria such as a load threshold.

This scenario excludes the mechanism used by the utility to trigger the connect/disconnect command or mechanism which control the determination of load set-points.

1.3 Use Case Detailed Narrative

For most service activation/termination situations the utility has the option of sending a field technician to physically connect/disconnect the service or to perform what has become known as "soft" turn-on/shut-off. The scheduling of field resources to visit the customer sites is complex and costly, and occasionally the activity cannot be carried out at the time that the customer wanted. Termination of service in support of credit and collections activities requires a "physical" interruption of services until appropriate financial arrangements are made to demonstrate that the customer will honor their obligations. Credit and collection service termination orders inherently carry with them the possibility of physical risk to the field technicians. The efficiencies provided by remote connect/disconnect include less man hours on site, shorter customer phone call activity,

faster switchover of customers, less opportunities for physical abuse of field reps by non paying customers, and overall improved customer service.

In addition, with the present metering systems deployed for residential and small/medium commercial customers there is no ability to limit load in response to constrained supply, credit issues, or where the customer desires to set a “maximum” load limit for a site.

Utilities are looking to AMI metering to provide capabilities to improve the efficiency of the service initiation/termination processes through remote turn on/off functions, and to provide a capability to remotely limit usage/load, particularly as a mitigating response to constrained supply and credit & collections issues. Some of the business transactions that will be investigated in this use case include:

- Routine shut-off of service (move out)
- Routine turn-on of service (move in)
- Credit & Collections termination of service
- Credit & Collections reinstatement of service
- Local/on site shut-off of service
- Local/on site turn-on of service
- Credit and Collection Service Limiting

1.4 Business Rules and Assumptions

Assumptions:

- AMI meter is installed.
- Meter is self-contained - not instrument rated.

2. Actors

Actor Name	*Actor Type (person, device, system etc.)*	*Actor Description*
AMI Meter	Device	Device that receives, records, displays and transmits data (e.g. usage, generation, text messages, event logs, etc.) to authorized systems (e.g. ADCS) and provides other advanced utility functions.
Customer Representative	Person	Customer Representatives respond to customer requests to activate, modify and/or terminate delivery of service. Other credit and collection customer representatives are responsible for termination of service when customer has failed to pay their bill in a timely manner.
Customer	Person	Residential or small business customers that receive electrical service from SCE.
AMI Back Office System	System	The AMI system is made up of various back office systems that are required to enable remote two-way communications and control with meters and allow for data storage and retrieval.
Field Service Technician	Person	Manual operations of field devices, repair and construction work. Work on power system equipment in the field, as instructed by work orders and as authorized by the distribution operator or other utility personnel Dispatched by System Operator to fix a fault.

3. Step by Step analysis of each Scenario

3.1 Primary Scenario 1 - Customer requests routine electric service shut off (Move Out)

This scenario describes a voluntary disconnection of service which might lead to the generation of a final energy bill for the service point.

Triggering Event	***Primary Actor***	***Pre-Condition***	***Post-Condition***
(Identify the name of the event that start the scenario)	*(Identify the actor whose point-of-view is primarily used to describe the steps)*	*(Identify any pre-conditions or actor states necessary for the scenario to start)*	*(Identify the post-conditions or significant results required to consider the scenario complete)*
Customer requests service order for shut off.	Customer		Service is disconnected. Utility has gathered enough information to generate a final energy bill for the customer.

3.1.1 Steps for this scenario

Step #	***Actor***	***Description of the Step***	***Additional Notes***
#	*What actor, either primary or secondary is responsible for the activity in this step?*	*Describe the actions that take place in this step. The step should be described in active, present tense.*	*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..*
1	Customer	Customer requests service order with a specific date and time	

Step #	*Actor*	*Description of the Step*	*Additional Notes*
2	Customer Representative	Customer Representative enters the date and time in AMI Back Office system.	Representative has the ability to connect real time, 5-15 minute desirement, 30-60 minute at minimum. CCA/ESP notification required at this step, although this may not be performed by the AMI Back Office System; currently email is the source of the notification.
2.1	AMI System	AMI System sends message to in-Home devices indicating scheduled turn off, if they exist.	
3	AMI System	AMI System sends disconnect event to the meter at the scheduled time, and can be canceled or updated/rescheduled	
4	AMI Meter	Meter provides interval data and read to AMI system	
5	AMI Meter	Meter disconnects electric service	
5.1	AMI Meter	Meter does not disconnect, data is provided to the AMI System(Trouble report is created, discussed in Use Case I2)	
5.2	AMI Meter	Meter does not disconnect and data is not provided	
6	AMI Meter	Meter sends disconnect acknowledgment, validating disconnect completed, real time	
6.1	AMI Meter	Meter disconnects electric service and does not send acknowledgement (covered in Use Case I2/B1)	

3.2 Primary Scenario 2 - Customer requests routine electric service turn on (Move In)

This scenario describes a turn-on request sequence which provides enough information to initialize the billing information for a customer.

