

## 1 Description of the Use Case

### 1.1 Name of Use Case: Microgrid Unscheduled Islanding

<i>Use Case Identification</i>		
<i>ID</i>	<i>Domain(s)/ Zone(s)</i>	<i>Name of Use Case</i>
		Microgrid Unscheduled Islanding

### 1.2 Version Management

<i>Version Management</i>				
<i>Version No.</i>	<i>Date</i>	<i>Name of Author(s)</i>	<i>Changes</i>	<i>Approval Status</i>
20161107a	20161107	SGIP OpenFMB Priority Action Plan	20161107 UML	
20181231a	20181231	UCA OpenFMB Users Group	20181011a UML	
1.0.0	20190430	UCA OpenFMB Users Group	Section 5 Information Exchanged separated into supplemental document	

### 1.3 Scope and Objectives of Use Case

<i>Scope and Objectives of Use Case</i>	
<i>Scope</i>	Unscheduled transition of microgrid from grid-connected to islanded
<i>Objective(s)</i>	Seamlessly island a low-inertia microgrid upon loss of grid power
<i>Related business case(s)</i>	Circuit Segment Optimization Microgrid Reconnection

### 1.4 Narrative of Use Case

<i>Narrative of Use Case</i>
<i>Short description</i>
The business objective of this Microgrid Unscheduled Islanding use case is to seamlessly transition a low-inertia microgrid from grid-connected to islanded mode. The microgrid PCC Coordination Service creates device schedules considering the status and capabilities of circuit segment actors over appropriate timeframes. These schedules maintain proper voltage, frequency, and power factor for safe, reliable operation, including switching the Primary Energy Storage System to voltage source inverter (VSI) isosynchronous (ISO) mode upon loss of grid power at the Point of Common Coupling (PCC).
<i>Complete description</i>
The business objective of this Microgrid Unscheduled Islanding use case is to seamlessly transition a low-inertia microgrid from grid-connected to islanded mode. Figure 1 shows the microgrid connected to a feeder and substation. The microgrid Point of Common Coupling (PCC), which is a motor operated switch, isolates the microgrid from the feeder and delineates two separate but coordinated, self-optimized layers, each with its own Coordination Service. The microgrid includes PV, multiple Energy Storage Systems, as well as controllable and uncontrollable loads. Within this OpenFMB reference implementation, the microgrid has the ability to independently seamlessly island and reconnect without interruption.

