1 Description of the Use Case

1.1 Name of Use Case: Microgrid-Unscheduled Islanding Transition

Use Case Identification		
ID	Domain(s)/ Zone(s)	Name of Use Case
001	SGIP	Microgrid – Unscheduled Islanding Transition

1.2 Version Management

Version Management				
Version No.	Date	Name of Author(s)	Changes	Approval Status
V001	2015-04-20	D.Bradley, S.Laval, D.Lawrence		Draft
V002	2015-04-28	M. Joe Zhou	Updates to the security trigger unintentional islanding use case	Draft review
V003	2015-05-04	M. Joe Zhou, Glen Chason	Updates due to comments by Glen Chason and use case meeting on 5/4/2015	Draft review
V004	2015	J.S.Camilleri,	Updates based on group review on 5/14/2015.	Draft review
V005	2015-09-28	S.Laval	Updated activity diagrams based on UML	Draft

1.3 Scope and Objectives of Use Case

Scope and Objectives of Use Case	
Scope	Microgrid – Unscheduled Islanding Transition
Objective(s)	The opening of Island Recloser triggers the battery inverter(s) to switch to voltage-source “Sv” mode, while also notifying the Microgrid controller and back-office SCADA of the unintentional island event.
Related business case(s)	Microgrid - Islanded to Grid Connected Transition, Microgrid – Optimization

1.4 Narrative of Use Case

Narrative of Use Case
Short description
The transition from Grid-Connected to Islanded Microgrid which we will refer to as unscheduled islanding
Complete description
This use case deals with the unscheduled islanding transition behaviour from grid-connected mode to an islanded microgrid, which consists of two scenarios. In the first scenario, a confirmed grid outage is detected by the island recloser (or switch) at the point of common coupling (PCC) to open and start the unscheduled islanding transition . In the second scenario, a triggering event is detected by the monitoring platform to initiate the island recloser (or switch) at the PCC to open and start the unscheduled islanding transition, or the utility operation center receives the triggering event(s) and work with Grid Operator to use DMS/SCADA to open the recloser. Upon opening of the recloser at the PCC, the battery inverter receives the recloser open status and switches from current-source “Sc” mode to voltage-source “Sv” mode. Additionally, the microgrid optimizer and the DMS/SCADA receive the recloser open status to update their models. There are two scenarios to this use case: Grid Outage and Triggering Event. <u>Grid Outage causing unscheduled Island</u> 1. Island recloser detects grid outage and opens switch at PCC 2. Island recloser publishes its unsolicited status (open) <u>Triggering Event causing unscheduled Island</u> 1. Local monitoring platform detects an event and triggers a unscheduled island 2. Local monitoring platform detects triggering event(s). As an example the triggering event could

be a a ballistic sensor detecting gun shots and/or security software agent inspects IP network traffic/packets and detects abnormal activities.

3. monitoring platform publishes the triggering event message
4. Island recloser receives triggering event message from monitoring platform
5. Island recloser does one of the two things:
    - Island recloser opens switch at the PCC based upon a predefined set of business rules
    - Island recloser determines insufficient data based on eventdata to “open”, and publishes the “security event – insufficient data” message
6. Utility Monitoring Platform receives the event message
7. Utility Operations Operator processes this information along with other “ events” and works with Utility Grid Operator who uses DMS/SCADA to control the distribution grid.
8. Utility Grid Operator determines sufficient information about the events and the need to isolate the micrigrid, and either instructs the SCADA system to “open” the recloser or not based on the evaluation.
9. Island recloser publishes its readings and status (open)

The Grid-connected to Island Transition performs the following functions:

1) Trigger Battery Inverter to switch to voltage source mode
2) Notify microgrid optimizer of status
3) Notify SCADA of status

