AMI Use Case: I3

Utility Upgrades AMI to Address Future Requirements

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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 steps	N
1.2	060216	Ben Rankin	Updates from I3W2 workshop notes	N
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Approvals

This document requires following approvals.

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Contents

1. Use Case Description

1.1 Use Case Title

Utility Upgrades AMI to Address Future Requirements

1.2 Use Case Summary

Because of the high capital cost of AMI, the system must be able to adapt to certain kinds of anticipated changes that may occur. The capability of the system to adapt can reduce the need for future system upgrades and corresponding significant costs.

Some of possible upgrades include:

- New physical communications methods
- New features available from equipment vendors
- New tariffs, possibly with certain restrictions, e.g. number of rates or time
- Connection to new types of load control equipment
- New communications protocols
- Changes to operating parameters
- New computing applications

Such changes should be possible at incremental cost, rather than wholesale replacement of system components.

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.

Meter or communication device vendors may offer product improvement revisions or Utility requests a program modification after the product has been placed into service requiring an upgrade to the meter firmware. The Utility wants to ensure error free device operation and therefore may apply the vendor-recommended changes after completing an assessment.. The revision should be as transparent as possible to the utility customers. The utility has an interest in making the management of firmware as hands free as possible, from the AMI field component's perspective, extending the functional lifetime of the AMI field components at a lower cost. This includes the ability to "on-demand" download

updates to the firmware as well as maintaining the ability for the AMI field component to automatically revert to a previous version of firmware in the event of a failure of the software while minimally impacting the collection of interval metering data.

In the future, a customer of Utility is expected to have an opportunity to enroll in a new program in which he will be compensated for connecting specific energy-saving or load shifting devices to his service. The customer is informed of SCE-approved devices. The customer enrolls the devices using an automated system. The devices identify themselves to the meter. The meter then reports to the AMI how many and what types of devices are installed in order for the customer to receive credit. The automated system reduces the cost to enable the customer HAN devices, increases customer participation, and improves the customer experience.

The devices use a variety of means to identify themselves to the meter. Some communicate using a simple power line carrier (PLC) protocol that the meter can be taught to use by downloading a new program to its digital signal processing (DSP) chip. Others use a ZigBee wireless home area network.

As new HAN technology is developed over the years, a customer may purchase a new device with new HAN technology which the AMI system does not recognize. The customer will then be notified that they must either pay the Utility to change the AMI meter (or service gateway) to one that accommodates the new HAN technology or to install a “bridge” to convert the device to the old HAN technology (if available). Forward and backward compatibility with the communications technology ensures that both the Customer’s and Utility’s investment is protected.

This use case also concerns cases where an unanticipated technology change is required. This could be due to either the communication technology becoming obsolete or the technology vendor ceasing to support the product. Modularity in LAN/WAN devices reduces the cost of upgrading when new/improved technologies become available as well as reducing the cost of maintenance.

1.4 Business Rules and Assumptions

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

Assumptions

- Regulators will approve valid technologies for HAN use. The Utility will specify the valid HAN technology.
- Not all field components will need to be upgraded for all program/firmware changes.
- Some program/firmware upgrades will be initiated by the utility as standard operating procedure, while others will be initiated because a customer joins a particular program.
- The lowest cost upgrade will be one in which:
    - The fewest number of sites need to be visited by utility personnel.
    - Each meter is unavailable for reading for the shortest possible period of time.

- Customers will not own AMI meters for direct access.

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
MSO Engineering	Organization	Performs lead role in acceptance testing of upgrade with IT and IDM participation
IT	Organization	May participate in acceptance testing of upgrade
IDM	Organization	Department in Revenue Services Org which may participate in acceptance testing of upgrade
Vendor	Organization	Supplier of AMI meters or AMI communication system components
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.
Meter Management system	System	Global data repository for information about each meter, as opposed to the AMI, 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 . (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 Meter	Device	The AMI meter to be installed, as opposed to the old meter that will be replaced.
AMI	System	The system responsible for communicating with the meter and gathering its metering

Actor Name	Actor Type (person, device, system etc.)	Actor Description
		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 also communicates with the meter and the field tool when installing the meter and analyzing meter problems.
Customer	Person	Residential or small business customers that receive electrical service from SCE.
Field Component	Device	Meter and/or communication component (LAN, NAN, WAN)

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: Vendor upgrades field component firmware

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)*
New firmware is available for the field component.	Utility	*Vendor identifies need to revise field component program/firmware, or Utilityidentifies need for vendor to revise field component program/firmware.*	*All identified field components are upgraded and working properly.*

