AMI Use Case: I2

Utility Manages End-to-End Lifecycle of the Meter System

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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	060215	Ben Rankin	Updated requirements and scenario names	N
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Approvals

This document requires following approvals.

Name	Title
Cathy Melton	Mega Team Lead
Cathy Melton	Use Case Team Lead
Kevin Wood	Systems Architecture Team Chair
Grant Watson	Engineering Team Chair

Contents

1. Use Case Description

1.1 Use Case Title

Utility Manages End-to-End Lifecycle of the Meter System

1.2 Use Case Summary

An AMI system is never static; equipment is continuously being acquired, maintained, tested, replaced and retired. The process of procuring, purchasing, installing, configuring and testing new equipment is covered in a different scenario; this scenario covers trouble reports, periodic maintenance, troubleshooting, testing, record keeping and reporting, and retirement of worn equipment.

Related to this scenario is the capability of the AMI system to diagnose itself, including the collection of device health indications, remote diagnostics, and optimizing operating parameters remotely.

1.3 Use Case Detailed Narrative

A complete narrative of the functions of the use case from the Primary Actor's point of view, describing what occurs when, why, how, and under what conditions. This narrative will act as the basis for identifying the Steps and the value of the use case to SCE.

This use case deals with the end-to-end lifecycle management of the AMI meter. Problems with meters are detected by the AMI system, Data Center Concentrator (DCC), the Customer, the Utility's field workforce. System intelligence regarding analyzing data to determine if a trouble report and visit to the meter is required reduces the number of unnecessary meter visits. When problems are identified they will normally result in the replacement of the meter, with the possible exception of certain minor repairs that can be safely handled in the field. Additionally, while most meter upgrades will be performed automatically it may be necessary for a Utility to dispatch a member of its field workforce to directly perform preventative or upgrade maintenance on installed equipment. The ability of the AMI meter to perform its own self diagnostic testing and to transmit the results to a remote user allows for determination of whether or not the meter needs to be replaced before the Utility has to dispatch a Installer and helps to reduce the number of erroneous premise visits and meter replacements.

One of the key tools for the Utilities field workforce is a self-contained workstation "field tool" that will permit authorized personnel to perform high speed downloading of information from the AMI meter. This information will include usage data as well as various event logs. This "field tool" will also be able to communicate with the meter during meter installation (and provisioning) and will automatically record information about the meter being removed (in the case of an AMI meter) and the meter being installed. This information will be used to complete the "trouble" ticket as well as

updating the Meter Management System at either the completion of the repair process or at an appropriate time during the day. The ability of this tool to automatically obtain and process information will ensure that the Meter Management System and "trouble" orders are updated in a timely and highly accurate manner eliminating lost updates and vastly reducing inaccuracies in the information used by the business.

1.4 Business Rules and Assumptions

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

Assumptions

- Although the AMI meter is expected to be more functionally complex than the communicating meters used by SCE today (i.e. Real-Time Energy Meters), it is also expected to have features included that make it simpler to use and maintain.

- The cost of the AMI meter will vary depending on how it is equipped; at its lowest cost level, it may not be economical to repair, while at its highest cost level, there may be components (such as communications modules) that it makes business sense to repair. Replacement of meter components will not be performed in the field. A cost/benefit analysis will performed to determine the optimal value of replacing or repairing meters.

- Some tests must be performed at the AMI meter to verify AMI meter accuracy that can't be performed by the AMI meter's self-test (i.e. phantom load test, customer load test)

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.

Actor Name	Actor Type (person, device, system etc.)	Actor Description
Meter Management System	System	Global data repository for information about each meter, as opposed to the AMI System, which gathers metering data *from* each meter. (Use case 1 is concerned with meter location, initially read value, test results) Schedules and dispatches the installation and maintenance orders for AMI meters and sends the order to the installer's field tool device. . Also coordinates the return and repair of failed meters. Meter management system will track status of meters such as never set, installed, removed, salvaged, and returned to manufacturer for repair. Could also include the capabilities described in "Forecasting System. In I1 use case" System ensures that there is sufficient inventory of AMI meters to address the current failure rate. (future vision of an amalgamation of the existing Meter Equipment System (MES), Meter Tracking System, Meter Process Automation (MPA), Material Management System (MMS), etc.)..
AMI System	System	The system responsible for communicating with the meter and gathering its metering data, may forward data to other utilities. Shall pass or carry some information from the meter to the Meter Management System and/or Customer Service System (CSS) during installation. ,Needs to know when the data from the meter is untrustworthy and when the meter is taken out of service. The AMI system also communicates with the meter and the field tool when installing the meter and analyzing meter problems.
3rd Parties	Organizations other than SCE	Alternative suppliers of energy to customers who desire to directly read 3rd Party meters or SCE Electric meters using the SCE AMI Communications Network.
Meter Technician (at Meter Shop)	Person	Fixes meters and components. Needs a clear definition of the problem reported with any equipment in order to fix the problem as quickly as possible.

Actor Name	*Actor Type (person, device, system etc.)*	*Actor Description*
Construction Maintenance Acct (at District)	Person	Is responsible to distribute meters to the Installer as required and to salvage failed meters if necessary. Also responsible to track the movement of the meter by scanning the meter into the meter management system. Meter Management System determines inventories in district along with Procurement Analyst.
AMI Meter	Device	Needs to report data to the AMI system as often and accurately as possible, including its current maintenance status.
TDBU Maintenance Planning Organization	Organization	Plans when to do SCE Distribution system maintenance. Needs to communicate to meters and customers planned outages. Needs to communicate unplanned outages as well to ensure AMI doesn't send out trouble reports due to outages.
Installer	Person	Generic term for the person who will be trained to install new and replace failed AMI meters.
Field Tool (Laptop Device)	Device	A hypothetical device derived from the laptop computers used by some installers today. It has a wireless connection to SCE which communicates installed service points and other information the Installer may need to perform their job function. The device also has the ability to resolve trouble reports and communicate information directly to the AMI meter. (installed service point, old meter ID and old meter final reading.) This device will likely communicate directly with AMI and/or the Material Management System. This tool will need to have the ability to communicate with multiple technologies SCE chooses to implement (i.e. RF, PLC, pager, GPRS or other) so a common field tool is used by all. Tool should also be capable of programming meter when required, capturing meter information by scanning meter (RFID or bar code), and providing GPS LAT/LONG for confirmation with the system.
Data Center Concentrator (DCC)	System	Manages and monitors the communications to and from the AMI meters. Keeps an up to date network topology of how devices are connected and communications status for each device (previously termed Head-End System and Meter Management System in other use cases)
Data Retrievers	Person	There are many groups of users within SCE that require access to meter data. Some of these users access the data through programs and some through queries. These users require relatively unlimited, read only access to the data retrieved from the meter. (Billing usage system, Load Research, Load Forecasting, Settlements, Energy Service Providers, end use customers, and others.)