1.5 General Remarks

General Remarks
Not Applicable

2 Diagrams of Use Case

Diagram(s) of Use Case
Use-case diagrams, sequence diagrams

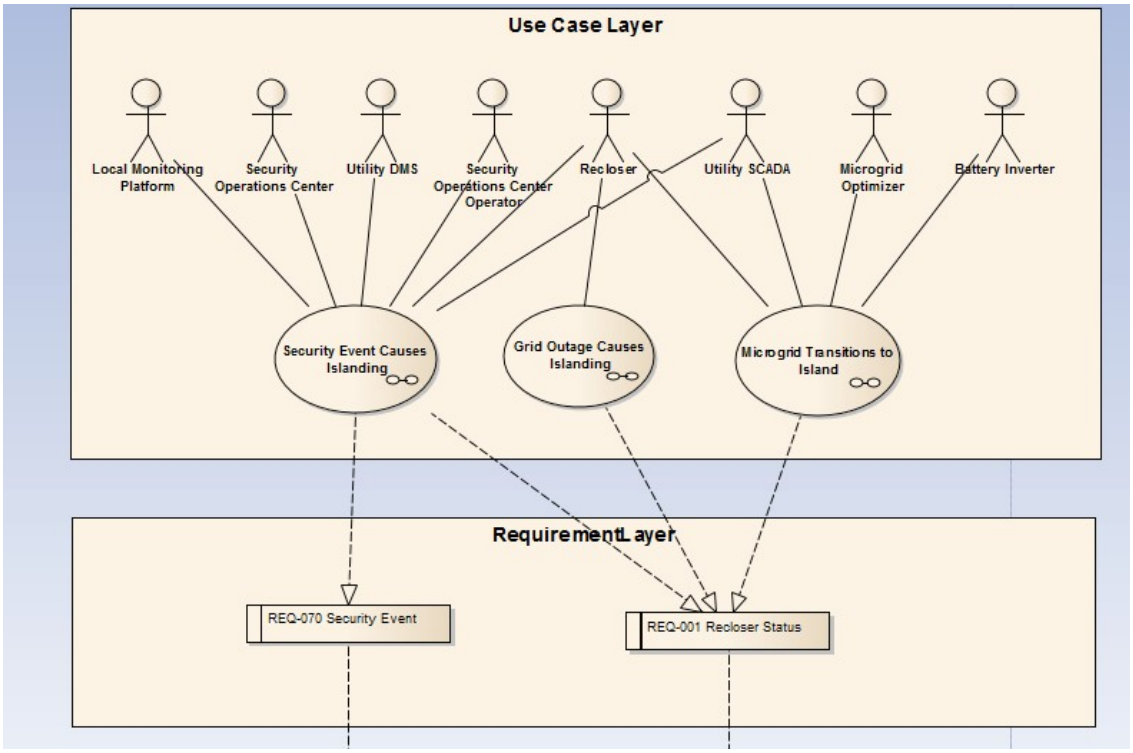

Figure 1 Use Case for Microgrid Unscheduled Islanding Transition

3 Technical Details

3.1 Actors

Actors			
Grouping *(e.g. domains, zones)*		***Group Description***	
Actor Name *see Actor List*	***Actor Type*** *see Actor List*	***Actor Description*** *see Actor List*	***Further information specific to this Use-Case***
SCADA	System, application	SCADA applications including data acquisition, supervisory control, user interface, and alarming.	
Microgrid Optimizer	System, application	Application which optimizes the resources included in the microgrid. Optimization is done using a constrained dynamic dispatch.	
Recloser	Device	This is the Point of Connection (common coupling) to the grid. Indicates whether microgrid is in grid-connected or Islanded mode of operation.	
Battery Inverter	Device	Inverter that connects battery to the microgrid. Assumed to be capable of operation as a rectifier. Controllable range of zero to current maximum capability of battery.	
Local Monitoring Platform	System, application	Application which manages health of the system operations and detects network threats or anomalies and notifies critical assets during security events.	
Utility Monitoring Platform	System application	Global Utility Application which manages health of the system operations and detects network threats or anomalies and notifies the Utility Operations Center Operator	
Utility DMS	System, application	System that manages and controls the utility distribution grid to which microgrids are connected.	
Untility Operations Center	Organization	Utility Operation Center monitors and acts on events throughout its controlled areas, including microgrids that are connected to the grid	
Utility Operations Center Operator	Human	Human governance on complex event processing	
Utility Grid Operator	Human	Human in control of DMS/SCADA system for the Utility.	