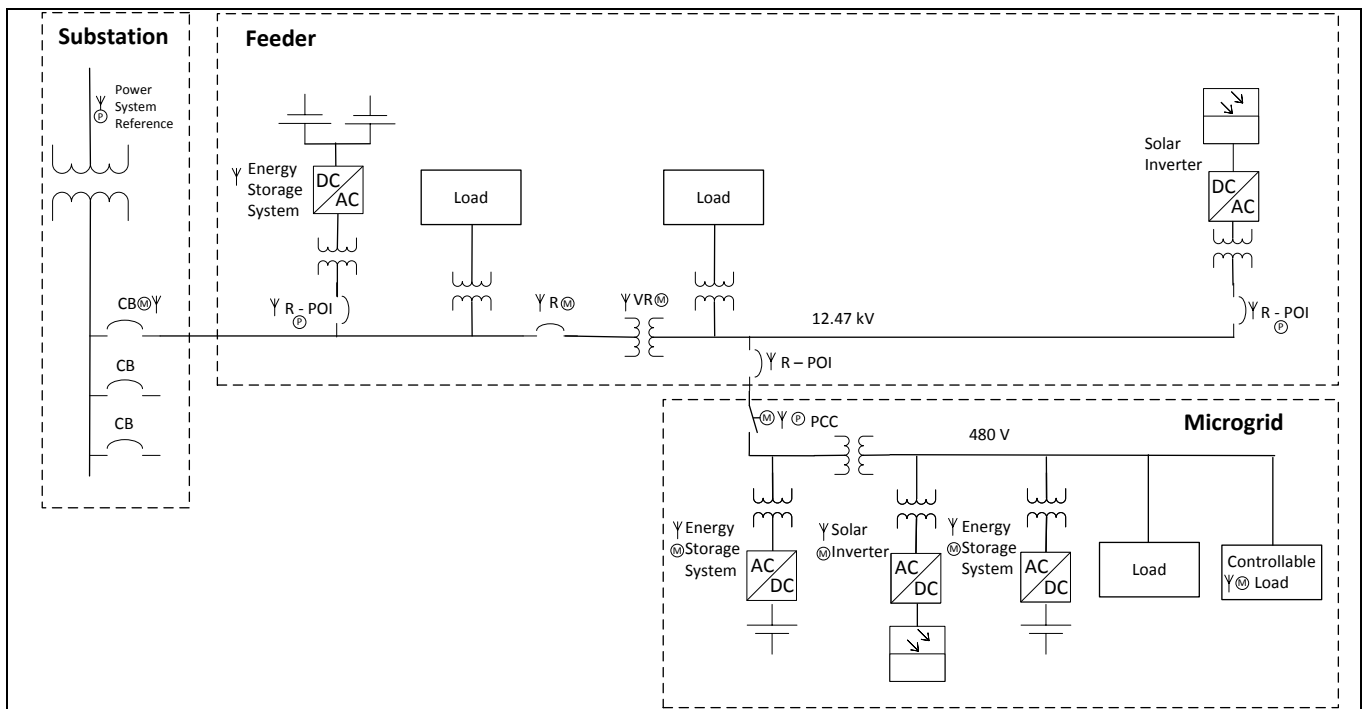


Figure 1: Microgrid Unscheduled Islanding Use Case Single Line Diagram

Considering the status and capabilities of circuit segment actors over appropriate timeframes, schedules created by the microgrid PCC Coordination Service maintain proper voltage, frequency, and power factor for safe, reliable operation. Depending upon local conditions and objectives, multiple algorithms may satisfy local needs. This use case is agnostic to such differing algorithms and only addresses interactions between the use case actors. The microgrid PCC Coordination Service may also consider objectives such as:

- Import or export schedules
- Economic dispatch
- Solar smoothing to reduce circuit segment volatility
- Volt-VAr for power factor optimization
- Peak demand management by shaving / shifting

For a microgrid, such as shown in Figure 1, the general event-driven flow of information for seamless low-inertia islanding is:

1. PCC Motor Operated Switch detects grid power has been lost considering any applicable ride-through, opens, and publishes anomaly event
2. Co-located PCC Coordination Service module subscribes to anomaly event from PCC Motor Operated Switch
3. Co-located PCC Coordination Service develops new schedules for unscheduled islanding
4. Co-located PCC Coordination Service publishes schedules
5. Primary ESS subscribes to and executes the schedule to change to VSI ISO mode
6. Other microgrid devices subscribe to and execute updated schedules from PCC Coordination Service