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	Field component vendor	Vendor notifies Edison of need to upgrade program in field component.	Could also be new version of program
2	MSO engineering	MSO Engineering analyzes the proposed upgrade.	
2.1	MSO Engineering	MSO Engineering pulls in other groups for analysis.	
2.2	MSO Engineering	MSO Engineering tests the proposed change.	
2.3	MSO Engineering	MSO Engineering identifies resources for upgrade.	
3	Utility	All parties agree to the change.	
4	MSO Engineering	MSO Engineering schedules upgrade through meter management system.	
5	Meter management system	Meter management system prepares an update package. (includes determining which field components are to be upgraded)	
6	Meter management system	Meter management system handles version control issues. (to ensure a "safe" version is always available - see FR11)	
7	Meter management system	Meter management system notifies field component that upgrade is available for download.	
7.5	Meter management system	Meter management system downloads upgrade into a memory/storage location separate from the active firmware in the AMI field component.	
7.6	Meter Management system	Meter Management system receives confirmation of successful download of upgrade.	

Step #	Actor	Description of the Step	Additional Notes
8	Meter Data Management system	Meter Data Management system collects all interval data, logs, register etc from field components	
9	Meter management system	Meter management system performs system health check on field component (HAN, NAN, LAN, WAN Meter) and report results to AMI Back Office System.	*Reports results to AMI along with meter data collected in step 8.*
10	Meter management system	Meter management system initiates switch to new version.	
11	AMI Field component	AMI Field component runs health check on field component (HAN, NAN, LAN, WAN Meter) and report results to AMI Back Office System.	AMI compares before and after results and reverts field component back to old version upon critical failure.
11.1	AMI Field component	AMI Field component auto-reverts upon critical failure and reports back to the Meter Management System (see FR13 and FR15)	
11.2	AMI Field component	AMI Field component, upon important failures also reports back to meter management system but does not auto-revert.(see FR15)	
12	AMI Field component	AMI Field component detects successful upgrade.	
12.1	AMI Field component	AMI Field component updates event log	
13	Meter Data Management system (MDMS)	Meter data management system receives logs on normally scheduled next day read. Unless immediate response is requested (see FR16)	Log information is passed on scheduled next day read.
14	Meter Data management system	Meter Data managements system performs data reconciliation. (see FR17)	
15	Meter management system	Meter management system compares before and after health check and status and reports any discrepancies	

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: AMI registers customer owned devices for communication on the HAN

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 enrolls in a program that requires communications with customer equipment	Customer	The AMI and/or meter already has a HAN capability	Utility and / or customer can make use of the customer equipment.

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	Customer	Customer enrolls in a program that requires communications with customer equipment	
2	Utility	Utility informs customer of how to select equipment in order to participate in the program.	The utility will specify the valid HAN technology.
3	Customer	Customer provides ID(s) of their equipment to the utility.	
4	AMI	AMI recognizes the customer equipment.	

Step #	Actor	Description of the Step	Additional Notes
5	AMI	AMI tests the equipment communication.	
6	AMI	AMI performs remote self-test of customer equipment if available.	
7	Utility	Utility notifies customer they are successfully enrolled.	
7.1	Utility	Utility notifies customer if communication cannot be established or if self-test fails.	
8	Utility	Utility and / or customer make use of the customer equipment.	

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: Utility upgrades HAN technology

Group indicated the new equipment would need to be backwards compatible with the previous standard for 5 or more years, otherwise it would involve a meter swap out prior to the 15 year useful life.

No additional functional requirements, only business requirements

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)*
New HAN technology is available that requires a hardware change. Customer installed a device with the new technology	Customer	Customer attempts to enroll device AMI does not recognize.	AMI recognizes device. Utility and/or customer can make use of the customer equipment.

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 installs device with new HAN technology.	
2	Customer	Customer provides ID(s) of their equipment to the utility.	
3	AMI	AMI does not recognize the customer equipment.	
4	Utility	Utility notifies customer of the need to pay to have new meter installed or customer can install bridge (if available)	
5	Customer	Customer has Utilityinstall appropriate meter or customer installs bridge and provides ID(s) of their equipment to the utility.	
6	AMI	AMI recognizes the customer equipment.	
7	AMI	AMI tests the equipment communication.	
8	AMI	AMI performs remote self-test of customer equipment if available.	
9	Utility	Utility notifies customer equipment is successfully enrolled.	
9.1	Utility	Utility notifies customer if communication cannot be established or if self-test fails.	

Step #	Actor	Description of the Step	Additional Notes
10	Utility	Utility and / or customer make use of the customer equipment.	

