AMI Use Case: S1

AMI system recovers after outage, communications or equipment failure

4/21/2006

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Document History

Revision History

Revision Number	Revision Date	Revision / Reviewed By	Summary of Changes	Changes marked
1.0	060131	Ben Rankin	Original Document	N
2.0	060316	Ben Rankin	Updates based on final session notes S1W3 v1.5	N
3.0	060324	John Bubb	Added missing scenario and step numbers, minor grammatical corrections.	Y
4.0	032906	Grant Watson	Use case stabilization; step 8 review	Y
5.0	060421	John Bubb	Incorporated comments from SAT Review (from DOCU S1 Use Case v3.1 060421)	N

Approvals

This document requires following approvals.

Name	Title
John Bubb	Mega Team Lead
John Bubb	Use Case Team Lead
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Contents

1. Use Case Description

1.1 Use Case Title

AMI system recovers after outage, communications or equipment failure

1.2 Use Case Summary

After a power outage, communications or equipment failure the AMI system returns to its normal operating state. The AMI meter retains data and continues to measure a customer's power usage during communications failures. After a communications failure is repaired the AMI system transmits its stored data and resumes a normal communication schedule. If present, data aggregators may also retain some portion of data. Equipment failures should be detectable by system components that are aware of the absence of expected data. Failed equipment has the ability to be replaced and restored to the same state as prior to the failure. Outages will be logged but will have no other permanent effects upon the system.

Two types of system outages are envisioned:

- Single-point equipment failure
- Wide-area outage (blackout)

Restoration after a wide-area outage must not overwhelm the communication system. The system should communicate planned outages to all involved actors (i.e. there may be "planned failures"). The AMI system shall attempt to classify the failure cause to optimize the recovery response.

1.3 Use Case Detailed Narrative

The AMI system should be designed to be robust in the presence of power outages and failures. The recovery will place the system in the identical state which it would have been if there had been no failure.

The AMI meter will have the ability to detect all communication failures. Upon failure, the meter logs the failure event and awaits restoration of the communications. The meter recovers any information which would have been sent to it in the absence of the error.

The AMI system, upon detecting the communication failure from a meter, will log the failure and attempt reconnection. If the restoration is not successful, the AMI system will identify the failed device and initiate a repair from an appropriate department within SCE. Upon replacement of the failed component, the AMI system will ensure system integrity and restore any required configuration data. If the restoration is successful, the AMI system will verify that the correct meter is operational and log the reconnection.

The ability of the AMI system to determine whether a failure is associated with an already issued trouble report, or a planned or unplanned outage will avoid the possibility of assigning two crews to the same problem. Additionally, the AMI back office systems ability to recognize meters with only a single communications path available (or no path available) will permit prioritization of the workload to ensure that the network is always able to reach the most meters possible. By better understanding the critical/non-critical nature of various failed components could also allow for better scheduling of field service personnel and potentially reduce overtime costs. Lastly, the ability of the AMI system to build a history of component failures will allow for better decisions in augmenting the communications network focusing on areas of greatest stability risk.

1.4 Business Rules and Assumptions

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
Outage Management System (OMS)	System	As implemented at SCE. Collects trouble calls and other information to determine the most likely failing piece of equipment based on its knowledge of power system topology.
Network Management System	System	A system external to AMI which manages and monitors the SCE Telecommunications network
Data Center Concentrator (DCC) (previously termed Head-End System and Meter Management System in other use cases)	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 (There was some discussion of whether the topology knowledge was required)
AMI Meter	Device	Collects energy, demand, and other data per specified time period.
Customer	Person	Agrees to participate in load control program. May or may not at time of system operation choose whether or not to participate
AMI Back Office system	System	This represents the components and function necessary to receive, store and/or process messages and events received from the AMI system and the messages/events that may be generated and sent through the AMI System to the meters/in-home display/other devices.
AMI system	System	Receives data and status information from the meters. Sends commands to the meters. Maintains historical information from the meters. Serves as common access point for all historical meter information. (Relationship between the AMI System and the DCC and the Network Management System still not resolved).
Repair Department	Organization	Initiates repair of failed equipment

Actor Name	*Actor Type (person, device, system etc.)*	*Actor Description*
System Operator	Person	Is notified of equipment failures either through a lack of data communication or other messages.
Telecom Control Center (TCC)	Organization	Collection of people & systems that dispatch calls to fix communication problems.
Grid Control Center (GCC)	Organization	Collection of people & systems responsible for area control of the bulk power transmission system.