Actor Name	Actor Type (person, device, system etc.)	Actor Description
Meter data management system (MDMS)	System	Meter Data Management System represents either the organization or system responsible for capturing and maintaining large quantities of data produced by interval meters. 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.
Revenue Protection Rep	Person	Typically an FSR who investigates potential energy theft.
Customer Representative(s)	Person	Customer Representatives respond to customer requests to activate, modify and/or terminate delivery of service. Many off cycle bill requests are initiated by Customer Representative's action to correct billing errors (due to inaccurate physical reads or estimates).
Meter Shop	Organization	Meter testing location.

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 Scenario Description

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: Meter issues trouble report

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)*
Meter detects failure of periodic internal diagnostics.	Meter	Meter performs routine self-diagnostics.	Meter is functional.

3.1.1 Steps for this scenario

Describe the normal sequence of events that is required to complete the 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	Meter	Meter detects failure of periodic internal diagnostics.	

Step #	*Actor*	*Description of the Step*	*Additional Notes*
2	Meter	Meter reports failure to AMI system.	
3	Meter management system	Meter management system determines whether a trouble report shall be issued.	
4	Meter management system	System issues trouble report to predefined organization based on failure type.	
4.1	Field Service Dispatcher	Service Dispatcher for assigned organization schedules “trouble” order based on promised customer schedule and/or available field resources.	
5	Meter management system	Meter management system downloads trouble report to the field tool.	
6	Installer	Installer visits customer site.	
7	Installer	Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	
8	Installer	Installer changes the meter.	
9	Meter	Meter performs diagnostics and self registration with AMI. (initializes itself, see I1)	
9.1	AMI	AMI downloads programs, settings, and schedules for the account.	
10	Installer	Installer confirms whether problem is resolved.	
11	Installer	Installer completes trouble report in field tool.	
11.1	Field Tool	Field tool sends results of tests and job status to Meter Management System.	
11.2	Meter Management System	Meter Management System indicates trouble report as complete and notifies Meter Data Management System of status and resolution information.	
11.3	Meter Data Management System	Meter Data Management System notifies any 3rd parties of issues with data.	

Step #	Actor	Description of the Step	Additional Notes
12	Installer	Installer gives removed meter to Construction Maintenance Analyst.	
13	Construction Maintenance Analyst	Construction Maintenance Analyst ships meter to Meter Shop	
14	Meter Shop Meter Technician	Meter Shop Meter Technician determines whether meter should be repaired, returned to manufacturer for repair, or salvaged.	

3.2 Scenario Description

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: Data Center Concentrator (DCC) issues trouble report

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)*
Data Center Concentrator (DCC) issues trouble report	Data Center Concentrator (DCC)	Data Center Concentrator (DCC) is unable to communicate with a meter or other component, and has confirmed that the meter is not currently part of a known service outage, planned maintenance event or active "trouble" order.	Failed component is operational.

3.2.1 Steps for this scenario

Describe the normal sequence of events that is required to complete the 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	Data Center Concentrator (DCC)	DCC utilizes alternate access paths to check and isolate the failed component.	
2	Data Center Concentrator (DCC)	DCC confirms the number and type of alternate access paths available.	This is used to determine the priority of the “trouble” order relative to other work.
3	Meter management system	System issues trouble report to predefined organization based on failure type.	This is a duplicate of Scenario 1 step 4 and included for readability
3.1	Field Service Dispatcher	Service Dispatcher for assigned organization schedules “trouble” order based on promised customer schedule and/or available field resources.	This is a duplicate of Scenario 1 step 4.1 and included for readability
4	Meter management system	Meter management system downloads trouble report to the field tool.	This is a duplicate of Scenario 1 step 5 and included for readability
5	Installer	Installer visits customer site.	This is a duplicate of Scenario 1 step 6 and included for readability
6	Installer	Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	This is a duplicate of Scenario 1 step 7 and included for readability
7	Installer	Installer changes the meter.	This is a duplicate of Scenario 1 step 8 and included for readability
8	Meter	Meter performs diagnostics and self registration with AMI (initializes itself, see I1)	This is a duplicate of Scenario 1 step 9 and included for readability
8.1	AMI	AMI downloads programs, settings, and schedules for the account.	

Step #	Actor	Description of the Step	Additional Notes
9	Installer	Installer confirms whether problem is resolved.	This is a duplicate of Scenario 1 step 10 and included for readability
10	Installer	Installer completes trouble report in field tool.	This is a duplicate of Scenario 1 step 11 and included for readability
10.1	Field Tool	Field tool sends results of tests and job status to Meter Management System.	
10.2	Meter Management System	Meter Management System indicates trouble report as complete and notifies Meter Data Management System of status and resolution information.	
11	Installer	Installer gives removed meter to Construction Maintenance Analyst.	
12	Construction Maintenance Analyst	Construction Maintenance Analyst ships meter to Meter Shop	
13	Meter Shop Meter Technician	Meter Shop Meter Technician determines whether meter should be repaired, returned to manufacturer for repair, or salvaged.	

3.3 Scenario Description

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: Customer issues trouble report

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 reports meter problem	Customer	Customer identifies problem	Failed component is operational.

3.3.1 Steps for this scenario

Describe the normal sequence of events that is required to complete the 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 reports situation involving possible damage/malfunction of meter.	
2	Customer Representative	Customer Representative issues “on-demand” self test and/or “on-demand” meter read to verify level of operability at Customer premise. Customer Representative confirms that a problem exists.	
3	Customer Representative	Customer Representative creates “trouble” order in CSS and if appropriate, schedules the order with the Customer.	
4	Meter management system	System issues trouble report to predefined organization based on failure type.	This is a duplicate of Scenario 1 step 4 and included for readability
4.1	Field Service Dispatcher	Service Dispatcher for assigned organization schedules “trouble” order based on promised customer schedule and/or available field resources.	This is a duplicate of Scenario 1 step 4.1 and included for readability
5	Meter management system	Meter management system downloads trouble report to the field tool.	This is a duplicate of Scenario 1 step 5 and included for readability

Step #	Actor	Description of the Step	Additional Notes
6	Installer	Installer visits customer site.	This is a duplicate of Scenario 1 step 6 and included for readability
7	Installer	Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	This is a duplicate of Scenario 1 step 7 and included for readability
8	Installer	Installer changes the meter.	This is a duplicate of Scenario 1 step 8 and included for readability
9	Meter	Meter performs diagnostics and self registration with AMI(initializes itself, see I1)	This is a duplicate of Scenario 1 step 9 and included for readability
9.1	AMI	AMI downloads programs, settings, and schedules for the account.	
10	Installer	Installer confirms whether problem is resolved.	This is a duplicate of Scenario 1 step 10 and included for readability
11	Installer	Installer completes trouble report in field tool.	This is a duplicate of Scenario 1 step 11 and included for readability
11.1	Field Tool	Field tool sends results of tests and job status to Meter Management System.	
11.2	Meter Management System	Meter Management System indicates trouble report as complete and notifies Meter Data Management System of status and resolution information.	
11.3	Meter Management System	Meter Management System updates CSS with status and resolution information from the completed “trouble” order.	
12	Installer	Installer gives removed meter to Construction Maintenance Analyst.	
13	Construction Maintenance Analyst	Construction Maintenance Analyst ships meter to Meter Shop	

Step #	Actor	Description of the Step	Additional Notes
14	Meter Shop Meter Technician	Meter Shop Meter Technician determines whether meter should be repaired, returned to manufacturer for repair, or salvaged.	

