Swedish Neutral

Premium Power Protection

Smart grid protection by neutral treatment and earth fault protection

Established in 1987

Resides in Stockholm – Sweden
GROUND FAULT NEUTRALIZER [GFN]

The GFN is the most sensitive and fastest earth fault protection system on the market meaning that you could avoid the damages normally caused by earth faults.

The GFN handles earth faults without an outage which means that you can avoid the costs/missed revenue normally connected to outages.

Earth faults (one phase to ground) constitutes 75-99% of all faults in HV networks.

Earth faults can cause injuries to humans, damage to equipment and start fires.

Earth faults cause outages and outages lead to financial losses.
DEFINITION OF RISK

IEC 60479 - General risk assessment

RISK \( f(t, I^2) \)

Both speed of protection and fault current can be effected by choice of neutral treatment.
<table>
<thead>
<tr>
<th>Neutral Treatment</th>
<th>Fault Current</th>
<th>Speed of Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Grounding</td>
<td>10kA</td>
<td>0.1-1.0 sec</td>
</tr>
<tr>
<td>NER Grounding</td>
<td>1kA</td>
<td>0.1-1.0 sec</td>
</tr>
<tr>
<td>Ungrounded</td>
<td>100A</td>
<td>0.1-1.0 sec</td>
</tr>
<tr>
<td>Resonance Grounding</td>
<td>10A</td>
<td>1.0-(∞) sec</td>
</tr>
<tr>
<td>Ground Fault Neutralizer</td>
<td>0A (&lt;50mA)</td>
<td>&lt;60 msec</td>
</tr>
</tbody>
</table>
GFN TESTED BY VICTORIAN (AUSTRALIA) GOVERNMENT
(CALLED RAPID EARTH FAULT CURRENT LIMITER IN VICTORIA)

https://www.youtube.com/watch?v=n5_SwJzFUP4 (click for full video)
SOLIDLY GROUNDED NEUTRAL
NEUTRAL EARTHING RESISTOR GROUNDED NEUTRAL
UNGROUNDED NEUTRAL
RESONANCE GROUNDED NEUTRAL
(ARC SUPPRESSION COIL, WIDLEY USED IN EUROPE)
GFN GROUNDED NEUTRAL
GFN SYSTEM – BLOCK DIAGRAM

Control Cabinet (Neutral Manager)

- Busbar VTs
- Feeder CTs

Power Supply

Local & Remote Control (SEFM interface)

SCADA

ASC

Grounding Transformer (Optional)

Grid Balancing

RCC (Inverter)

Transformer Neutral

L1 L2 L3

Power Supply

Balancing

SCADA

Local & Remote Control (SEFM interface)

Power Supply
1. Earth Fault
2. The ASC instantly compensates for the capacitive earth fault current
3. The GFN detects the fault in 1 ms when the EF threshold is exceeded
4. The GFN determines the faulty phase within 10 ms from detection and requests RCC compensation
5. The RCC compensates for the earth fault current within 60 ms
6. What happens next is up to the operator to decide
LOAD BETWEEN PHASES – GFN BETWEEN PHASE & GROUND

\[ \text{Source} \quad E \quad \text{Fault} \quad \text{Load} \]

\[ Z_+ Z_- \quad 3\varnothing, 2\varnothing \quad 1\varnothing \quad Z_+ Z_- \]

GFN \xrightarrow{\infty} Z_0 \quad I_F \xrightarrow{0}
VECTOR DIAGRAM RESONANCE GROUNDED SYSTEM, EARTH FAULT IN L3
NMTERM (USER INTERFACE) – MAIN WINDOW