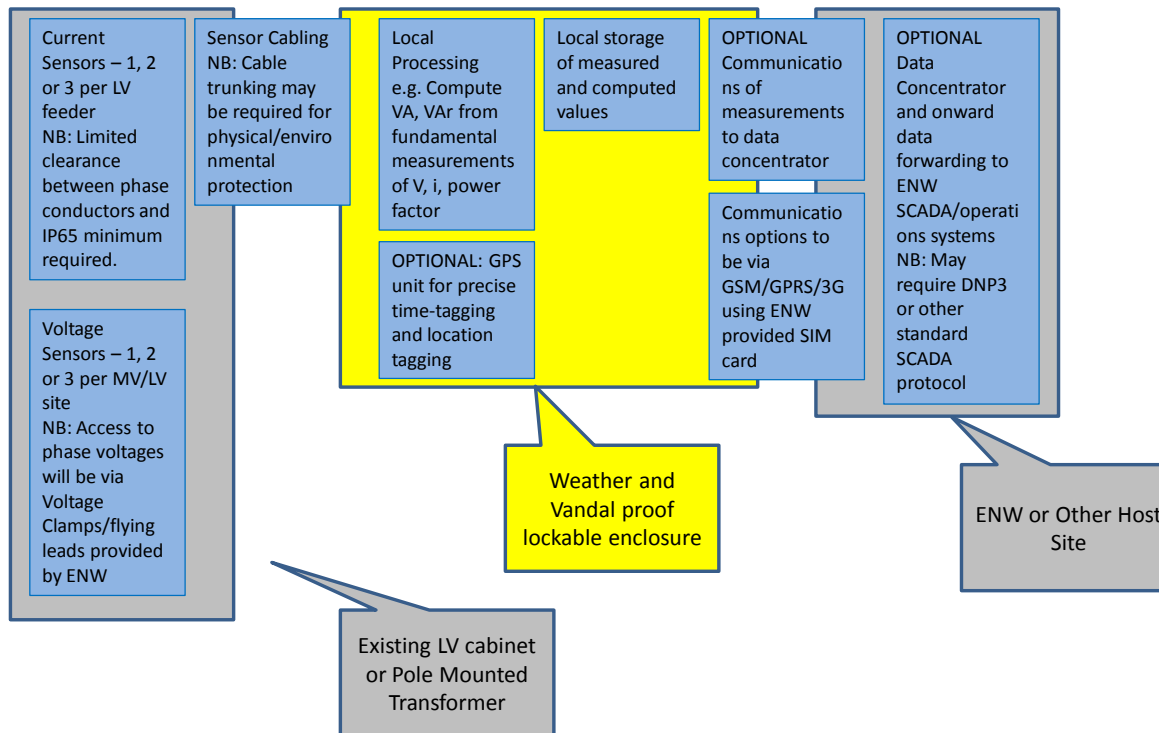


An overview of the MV/LV substation and pole mounted transformer monitoring requirements.

MV/LV Substation Sensor Overview



Technical specification for the MV/LV substation monitoring

Below is Electricity Northwest’s (ENW) technical specification for MV/LV substation monitoring. Suppliers are asked to clearly indicate whether their proposed solution is compliant with each of the requirements. Suppliers are encouraged to add comments as appropriate to help clarify their proposals or to aid understanding.

Item	Requirement	Compliant	Comment
1	General		
1.1	Low voltage substation monitoring will be required at substation ‘near points’ – typically attached at/near the LV fuses on a Pole Mounted Transformer or at each outgoing LV cable in an LV cabinet.		
2	Sites to be monitored		
2.1	Overhead/pole mounted transformers and at other selected overhead openwire sites. These sites are usually/all single LV feeder 1, 2 or 3 phase with ratings between 5kVA and 200kVA.		
2.2	Ground mounted 11kV/LV or 6.6kV/LV substations with LV cabinet/feeder pillars. Typically between 2 and 8 three-phase LV cables at each LV cabinet – each phase of each feeder requires monitoring.		
2.3	Please indicate whether it is necessary to measure directly the current in the neutral conductor or whether this value can be derived via post processing based only upon the 3-phases.		
3	Measurements		
3.1	All measurements are required to be capable of being sampled and stored on a 60 second sampling rate. This may require GPS time synchronisation (or other method, e.g. via		

