sub.net Power in the Savings



"Through the event capture process it is estimated that 3 potentially 'sticky' breakers have been found prior to them having to operate for an actual fault... estimate that this could have saved as much as £500k."

Save Costs with sub.net

sub.net is a compact, web enabled, multi-function substation monitor which provides valuable intelligence to help improve network management and enable substantial cost savings. Two key **sub.net** functions make significant cost savings possible for UK Utilities - fault location and asset management.

Fault Location for Distribution

Line and cable faults are recorded and the locations of permanent faults are sent to the control room to improve restoration times and reduce CML.



RMS Waveforms, Summary and Fault Locations from an Event Report



Fault location from Portballintrae

Impedance to fault circuit model search.

Line	Location	Easting Northing	UDB
FEEDER BREAKER 03	0.020 km past Line 876 TO Pole 87 SHORT SPUR		1284232
FEEDER BREAKER 03	0.050 km past Line 877 TO Pole 10 08/4451/003/P- SHORT SPUR		1285844
FEEDER BREAKER 03	0.234 km before Line 971 TO Pole 7 08/4350/001/P		1284222

Summary

Measurements from the event.

System	823
Class	Downstream
Trigger	Analogue RoC, 2:T1 Vyn
Event priority	4
Fault type	A-B-C
Fault level	1236.3 A
Fault resistance	3.617 R
Ambient temperature	24.2 C

The position of repeating transient faults are immediately identified allowing timely repair thus producing direct cost savings by reducing penalties and minimising CI.





Asset Management

Circuit Breakers

sub.net monitors every operation of every breaker and highlights faulty or slow operations. This on-line monitoring has significant advantages over off-line:-



- All operations are recorded and analysed not just test trips
- Contact duty is accurately assessed
- 'First trip' monitoring catches sticky mechanism
- Any problems are reported immediately

The number of operations and cleared current per phase are accumulated and wear thresholds set to flag maintenance requirements. Analysed values are integrated into an asset database to implement a RCM or CBM strategy.



Waveforms and Breaker Measurements from a Fault Event Report

Assets

Switchgear operations during the event.

CB43-1844 (Trip) FEEDER BREAKER 03 at 415.5 mS

Operate time	68.4 ms
Coil current	5.260 A
Pulse width	46.4 ms
Aux contact	41.84 ms
Battery Vm	53.756 V
Battery impedance	0.036 R

CB43-1844 (Close) FEEDER BREAKER 03 at 10433.8 mS

Operate time	66.2 ms
Coil current	5.705 A
Pulse width	27.0 ms
Aux contact	36.23 ms
Battery Vm	54.009 V
Battery impedance	0.036 R



Batteries

The tripping battery source impedance is measured to identify problems with cabling, connectors and battery cells (see breaker report above).



Fault clearance times are measured to check for correct protection settings.



Transformers

The oil temperature is compared with ambient and per phase loading including K factor. Through fault levels are recorded to determine de-rating levels.



Additional sub.net Functions



Power Quality

Regular power quality reports are sent including harmonics (to 50th), flicker & imbalance. Voltage dips are reported immediately.



Grid code compliance

Renewable generator compliance tests are monitored and compared with required standards.





Input and computed quantities are available to SCADA via Modbus & DNP3.





Phasor measurement (PMU)

Phasor data are sent at up to 50 frames per second using IEEE C37.118.1/2-2011 as part of a WAMS.

Metering

Real & reactive power is metered on 3 circuits with import & export and maximum demand.

Integration

sub.net can interface with enterprise level applications like PI Historian, PhasorPoint, iHost, OSIsoft PDC & Maximo.

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Excerpt from an IFI report

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