3.4 Scenario Description

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 periodically performs routine maintenance on meter

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)*
Utility performs routine maintenance	Meter Management System	Random sample of meters is selected for testing	AMI Meter operating normally

3.4.1 Steps for this scenario

Describe the normal sequence of events that is required to complete the 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	Installer	Installer receives routine meter maintenance (sample test) order	
2	Installer	Installer attaches field tool to meter and performs field test on meter.	
3	Installer	Installer determines meter is not accurate and/or not communicating properly and needs to be changed.	
3.1	Installer	Installer determines meter information is accurate and is communicating properly.	
3.2	Installer	Installer completes order in field tool.	
4	Field Tool	Field tool sends failed test results to Meter Management System.	
5	Installer	Installer has replacement meter.	
5.1	Installer	Installer does not have replacement meter and inputs into field tool a trouble order to replace meter.	
5.2	Field Tool	Field Tool sends trouble order to Meter Management System to issue trouble report to replace meter.	
6	Installer	Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	This is a duplicate of Scenario 1 step 7 and included for readability
7	Installer	Installer changes the meter.	This is a duplicate of Scenario 1 step 8 and included for readability
8	Meter	Meter performs diagnostics and self registration with AMI (initializes itself, see I1).	This is a duplicate of Scenario 1 step 9 and included for readability
8.1	AMI	AMI downloads programs, settings, and schedules for the account.	
9	Installer	Installer confirms whether problem is resolved.	This is a duplicate of Scenario 1 step 10 and included for readability

Step #	Actor	Description of the Step	Additional Notes
10	Installer	Installer completes trouble report in field tool.	This is a duplicate of Scenario 1 step 11 and included for readability
10.1	Field Tool	Field tool sends results of tests and job status to Meter Management System.	
10.2	Meter Management System	Meter Management System indicates trouble report as complete and notifies Meter Data Management System of status and resolution information.	
10.3	Meter Data Management System	Meter Data Management System notifies any 3rd parties of issues with data.	
11	Installer	Installer gives removed meter to Construction Maintenance Analyst.	
12	Construction Maintenance Analyst	Construction maintenance Analyst ships meter to Meter Shop	
13	Meter Shop Meter Technician	Meter Shop Meter Technician determines whether meter should be repaired, returned to manufacturer for repair, or salvaged.	

3.5 Scenario Description

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: Customer reports high bill

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 reports high bill	Customer	Customer complains of high bill.	Source of high bill complaint identified and if necessary malfunctioning component is replaced/repaired and is working correctly.

3.5.1 Steps for this scenario

Describe the normal sequence of events that is required to complete the 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 contacts utility to complain of high bill	
2	Customer Representative	Customer Representative reviews billed, historical and current usage from meter to try and resolve Customer's concern	
3	Customer Representative	Customer Representative issues an "on-demand" read from the meter as well as an "on-demand" self test	
3.1	AMI Meter	AMI Meter responds to "on-demand" request for meter read and self-test	
4	Customer Representative	If self-test indicates no problem, but usage data is not consistent with current usage data, Customer Representative issues request test to check for other problem not detectable by meter self test.	
4.1	Customer Representative	If self-test indicates a problem with the meter, Customer Representative creates a "trouble" ticket	

Step #	Actor	Description of the Step	Additional Notes
5	Meter management system	System issues trouble report to predefined organization based on failure type.	This is a duplicate of Scenario 1 step 4 and included for readability
5.1	Field Service Dispatcher	Service Dispatcher for assigned organization schedules “trouble” order based on promised customer schedule and/or available field resources.	This is a duplicate of Scenario 1 step 4.1 and included for readability
6	Meter management system	Meter management system downloads trouble report to the field tool.	This is a duplicate of Scenario 1 step 5 and included for readability
7	Installer	Installer visits customer site and performs field test on meter.	
8	Installer	Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	This is a duplicate of Scenario 1 step 7 and included for readability
9	Installer	Installer changes the meter.	This is a duplicate of Scenario 1 step 8 and included for readability
10	Meter	Meter performs diagnostics and self registration with AMI (initializes itself, see I1) .	This is a duplicate of Scenario 1 step 9 and included for readability
10.1	AMI	AMI downloads programs, settings, and schedules for the account.	
11	Installer	Installer confirms whether problem is resolved.	This is a duplicate of Scenario 1 step 10 and included for readability
12	Installer	Installer completes trouble report in field tool.	This is a duplicate of Scenario 1 step 11 and included for readability
12.1	Field Tool	Field tool sends results of tests and job status to Meter Management System.	
12.2	Meter Management System	Meter Management System indicates trouble report as complete and notifies Meter Data Management System of status and resolution information.	

Step #	Actor	Description of the Step	Additional Notes
12.3	Meter Data Management System	Meter Data Management System notifies CSS of resolution of issue.	
13	Installer	Installer gives removed meter to Construction Maintenance Analyst.	
14	Construction Maintenance Analyst	Construction Maintenance Analyst ships meter to Meter Shop	
15	Meter Shop Meter Technician	Meter Shop Meter Technician determines whether meter should be repaired, returned to manufacturer for repair, or salvaged.	

3.6 Scenario Description

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: Data Retrievers reports trouble with meter data

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)*
Data Retrievers reports trouble with meter data	Data Retrievers	Data Retrievers routinely review data received from meters	Failed component is operational.

3.6.1 Steps for this scenario

Describe the normal sequence of events that is required to complete the 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	Data Retriever	Identifies anomaly in meter data and notifies Meter Data Management System Technician	
2	Meter Data Management System Technician	Examines anomalous data and issues “on-demand” read and “on-demand” meter self-test.	
3	AMI Meter	AMI Meter responds to “on-demand” request for meter read and self test.	
3.1	Meter Data Management System Technician	Self test indicates problem with meter and read data continues to show anomaly. Meter Data Management System Technician creates “trouble” ticket on meter	
4	Meter management system	System issues trouble report to predefined organization based on failure type.	This is a duplicate of Scenario 1 step 4 and included for readability
4.1	Field Service Dispatcher	Service Dispatcher for assigned organization schedules “trouble” order based on promised customer schedule and/or available field resources.	This is a duplicate of Scenario 1 step 4.1 and included for readability
5	Meter management system	Meter management system downloads trouble report to the field tool.	This is a duplicate of Scenario 1 step 5 and included for readability
6	Installer	Installer visits customer site and performs field test on meter .	This is a duplicate of Scenario 1 step 6 and included for readability
7	Installer	Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	This is a duplicate of Scenario 1 step 7 and included for readability
8	Installer	Installer changes the meter.	This is a duplicate of Scenario 1 step 8 and included for readability