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 upgrades NAN technology

Group thinks the new equipment would need to be backwards compatible with the AMI meter technology for 5 or more years, otherwise it involves a meter swap out prior to the 15 year useful life. Escrowed design of AMI technologies protects against vendors going out of business. (see BR10)

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)*
NAN communication vendor goes out of business.	Vendor	Technology at the end of life cycle and new technology is available.	Collectors and meters are available for maintenance of old technology. New technology is installed at selected sites.

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..*
1	Vendor	NAN communication vendor goes out of business.	
2	Utility	Utility selectively upgrades collectors and meters to "free up" spares of the old technology.	

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: Utility upgrades WAN technology

Group indicated that the most likely scenario to occur for a technology upgrade would require an upgrade of collectors and other back end devices but not meters.

Modularity in design reduces the cost of upgrading WAN devices.

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)*
New Technology is available and Utility chooses to upgrade WAN to new technology	Utility	Replacing WAN technology	*WAN technology is replaced.*

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	Utility	Utility upgrades or replaces collectors and other back end network devices.	Requires connectivity with meters and back office systems.

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)*
(I3FR1) During a software upgrade, the meter's view of the state of the customer service (connected/disconnected) load control/DG control shall not change, including any settings in the meter such as NEM channels, pulse output, pending next day CPP event, meter multiplier, power quality settings, etc. The customer's HAN may be non-responsive while the meter is transitioning to the new program version.	1	10, 11, 15
(I3FR2) The meter shall be designed with failsafe logic to minimize mis-operation of the disconnect switch and load control/distributed generation during upgrades.	1	10, 11, 15
(I3FR3) Remote upgrades shall have the option to either reset or preserve the current register reads in the meter.	1	5
(I3FR4) Before an upgrade, the Meter Data Management system shall retrieve all interval data, logs register reads, switch status etc and perform a health check including time synchronization. Which it shall compared to the same data after the upgrade to ensure the upgrade was successful.	1	8
(I3FR5) The Meter Management system shall schedule the switch to the new version to minimize the number of intervals affected by an upgrade.	1	4, 14
(I3FR6) It shall be possible to upgrade the field component software/firmware remotely and at the site.	1	4, 7, 7.5
(I3FR7) The meter management system shall co-ordinate upgrade scheduling, including	1	4

Functional Requirements	Associated Scenario # (if applicable)	Associated Step # (if applicable)
identifying which meters need to be upgraded.		
(I3FR8) The meter shall continue operation while downloading firmware using its existing program until instructed to change to the new program. And shall log completion of downloading the new program.	1	7, 7.5
(I3FR9) The meter shall permit remote and local reversion to a previous version of firmware	1	11.1
(I3FR10) The version of the meter firmware shall be remotely and locally readable.	1	5, 12.1, 12
(I3FR11) The meter management system and the meter shall ensure that firmware versions are managed so a “safe” firmware version is always available.	1	6
(I3FR12) The meter shall permit a remotely or locally initiated non-destructive health check of itself, at any time. The health check shall include a test of the HAN//NAN and shall include time synchronization.	1	9, 11
(I3FR13) The meter shall automatically revert to a previous version of firmware if a critical failure is detected on start-up. Reversion shall not happen repeatedly	1	11.1
(I3FR14) The meter shall log firmware upgrade attempts, failures, successes, reversions etc including timestamp.	1	12.1
(I3FR15) The meter shall report important or critical failures to the meter management system within 15 minutes after start-up of new program Critical failures could include billing information loss or loss of electric service. Ability to program what failures report immediately needs to be configurable.	1	11.1, 11.2
(I3FR16) The meter management system shall have the option of requiring immediate acknowledgement of the status of firmware upgrade from the meter. If immediate acknowledgement is not requested from the meter, the status is sent with the next scheduled read.	1	13
(I3FR17) The Meter Data Management system shall automatically detect and correct for corrupted interval data due to upgrades.	1	14

