

XPG for Power System Monitoring

1 | Context

Power Monitoring

For power monitoring, voltages and currents are recorded at high sampling rates during electrical events (e.g. power disturbance, voltage dips, overvoltage, short circuit). These records can be used, for example, for post-incident analysis, predictive maintenance or equipment monitoring.

After an electrical event, an event record file (e.g. COMTRADE, PQDIF) is generated by the measurement equipment. These files can either be downloaded manually from the measurement equipment or transferred securely via a gateway to a central storage location.

XPG gateways

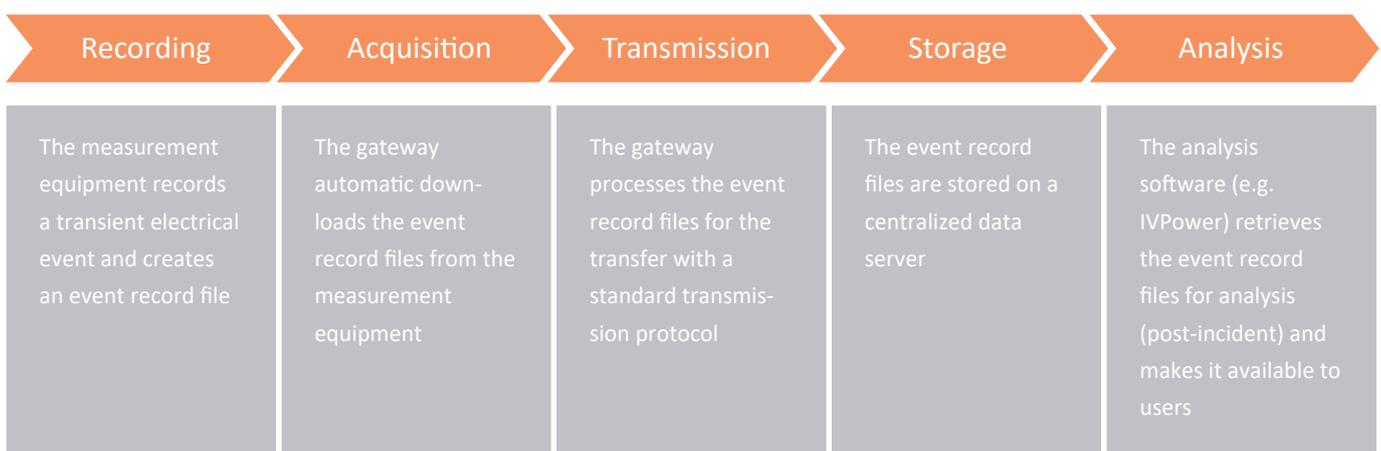
XPG is a secure multi-protocol communication gateway engineered and developed by Elvexys which allows the exchange of information between a wide range of devices such as IEDs, remote control systems, RTUs or PLCs.

The XPG Gateway software can be used in conjunction with rugged hardware in a substation or be used as a virtual machine (VM) in a virtualization infrastructure.

For more info, take a look at the [product sheet](#)