## 1.5 General Remarks

General Remarks
Not Applicable

## 2 Diagrams of Use Case

### Diagram(s) of Use Case

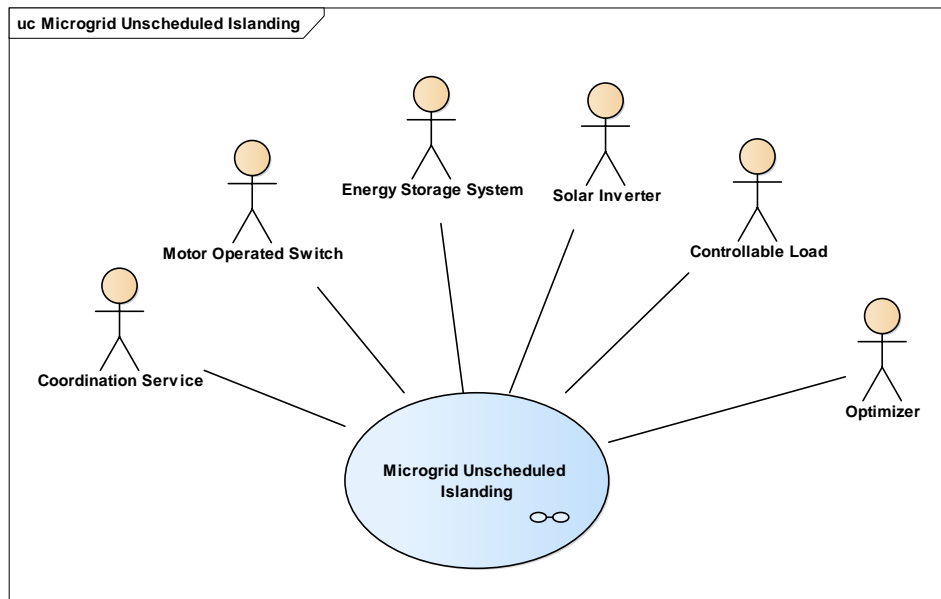


Figure 2: Microgrid Unscheduled Islanding Use Case

### 3 Technical Details

#### 3.1 Actors

<i>Actors</i>			
<i>Grouping (e.g. domains, zones)</i>		<i>Group Description</i>	
<i>Actor Name</i> <small>see Actor List</small>	<i>Actor Type</i> <small>see Actor List</small>	<i>Actor Description</i> <small>see Actor List</small>	<i>Further info</i>
Devices			
Controllable Load	Device	Electrical components whose power consumption can be adjusted by a specified entity.	
Energy Storage System	Device	Device that stores energy at one time to discharge it at a later time. Commonly includes power control system inverter / rectifier converting alternating current to or from battery direct current.	
Load	Device	Electrical components whose power consumption is not under the control of the entity of concern.	
Motor Operated Switch	Device	A switch which can be operated by activating its motor.	
PCC	Device	Point of common coupling where a portion of the electrical grid under separate administration can disconnect from or reconnect to a portion of the larger electrical grid.	
Solar Inverter	Device	Inverter providing AC current from photovoltaic panels.	
Services			
PCC Coordination Service	Service	A system service that coordinates actions of devices on a portion of the grid under separate administration. Coordinates with POI Coordination Service.	
PCC Optimizer	Service	Publishes requested schedule for a service provider defined period of time with time intervals ranging from minutes to several hours.	

#### 3.2 Triggering Event, Preconditions, Assumptions

<i>Use Case Conditions</i>			
<i>Actor/System/Information /Contract</i>	<i>Triggering Event</i>	<i>Pre-conditions</i>	<i>Assumption</i>
PCC Motor Operated Switch	PCC Motor Operated Switch detects grid power has been lost	PCC Motor Operated Switch operating	
PCC Coordination Service	Coordination Service publishes planned islanded mode schedules	PCC Coordination Service operating	
Other devices and Optimizer	Other devices and Optimizer respond to new schedules	Other devices and Optimizer operating	

#### 3.3 References

<i>References</i>						
<i>No.</i>	<i>References Type</i>	<i>Reference</i>	<i>Status</i>	<i>Impact on Use Case</i>	<i>Originator Organisation</i>	<i>Link</i>
1	IEC	62559-2		Utilized use-case narrative template	Omnetric, Jim Waight	

#### 3.4 Further Information to the Use Case for Classification / Mapping

<i>Classification Information</i>	
<i>Relation to Other Use Cases</i>	
This use case is precipitated by some scenarios of the DER Circuit Segment Management use case	
<i>Level of Depth</i>	
Mid level	
<i>Prioritization</i>	
High	

## OpenFMB Microgrid Unscheduled Islanding Use Case

<i>Generic, Regional or National Relation</i>
Will be applied in a generic test at Duke test bed.
<i>Viewpoint</i>
Technical
<i>Further Keywords for Classification</i>

## 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	Microgrid Unscheduled Islanding	PCC Coordination Service	PCC Motor Operated Switch detects grid power has been lost	PCC Coordination Service, PCC Optimizer, and devices operating	Devices executing schedules in islanded mode PCC Optimizer responds to schedule