Functional Requirements	*Associated Scenario # (if applicable)*	*Associated Step # (if applicable)*
(I3FR18) The Meter Data Management system shall recognize when upgrade failures have occurred when the next scheduled read is received (and the status of the upgrade is sent) and schedule follow-up reads and create exception reports as required.	1	14
(I3FR19) Utility shall associate customer equipment with the installed service location and account prior to enabling a program controlling those devices.	2 3	4 6
(I3FR20) The method used to associate customer equipment with an installed service location and account shall require no human intervention	2 3	3 2,5
(I3FR21) The AMI shall be able to test the communication path to the customer equipment.	2 3	5 6
(I3FR22) If customer's equipment supports self-test, the AMI shall be able to remotely perform self-test of customer equipment. This requirement could be met by transparently passing proprietary commands or by supporting standardized self-test commands.	2 3	6 7
(I3FR23) Utility shall notify the customer of the enrollment process outcome as verified by communications with the customer equipment	2 3	7, 7.1 9, 9.1
(I3FR24) Moved to NFR3		
(I3FR25) Collector and network components shall be modular to permit change of WAN technology.	5	1
(I3FR26) Prepayment info shall be retained in the meter or AMI system over upgrades.	1	10, 11, 15
(I3FR27) Scheduled pricing events shall be retained in meter or AMI system over upgrades (see FR1)	1	10 11, 15
(I3FR28) Grid load control events shall be retained in meter or AMI system over upgrades (see FR1).	1	10 11, 15

Functional Requirements	Associated Scenario # (if applicable)	Associated Step # (if applicable)
(I3FR29) The meter or AMI system shall retain info on distributed generation channels over upgrades.	1	10 11, 15
(I3FR30) The meter management system shall schedule upgrades to avoid conflict with pricing events.	1	4, 10
(I3FR31) Upgrades shall not affect power quality programming/configuration.	1	10 11, 15
(I3FR32) The customer shall be notified before, during, and after an upgrade if the upgrade shall affect the data provided to the customer equipment during the upgrade period through in-home device and meter display.	1	Not in steps
(I3FR33) Meter management system shall notify meters that the new firmware upgrades are available for download separately with the upgraded firmware.	1	7
(I3FR34) Remote connect/disconnect/limiting event shall be retained over upgrades in the meter or AMI sytems.		

4.2 Non-functional Requirements

Non-Functional Requirements	Associated Scenario # (if applicable)	Associated Step # (if applicable)
(I3NFR1) When upgrading large number of meters, failures (where meters reverted to the previous version) shall be reported at the next meter read. (Failures of individual meter upgrade failures shall be reported immediately – see FR16 which establishes the ability to be able to tell the meter whether to report immediately or with next meter read)	1	13
(I3NFR2) The customer shall be informed of communication status with their equipment within 30 minutes of enrolling. Expected value is 2 minutes 90% of the time.	2 3	7, 7.1 9, 9.1
(I3NFR3) Home area network identifiers shall be globally unique	2 3	4 3,6

4.3 Business Requirements

Business Requirement	Associated Scenario # (if applicable)	Associated Step # (if applicable)
(I3BR1) The customer shall be notified whenever the electrical service is affected by an upgrade. Customers will be notified in advance in the same manner and timeframe that TDBU notifies customers for routine maintenance today.	1	Not in steps
(I3BR2) Changed to FR32		

Business Requirement	Associated Scenario # (if applicable)	Associated Step # (if applicable)
(I3BR3) Vendors shall notify Edison of all firmware changes prior to implementation. (MSO Engineering)	1	1
(I3BR4) Utility must identify a permanent test population for testing upgrades	1	4
(I3BR5) Utility shall not make use of customer equipment in the home unless and until the customer provides authorization.	2 3	3, 2, 5
(I3BR6) Utility shall specify the valid HAN communication technology for each service area.	2 3	2 4
(I3BR7) When HAN technology must be upgraded at a site with new technology the entire meter shall be replaced. (no meter components shall be replaced in the field)	3	4, 5
(I3BR8) When meters with new HAN technology are deployed they shall continue to support older HAN technologies along with new technology until 2028	3	4, 5
(I3BR9) In the absence of regulatory mandate or meter failure, the utility shall charge the customer for upgrading the meter to new HAN technology. Customer may also have option to purchase a bridge in order to convert to old HAN technology if available.	3	4, 5
(I3BR10) Vendors shall escrow design of meters and other components of the AMI and keep the escrowed documentation up to date.	4	
(I3BR11) There shall be no field hardware component upgrades or repairs, only remote software upgrades shall be performed. This could also be accomplished with external equipment.	1 3 4	all 4,5 2

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, Vendor notifies Edison of need to upgrade program in field component.	Meter Vendor	MSO Engineering	e-mail/electronic document detailing upgrade
	2. MSO Engineering analyzes the proposed upgrade.	AMI Meter	AMI test environment	Test proposed upgrade
1	3, All parties agree to the change.	MSO Engineering	Utility	Electronic or physical document agreeing to deploy upgrade.
1	4, MSO Engineering schedules upgrade through meter management system.	MSO Engineering	Meter Management system	Schedules upgrade
1	7, Meter management system notifies field component that upgrade is available for download.	Meter Management system	AMI Field component	Notice to schedule upgrade