Step #	*Actor*	*Description of the Step*	*Additional Notes*
9	Meter	Meter performs diagnostics and self registration with AMI (initializes itself, see I1).	This is a duplicate of Scenario 1 step 9 and included for readability
9.1	AMI	AMI downloads programs, settings, and schedules for the account.	
10	Installer	Installer confirms whether problem is resolved.	This is a duplicate of Scenario 1 step 10 and included for readability
11	Installer	Installer completes trouble report in field tool.	This is a duplicate of Scenario 1 step 11 and included for readability
11.1	Field Tool	Field tool sends results of tests and job status to Meter Management System.	
11.2	Meter Management System	Meter Management System indicates trouble report as complete and notifies Meter Data Management System of status and resolution information.	
11.3	Meter Data Management System Technician	Meter Data Management System Technician updates Meter Data Management System to indicate that data is “untrustworthy”.	Not clear If there is a requirement to attempt to actually correct anomaly or if identification is sufficient.
11.4	Meter Data Management System	Meter Data Management System notifies any 3rd parties of issues with data.	
11.5	Meter Data Management System Technician	Meter Data Management System Technician checks other meters from the same “lot” to determine if they are also demonstrating the anomaly	
12	Installer	Installer gives removed meter to Construction Maintenance Analyst.	
13	Construction Maintenance Analyst	Construction Maintenance Analyst ships meter to Meter Shop	

Step #	Actor	Description of the Step	Additional Notes
14	Meter Shop Meter Technician	Meter Shop Meter Technician determines whether meter should be repaired, returned to manufacturer for repair, or salvaged.	

3.7 Scenario Description

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: Installer discovers customer service panel upgraded or relocated

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)*
Tamper detection reported on AMI meter	AMI Meter	Meter Data Management System receives notification of meter tampering.	Meter operating properly.

3.7.1 Steps for this scenario

Describe the normal sequence of events that is required to complete the 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	AMI Meter	AMI meter detects meter tampering and notifies Meter Data Management System.(see use case B3)	
2.	Meter Data Management Technician	Meter Data Management Technician reviews account, identifies usage anomaly, and determines trouble report is required.	
3.	Meter Data Management Technician	Meter Data Management Technician requests Meter Management System to issue trouble report.	
4	Meter management system	Meter management system downloads trouble report to Revenue Protection Rep field tool.	
5	Revenue Protection Rep	Revenue Protection Rep visits customer site, checks for meter tampering, bypass, or other energy theft scenarios, and tests meter.	
6	Revenue Protection Rep	Revenue Protection Rep determines no energy theft has occurred but test results indicate meter is not operating properly and needs to be replaced.	
6.1	Revenue Protection Rep	Revenue Protection Rep determines there is no energy theft and tests results indicate meter is operating properly.	
6.1.2	Revenue Protection Rep	Revenue Protection Rep installs lock ring and completes job in field tool.	
6.2	Revenue Protection Rep	Revenue Protection Rep determines energy theft has occurred, inputs into field tool, and proceeds with Revenue Protection process.	
7	Revenue Protection Rep	Revenue Protection Rep downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	This is a duplicate of Scenario 1 step 7 and included for readability
8	Revenue Protection Rep	Revenue Protection Rep changes the meter and installs lock ring.	This is a duplicate of Scenario 1 step 8 and included for readability

Step #	Actor	Description of the Step	Additional Notes
9	Meter	Meter performs diagnostics and self registration with AMI (initializes itself, see I1).	This is a duplicate of Scenario 1 step 9 and included for readability
9.1	AMI	AMI downloads programs, settings, and schedules for the account.	
10	Revenue Protection Rep	Revenue Protection Rep completes trouble report in field tool.	This is a duplicate of Scenario 1 step 11 and included for readability
10.1	Field Tool	Field tool sends results of tests and job status to Meter Management System.	
10.2	Meter Management System	Meter Management System indicates trouble report as complete and notifies Meter Data Management System of status and resolution information.	
11	Revenue Protection Rep	Revenue Protection Rep gives removed meter to Construction Maintenance Analyst.	
12	Construction Maintenance Analyst	Construction Maintenance Analyst ships meter to Meter Shop	
13	Meter Shop Meter Technician	Meter Shop Meter Technician determines whether meter should be repaired, returned to manufacturer for repair, or salvaged.	

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

Functional Requirements	*Associated Scenario # (if applicable)*	*Associated Step # (if applicable)*
(I2FR1) The meter shall perform a self diagnostic upon installation and periodically at a preconfigured frequency. Detect and log all failures. Report any SCE defined critical failure(at a minimum: check sum error, meter failure from firmware upgrade, metrology failure, program or memory failure, time synch failure) immediately to the AMI system	1	1
(I2FR2) The meter shall recognize it is in the wrong socket. (configuration, i.e. number of clips)	1	1
(I2FR3) (DELETED)		
(I2FR4) (DELETED)		
(I2FR5) The meter shall detect and report program or memory failure	1	1
(I2FR6) The meter shall detect and report a time synch failure	1	1
(I2FR7) The meter shall detect and report a failure communicating with subscribed home devices and report exceptions to the AMI system. (specifics included in C4 and C1)	1	1
(I2FR8) The meter shall detect and log an SCE communications failure on communications initiated from the meter.	1	1
(I2FR9) (DELETED)		
(I2FR10) The AMI system shall maintain a log of meter events by billing account	1	2

Functional Requirements	*Associated Scenario # (if applicable)*	*Associated Step # (if applicable)*
(I2FR11) The AMI system shall maintain a log of meter events by meter	1	2
(I2FR12) The AMI system shall maintain a log of meter events by meter type / module / manufacturer		2
(I2FR13) The AMI system shall have the ability to analyze event log data to look for chronic failures	1	2
(I2FR14) The meter can determine internal data inconsistencies	1	1
(I2FR15) (DELETED)		
(I2FR16) The meter prioritizes failures by safety / service vs. other failure types	1	2
(I2FR17) Meter shall test / check that it is recording correctly and shall generate an event specific to the metrology of the meter and store that event in the meter and report it to the AMI system immediately.	1	1
(I2FR18) The meter management system shall recognize diagnostic failures occurring relative to scheduled planned maintenance of the meter or planned/unplanned circuit outages and not issue a trouble report.	1	3
(I2FR19) The meter management system shall evaluate meter self-diagnostic failures to determine whether a trouble report shall be issued. The meter management system shall attempt to resolve problems (ie. Upgrade programming) and identify what components have failed (WAN, LAN or HAN).	1	3
(I2FR20) The meter management system shall be able to either require or not require human intervention in the determination of issuing trouble reports based on specific criteria. (need to develop criteria for human intervention)	1	4
(I2FR21) AMI trouble reports shall contain at least the information contained in IDR trouble reports today. (examples provided)	1	4
(I2FR22) A wireless field tool shall be used by a Installer to investigate / work / resolve trouble reports. Installer shall be able to initiate a trouble report for problems they identify in the field (i.e. broken glass).	1	5