### 4.2 Steps – Scenarios

#### 4.2.1 Steps – Microgrid Unscheduled Islanding

## OpenFMB DER Circuit Segment Management Use Case

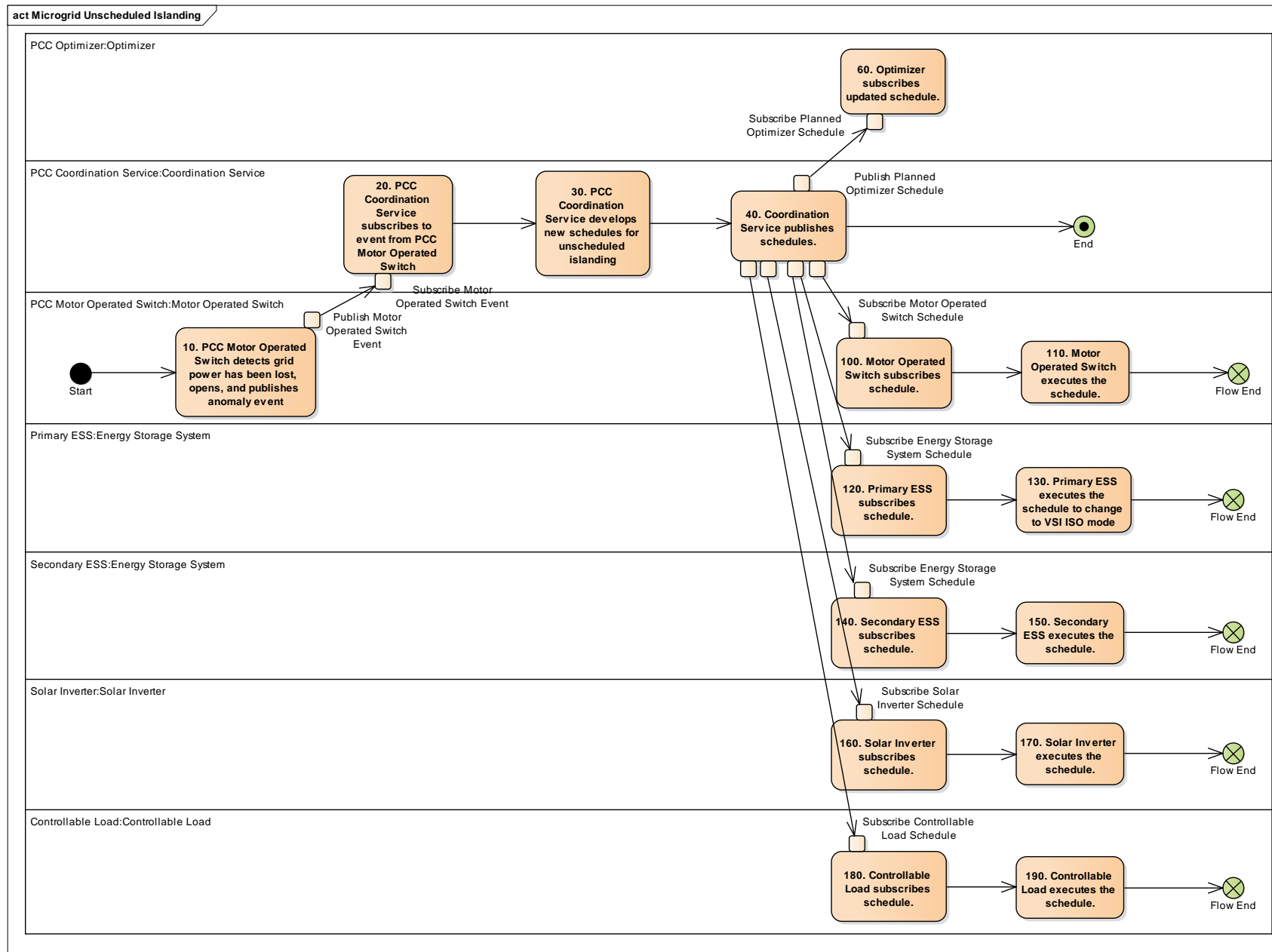


Figure 3: Microgrid Unscheduled Islanding Activity Diagram

## 5 Information Exchanged

See OpenFMB Information Exchanged supplementary document.

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**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
NA	

**8 Custom Information (optional)**

Custom Information (optional)		
Key	Value	Refers to Section
NA		