3.2 Triggering Event, Preconditions, Assumptions

Use Case Conditions			
Actor/System/Information/Contract	***Triggering Event***	***Pre-conditions***	***Assumption***
Microgrid Optimizer	Dispatching is done on a periodic basis that is set during system configuration.	Microgrid Optimizer dispatching is always on.	Resource attributes are prepopulated in Microgrid Optimizer. Assumption is that microgrid optimizer publishes and subscribes to the open field message bus.
SCADA	SCADA systems polls and/or subscribes to open field message bus data on a periodic basis.	SCADA is always on.	Resource attributes are prepopulated in Microgrid Optimizer. Assumption is that back-office SCADA subscribes to open field message bus.
Monitoring Platform	Always on. Detects events and notifies	Monitoring platform is	Assumption is that security platform is

	recloser at PCC.	always on.	publishing message to the open field message bus.
Recloser	Power system disturbance is detected by relaying protection scheme that operates the grid.	Separation of the microgrid from the main grid is the objective of protection scheme. Protection scheme also performs initial balancing through load shedding.	Separation and reconnection of microgrid were part of design of microgrid protection scheme. Assumption is that microgrid optimizer publishes and subscribes to the open field message bus.
Battery Inverter	Always on. Microgrid Optimizer can dispatch inverter up to current maximum capability of battery.		Resource attributes are prepopulated in Microgrid Optimizer. Assumption is that microgrid optimizer publishes and subscribes to the open field message bus.

3.3 References

References						
No.	***References Type***	***Reference***	***Status***	***Impact on Use Case***	***Originator / Organisation***	***Link***
1	EPRI	Intelligrid Report		Similar to current usecase (specific ref)	Electric Power Research Institute	
2	NEDO	Microgrid		Similar to current usecase	New Energy and Technology Development Organization, Japan	
3	IEC	62559-2		Similar to current usecase	Omnetric, Jim Waight	
4	ORNL	Microgrid use cases		Similar to current usecase (specific ref)	Oakridge National Laboratory, Tennesse	

3.4 Further Information to the Use Case for Classification / Mapping

Classification Information
Relation to Other Use Cases
There are other use cases related to the optimization of the microgrid and its reconnection.
Level of Depth
Mid level
Prioritisation
High
Generic, Regional or National Relation
Will be applied in a generic test at Duke, CPS Energy and SCE test beds.
Viewpoint
Technical
Further Keywords for Classification

4 Step by Step Analysis of Use Case

4.1 Steps – Scenario Name

Scenario Conditions					
No.	**Scenario Name**	**Primary Actor**	**Triggering Event**	**Pre-Condition**	**Post-Condition**
1	Grid Outage causes unscheduled island	Island recloser at PCC	Grid outage	Recloser set up, tested.	Uncheduled island transition

2	Triggering Event causes potential unscheduled island	Monitoring Platform	Triggering Event	Monitoring platform set up, tested	Potential Unscheduled island transition

