

Low Voltage Current Sensor Technology Evaluation

Funding mechanism: LCNF Tier 1

Project budget: £500,000 (split 50:50 between UK Power Networks and Western Power Distribution)

Status: Completed
Start date: December 2011
End date: June 2013



Project concept/overview/challenge

Monitoring of our low voltage network is currently limited. To maintain reliable power supplies in the future, we need better monitoring to understand the impact as customers use more electricity and connect more renewable generation to our network.

UK Power Networks and Western Power Distribution (WPD) collaborated to evaluate low voltage monitoring solutions in a laboratory and on live electricity networks. Sensors from seven manufacturers were fitted at 28 substations across London and the WPD area.

Stakeholder benefits

The project was developed to conduct a detailed assessment and comparison of the current sensors available in the market, to inform the wider DNO community of their benefits and limitations. This knowledge would benefit if a wider rollout of monitoring is required to facilitate activities associated with a low carbon future.

What we are doing/deliverables

- Evaluation and comparison of LV current sensors from seven manufacturers.
- Assessment of each sensor's accuracy in a controlled laboratory environment at NPL.
- Field trials on the distribution system of both UK Power Networks and Western Power Distribution to understand actual installation requirements and to test each product's reliability.
- Assessment of a range of current sensors and voltage measurement techniques.

- Development of a non-invasive safe installation practice to facilitate the installation of the current sensors and voltage measurement products without disrupting existing customers.
- Summarised report detailing the results of individual tests and the comparative assessments.

Findings

- The assessment of several voltage measurement techniques and products resulted in a hierarchy of preferred voltage measurement methods being developed.
- An Installation Policy that enabled LV monitoring equipment to be installed safely, without the need for any customer interruptions was developed.
- All the current sensors had good or satisfactory scores in the laboratory accuracy assessment, which has increased our confidence in the sensors. This process also identified some useful generic results for different types of sensor.
- The field and laboratory trials allowed detailed feedback to be provided to participating manufacturers, which is leading to improved products being developed.
- A comparison table has been produced rating each of the sensors tested.
- The data collected confirmed that LV monitoring could provide useful information to facilitate a low carbon future.
- The current sensor products and their installation costs were achieved at below initial estimates, but a cost benefit analysis does not currently justify a universal roll-out of secondary substation monitoring, favouring instead targeted deployment.
- UK Power Networks has revised the Remote Terminal Unit specification for secondary substations following the project.

| Manufacturer | Overall Rating | NPL Test | Ease of installation | Installation time per site (Mins) | Relative Cost | Positive | Negative | Monitoring type |
|------------------------|----------------|----------|----------------------|-----------------------------------|---------------|-------------------------------|--------------------------------------------------|-----------------|
| GMC i-Prosys | Excellent | Average | Easy | 35-45 | £ | Plug and Play | Bulky metrology unit | Advanced |
| Sentec/Selex (Gridkey) | Excellent | Good | Easy | 40-50 | £ | Plug and Play | Hard to access internal electronics | Advanced |
| Current | Good | Good | Easy | 45-60 | £££ | Plug and Play | Case not fully weather proof | Advanced |
| PowerSense | Good | Average | Medium | 60-90 | ££ | Back up, battery, robust case | Time consuming sensor connection | Advanced |
| Ambient | Good | Good | Easy | 45-60 | £££ | Plug and Play | No commissioning indicators. One unit per feeder | Advanced |
| Haysys | Satisfactory | Average | Hard | 90-100 | £ | Large sensor aperture | Time consuming sensor connection | Basic |
| Locamation | Satisfactory | Good | Easy | 45-60 | ££ | Plug and Play | Electronics prone to failure | Advanced |

Next steps

Variations between substation sites identified some sensor product limitations. A number of potential solutions for these particular issues have been proposed and are under consideration. Further installation trials will be necessary to prove these.

Discussions with manufacturers will continue to improve the product design and reduce both the equipment and installation costs.

Partners

