



**OPENING UP
THE SMART GRID**

OpenLV Measurement Points

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Executive summary

This document lists the measurements which are made by the OpenLV hardware and published on the LV-CAP Data Marketplace so that Applications running in the substation can make use of them.

This version has been updated to reflect the fact that Neutral current is now being measured as standard in the project installations.

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1. Electrical Measurements

Electrical measurement values will be published every 60 seconds.

1.1 LV Busbar

- RMS Voltage phase to neutral for each phase
 - Minimum, Maximum and Mean values

1.2 Transformer Secondary

- RMS current in each phase
 - Minimum, Maximum and Mean values
- RMS current in the transformer neutral
 - Minimum, Maximum and Mean values
- Current phase angle (power factor) for each phase
 - Mean value
- Real (Active) and Reactive power flow in each phase (including direction)
 - Mean values
- Real (Active) and Reactive energy in each phase
 - Energy flow values for each 60 second measurement period

1.3 Outgoing Feeder

One outgoing feeder will be monitored. Additional feeders maybe monitored subject to funding for the additional measurement hardware costs.

- RMS current in each phase
 - Minimum, Maximum and Mean values.
- RMS current in the feeder neutral (subject to being able to install the sensor)
 - Minimum, Maximum and Mean values
- Power factor for each phase
 - Mean value
- Real (Active) and Reactive power flow each phase (including direction)
 - Mean values
- Real (Active) and Reactive energy in each phase
 - Energy flow values for each 60 second measurement period

2. Temperature Measurements

Temperature measurement values will be published every 10 seconds.

2.1 General

- Outdoor ambient air temperature
- Indoor ambient air temperature (indoor substations). In multiple room substations this will be in the transformer chamber.

2.2 Transformer

- Transformer top oil temperature (or as close an approximation as can be managed) will be reported every 60 seconds.

3. Additional Measurement Inputs

3.1 Additional feeder current monitoring

- Monitoring of additional outgoing feeders can be added. The measurements made on additional outgoing feeders are the same as those listed above.
- The system can be expanded up to a total of 4 outgoing feeders plus the substation total, or 5 outgoing feeders using a calculated total *if all outgoing feeders are then being monitored*.
- The additional sensors required (four per feeder) would need to be purchased.
- No additional software development is required.

3.2 Additional temperature monitoring

- Monitoring of additional temperatures can be added. The measurement parameters would be the same as the core temperature measurements above.
- The platform has 5 further thermocouple temperature measurement channels available.
- The thermocouple probe itself and suitable cable to the OpenLV enclosure would have to be purchased.
- No additional software development is required.

3.3 Additional analogue inputs

- A suitable interface for 0-5V, 0-10V 4-20mA etc. analogue inputs has been identified.
- It has 8 analogue input channels.
- This will not be fitted to the OpenLV systems as standard but could be added at an equipment cost of around £150.
- The software support would be shared with the rest of the system and so not add additional costs.