Triggering Event	Primary Actor	Pre-Condition	Post-Condition
(Identify the name of the event that start the scenario)	*(Identify the actor whose point-of-view is primarily used to describe the steps)*	*(Identify any pre-conditions or actor states necessary for the scenario to start)*	*(Identify the post-conditions or significant results required to consider the scenario complete)*
Customer request to establish service.	Customer		Service is connected.

3.2.1 Steps for this scenario

Step #	Actor	Description of the Step	Additional Notes
#	*What actor, either primary or secondary is responsible for the activity in this step?*	*Describe the actions that take place in this step. The step should be described in active, present tense.*	*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.*
1	Customer	Customer makes request to establish service	
2	Customer Representative	Call Center Representative performs turn on process	
3	Customer Representative	Call Center Representative determines the AMI meter's energized status	
4	Customer Representative	Call Center Representative schedules remote connect in AMI system, and scheduled turn on can be canceled or Updated/rescheduled	
5	AMI Meter / AMI System	AMI System sends Turn On/Reconnect event to the meter at scheduled time	
6	AMI Meter	Meter provides interval data and read to AMI System	

Step #	Actor	Description of the Step	Additional Notes
7	AMI Meter	Meter executes turn on, if applicable	
8	AMI Meter	Meter acknowledges turn on is completed	

3.3 Primary Scenario 3 - Utility disconnects customer for credit or collection cause

This scenario describes an involuntary disconnection sequence which is caused by the failure of the customer to pay or provide credit for electric service.

Triggering Event	Primary Actor	Pre-Condition	Post-Condition
(Identify the name of the event that start the scenario)	*(Identify the actor whose point-of-view is primarily used to describe the steps)*	*(Identify any pre-conditions or actor states necessary for the scenario to start)*	*(Identify the post-conditions or significant results required to consider the scenario complete)*
Customer eligible for disconnect, credit reasons	Customer	Regulatory requirements are met, regular credit process complete	Meter sends disconnect acknowledgement

3.3.1 Steps for this scenario

Step #	Actor	Description of the Step	Additional Notes
#	*What actor, either primary or secondary is responsible for the activity in this step?*	*Describe the actions that take place in this step. The step should be described in active, present tense.*	*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.*

Step #	Actor	Description of the Step	Additional Notes
1	Customer	Regular credit process complete; Customer is eligible for disconnect due to credit reasons; All regulatory requirements met	
2	Customer	Customer receives final notice	
3	AMI System	AMI System schedules disconnect event	
4	AMI System	AMI System sends disconnect event to the meter at scheduled time	
5	AMI Meter	Meter provides interval data and read to AMI System	
6	AMI Meter	Meter disconnects electric service	
7	AMI Meter	Meter sends disconnect acknowledgment, validating disconnect completed, real time	

3.4 Primary Scenario 4 - Utility reconnects customer following credit and collection disconnect

Triggering Event	Primary Actor	Pre-Condition	Post-Condition
(Identify the name of the event that start the scenario)	*(Identify the actor whose point-of-view is primarily used to describe the steps)*	*(Identify any pre-conditions or actor states necessary for the scenario to start)*	*(Identify the post-conditions or significant results required to consider the scenario complete)*
Customer requests re-connect	Customer	Customer meets re-connect requirements	Customer service is restored

3.4.1 Steps for this scenario

The scenario describes the restoration of service after an involuntary disconnection of the service.

