

## Use Case 9: Load Shedding (by Frequency Relay)

### Summary:

The Load Shedding function provides under-frequency protection at the main distribution substation. As system frequency decreases, load is disconnected in discrete steps according to frequency thresholds. Protective relays are used for automatic gradually under-frequency load shedding. Under and over-frequency relays are specified by frequency settings and delays. The frequency must remain above/below the specified frequency for the specified delay for the relay to operate. Zero delays are permitted.

This procedure describes what activities are performed by an operator after the function load shedding by frequency opened a corresponding set of circuit breakers which resulted in the loads being disconnected from the power system.

When the emergency situation is over, the operator has to restore the power. Load Shedding (by order) is described in [UC27]. It is possible to create and execute certain jobs in order to restore power [UC24], [UC25] and [UC26].

### Actor(s):

| Name                         | Role description   |
|------------------------------|--------------------|
| Operator in the control room | restores the power |

### Participating Systems:

| System                                | Services or information provided   |
|---------------------------------------|--|
| Network Operation                     | <ul style="list-style-type: none"> <li>Network operation monitoring (substation- and network state supervision, logging)</li> <li>Network control (Automatic control: Protection)</li> </ul> |
| Operational Planning and Optimization | <ul style="list-style-type: none"> <li>Network operation simulation (Load forecast, Power flows computation)</li> </ul>  |

### Pre-conditions:

The SCADA System is in operation. The operator is logged in to the system. A group of head feeder breakers are open due to frequency relay trigger.

### Assumptions / Design Considerations:

None.

### Normal Sequence:

| Use Case Step    | Description   |
|------------------|---|
| List of breakers | The system should determine the group of head feeder breakers that were open due to a trigger of the under frequency relay.   |
| List of priority | The system then should build order the previous list according to the priority each of the feeder. the order would be establish by a set of rules (e.g.: feeder priority, number of clients, importance of clients, load on the feeder, time/date, etc.). The |

|             |   |
|-------------|---|
|             | rules work as a black box and it must be defined by utility company policy.   |
| Restoration | The operator (or automatic system) restores the power to the feeder as soon as that action is possible according to the list of priority (list build in previous step), from the highest to the lowest priority.<br>[ <b>Exception</b> - The operator executes a job to restore power.] |

**Exceptions / Alternate Sequences:**

[**Exception** - The operator executes a job to restore power.]: The operator has the possibility to create a new job or to use a suitable existing job for restoration of power [UC24], [UC25] and [UC26].

**Post-conditions:**

The power is restored to every feeder.

**References:**

- [1] Use Case – UC24 Job Management/Interactive Job Creation
- [2] Use Case – UC25 Job Management/Job Execution
- [3] Use Case – UC26 Job Management/Job Creation by Recording
- [4] Use Case – UC27 Load Shedding (by Order)