Item	Requirement	Compliant	Comment
	communications to central UTC clock) to ensure that separate samples from different sites can be combined/compared in a meaningful way. Sampling rates should be remotely adjustable eg from 1 minute up to 30 minutes. Sampling rates are expected to be reduced at individual sites as appropriate dictated by the results obtained and it would be advantageous if sampling rates could be changed remotely or via on-site logic to reduce sample volumes without seriously impacting sample resolution.		
3.2	The 60 second sample rates are expected to be aggregated into larger packets for transmission to the data concentrator. Sample rates and transmission rates are to be adjustable remotely.		
3.3	The solution will be required to provide monitoring, local analysis, data storage and possibly communications/forwarding of the following quantities, per LV phase, per LV circuit at selected overhead/pole mounted transformers and ground/pad mounted substations/LV cabinets:		
3.4	RMS Volts, bi-directional RMS Amps, power factor/phase angle (all per phase) plus derived or measured neutral amps.		
3.5	Harmonics (5th or THD), transformer temperature, and ambient temperature.		
3.6	kWh, kVA, kVAr.		
3.7	All measurements to include date, time, site, circuit, phase, max. min. and periodic/half-hour average.		
4	Accuracy		
4.1	Amps: Plus/minus 1% preferred, minimum of better than plus/minus 5 percent		
4.2	Voltages: Plus/minus 1% preferred, minimum of better than		

Item	Requirement	Compliant	Comment
	plus/minus 2 percent		
5	Installation		
5.1	All monitoring/sensors and associated items must be capable of being installed without the need for a substation shutdown (ie live under safe working procedures) and within a reasonable amount of time.		
5.2	There is a variety of LV cabinet and busbar arrangements involving different challenges including: protection from weather, protection from vandalism, access to and clearance around phase conductors.		
5.3	The clearance between separate cable cores at the point of current monitoring may be as small as 5 – 10 mm and a suitable current sensor may be a flexible Rogowski type or similar.		
5.4	Voltage monitoring at substation LV busbars will involve hazardous fault levels and will require the live installation of insulated busbar clamps including fused flying-leads. Please indicate if you provide a suitable solution as per the above.		
5.5	Power for the monitoring device is expected to require a separate fused phase and neutral connection – some modern LV cabinets include a 3-pin socket for these purposes. ENW staff/contractors will connect/install all equipment.		
5.6	The provision of battery storage (or suitable alternatives) with minimum 3 hours capacity to maintain clock time and other on-site parameters during outages may be necessary.		
5.7	Please indicate what additional items are required to be procured by ENW in order to install the monitoring equipment fully e.g. mains supply to the equipment.		
6	Environmental		

Item	Requirement	Compliant	Comment
6.1	A weather-proof enclosure (eg IP65) or cabinet is required to house all monitoring and associated equipment.		
6.2	Cabinet/enclosures must be lockable and vandal-proof for either indoor/outdoor installation.		
6.3	Provision of mechanically-sound trunking for voltage and current sensing leads between weather proof housing and installed sensors.		
6.4	With respect to the above outline requirements, supplier shall provide details on how they ensure physical protection, operator safety and minimise time needed for installation.		
6.5	Please indicated if any ancillary items or required for the cabinets/enclosures such as heaters/lighting/fixtures and fittings etc. Are these included in the cost.		
7	Data storage and retrieval		
7.1	All measurements should be stored on-site for either local data collection via laptop or for communications via radio. It should be possible to store at least 30 days of all monitored data for collection/communications so as to reduce the number of required site visits.		
7.2	All monitored data and monitoring device configuration data shall be stored in non-volatile memory and unaffected by interruptions to supply.		
7.3	Reduce storage by asking for on-site processing and storage of samples into e.g. half-hour summaries (max, min, average).		
7.4	Opportunity for 'unsolicited reporting by exception' where real-time comms exists. It should be possible, where remote communications is included, to set and reset a deadband for each analogue which is monitored. For current analogues, a deadband should be definable in 1A steps so that a non-		