Step #	Actor	Description of the Step	Additional Notes
#	*What actor, either primary or secondary is responsible for the activity in this step?*	*Describe the actions that take place in this step. The step should be described in active, present tense.*	*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.*
1	Customer	Customer requests re-connection following disconnect/limiting for credit reasons	
2	Customer	Customer meets credit/collection requirements for reconnection (possibly by remitting overdue payments)	
3	N/A	Proceed to Primary Scenario 2 – Customer requests routine electric service turn on	

3.5 Primary Scenario 5 - Field Rep performs local electric service connection/disconnection

Triggering Event	Primary Actor	Pre-Condition	Post-Condition
(Identify the name of the event that start the scenario)	*(Identify the actor whose point-of-view is primarily used to describe the steps)*	*(Identify any pre-conditions or actor states necessary for the scenario to start)*	*(Identify the post-conditions or significant results required to consider the scenario complete)*
Field Representative is sent to site to turn on/off electric service	Field Representative		Service connection status is changed and AMI system is notified of that change.

3.5.1 Steps for this scenario

This scenario describes a change to service connection status that bypasses the AMI system. The AMI system, however, is informed of the change after-the-fact.

Step #	Actor	Description of the Step	Additional Notes
#	*What actor, either primary or secondary is responsible for the activity in this step?*	*Describe the actions that take place in this step. The step should be described in active, present tense.*	*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.*
1	Field Representative	Field Representative is standing at the meter	
2	Field Representative	Field Representative can turn on/off electric service through the meter on site	Field Representative, via common utility practice, will also download the meter data into their field device for later transmission to the AMI back office system.
3	Meter	Meter logs local electric service on/off occurred and captures users identification	

3.6 Primary Scenario 6 - Utility limits customer's electric service due to credit or collection causes

Triggering Event	Primary Actor	Pre-Condition	Post-Condition
(Identify the name of the event that start the scenario)	*(Identify the actor whose point-of-view is primarily used to describe the steps)*	*(Identify any pre-conditions or actor states necessary for the scenario to start)*	*(Identify the post-conditions or significant results required to consider the scenario complete)*
For credit reasons, non-payment, the customer is eligible for load limiting/disconnection	Customer	Customer has met regulatory requirements for load limiting/disconnection for credit reasons	

3.6.1 Steps for this scenario

Step #	Actor	Description of the Step	Additional Notes
#	*What actor, either primary or secondary is responsible for the activity in this step?*	*Describe the actions that take place in this step. The step should be described in active, present tense.*	*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.*
1	Customer	Regular credit process is complete, customer is eligible for disconnect/load limiting for credit reasons: All regulatory requirements met.	
2	Customer	Customer receives final notice	
3	AMI System	Partial electric service limiting event is scheduled	
4	AMI Meter	AMI system sends limiting event to the meter at scheduled time	
5	AMI Meter	AMI meter limits electric service and sends acknowledgement to AMI system	
5.a	Customer	Customer makes payment . - Go to Scenario P4 (Utility reconnects customer following credit and collection disconnect) - Service is restored to 100% level	
5.b	Customer	No payment after period of time further limiting of service	
5.b.2	Customer	No payment longer time period – Go to Scenario P3 - Utility disconnects customer for credit or collection cause	
5.b.3	Customer	Customer makes payment - Go to Scenario P4 (Utility reconnects customer following credit and collection disconnect) - Service is restored to 100% level	

4. Requirements

4.1 Functional Requirements

Functional Requirements	Associated Scenario # (if applicable)	Associated Step # (if applicable)
Electric service turn On/Off and electric service limiting commands to the meter shall be able to be cancelled or updated/rescheduled prior to completion.	P1 P2 P3 P6	3 5 4 4
All self contained meters (including class 320) shall be able to remotely connect/disconnect/limit electric service to customer premise.	P1 P2 P6	5 7 5
Customer representative shall be able to schedule Date and Time for electric service turn On/Off and electric service limiting using AMI back office system(s).	P1 P2 P6	2 4 3
Meter shall be able to be turn electric service on/off and limit electric service on demand	P1 P2 P6	3 5 4
Meter shall send acknowledgement of a successfully completed or failed electric service turn On/Off or electric service limiting event to MDMS and/or AMI back office system(s)	P1 P2 P3 P6	6 8 7 5

