

Use Case 12: Earth Fault Localization

Summary:

This procedure describes what activities are performed by an operator in the control room when the protection system detects an earth fault in the power system. The Earth Fault Localization function has to find the domain in an electrical network where the earth fault is located. The located network part is marked in a special color [UC21].

Actor(s):

Name	Role description
Operator in the control room	manages the field crew and starts a confirmation after resolving
Field operatives	searches for the detailed location and reason (if necessary) and confirms resolving of the problem

Participating Systems:

System	Services or information provided
Network Operation	<ul style="list-style-type: none"> Network operation monitoring Fault management (Fault occurrence diagnostic and Fault localization analysis)
Operational Planning and Optimization	<ul style="list-style-type: none"> Operation work scheduling (dispatching of field crews)
Work Management System	<ul style="list-style-type: none"> Allocation of work, staff and initiation of updating the Asset Register
Customer Interface Management and Control	<ul style="list-style-type: none"> Customer trouble information (Outage analysis and Outage reporting)

Pre-conditions:

The SCADA System is in operation. The operator is logged in the system. Earth fault localization function receives correct and sufficient information for a reliable localization. The field operative is ready and equipped.

Assumptions / Design Considerations:

Real time performance: The fault diagnosis is generated fast enough to allow the operator to take corrective action.
No interaction is needed to obtain analysis results.

Normal Sequence:

Use Case Step	Description
Start Earth Fault localization function	The earth fault localization procedure starts automatically (e.g. move to other picture, change coloring mode, etc.)
View results	The function produces events, alarms and changes

	the map representation of the network.
Analyze results	Dependent on results there are different orders: 1) The function is able to locate the exact faulted element. The operator contacts a field operative to resolve the problem on the element. 2) The function is only able to locate faulted area (group of elements). Then the operator tells the field operative to search for the problem within the area. 3) The function can not locate an element or an area, it only give a suspicious area. The operator orders the field operative to check the suspicious area for the problem.
Fault Isolation	Use case Fault Isolation is described in [UC29].
Update customer information	The operator updates data in the Customer trouble information (e.g. affected feeder and Estimated time to restore - ETOR). [Exception - There are no customers affected by the short circuit.]
Service Restoration	Use case Service Restoration is described in [UC32].
Start Earth Fault localization function	After the problem has been resolved by the field crew the operator starts a confirmation manually (using the function again).

Exceptions / Alternate Sequences:

No special alternate sequences are to be described.

Post-conditions:

It should be possible in some cases for the operator to locate the element of the earth fault or one group of elements (within which one is the fault element). If the operator can not pinpoint the location, he got a series of possible (suspicious) elements. Elements can be busbars, switches, transformers or lines.

References:

- [1] Use Case – UC21 Network Coloring
- [2] Use Case – UC29 Fault Isolation
- [3] Use Case – UC32 Service Restoration