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: AMI data center concentrator detects individual meter communications failure

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 fails to communicate with a meter.	Data center concentrator		Data center concentrator is able to communicate with the meter.

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..*

Step #	*Actor*	*Description of the Step*	*Additional Notes*
1	Data center concentrator	Data center concentrator fails to contact meter, decides link is failed.	
2	Data center concentrator	Data center concentrator sends a request to the AMI Back Office System alerting it to the communications failure.	
2.5	AMI Back Office System	AMI Back Office System determines whether the failure is related to scheduled work.	
3	AMI Back Office System	AMI Back Office System checks with OMS and Network Management System for previously reported problems.	
4	Data center concentrator	Data center concentrator localizes the problem to a set of equipment.	
5	Data center concentrator	Data center concentrator retrieves diagnostic information from the equipment that is responding.	
6	Data center concentrator	Data center concentrator attempts to re-establish communications. (This may not need to be an explicit step. There was workshop discussion that the “self-healing” component of the communications system is always working in the background and no additional action is taken by the system at this point.)	
7	Data center concentrator	Data center concentrator notifies AMI Back Office System that field service is required.	
7.5	AMI Back Office System	AMI Back Office System issues trouble report	
8	Field personnel	Field personnel respond to trouble report and fix the problem. (Use Case I2)	NFR1 provides guidance on how soon to issue a trouble report
8.4	AMI Meter	Once repaired by Field personnel the failed component establishes communications with the Data Center concentrator.	

Step #	Actor	Description of the Step	Additional Notes
8.5	AMI Back Office System	AMI Back Office System notifies Data center concentrator that failed component has been repaired.	
9	Data center concentrator	Data center concentrator verifies that problem has been corrected.	

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: Meter responds to communications failure

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 determines that it is unable to communicate with the AMI system.	Meter		

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	Meter	Meter determines that primary link has failed.	
2	Meter	Meter attempts to use redundant links if they are available.	
3	Meter	Meter logs communications attempts and link status changes.	
4	Meter	Meter cannot re-establish communications.	
5	Meter	Meter continues to record data.	
6	Meter	Meter periodically attempts to re-establish communications.	
7	Meter	Meter re-establishes connection and DCC is updated with status.	
8	Data center concentrator	DCC collects missing meter data under flow control	
9	Data center concentrator	The DCC sends any pending (unexpired) information to the meter under flow control .	
10	Data center concentrator	DCC collects missing meter data under flow control	

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: AMI Data center concentrator detects meter failures in an area. (Area can have multiple definitions. 1-9% of the system, <20,000 devices, distribution sub-station, circuit or feeder)

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 loses network communications with one or more neighborhood aggregators.	Data center concentrator	Operational system	Operational system

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	Data center concentrator	DCC registers an operational network. (a mostly working system)	
2	AMI Back Office System	AMI Back Office System finishes the daily scheduled read of meters. (all meters / large subset)	Depending on the architecture the meters may, based on a schedule, send their data. In either case the AMI Back Office System would check for completeness of the process.
3	AMI Back Office System	AMI Back Office System fails to see expected read data from a subset of meters.	