Functional Requirements	*Associated Scenario # (if applicable)*	*Associated Step # (if applicable)*
AMI system shall send message to in-home/business device, if it exists, informing customer of impending/Scheduled electric service turn off or electric service limiting event including date and time of scheduled event.	P1 P2 P3 P6	2.1 5 4 4
The AMI back office system(s) must allow for electric service disconnects and electric service limiting events to be prioritized, scheduled, and balanced throughout the day. (e.g. to avoid large volumes of disconnects occurring at the same time)	P1 P3	3 3
Meter shall externally indicate electric service connect/disconnect status so that it is discernable to a customer or SCE employee on site.	P5	1
Authorized SCE Employee on-site shall have the ability to physically toggle electric service connect/disconnect switch at any time. 24 hours 7 days a week, 365 days a year.	P5	2
Meter shall log date/time and status of attempts to toggle electric service connect/disconnect switch, including user identity and whether attempt is authorized or unauthorized.	P5	3
Meter shall accept remotely scheduled electric service connect/disconnect/limiting event while field rep is on site.	P5	2
The AMI system shall have the ability to have multiple electric service events (connect/disconnect/load limiting) scheduled for a single meter.	P1 P2 P3 P6	3 4 3 4
Should a disconnect event and connect event be scheduled to occur for the same meter on the same day, the meter shall log the events, and automatically provide an “on-demand type” read to the MDMS without toggling the connect/disconnect switch.	P1 P2	5 7
The meter shall have the ability to limit load/service, at multiple configurable steps (e.g. 90% of rated capacity, 75% of rated capacity, etc.)	P6	5

Functional Requirements	*Associated Scenario # (if applicable)*	*Associated Step # (if applicable)*
Meter limiter shall reconnect automatically after 2 minutes (to presently configured limiting level) if meter trips off because configured limit is exceeded.	P6	0
Meter limiter shall reconnect automatically no more than once in a 24 hour period.	P6	0
Customer shall have the ability to manually reconnect meter limiter at the meter (to presently configured limiting level) if meter trips off because configured limit is exceeded.	P6	0
By default, meter disconnect switch shall be in the “Closed”/connected position upon installation	P1	0
When the disconnect switch is in the open position the meter shall remain energized and continue to monitor and record consumption/usage in all channels at the interval for which the meter is programmed.	P1 P3	5 6
Meter shall provide an on-demand read to AMI Back Office system at the time of a remote electric service turn on/off/load limiting event.	P1 P2 P3 P6	4 6 5 5
The AMI Meter shall be able to accept duplicate electric service connect/disconnect/limiting commands with no action occurring. (Meter is on, Turn On message acceptable with no action taken)	P1 P2 P3	0 0 0
Customer Representative shall be able to have access to meter’s current switch position (on/off/limit level) and energized status from the call center, via AMI back office systems	P2	3

4.2 Non-functional Requirements

Non-Functional Requirements	*Associated Scenario # (if applicable)*	*Associated Step # (if applicable)*
Electric service turn on message to meter shall be persistent until meter acknowledges that turn on has been completed successfully.	P2	5
Electric service turn off message to the meter shall be persistent until meter acknowledges that turn off has been completed successfully.	P1	3
On demand electric service turn on/off and Limiting commands shall be completed, and acknowledgement received by requestor, within 1 minute of being requested by AMI back office system(s).	P1 P2 A3	5 7 5
Remote electric service Turn Off commands shall complete only at the end of a billing interval.	P1 P3	2 3
Meter has an authorization/authentication routine allowing only active/eligible employees to turn electric service on/off locally	A1	2
Authorized SCE Employee shall have the ability to locally toggle connect/disconnect switch immediately (regardless of interval) or schedule the connect/disconnect for a future interval.	A1	2
Electric service limiting messages/events sent to the meter shall be persistent until meter acknowledges limiting has been completed successfully.	A3	4

4.3 Business Requirements

Business Requirement	*Associated Scenario # (if applicable)*	*Associated Step # (if applicable)*

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

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
#	Name of the step for this scenario.	What actors are primarily responsible for Producing the information?	What actors are primarily responsible for Receiving the information?	Describe the information being exchanged
1	1 Customer requests service order with a specific date and time	Customer	Customer Representative	Customer account information(account #, name, address) Electric service disconnection date and time
	2 Customer Representative enters the date and time in AMI system.	Customer Representative	AMI Back Office System	Customer account information(account #, name, address) Electric service disconnection date and time
	2.1 AMI System sends message to in-Home devices indicating scheduled turn off, if they exist.	AMI System	Customer Premise Devices	Electric service disconnection date and time