Functional Requirements	Associated Scenario # (if applicable)	Associated Step # (if applicable)
(I2FR23) The meter management system shall identify to the field tool the resources needed to address trouble report (i.e. meter material code and/or communication device if at the meter)	1	6
(I2FR24) The wireless field tool shall be able to read all data contained in the meter (i.e. register read, demand, interval data, logs, voltage, PF, etc.). If the meter has a communication failure, a local connection shall be available for the field tool to read the data.	1	7
(I2FR25) At completion of the trouble report the field tool automatically uploads all related information from the field tool to the appropriate system.	1	11
(I2FR26) Meter shall be configured to allow AMI communication to be pre-empted by local connection (and vice versa). Meter can be configured to allow both ports to be used simultaneously. Meter can be configured to allow more than one interaction with the meter at the same time.	1	
(I2FR27) Trouble report information in the Meter Management System shall be available to other systems in order for data users to have access to trouble report information.	1 2 3 5 6	4 3 4 5 4

4.2 Non-functional Requirements

Non-Functional Requirements	Associated Scenario # (if applicable)	Associated Step # (if applicable)
(I2NFR1) The meter shall comply with ANSI environmental standards as defined by MSO in the RFI.		
(I2NFR2) The meter shall have a maximum failure rate of 1% at install and a .5% steady state annual failure rate after installation.	1	2
(I2NFR3) (DELETED)		
(I2NFR4) Meter sends safety / service failures within 15 minutes	1	2
(I2NFR5) The meter shall maintain diagnostic events / errors in the log for at least 45 days.	1	2
(I2NFR6) Metrology check shall be performed at least once per month and as often as once per day and results logged and sent in with next scheduled read.	1	1
(I2NFR7) Meter information download into field tool shall occur within 10 seconds	1	7
(I2NFR8) Meter shall have a life expectancy of 15 years including its energy storage device (battery)		

4.3 Business Requirements

Business Requirement	*Associated Scenario # (if applicable)*	*Associated Step # (if applicable)*
(I2BR1) Due to expectations that may come along with a new AMI system, repair / maintenance SLA's must be adequately responsive to customer / regulator expectations and requirements	1	2
(I2BR2) Part of vendor selection shall be validation of all different failure rates claimed by the vendor, since these rates affect the business case. Evaluation shall consider all components as well as the overall system.	1	1
(I2BR3) Enterprise system shall support definition of which organization is responsible for handling a trouble report based on diagnostic failure types. (i.e. comm. system=IT, Meter=MSO, HAN=TP&S)	1	

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	2; Meter reports failure to AMI system.	AMI Meter	Meter management system	Notice of meter failure.
1	4; Meter Management System issues trouble report to predefined organization based on failure type.	Meter management system	Appropriate field force planning and dispatch system.	“trouble” order
1	4.1; Service Dispatcher for assigned organization schedules “trouble” order based on promised customer schedule and/or available field resources.	Appropriate field force planning and dispatch system.	Meter management system	Orders assigned for field personnel.
1	5; Meter management system downloads trouble report to the field tool.	Meter management system	Field tool	“Trouble” orders, including: Premise address, Installed equipment, Order type, Scheduled “delivery” time (if applicable)

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
1	7; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Alert if AMI meter information does not match information in field tool.
1	7; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Requests download of meter data and logs.
1	7; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	AMI Meter	Field tool	Meter data and logs download.
1	7; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Notice that download completed successfully.

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
1	7; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Requests upload of meter data and logs to AMI.
1	7; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	AMI Meter	AMI	Meter data and logs upload.
1	7; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists). =	AMI	AMI meter	Notice that upload completed successfully.
1	9; Meter performs diagnostics and self registration with AMI (initializes itself, see I1)	AMI Meter	Meter management system	Notice of old meter removal; notice of meter installation; Time synchronization transaction; Meter configuration synchronization transaction;

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
1	9; Meter performs diagnostics and self registration (initializes itself, see I1)	AMI Meter	Field tool	In the event that communications is temporarily unavailable: Time synchronization transaction; Meter configuration synchronization transaction (based on information contained in "trouble" order and information downloaded from "old" meter).
1	9.1, AMI downloads programs, settings, and schedules for the account.	AMI	AMI Meter	Programs, setting, and schedules for the account
1	11; Installer completes trouble report in field tool.	AMI Meter	Field tool	Information to complete "trouble" order;
1	11.1; _	Field tool	Meter management system	Information to complete "trouble" order;
1	11.2; Meter Management System indicates trouble report as complete and notifies Meter Data Management System of status and resolution information.	Meter Management system	Meter Data Management system	Meter data and logs downloaded from "old" meter; information on "new" meter;
1	11.3, Meter Data Management System notifies any 3rd parties of issues with data.	Meter Data Management System	3rd Parties	Data issues

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
1	12,	Installer	Meter Management System	Meter status and location update
1	13, Construction Maintenance Analyst ships meter to Meter Shop	Construction maintenance analyst	Meter Data Management System	Meter status and location update
1	14,	Meter Shop Meter Technician	Meter Data Management System	Results of meter test. Meter status and location update
2	1; DCC utilizes alternate access paths to check and isolate the failed component.	Data Center Concentrator (DCC)	AMI Meter	Status check transaction (verify meter connectivity).
2	1; DCC utilizes alternate access paths to check and isolate the failed component.	AMI Meter	Data Center Concentrator (DCC)	Response to status check transaction (including network routing information)
2	3; System issues trouble report to predefined organization based on failure type.	Meter management system	Appropriate field force planning and dispatch system.	“trouble” order
2	3.1; Service Dispatcher for assigned organization schedules “trouble” order based on promised customer schedule and/or available field resources.	Appropriate field force planning and dispatch system.	Meter management system	Orders assigned for field personnel.

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
2	4; Meter management system downloads trouble report to the field tool.	Meter management system	Field tool	"Trouble" orders, including: Premise address, Installed equipment, Order type, Scheduled "delivery" time (if applicable)
2	6; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Alert if AMI meter information does not match information in field tool.
2	6; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Requests download of meter data and logs.
2	6; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	AMI Meter	Field tool	Meter data and logs download.

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
2	6; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists). =	Field tool	AMI meter	Notice that download completed successfully.
2	6; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Requests upload of meter data and logs to AMI.
2	6; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	AMI Meter	AMI	Meter data and logs upload.
2	6; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists). =	AMI	AMI meter	Notice that upload completed successfully.