Step #	*Actor*	*Description of the Step*	*Additional Notes*
4	Data center concentrator	DCC performs failure correction analysis.	
4.1	Data center concentrator	DCC sends a request to the AMI Back Office System alerting it to the communications failure.	
4.1.5	AMI Back Office System	AMI Back Office System checks with OMS and Network Management System for previously reported problems.	
4.2	AMI Back Office System	AMI Back Office System checks whether meter maintenance was scheduled.	It is important for meter activities such as a meter removal to be reflected back to the AMI Back Office System so it can correctly determine the cause of an exception and update its operational database.
4.3	Data center concentrator	DCC checks if any system components previously lost communications.	
4.4	Data center concentrator	DCC identifies if the failed reads correlate to particular network components.	
4.5	AMI Back Office System	AMI Back Office System identifies if the failed reads correlate with particular power system components (uses OMS system for this identification).	
4.6	AMI Back Office System	AMI Back Office System correlates failed reads with the output of intrusion detection system.	
5	Data center concentrator	DCC attempts to correct the failure by switching routes through reconfiguration (if available).	
6	Data center concentrator	DCC verifies whether the failed network component is now responding.	

Step #	Actor	Description of the Step	Additional Notes
7	Data center concentrator	DCC notifies Telecom Control Center (TCC) of the read failure correlation with a network component.	
8	Telecom Control Center	TCC fixes the network communication problem.	
9	Data center concentrator	DCC recovers missing data from the meters.	

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: AMI Data center concentrator detects meter failures for a disaster (disaster is currently defined as: >10%, 500,000+ devices, earthquake, fire, flood)

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 loses network communications with one or more neighborhood aggregators.	Data center concentrator	Operational system	Operational system

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	Data center concentrator	DCC is notified of large scale failure through multiple systems.	
2	Data center concentrator	DCC performs failure correction analysis	
2.0.5	Data center concentrator	DCC sends a request to the AMI Back Office System alerting it to the communications failure.	
2.1	AMI Back Office System	AMI Back Office System checks with OMS for planned or unplanned power outages.	
2.2	AMI Back Office System	AMI Back Office System checks if any system components previously lost communications.	
2.3	Data center concentrator	DCC identifies if the failed reads correlate to particular network components.	
2.4	Data center concentrator	DCC identifies if the failed reads correlate with particular power system components (uses OMS system for this identification).	
2.5	AMI Back Office System	AMI Back Office System correlates failed reads with the output of intrusion detection system.	
3	Data center concentrator	DCC attempts to correct the failure by switching routes through reconfiguration (if available).	
4	GCC	GCC is notified of wide-scale outage.	
5	Data center concentrator	DCC verifies whether the failed network component is now responding.	

Step #	*Actor*	*Description of the Step*	*Additional Notes*
6	Data center concentrator	DCC notifies Telecom Control Center (TCC) of the read failure correlation with a network component.	
7	Telecom Control Center	TCC fixes the network communication problem.	
7.5	Data center concentrator	DCC verifies all meters are communicating	
8	Data center concentrator	DCC recovers missing data from the meters.	

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)*
(S1FR1) The AMI system shall validate operational status from network management, planning, scheduling and outage management systems before issuing trouble reports.	1	2,3
(S1FR2) The AMI DCC shall automatically generate trouble reports when appropriate.	1	7
(S1FR3) The meter does not have to maintain communications when a power outage occurs. (Last gasp or special meter usage (DG) may change this requirement.)	3	4.5
(S1FR4) The AMI DCC shall have the ability to identify the probable cause of a communications failure within the AMI network.	1	4,5
(S1FR5) Each device in the AMI communications network shall permit remote - status report (up / down) - diagnostics - link status report - communications event log retrieval	1	5
(S1FR6) The AMI DCC shall periodically check the health of the network and the equipment.	1	3
(S1FR7) The communications network shall automatically select from redundant communications paths if available.	2	2
(S1FR8) The DCC shall identify when links no longer have redundant paths available. (Also discussed notification before the system is reduced to its last link)	2	2

