

HIGH VOLTAGE TRANSMISSION TOWER MONITORING



APPLICATION BACKGROUND

Electricity utility companies need to monitor the high voltage transmission towers for several reasons.

There is often a need or desire to monitor the transmission voltages and currents to assist with the management of the transmission network.

There may also be a need to monitor the physical stability of the tower by using accelerometers or seismic instruments which measure earth tremors, strong winds or perhaps vandals damaging the structure.

There are some instances where vandals damaged the towers by removing / stealing parts of the structure to be sold as scrap metal.

As well as having monitoring sensors it may be desirable to have some level of video surveillance. Unidata has received many requests for enhanced remote monitoring with images for remote measurement industrial equipment. Such requests are driven by the need to see what is happening on the sites to confirm measurement instrument readings, and to have a regular, perhaps daily, image of the tower to check for any damage.

The ambient weather conditions can also be measured, like temperature, humidity, wind speed and direction. This can be achieved simply by using modern easily installed, all-in-one, ultrasonic weather transmitter.

APPLICATION DETAIL

The voltage and current monitoring is routinely performed and can be accomplished by directly connecting measurement instruments to conductors or indirectly, by measuring field effect surrounding a high voltage conductor.

There are many instruments designed to measure voltages directly, however installation of such devices requires special safety planning which may be difficult.

Simpler approach would be to use instruments that measure field strength in close proximity to conductors rather than directly connecting to them.

Electrical field strength is dependent on the voltage of the power line and remains relatively stable with the line energized.

The higher the voltage on the conductor - the stronger the electrical field around it. For example, a typical overhead distribution line at 11,000V (Volts) and 11m (meters) up in the air will produce average electric field strength beneath the line of (11,000V/11m) approximately 1000V/m.

There are other factors affecting measurement, like electrical field decrease with an increase in distance from the line, but example above is just to give general idea of the process involved.

The tower stability can be measured using any general purpose accelerometer, which detects small movements in the tower structure. If the tower is in a region prone to earthquakes, seismic instrument can be added to monitor earth movements.

For continuous monitoring of the site, a low resolution video camera or cameras can be added to take a photograph of the structure every hour as a permanent record of the structure. These images are available for engineers at a central location to be viewed and structure assessed for any possible damage.

All of the instruments can be used together to determine the stability of the structure, for example a brief disturbance in the structure would be recorded by the accelerometer and the data from all the sensors can be correlated to determine the likely cause. All of the instruments would be mounted on the tower structure, along with a small solar panel and backup battery so the power system remained independent.

Sensors can be connected to a Neon Remote Logger via SDI 12, Modbus, analog or digital inputs. Logger will scan / collect readings from the sensors on regular, custom specified or intervals. It will check for any unusual out of limits readings and routinely send data to a central Neon Server located at the electricity utility headquarters.

Logged data or alarms are sent using cell phone modem or satellite modem depending on network availability. Data is then displayed on a web browser to be viewed or could also be sent, perhaps once per minute, via web services or FTP to other processing systems for example to the main SCADA system used by the electricity utility.





TYPICAL CONFIGURATION

APPLICATION SPECIFIC INSTRUMENTS/INPUTS

Options	Unidata Part Number	Description
WXT536 measures barometric pressure, humidity, precipitation, temperature, wind speed & direction	6501V-H	Vaisala Weather Transmitter RS232/422/485 SDI-12
Field Effect Voltage sensors	Various	Analog or Digital outputs
Accelerometers	Various	Analog or Digital outputs
Small Power Monitor RTU	Various	Modbus output field Effect meters
Seismic instrument	Various	Analog or Digital outputs
RS232 Camera with 3G/4G NRT	2502E-3E-L	Neon Camera System with 3G/4G NRT
Ethernet Camera	2502B/C/F	Various IP Cameras

NEON TELEMETRY - NRL / RTU / FIELD UNITS

Options	Unidata Part Number	Description
Ethernet	3016A-000 / 3008A-000	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Ethernet & 3G/4G	3016A-C00 / 3008A-C00	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Ethernet & 3G/4G and LoRa	3016A-CL0 / 3008A-CL0	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Equatorial Orbit Satellite-Inmarsat	3016A-001 / 3008A-001	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Equatorial Orbit Satellite-Inmarsat & 3G/4G	3016A-C01 / 3008A-C01	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Low Earth Orbit Satellite - Globalstar	3016A-00G / 3008A-00G	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Satellite - Iridium Short Burst Data	3016A-00R / 3008A-00R	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Standalone RTU/NRL - Industrial	3004A-00 / 3004A-0L	Neon Remote Logger-4 Analog Ch with or without Touch Screen Display
Cellular RTU/NRL 3G/4G - Industrial	3004A-C0 / 3004A-CL	Neon Remote Logger-4 Analog Ch with or without Touch Screen Display
M – Series Standalone RTU/NRL	3004A-M000 / 3004A-M0B0	Neon Remote Logger-4 Analog Ch with or without Li Battery
M – Series Cellular RTU/NRL 3G/4G	3004A-MC00 / 3004A-MCB0	Neon Remote Logger-4 Analog Ch with or without Li Battery
M – Series LoRa RTU/NRL	3004A-ML00 / 3004A-MLB0	Neon Remote Logger-4 Analog Ch with or without Li Battery
M – Series Ethernet RTU/NRL	3004A-MEBL	Neon Remote Logger-4 Analog Ch, Li Battery & LCD are optional
M – Series Microsatellite RTU/NRL	3004A-MHBL	Neon Remote Logger-4 Analog Ch, Li Battery & LCD are optional
M – Series Iridium Short Burst Data RTU/NRL	3004A-MIBL	Neon Remote Logger-4 Analog Ch, Li Battery & LCD are optional

NEON APPLICATION SOFTWARE - CUSTOMER SERVER

Options	Unidata Part Number	Description
Neon Applications Software	2302A	Neon Server Software Licence Incl 5 NAL
Neon Applications Software	2302A-10	Additional 10 NRT Access Licence
Neon Applications Software	2302A-20	Additional 20 NRT Access Licence
Neon Applications Software	2302A-50	Additional 50 NRT Access Licence

NEON HOSTING SERVICE - UNIDATA SERVER

Options	Unidata Part Number	Description
Neon Hosting Service	2301A	Neon Data Initial Subscription Setup Fee
Neon Hosting Service	2301A-01	Neon Data Service Fee for 1-50 NRT
Neon Hosting Service	2301A-02	Neon Data Service Fee for 51-100 NRT
Neon Hosting Service	2301A-10	Neon Data Service Fee Metering

DATALOGGER MANAGEMENT SOFTWARE

Options	Unidata Part Number	Description
Starlog V4 Management Software	6308A-AUE	STARLOG V4 Full Licence Key

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