LV MONITORING – AN ENABLER

Steven Burns

WESTERN POWER DISTRIBUTION
Serving the Midlands, South West and Wales

UK Power Networks
Delivering your electricity
Matthieu Michel
LV MONITORING – AN ENABLER

Steven Burns
Innovation & Low Carbon Networks Engineer

NEXT GENERATION NETWORKS

LCNF2013 Wednesday 13th November 2013
Agenda

• What is LV Monitoring?
• Project Timeline – Our Developments
• Introduction to LV Sensor Evaluation
  • Joint WPD / UKPN project
• Learnings
• Applications
Generally 1 to 8 LV legs
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2010
WESTERN POWER DISTRIBUTION
NETWORK TEMPLATES

2011
WESTERN POWER DISTRIBUTION
EARLY LEARNING
WESTERN POWER DISTRIBUTION
SMART HOOKY
WESTERN POWER DISTRIBUTION
SUBURBAN PV IMPACT
WESTERN POWER DISTRIBUTION
LV SENSORS
WESTERN POWER DISTRIBUTION
FALCON
WESTERN POWER DISTRIBUTION
COMMUNITY ENERGY ACTION

2012

2013

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2010

2011

2012

2013

WESTERN POWER DISTRIBUTION
NETWORK TEMPLATES

WESTERN POWER DISTRIBUTION
EARLY LEARNING

WESTERN POWER DISTRIBUTION
SMART HOOKY

WESTERN POWER DISTRIBUTION
SUBURBAN PV IMPACT

WESTERN POWER DISTRIBUTION
LV SENSORS

WESTERN POWER DISTRIBUTION
FALCON

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COMMUNITY ENERGY ACTION

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- 2010: Western Power Distribution Network Templates
- 2011: Western Power Distribution Early Learning
- 2012: Western Power Distribution Suburban PV Impact
- 2013: Western Power Distribution LV Sensors
- 2013: Western Power Distribution Falcon
- 2013: Western Power Distribution Community Energy Action

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LV CURRENT SENSOR TECHNOLOGY EVALUATION
January 2013- June 2013

Project Brief
• Live installation procedures
• Evaluate sensors from 7 manufacturers
• 12 month field trial
• Indoor and outdoor sites
• Laboratory environment testing
• Comparative assessments
• Report findings
• Feed into future projects
Range of tests on 7 systems

• Accuracy
• Linearity
• Positional sensitivity
• Over rated current
• Stray fields
• Distortion waveform
• Temperature
• Amplitude frequency response

Additional PQ functions not tested
LV Monitoring – an enabler
Matthieu Michel
Main Outcomes of the Project

- Installation policy developed and available to other DNOs
  - Installation time: 35 mins
- Laboratory accuracy assessment: Good or Average scores
  - Current Transformers: 0.5% to 1%
  - Rogowski Coils: around 2%
- Preferred methods of connection for voltage & current identified
- Feedback provided to manufacturers:
  - Better products are now available for DNOs to purchase
- A comparison table produced
## Preferred Methods of Connections

<table>
<thead>
<tr>
<th>Current</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional CT (PowerSense)</td>
<td>Solid Rogowski Coil (GridKey)</td>
</tr>
<tr>
<td><img src="image1" alt="Modified Fuse Carrier with voltage terminal" /></td>
<td><img src="image2" alt="Voltage Clamp" /></td>
</tr>
</tbody>
</table>

**Preferred Method of Connection**

- Modified Fuse Carrier with voltage terminal
- Voltage Clamp
- Existing Voltage Test Points
## Comparison Table*

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Overall Rating</th>
<th>Installation time per site (Mins)</th>
<th>Positive</th>
<th>Areas to improve</th>
</tr>
</thead>
<tbody>
<tr>
<td>GMC-PROSys</td>
<td>Excellent</td>
<td>35-45</td>
<td>Plug and Play</td>
<td>Bulky metrology unit</td>
</tr>
<tr>
<td>GridKey</td>
<td>Excellent</td>
<td>40-50</td>
<td>Plug and Play</td>
<td>Hard to access internal electronics</td>
</tr>
<tr>
<td>Current</td>
<td>Good</td>
<td>45-60</td>
<td>Plug and Play</td>
<td>Case not fully weather proof</td>
</tr>
<tr>
<td>PowerSense</td>
<td>Good</td>
<td>60-90</td>
<td>Back up battery, robust case</td>
<td>Time consuming sensor connections</td>
</tr>
<tr>
<td>Ambient</td>
<td>Good</td>
<td>45-60</td>
<td>Plug and Play</td>
<td>One unit per feeder No commissioning indicators.</td>
</tr>
<tr>
<td>Haysys</td>
<td>Satisfactory</td>
<td>90-100</td>
<td>Large sensor aperture</td>
<td>Time consuming sensor connection</td>
</tr>
<tr>
<td>Locamation</td>
<td>Satisfactory</td>
<td>45-60</td>
<td>Plug and Play</td>
<td>Electronics prone to failure</td>
</tr>
</tbody>
</table>

* For equipment tested as part of this project
Monitoring Solutions Improvements

Bulky Current Transformers

Difficult connections to metrology unit

One metrology unit per LV way

Rogowski sensors and easy connections

Multiple feeders supported

DISCOS® Satellite Rogowski
4 x 3-Phased LV Feeders

Connection to the DISCOS® System
Low Voltage Monitoring Applications (1/2)

- Association with other data sources:
  
  Rating of Transformer + Load $\rightarrow$ Spare Capacity

- Business benefit: Facilitate the connection of additional load

[Map showing substations with spare capacity available and those with little or no capacity available]
Low Voltage Monitoring Applications (2/2)

- Combination with control functions:
  Use analogues as triggers to reconfigure the network
- Business benefit: Defer network reinforcement
Conclusions

• Increasing number of network monitoring solutions available
• Monitoring equipment can be deployed quickly and safely
• Benefits are maximised by combining monitoring with:
  – Other data sources
  – Control functions

LV Current Sensor Technology Evaluation Close Down Report Published
Thank you