4.2 Steps – Scenarios

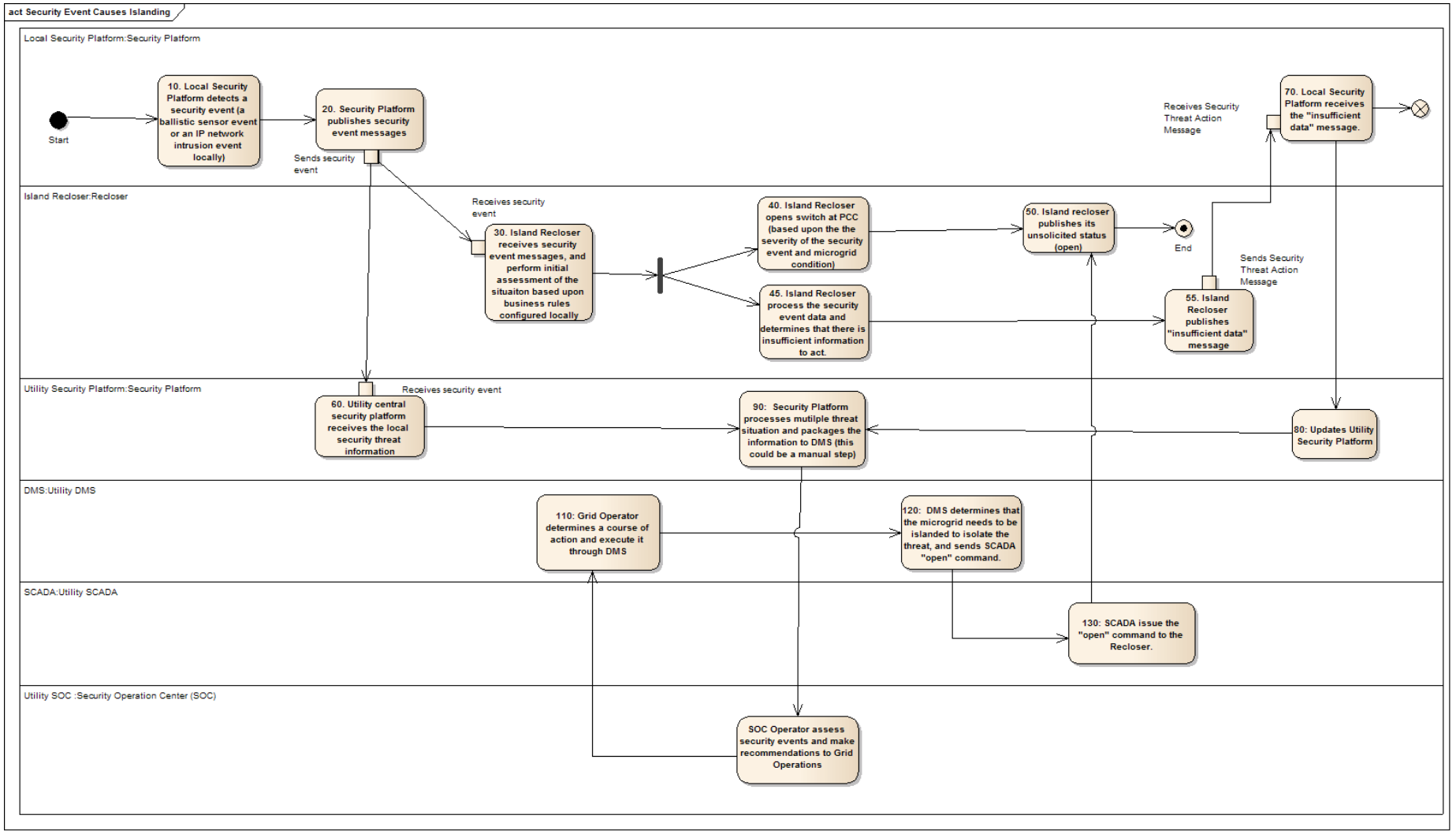

Figure 2: Scenario 1 Activity Diagram - Security causing Unscheduled Islanding

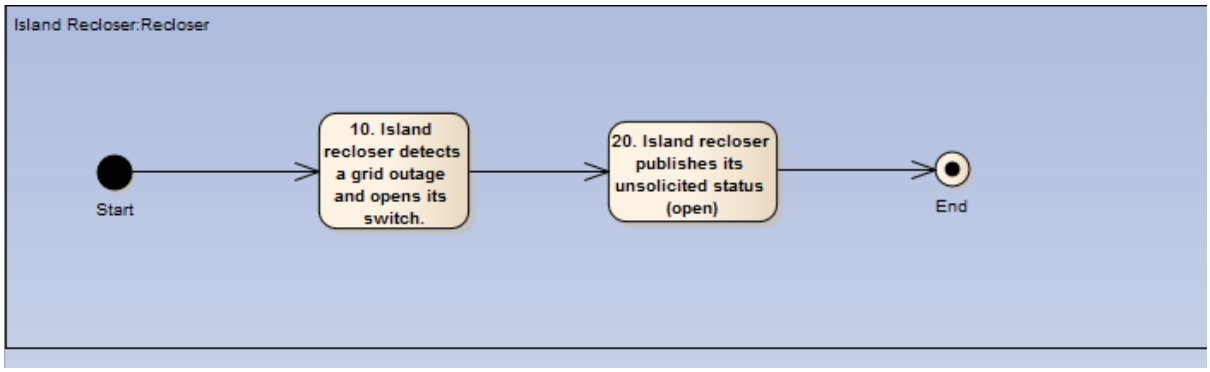

Figure 3: Scenario 2 Activity Diagram - Grid Outage causing Unscheduled Islanding