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
1	7.5, Meter Management System downloads upgrade into a memory/storage location separate from the active firmware.	Meter Management System	AMI Field component	Initiate upgrade download.
1	7.5, Meter management system downloads upgrade into a memory/storage location separate from the active firmware.	Meter management system	AMI Field component	Upgrade downloaded to AMI field component
1	7.6, Meter Management system receives confirmation of successful download of upgrade.	AMI Field component	Meter Management System	Notification of successful completion of upgrade download.
1	8, Meter Management System collects all interval data, log, register etc from field components	Meter Management System	AMI Field component	”On-demand” read request for logs and interval data.
1	8, Meter Management System collects all interval data, log, register etc from field components	AMI Field component	Meter Data Management System	Sends logs and interval data in response to “On-demand” request.
1	9, Meter management system performs system health check on field component (HAN, NAN, LAN, WAN, Meter) and report results to AMI Back Office System.	Meter Management System	AMI	Request on-demand “health check” from AMI components with capability

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
1	9, Meter management system performs system health check on field component (HAN, NAN, LAN, WAN, Meter) and report results to AMI Back Office System.	AMI Field component	Meter Management System	Response from “On-demand” “health check” request.
1	10, Meter management system initiates switches to new version.	Meter Management System	AMI Field component	Initiate switch to upgraded firmware.
1	11, AMI Meter runs health check on field component (HAN, NAN, LAN, WAN, Meter) and report results to AMI Back Office System.	AMI Field component	Meter Management System	Results of AMI field component “health check” running upgraded firmware.
1	11.1, AMI Field component auto-reverts upon critical failure and reports back to the Meter Management System	AMI Field component	Meter Management System	Report of critical failure and reversion to prior version
1	11.2, AMI Field component upon important failure also reports back to the Meter Management System, but does not auto-revert	AMI Field component	Meter Management System	Report of important failure
1	13, Meter data management system receives log on normally scheduled next day read.	AMI Field component	Meter Data Management System	Field component data and logs.

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
1	15, Meter management system compares before and after health check and status and reports any discrepancies	Meter Management System	Meter Data Management System	Request for Field component and log data from before and after upgrade
1	15, Meter management system compares before and after health check and status and reports any discrepancies	Meter Data Management System	Meter Management System	Field component and log data from before and after upgrade
2	1, Customer enrolls in a program that requires communications with customer equipment.	Load Control Program System	AMI	Notification of customer enrollment in program
2	2, Customer provides ID(s) of their equipment to the utility.	Customer	AMI	Device id(s) for new equipment to be supported
2	2, AMI recognizes the customer equipment.	Customer Equipment	AMI	AMI is able to see customer equipment
2	5, AMI tests the equipment communication.	AMI	Customer equipment	Communications verification transaction
2	6, AMI performs remote self-test of customer equipment if available.	AMI	Customer equipment	Request self test of Customer equipment (if supported)

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
2	6, AMI performs remote self-test of customer equipment if available.	Customer equipment	AMI	Results of self test of Customer equipment (if supported)
2	7, Utility notifies customer they are successfully enrolled.	AMI	Load Control Program System	Results of enrollment efforts
2	7.1, Utility notifies customer if communication cannot be established or if self-test fails.	AMI	Load Control Program System	Results of unsuccessful enrollment efforts
3	3, AMI does not recognizes the customer equipment.	Customer Equipment	AMI	AMI is unable to see customer equipment
3	3, AMI does not recognizes the customer equipment.	AMI	Load Control Program System	Report inability to see device.
3	6, AMI recognizes the customer equipment.	Customer Equipment	AMI	AMI is able to see customer equipment
3	7, AMI tests the equipment communication.	AMI	Customer equipment	Communications verification transaction
3	8, AMI performs remote self-test of customer equipment if available.	AMI	Customer equipment	Request self test of Customer equipment (if supported)

Scenario #	Step #, Step Name	Information Producer	Information Receiver	Name of information exchanged
3	8, AMI performs remote self-test of customer equipment if available.	Customer equipment	AMI	Results of self test of Customer equipment (if supported)
3	9, Utility notifies customer they are successfully enrolled.	AMI	Load Control Program System	Results of successful enrollment efforts
3	9.1, Utility notifies customer if communication cannot be established or if self-test fails.	AMI	Load Control Program System	Results of unsuccessful enrollment efforts

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**
NAN	Neighborhood Area Network – communication system interface between meter and remainder of Utility network
HAN	Home Area Network – communication system between meter and remainder of customer premise equipment
WAN	Wide Are Network – communication system interface between the DCC and the neighborhood collector. It might be the same technology as the NAN.

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.