Functional Requirements	***Associated Scenario #*** ***(if applicable)***	***Associated Step #*** ***(if applicable)***
(S1FR9) The meter shall keep an on-board log of communications events: - link fail - link switch - link up - link quality	2	3
(S1FR10) The meter's communication event log shall be separate from other logs and metering data on the meter.	2	3
(S1FR11) The communications log is available to field personnel at the customer site.	1	8
(S1FR12) The meter shall continue to record data during a communications failure	2	5
(S1FR13) The meter shall distinguish between a missing interval and zero usage.	3	3
(S1FR14) The DCC shall notify : - GCC - Tariffs, Programs and Services - Customer Call Center - Energy Supply and Marketing - Revenue Services Organization - When a given percentage of meters cannot be read after a recovery attempt.	3	7
(S1FR15) DELETED		
(S1FR16) The DCC shall notify the Telecom Control Center when a given percentage of meters cannot be read on first attempt and correlates with a network component failure.	3	7
(S1FR17) DCC shall communicate with OMS to determine if failed reads were due to power outages	3	4.1
(S1FR18) DCC shall correlate meter read failures with planned maintenance.	3	4.2
(S1FR19) DCC shall correlate meter read failures with existing reports of failures of network components	3	4.3
(S1FR20) Combined with FR4 – DO NOT RENUMBER FR's		

Functional Requirements	*Associated Scenario # (if applicable)*	*Associated Step # (if applicable)*
(S1FR21) DCC shall correlate meter read failures with the power system topology in cooperation with the OMS	3	4.1,4.5
(S1FR22) DCC shall correlate meter read failures with output of an intrusion prevention system	3	4.6
(S1FR23) DCC shall be able to determine whether any network component is communicating correctly.	3	6
(S1FR24) The AMI system shall perform data flow control after a communication or power outage to prevent resources from being overloaded.	2	7,8
(S1FR25) DELETED		
(S1FR26) The DCC shall notify the GCC (Grid Control Center) and OMS if greater than 5-10% of the meters are not available. Includes how much demand response is not available and where it is located.	4	4
(S1FR27) The AMI system shall include an intrusion prevention system that monitors communications, infers when an attack is occurring and notifies components of the AMI system to take action. It may also take direct action to block malicious traffic.	3	4.6
(S1FR28) The meter and network components shall maintain information on the following events for security purposes: - authentications - registrations - addressing information of connecting devices - all of the above on HAN and NAN / WAN and send it to the DCC and IDP	4	2.5
(S1FR29) Commands to customer premise equipment including meters shall include an expiration time and date after which the network equipment will not forward commands.	4	8
(S1FR30) The DCC shall receive an alarm/event from meters and collectors when a configurable number of link failures occur. Nominal value: 3 consecutive failures.	1	1

Functional Requirements	*Associated Scenario # (if applicable)*	*Associated Step # (if applicable)*
(S1FR31) DCC shall communicate with OMS to determine if failed network components are due to power outages.	4	2.1
(S1FR32) DCC shall correlate network component failures with planned maintenance.	4	2.2
(S1FR33) DCC shall correlate network component failures with the power system topology in cooperation with the OMS.	4	2.4
(S1FR34) DCC shall correlate network component failures with output of an intrusion prevention system.	4	2.5
(S1FR35) Commands to meters shall have an expiration time and date. Meters shall not execute expired commands. (Note: in theory, these messages should never reach the meter).	4	8
S1FR36 After communications are restored the DCC shall deliver any pending (unexpired) information to the meter(s) and/or customer premise equipment	2	7b
(S1FR37) DCC shall be able to retrieve diagnostic information from equipment on demand	1	5
(S1FR38) Meter shall be able to determine that the provisioned communication link has failed and shall select alternate redundant link if available.	2	2

4.2 Non-functional Requirements

Non-Functional Requirements	***Associated Scenario #*** ***(if applicable)***	***Associated Step #*** ***(if applicable)***
(S1NFR1) The DCC shall provide meter read failure information to the MDMS for each failure occurrence.	1	1
(S1NFR2) (DO NOT RENUMBER)		
(S1NFR3) The meter shall retain the last 512 communications events. The rationale for 512 events is to provide a reasonable level of assurance to retain 10 days worth of activity.in the event of communications loss. This would equate to 51 events per day which may accommodate a reasonably high level of event activity. Lastly, this event log size would seem to be a reasonable amount of storage to allocate in order to assist with intermittent communication diagnostics.	FR9, 1	5
(S1NFR4) The meter shall store metering data for at least 45 days after a communications failure.	2	5
(S1NFR5) DELETED		
(S1NFR6) The DCC shall detect if any network components are not responding within the following intervals based on the number of meters affected. (Rough estimate. Different network topologies will result in different values.) A) < 200 meters - next read. B) 200 - 1000 meters - within 6 hours C) 1000 - 5000 meters - within 1 hour D) 5k - 20k meters - within 15 minutes. E) 20k - 50k meters - within 1 minute.	3	4.4
(S1NFR7) DCC shall learn that each meter has re-established communications within 3 minutes.	2 4	7 7.5