Monitoring Process

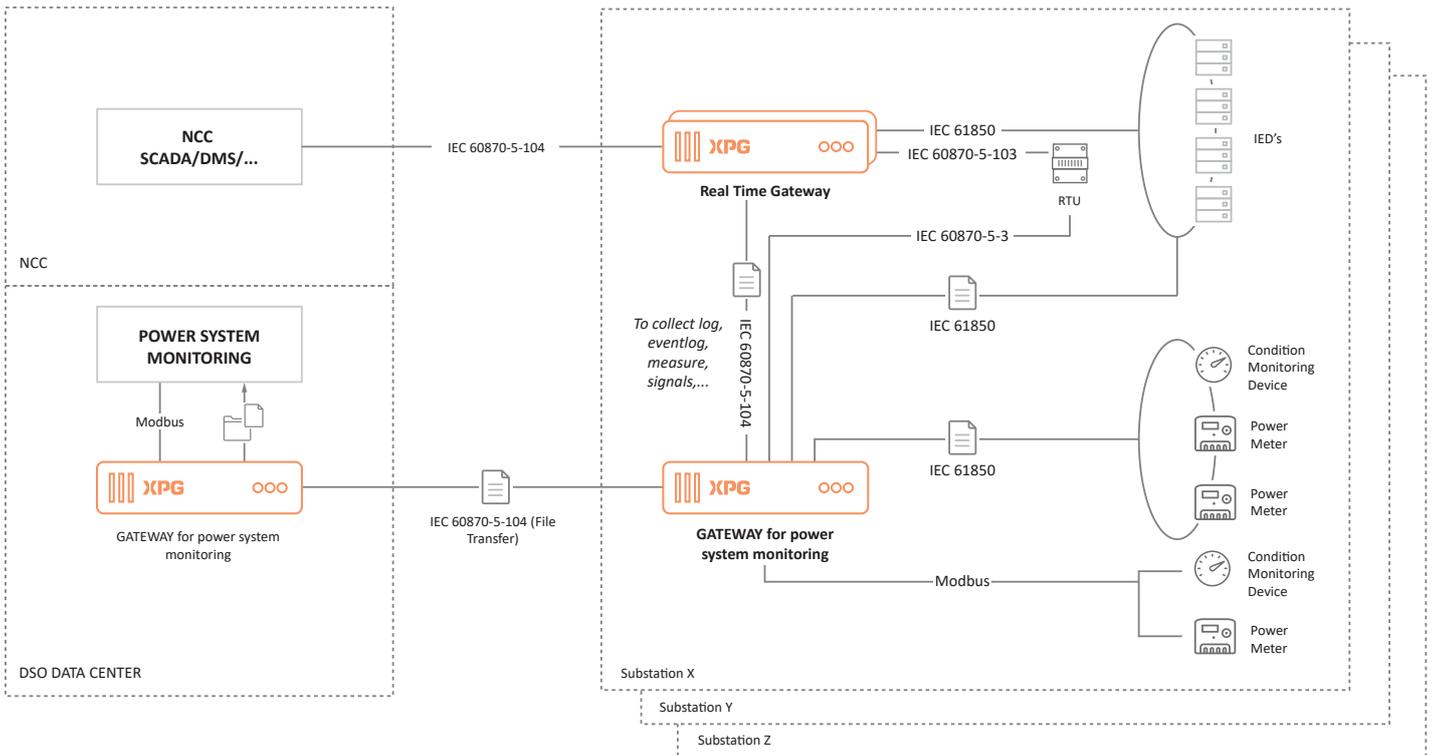
The process from data recording to the data analysis via an gateway can be described as follows.



The gateway can also collect measurements and indications via standardized protocols to provide a wide range of information to the power system monitoring.

2 | Overview

Hereunder an overview of the possibilities offered by XPG.



Storage and Analysis	Transmission	Acquisition and Transmission	Recording
<p>The solution for power system monitoring complements the information provided by the SCADA/DMS in Network Control Center.</p> <p>For the Power System Monitoring the data can be stored, visualized, processed, monitored or analyzed at different locations.</p>	<p>The data can be transmitted to different clients via different protocols through a secured network.</p>	<p>XPG gateway functionalities:</p> <ul style="list-style-type: none"> XPG gateway can be used as Real-time gateway and/or as gateway for power system monitoring XPG gateway can be single or redundant XPG can be a dedicated hardware or virtual appliance <p>XPG gateway for power system monitoring can collect:</p> <ul style="list-style-type: none"> files (COMTRADE, PQDIF, Eventlog, ...) indications measurements other data <p>XPG can transmit commands and instructions</p>	<p>In a substation different equipment can communicate via different protocols to the XPG Gateway.</p>