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
2	8; Meter performs diagnostics and self registration (initializes itself, see I1)	AMI Meter	Meter management system	Notice of old meter removal; notice of meter installation; Time synchronization transaction; Meter configuration synchronization transaction;
2	8; Meter performs diagnostics and self registration (initializes itself, see I1)	AMI Meter	Field tool	In the event that communications is temporarily unavailable: Time synchronization transaction; Meter configuration synchronization transaction (based on information contained in “trouble” order and information downloaded from “old” meter).
2	8.1, AMI downloads programs, settings, and schedules for the account.	AMI	AMI Meter	Programs, setting, and schedules for the account
2	10; Installer completes trouble report in field tool.	AMI Meter	Field tool	Information to complete “trouble” order;
2	10.1; _	Field tool	Meter management system	Information to complete “trouble” order;

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
2	10.2; Meter Management System indicates trouble report as complete and notifies Meter Data Management System of status and resolution information.	Meter Management system	Meter Data Management system	Meter data and logs downloaded from “old” meter; information on “new” meter;
2	11,	Installer	Meter Management System	Meter status and location update
2	12, Construction Maintenance Analyst ships meter to Meter Shop	Construction maintenance analyst	Meter Data Management System	Meter status and location update
2	13,	Meter Shop Meter Technician	Meter Data Management System	Results of meter test. Meter status and location update
3	1; Customer reports situation involving possible damage/malfunction of Utility equipment (e.g. damaged meter, pole/line down)	Customer	Customer Representative	Customer information; premise location; problem description

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
3	2; Customer Representative issues "on-demand" self test and/or "on-demand" meter read to verify level of operability at Customer premise. Customer Representative confirms that a problem exists.	Customer Representative	AMI Meter	Request "on-demand" self-test; Request "on-demand" meter read.
3	2; Customer Representative issues "on-demand" self test and/or "on-demand" meter read to verify level of operability at Customer premise. Customer Representative confirms that a problem exists.	AMI Meter	Customer Representative	Results of "on-demand" self-test request (or error indicating request failed); Results "on-demand" meter read request (or error indicating request failed).
3	3; Customer Representative creates "trouble" order in CSS and if appropriate, schedules the order with the Customer.	Customer Representative	CSS	"Trouble" order
3	3; Customer Representative creates "trouble" order in CSS and if appropriate, schedules the order with the Customer.	CSS	Meter Management System	"Trouble" order.

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
3	4; System issues trouble report to predefined organization based on failure type.	Meter management system	Appropriate field force planning and dispatch system.	"trouble" order
3	4.1; Service Dispatcher for assigned organization schedules "trouble" order based on promised customer schedule and/or available field resources.	Appropriate field force planning and dispatch system.	Meter management system	Orders assigned for field personnel.
3	5; Meter management system downloads trouble report to the field tool.	Meter management system	Field tool	"Trouble" orders, including: Premise address, Installed equipment, Order type, Scheduled "delivery" time (if applicable)
3	7; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Alert if AMI meter information does not match information in field tool.

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
3	7; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Requests download of meter data and logs.
3	7; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	AMI Meter	Field tool	Meter data and logs download.
3	7; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Notice that download completed successfully.
3	7; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Requests upload of meter data and logs to AMI.

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
3	7; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	AMI Meter	AMI	Meter data and logs upload.
3	7; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists). =	AMI	AMI meter	Notice that upload completed successfully.
3	9; Meter performs diagnostics and self registration (initializes itself, see I1)	AMI Meter	Meter management system	Notice of old meter removal; notice of meter installation; Time synchronization transaction; Meter configuration synchronization transaction;
3	9; Meter performs diagnostics and self registration (initializes itself, see I1)	AMI Meter	Field tool	In the event that communications is temporarily unavailable: Time synchronization transaction; Meter configuration synchronization transaction (based on information contained in “trouble” order and information downloaded from “old” meter).

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
3	9.1, AMI downloads programs, settings, and schedules for the account.	AMI	AMI Meter	Programs, setting, and schedules for the account
3	11; Installer completes trouble report in field tool.	AMI Meter	Field tool	Information to complete "trouble" order;
3	11.1; _	Field tool	Meter management system	Information to complete "trouble" order;
3	11.2; Meter Management System indicates trouble report as complete and notifies Meter Data Management System of status and resolution information.	Meter Management system	Meter Data Management system	Meter data and logs downloaded from "old" meter; information on "new" meter;
3	13; Updates CSS with status and resolution information from the completed "trouble" order.	Meter Management System	CSS	"trouble" order completion information; information about meter removed; information about meter installed;
3	12,	Installer	Meter Management System	Meter status and location update
3	13, Construction Maintenance Analyst ships meter to Meter Shop	Construction maintenance analyst	Meter Data Management System	Meter status and location update
3	14,	Meter Shop Meter Technician	Meter Data Management System	Results of meter test. Meter status and location update

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
4	1, Installer receives routine meter maintenance (sample test) order	Meter Management System	Field Tool	Routine sample meter tests
4	2, Installer attaches field tool to meter and performs field test on meter.	Field Tool	AMI Meter	Testing of meter
4	3.2, Installer completes order in field tool.	Installer	Field Tool	Results of test and closure of job.
4	3.2, Installer completes order in field tool.	Field Tool	Meter Management System	Test okay results and closure of job
4	4, Field tool sends test results to Meter Management System	Field tool	Meter Management System	Test bad results
4	5, Installer does not have replacement meter and inputs into field tool a trouble order to replace meter.	Installer	Field Tool	Need for trouble report to replace meter
4	5.1, Field Tool sends trouble order to Meter Management System to issue trouble report to replace meter.	Field Tool	Meter Management System	Need for trouble report to replace meter

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
4	6; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Alert if AMI meter information does not match information in field tool.
4	6; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Requests download of meter data and logs.
4	6; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	AMI Meter	Field tool	Meter data and logs download.
4	6; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Notice that download completed successfully.

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
4	6; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Requests upload of meter data and logs to AMI.
4	6; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	AMI Meter	AMI	Meter data and logs upload.
4	6; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists). =	AMI	AMI meter	Notice that upload completed successfully.
4	6; Meter performs diagnostics and self registration (initializes itself, see I1)	AMI Meter	Meter management system	Notice of old meter removal; notice of meter installation; Time synchronization transaction; Meter configuration synchronization transaction;

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
4	8; Meter performs diagnostics and self registration (initializes itself, see I1)	AMI Meter	Field tool	In the event that communications is temporarily unavailable: Time synchronization transaction; Meter configuration synchronization transaction (based on information contained in "trouble" order and information downloaded from "old" meter).
4	8.1, AMI downloads programs, settings, and schedules for the account.	AMI	AMI Meter	Programs, setting, and schedules for the account
4	10 Installer completes trouble report in field tool.	AMI Meter	Field tool	Information to complete "trouble" order;
4	10.1;	Field tool	Meter management system	Information to complete "trouble" order;
4	10.2; Meter Management System indicates trouble report as complete and notifies Meter Data Management System of status and resolution information.	Meter Management system	Meter Data Management system	Meter data and logs downloaded from "old" meter; information on "new" meter;
4	10.3,	Meter Data Management System	3rd parties	Data issues