Item	Requirement	Compliant	Comment
	varying analogue will involve less data storage.		
7.5	Likely communications option may be limited to GPRS/3G, where available.		
7.6	Where communication are included it is expected that ENW will issue or SIM cards. Please indicate if this provided any associated problems/issues.		
7.7	All communications to be via DNP3.		
7.8	ENW uses the iHOST system and it is preferable that all data sent from the site is direct to ENW's host systems using DNP3. In some instances it is expected that devices will need to be appropriately configured to provide this functionality.		
7.9	It is understood that suppliers can offer alternative data hosting solutions. Please clearly indicate what the specific costs are associated with such systems, the advantage of using such systems and whether the hosted system can integrate with ENW's iHost system. If not what will be required to achieve this?		
8	Data Concentrator		
8.1	All on-site monitored data which includes communications provisions should be monitored via a single central data concentrator. Where comms are included this device will communicate via DNP3 over GPRS/3G with each on-site monitoring unit to collect all data and to provide remote configuration capabilities.		
8.2	The data concentrator will also provide monitored data reporting via secure file transfer protocol (SFTP) over TCP/IP on a local ENW network. The format of the monitored data will be as shown below, or similar to: <feeder><location><date><time><measured value/ periodic average, maximum, minimum, phase>		

Item	Requirement	Compliant	Comment
	WHERE: <feeder> Feeder codename according to ENWL's database <location> geo-location compatible with ENWL's format (this can either be provided via e.g. GPS equipment or via manual updating at the data concentrator). <date> DD-MM-YY <time> HH:MM:SS <measured value/ periodic average, maximum, minimum, phase> <voltage> periodic avg V, max V, min V, (Red, Yellow, Blue) <current> periodic avg A, max A, min A, (Red, Yellow, Blue & Neutral if calculated/measured)		
9	Training, support and warranty		
9.1	Supplier to provide details of any warranty included and any support for the end-to-end monitoring solution.		
9.2	It is expected that the supplier will be available to support the installation of the monitoring equipment and where appropriate the commissioning of the data interfaces into ENW's iHOST platform. This is to include on-site support for the first x2 installations.		
9.3	In some instances training of installation and operating personnel is expected.		
9.4	Please indicate what support is offered during the project (ie following installation during the data collection phase). For instance in the event of equipment failure will the supplier inform ENW that a device has failed and will maintenance support be offered?		
9.5	ENW is working in partnership with the University of Manchester who are supporting data analysis and network analysis. It is expected that ENW will make all monitored		

Item	Requirement	Compliant	Comment
	data available to the University via database transfer via iHOST. Please indicate what support will be offered to the university during the data collection phase.		
9.6	Please indicate what warranty is provide on the total solution.		
10	Installation and Operating procedures		
10.1	Safe working procedures will be provided by equipment suppliers for review and any amendments by ENW safety officers.		
10.2	Please indicate what documentation will be provided.		
11	Equipment lead times and delivery options		
11.1	Please indicate the lead times for delivery of equipment.		
11.2	ENW is likely to need to undertake a phased installation for substation monitoring commencing in the period January 2012 to March 2012 and continuing into the early spring/summer of 2012.		
12	Deployment history		
12.1	Substation monitoring is a relatively recent activity for UK DNOs. As such please indicate how many similar installations you have undertaken for UK DNOs. Please also indicate which aspects of your proposed solution have not had any DNO field trials.		
13	Volumes		
13.1	ENW is expecting to install substation monitoring at 200 MV/LV substations as per the information in the attached pricing schedule. Please indicate how your prices would be affected by changes in the volume of sites offered. Please provide prices for 50 sites, 100 sites, 150 sites and 200 sites.		
14	Specification Compliance		

Item	Requirement	Compliant	Comment
14.1	Do you comply totally with the ENWL specification supplied for this project? Please indicate any omissions and if you intend to supply any alternative solution.		