4.3 Business Requirements

Business Requirement	Associated Scenario # (if applicable)	Associated Step # (if applicable)
(S1BR1) The system shall comply with state standards at a minimum for direct access customers for time check between the meter and the rest of the system		
(S1BR2) The utility shall file a disaster recovery plan with CAISO for each of the following time frames. - < 4 hours - 4 < 48 hours - > 48 hours	2,3,4	all
(S1BR3) The system shall not permit energy traders to view information about network or system failures	1	3
(S1BR4) State regulations do not permit the estimation of 2 consecutive billing cycles.	1	8
(S1BR5) A trouble report for a meter shall be issued by the MDMS after the link failure has been known for 3 days. (Assumption: failure domain is limited to one meter)	1	1
(S1BR6) Note to I1: The physical location of all network components needs to be stored where outage management and the DCC can find it.		

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, Data center concentrator sends a request to the AMI Back Office System alerting it to the communications failure.	Data center concentrator	AMI Back Office System	Communications with meter failure alert message
1	3, AMI Back Office System checks with OMS and Network Management System for previously reported problems.	AMI Back Office System	Data center concentrator	Alert response indicating results of Trouble Report, schedule maintenance, OMS and Network management check.
1	7, Data center concentrator notifies AMI Back Office System that field service is required.	Data center concentrator	AMI Back Office System	Trouble report required message.
1	7.5, AMI Back Office System issues trouble report	AMI Back Office System	Field Service Order system	Request to create Trouble report

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
1	8.4, Once repaired by Field personnel the failed component establishes communications with the Data Center concentrator.	AMI Meter	Data center concentrator	Synchronize clock; synchronize configuration; transmit outstanding logs and data
1	8,5, AMI Back Office System notifies Data center concentrator that failed component has been repaired.	AMI Back Office System	Data center concentrator	On-demand self test; On-demand time synchronization; On-demand upload of meter logs and data.
2	7, Meter re-establishes connection and DCC is updated with status.	AMI Meter	Data center concentrator	Synchronize clock; synchronize configuration; transmit outstanding logs and data
3	4.1, UC32.3.4.1 DCC sends a request to the AMI Back Office System alerting it to the communications failure.	Data center concentrator	AMI Back Office System	Communications with meter failure alert message
3	4.2 AMI Back Office System checks whether meter maintenance was scheduled.	AMI Back Office System	Data center concentrator	Alert response indicating results of Trouble Report, schedule maintenance, OMS and Network management check.

Scenario #	*Step #, Step Name*	*Information Producer*	*Information Receiver*	*Name of information exchanged*
3	7, DCC notifies Telecom Control Center (TCC) of the read failure correlation with a network component.	Data center concentrator	Telecom Control Center	Alert of communications failure associated with a network component
4	2.0.5, UC32.3.4.1 DCC sends a request to the AMI Back Office System alerting it to the communications failure.	Data center concentrator	AMI Back Office System	Communications with meter failure alert message
4	2.2, AMI Back Office System checks if any system components previously lost communications.	AMI Back Office System	Data center concentrator	Alert response indicating results of Trouble Report, schedule maintenance, OMS and Network management check.
4	4, UC32.4.4 GCC is notified of wide-scale outage.	Data center concentrator	GCC (not listed in Actor list)	Alert of wide-scale outage
4	6, DCC notifies Telecom Control Center (TCC) of the read failure correlation with a network component.	Data center concentrator	Telecom Control Center	Alert of communications failure associated with a network component

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**

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.