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
4	11,	Installer	Meter Management System	Meter status and location update
4	12, Construction Maintenance Analyst ships meter to Meter Shop	Construction maintenance analyst	Meter Data Management System	Meter status and location update
4	13,	Meter Shop Meter Technician	Meter Data Management System	Results of meter test. Meter status and location update
5	1; Customer contacts utility to complain of high bill	Customer	Customer Representative	Customer/Account information; Premise information; Information on why Customer believes bill is "too high"
5	2; Customer Representative reviews billed, historical and current usage from meter to try and resolve Customer's concern	Customer Representative	CSS	Verifies Customer/Account information; Bill history for Customer/Account/Premise.
5	3; Customer Representative issues an "on-demand" read from the meter as well as an "on-demand" self test	Customer Representative	AMI Meter	Request "on-demand" self-test; Request "on-demand" meter read.
5	3.1; AMI Meter responds to "on-demand" request for meter read and self-test	AMI Meter	Customer Representative	Results of "on-demand" self-test request (or error indicating request failed); Reults "on-demand" meter read request (or error indicating request failed).

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
5	4, If self-test indicates no problem, but usage data is not consistent with current usage data, Customer Representative issues request test to check for other problem not detectable by meter self test.	Customer Representative	CSS	“Trouble” order
5	4, If self-test indicates no problem, but usage data is not consistent with current usage data, Customer Representative issues request test to check for other problem not detectable by meter self test.	CSS	Meter Management System	“Trouble” order.
5	4, If self-test indicates no problem, but usage data is not consistent with current usage data, Customer Representative issues request test to check for other problem not detectable by meter self test.	Meter management system	Appropriate field force planning and dispatch system.	“trouble” order

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
5	4, If self-test indicates no problem, but usage data is not consistent with current usage data, Customer Representative issues request test to check for other problem not detectable by meter self test.	Appropriate field force planning and dispatch system.	Meter management system	Orders assigned for field personnel.
5	4, If self-test indicates no problem, but usage data is not consistent with current usage data, Customer Representative issues request test to check for other problem not detectable by meter self test.	Meter management system	Field tool	"Trouble" orders, including: Premise address, Installed equipment, Order type, Scheduled "delivery" time (if applicable)
5	4.1, If self-test indicates a problem with the meter, Customer Representative creates a "trouble" ticket	Customer Representative	CSS	"Trouble" order
5	4.1, If self-test indicates a problem with the meter, Customer Representative creates a "trouble" ticket	CSS	Meter Management System	"Trouble" order.

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
5	4.1, If self-test indicates a problem with the meter, Customer Representative creates a "trouble" ticket	Meter management system	Appropriate field force planning and dispatch system.	"trouble" order
5	4.1, If self-test indicates a problem with the meter, Customer Representative creates a "trouble" ticket	Appropriate field force planning and dispatch system.	Meter management system	Orders assigned for field personnel.
5	4.1, If self-test indicates a problem with the meter, Customer Representative creates a "trouble" ticket	Meter management system	Field tool	"Trouble" orders, including: Premise address, Installed equipment, Order type, Scheduled "delivery" time (if applicable)
5	5, System issues trouble report to predefined organization based on failure type.	Meter management system	Appropriate field force planning and dispatch system.	"trouble" order
5	5.1, Service Dispatcher for assigned organization schedules "trouble" order based on promised customer schedule and/or available field resources.	Appropriate field force planning and dispatch system.	Meter management system	Orders assigned for field personnel.

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
5	6, Meter management system downloads trouble report to the field tool.	Meter management system	Field tool	"Trouble" orders, including: Premise address, Installed equipment, Order type, Scheduled "delivery" time (if applicable)
5	7, Installer visits customer site and performs field test on meter.	Installer	AMI Meter	Perform test
5	8; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Alert if AMI meter information does not match information in field tool.
5	8; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Requests download of meter data and logs.
5	8; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	AMI Meter	Field tool	Meter data and logs download.

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
5	8; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists). =	Field tool	AMI meter	Notice that download completed successfully.
5	8; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Requests upload of meter data and logs to AMI.
5	8; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	AMI Meter	AMI	Meter data and logs upload.
5	8; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists). =	AMI	AMI meter	Notice that upload completed successfully.

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
5	10; Meter performs diagnostics and self registration (initializes itself, see I1)	AMI Meter	Meter management system	Notice of old meter removal; notice of meter installation; Time synchronization transaction; Meter configuration synchronization transaction;
5	10; Meter performs diagnostics and self registration (initializes itself, see I1)	AMI Meter	Field tool	In the event that communications is temporarily unavailable: Time synchronization transaction; Meter configuration synchronization transaction (based on information contained in "trouble" order and information downloaded from "old" meter).
5	10.1, AMI downloads programs, settings, and schedules for the account.	AMI	AMI Meter	Programs, setting, and schedules for the account
5	12; Installer completes trouble report in field tool.	AMI Meter	Field tool	Information to complete "trouble" order;
5	12.1; _	Field tool	Meter management system	Information to complete "trouble" order;

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
5	12.2; Meter Management System indicates trouble report as complete and notifies Meter Data Management System of status and resolution information.	Meter Management system	Meter Data Management system	Meter data and logs downloaded from “old” meter; information on “new” meter;
5	12.3; Meter management System reports completion of “trouble” ticket to CCS.	Meter Data Management System	CSS	“trouble” order completion information; information about meter removed; information about meter installed;
5	13,	Installer	Meter Management System	Meter status and location update
5	14, Construction Maintenance Analyst ships meter to Meter Shop	Construction maintenance analyst	Meter Data Management System	Meter status and location update
5	15,	Meter Shop Meter Technician	Meter Data Management System	Results of meter test. Meter status and location update
6	1; Identifies anomaly in meter data and notifies Meter Data Management System Technician	Data Retriever	Meter Data Management System Technician	e-mail or telephone call with information on anomaly: Premise; meter #; read date(s)
6	2; Examines anomalous data and issues “on-demand” read and “on-demand” meter self-test.	Meter Data Management System Technician	AMI Meter	Request “on-demand” self-test; Request “on-demand” meter read.

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
6	3; AMI Meter responds to "on-demand" request for meter read and self test.	AMI Meter	Meter Data Management System Technician	Results of "on-demand" self-test request (or error indicating request failed); Reults "on-demand" meter read request (or error indicating request failed).
6	3.1; Self test indicates problem with meter and read data continues to show anomaly. Meter Data Management System Technician creates "trouble" ticket on meter	Meter Data Management System Technician	Meter Management System	"Trouble" order.
6	4; System issues trouble report to predefined organization based on failure type.	Meter management system	Appropriate field force planning and dispatch system.	"trouble" order
6	4.1; Service Dispatcher for assigned organization schedules "trouble" order based on promised customer schedule and/or available field resources.	Appropriate field force planning and dispatch system.	Meter management system	Orders assigned for field personnel.