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
	3 AMI System sends disconnect event to the meter at the scheduled time, and can be canceled or updated/rescheduled	AMI Back Office System	AMI Meter	Electric service disconnection event
	4 Meter provides interval data and read to AMI system	AMI Meter	MDMS	Interval usage data
	5 Meter disconnects electric service	AMI Meter	Electric service switch	Disconnect command
	5.1 Meter does not disconnect, data is provided to the AMI System(Trouble report is created, continued in I2)	AMI Meter	AMI System	Disconnection failure message
	5.2 Meter does not disconnect and data is not provided			
	6 Meter sends disconnect acknowledgment, validating disconnect completed, real time	AMI Meter	AMI Back Office System	Disconnection success message
	6.1 Meter disconnects electric service and does not send acknowledgement (covered in Use Case I2/B1)			
2	1 Customer makes request to establish service	Customer	Customer Representative	Service connection request Customer account information

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
	2 Call Center Representative performs turn on process	Customer Representative	AMI Back Office System	Service connection request Customer account information
	3 Call Center Representative determines the AMI meter's energized status	AMI Meter or AMI System	Customer Representative	Electric service connection status
	4 Call Center Representative schedules remote connect in AMI system, and scheduled turn on can be canceled or Updated/rescheduled	Customer Representative	AMI System	Electric service connection event
	5 AMI System sends Turn On/Reconnect event to the meter at scheduled time	AMI System	AMI Meter	Electric service connection event
	6 Meter provides interval data and read to AMI System	AMI Meter	AMI System	Interval usage data
	7 Meter executes turn on, if applicable	AMI Meter	Electric service switch	Connect command
	8 Meter acknowledges turn on is completed	AMI Meter	AMI System	Connection success message
3	1 Regular credit process complete; Customer is eligible for disconnect due to credit reasons; All regulatory requirements met			

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
	2 Customer receives final notice	Utility	Customer	Final notification of electric service disconnection
	3 AMI System schedules disconnect event			
	4 AMI System sends disconnect event to the meter at scheduled time	AMI Back Office System	AMI meter	Electric service disconnection event
	5 Meter provides interval data and read to AMI System	AMI Meter	MDMS	Interval usage data
	6 Meter disconnects electric service	AMI Meter	Electric service switch	Disconnect command
	7 Meter sends disconnect acknowledgment, validating disconnect completed, real time	AMI Meter	AMI Back Office System	Disconnection success message
4	1 Customer requests re-connection following disconnect/limiting for credit reasons	Customer	Customer Representative	Service connection request Customer account information
	2 Customer meets requirements for reconnection			
	3 Proceed to Primary Scenario 2 – Customer requests routine electric service turn on	*See scenario 2*		

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
5	1 Field Representative is standing at the meter			
	2 Field Representative can turn on/off electric service through the meter on site	Field Representative	AMI Meter	Electric service connect/disconnect command
	3 Meter logs local electric service on/off occurred and captures users identification	AMI Meter	AMI System (using meter log)	Field Representative identifier Date and Time of electric service command Type of electric service command (connect/disconnect)
6	1 Regular credit process is complete, customer is eligible for disconnect/load limiting for credit reasons: All regulatory requirements met.			
	2 Customer receives final notice	Utility	Customer	Final notification of electric service curtailment
	3 Partial electric service limiting event is scheduled			
	4 AMI system sends limiting event to the meter at scheduled time	AMI Back Office System	AMI Meter	Electric service limiting event
	5 AMI meter limits electric service and sends acknowledgement to AMI system	AMI Meter	AMI System	Limit success message

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
	1 Customer makes payment . - Go to Scenario P4 (Utility reconnects customer following credit and collection disconnect) - Service is restored to 100% level	Customer *See scenario 4*	Utility	Service payment
	2 No payment after period of time further limiting of service			
	2.1 No payment longer time period – Go to Scenario P3 - Utility disconnects customer for credit or collection cause	*See scenario 3*		
	2.2 Customer makes payment - Go to Scenario P4 (Utility reconnects customer following credit and collection disconnect) - Service is restored to 100% level	Customer *See scenario 4*	Utility	Service payment

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.

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.

Issue
Describe the issue as well as any potential impacts to the use case.

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**
Instrument-rated Meter	**A meter is considered instrument rated when there are the presence of various transformers (potential, voltage, circuit) installed along with the meter. The electricity provided in this type of installation does not flow through the meter as it will with a non-instrument rated (i.e. self contained) meter.**

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.