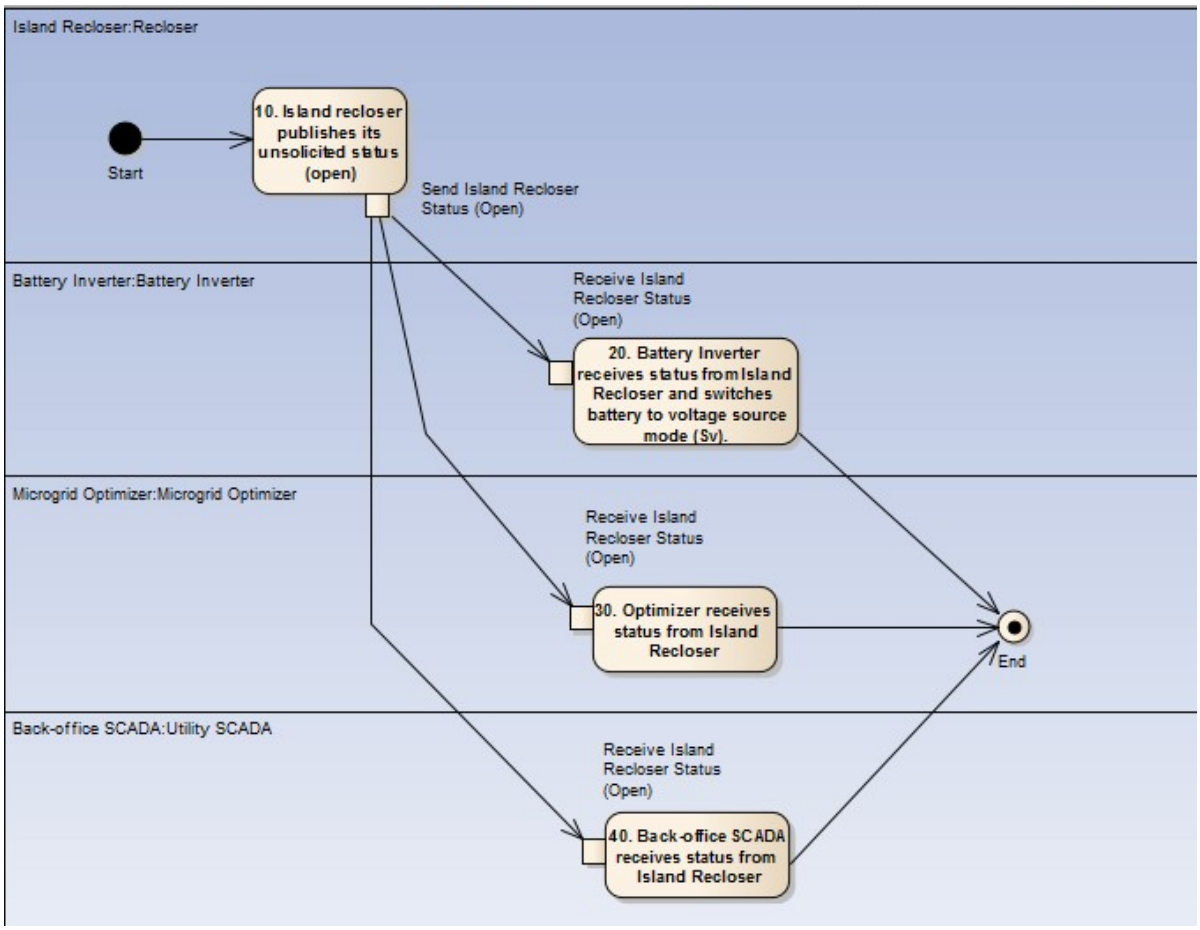

Figure 4: Activity Diagram - Transition from Grid-Connected microgrid to Unscheduled Island

5 Information Exchanged

See Model Output IDL or XSD for a detailed CIM data description.

Information Exchanged		
Name of Information (ID)	***Description of Information Exchanged***	***Requirements to information data***
Recloser Status	timeStamp normalOpen	Recloser Status (open or

	isLockedOut isOpen	closed)
Recloser Readings	timestamp value flowDirection multiplier name phases unit	Reading and Reading Type defined in CIM
Battery Inverter Status	timestamp isCharging isConnected	Battery Inverter Status (charging or discharging, Sv or Sc mode)
Battery Inverter Control	timeStamp eventOrAction – Mode Control -- type controlType – SetPoint Control -- unitMultiplier unitSymbol value	Batter Inverter Control (CIM End Device Control)
Back-office SCADA	timestamp value flowDirection multiplier name phases unit	Reading and Reading Type defined in CIM
Local Monitoring Platform	Timestamp Value Event name Event type Event description Event severity	Leverage “event”

6 Requirements (optional)

Requirements (optional)	
Categories for Requirements	**Category Description**
NA	
Requirement ID	**Requirement Description**
NA	

7 Common Terms and Definitions

Common Terms and Definitions	
Term	**Definition**

8 Custom Information (optional)

Custom Information (optional)		
Key	***Value***	***Refers to Section***
NA		