Overview of system architecture and XPG Gateway functionalities

3 | Benefits

Benefits of using a XPG Gateway for data acquisition and transmission:

- Remote availability of information (event records/Comtrade files)
- Fast and automatic data feedback in the case of an electrical event
- Reduced analysis and troubleshooting time and incident reporting
- No manual download at the IED required (on site)
- Allows communication between equipment of various kinds (e.g. IED, Power Meter)
- Complete and flexible protocol conversion system
- Compliant with the highest cybersecurity standards
- Secured gateway management application (StreamConsole)
- Comprehensive online configuration management platform (StreamTools)
- Full control of the Infrastructure
- Data acquisition, routing data to manoeuvre applications related to local and/or remote-control centers
- Flexible and wide range of products starting from an ultra-compact industrial PC to rackmount servers or virtual appliances
- Can be installed as software on an existing PC in your infrastructure

4 | Architecture

4.1 | In the substation

Thanks to the numerous communication protocols available with the XPG gateway (list in product sheet), you can collect data from:

- IED
- RTU
- Power Meter
- Condition Monitoring Device (e.g. for monitoring transformers)
- Etc.

The XPG gateway can be:

- Simple or redundant
- Dedicated hardware or a virtual machine

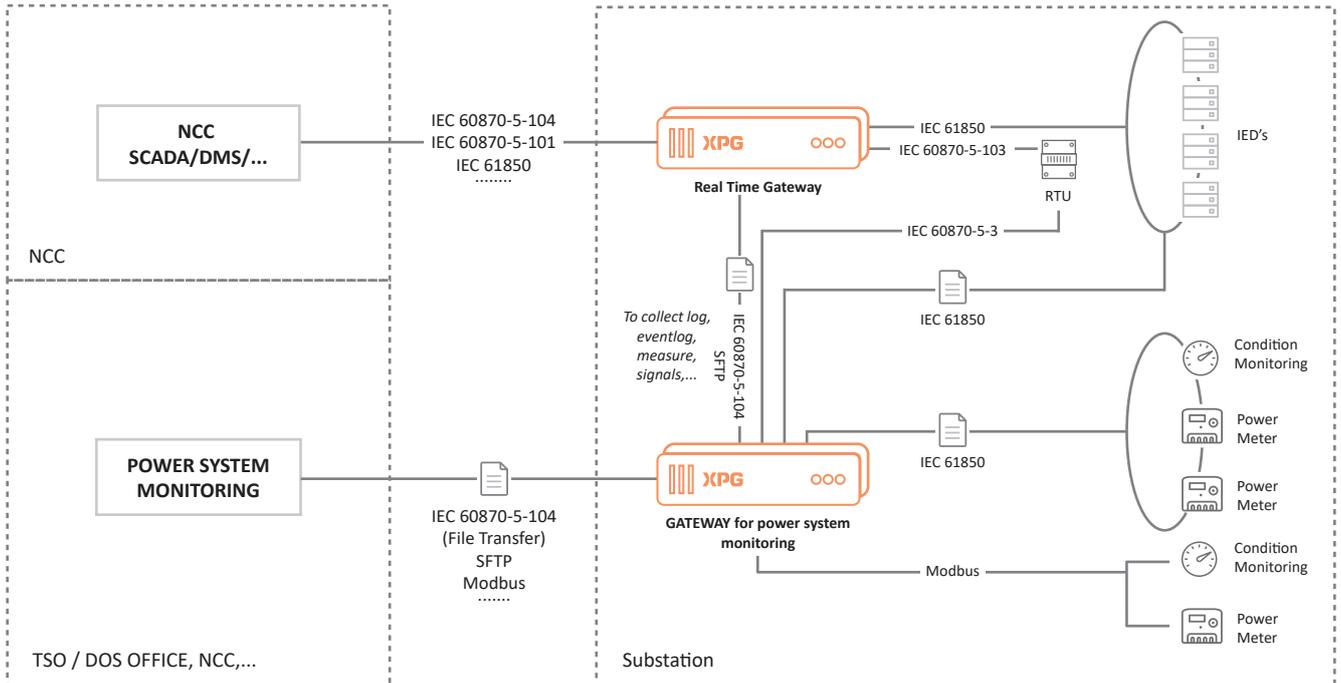
The XPG gateway is managed remotely with the secure StreamConsole application.