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
6	5; Meter management system downloads trouble report to the field tool.	Meter management system	Field tool	"Trouble" orders, including: Premise address, Installed equipment, Order type, Scheduled "delivery" time (if applicable)
6	7; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Alert if AMI meter information does not match information in field tool.
6	7; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Requests download of meter data and logs.
6	7; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	AMI Meter	Field tool	Meter data and logs download.

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
6	7; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Notice that download completed successfully.
6	7; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Requests upload of meter data and logs to AMI.
6	7; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	AMI Meter	AMI	Meter data and logs upload.
6	7; Installer downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	AMI	AMI meter	Notice that upload completed successfully.

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
6	9; Meter performs diagnostics and self registration (initializes itself, see I1)	AMI Meter	Meter management system	Notice of old meter removal; notice of meter installation; Time synchronization transaction; Meter configuration synchronization transaction;
6	9; Meter performs diagnostics and self registration (initializes itself, see I1)	AMI Meter	Field tool	In the event that communications is temporarily unavailable: Time synchronization transaction; Meter configuration synchronization transaction (based on information contained in “trouble” order and information downloaded from “old” meter).
6	9.1, AMI downloads programs, settings, and schedules for the account.	AMI	AMI Meter	Programs, setting, and schedules for the account
6	11, Installer completes trouble report in field tool.	AMI Meter	Field tool	Information to complete “trouble” order;
6	11.1; _	Field tool	Meter management system	Information to complete “trouble” order;

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
6	11.2; Meter Management System indicates trouble report as complete and notifies Meter Data Management System of status and resolution information.	Meter Management system	Meter Data Management system	Meter data and logs downloaded from “old” meter; information on “new” meter;
6	11.3; Meter Data Management System Technician updates Meter Data Management System to indicate that data is “untrustworthy”	Meter Data Management System Technician	Meter Data Management system	identifies untrustworthy data
6	11.4 Meter Data Management System notifies any 3rd parties of issues with data	Meter Data Management System	3rd Parties	Data issues
6	11.5; Meter Data Management System Technician checks other meters from the same “lot” to determine if they are also demonstrating the anomaly	Meter Data Management System Technician	Meter Management System	Request list of meters in same “lot” as “old” meter replaced.
6	11.5; Meter Data Management System Technician checks other meters from the same “lot” to determine if they are also demonstrating the anomaly	Meter Management System	Meter Data Management System Technician	List of meters in same “lot” as “old” meter replaced.

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
6	11.5; Meter Data Management System Technician checks other meters from the same "lot" to determine if they are also demonstrating the anomaly	Meter Data Management System Technician	Meter Data Management system	Request current/historical read data for list of meters in same "lot" as "old" meter replaced.
6	11.5; Meter Data Management System Technician checks other meters from the same "lot" to determine if they are also demonstrating the anomaly	Meter Data Management system	Meter Data Management System Technician	Current/historic meter data retrieved to satisy request.
6	12,	Installer	Meter Management System	Meter status and location update
6	13, Construction Maintenance Analyst ships meter to Meter Shop	Construction maintenance analyst	Meter Data Management System	Meter status and location update
6	14,	Meter Shop Meter Technician	Meter Data Management System	Results of meter test. Meter status and location update
7	1, AMI meter detects meter tampering and notifies AMI.	AMI Meter	AMI	Tamper event
7	3, Meter Data Management Technician requests Meter Management System to issue trouble report.	Meter Data Management Technician	Meter Management System	Trouble Report Request

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
7	4, Meter management system downloads trouble report to Revenue Protection Rep field tool.	Meter Management System	Field Tool	Trouble Report with tamper event
7	5, Revenue Protection Rep visits customer site, checks for meter tampering, bypass, or other energy theft scenarios, and tests meter.	Revenue Protection Rep	AMI Meter	Tests and check for meter theft
7	6.2.		Field Tool	Energy theft incident information
7	7; Revenue Protection Rep downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Alert if AMI meter information does not match information in field tool.
7	7; Revenue Protection Rep downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Requests download of meter data and logs.

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
7	7; Revenue Protection Rep downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	AMI Meter	Field tool	Meter data and logs download.
7	7; Revenue Protection Rep downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists). =	Field tool	AMI meter	Notice that download completed successfully.
7	7; Revenue Protection Rep downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	Field tool	AMI meter	Requests upload of meter data and logs to AMI.
7	7; Revenue Protection Rep downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists).	AMI Meter	AMI	Meter data and logs upload.

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
7	7; Revenue Protection Rep downloads the information contained in the meter into the field tool and triggers meter to send meter logs and data to AMI (if communications exists). =	AMI	AMI meter	Notice that upload completed successfully.
7	9; Meter performs diagnostics and self registration (initializes itself, see I1)	AMI Meter	Meter management system	Notice of old meter removal; notice of meter installation; Time synchronization transaction; Meter configuration synchronization transaction;
7	9; Meter performs diagnostics and self registration (initializes itself, see I1)	AMI Meter	Field tool	In the event that communications is temporarily unavailable: Time synchronization transaction; Meter configuration synchronization transaction (based on information contained in “trouble” order and information downloaded from “old” meter).
7	9.1, AMI downloads programs, settings, and schedules for the account.	AMI	AMI Meter	Programs, setting, and schedules for the account

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
7	10; Revenue Protection Rep completes trouble report in field tool.	AMI Meter	Field tool	Information to complete "trouble" order;
7	10.1; Field tool sends results of tests and job status to Meter Management System.	Field tool	Meter management system	Information to complete "trouble" order;
7	10.2; Meter Management System indicates trouble report as complete and notifies Meter Data Management System of status and resolution information.	Meter Management system	Meter Data Management system	Meter data and logs downloaded from "old" meter; information on "new" meter;
7	11, Revenue Protection Rep gives removed meter to Construction Maintenance Analyst.	Revenue Protection Rep	Meter Management System	Meter status and location update
7	12, Construction Maintenance Analyst ships meter to Meter Shop	Construction maintenance analyst	Meter Data Management System	Meter status and location update
7	13, Meter Shop Meter Technician determines whether meter should be repaired, returned to manufacturer for repair, or salvaged.	Meter Shop Meter Technician	Meter Data Management System	Results of meter test. Meter status and location update

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**
Failure Report Classes	1. High importance classes that need to be reported "immediately" (based on the communications system abilities) - safety affecting - service affecting 2. Low importance classes that should be reported no later than the next billing reporting period - billing affecting - customer affecting - informational
IDR	Interval Data Recorder
VEE	Validating, Estimating and Editing
CSS	Customer Service System
HAN	Home area network
LAN	Local area network (between meter and "pole top device") This may or may not exist in some network communication schemes.
Metrology Health Check	**Meter self test/check to determine whether the AMI meter is recording consumption correctly.** This is a specific test of the metrology portions of the meter's functionality, performed on request by the meter itself. It is performed to identify to the AMI System whether the data being reported by the meter can be trusted.

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.