For this type of application, XPG gateway is compatible with:

- IEC 61850 DR (Disturbance Recording)
- IEC 60870-5-104 File Transfer
- IEC 60870-5-101 File Transfer
- IEC 60870-5-103
- SFTP

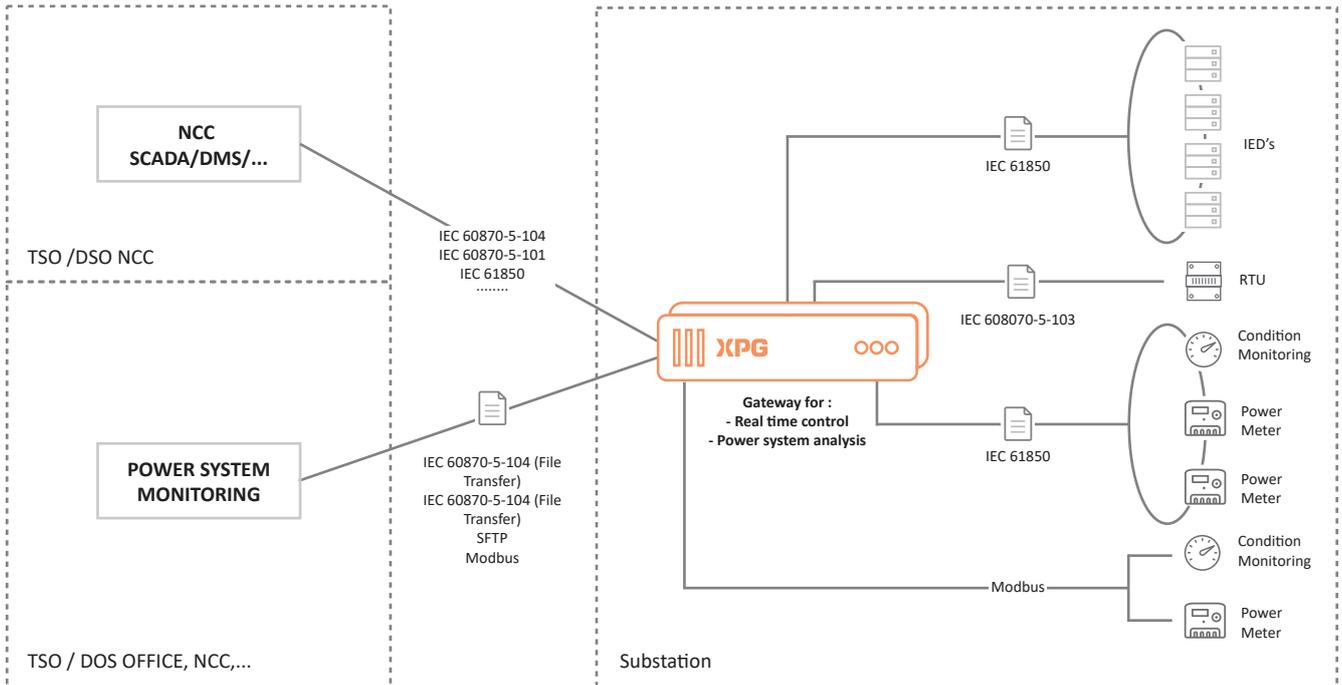
4.1.1 | XPG gateway dedicated for each specific application

- Used as a real-time gateway and as a gateway for power system monitoring
- XPG gateways, event logs and other information can be exchanged between XPG gateways



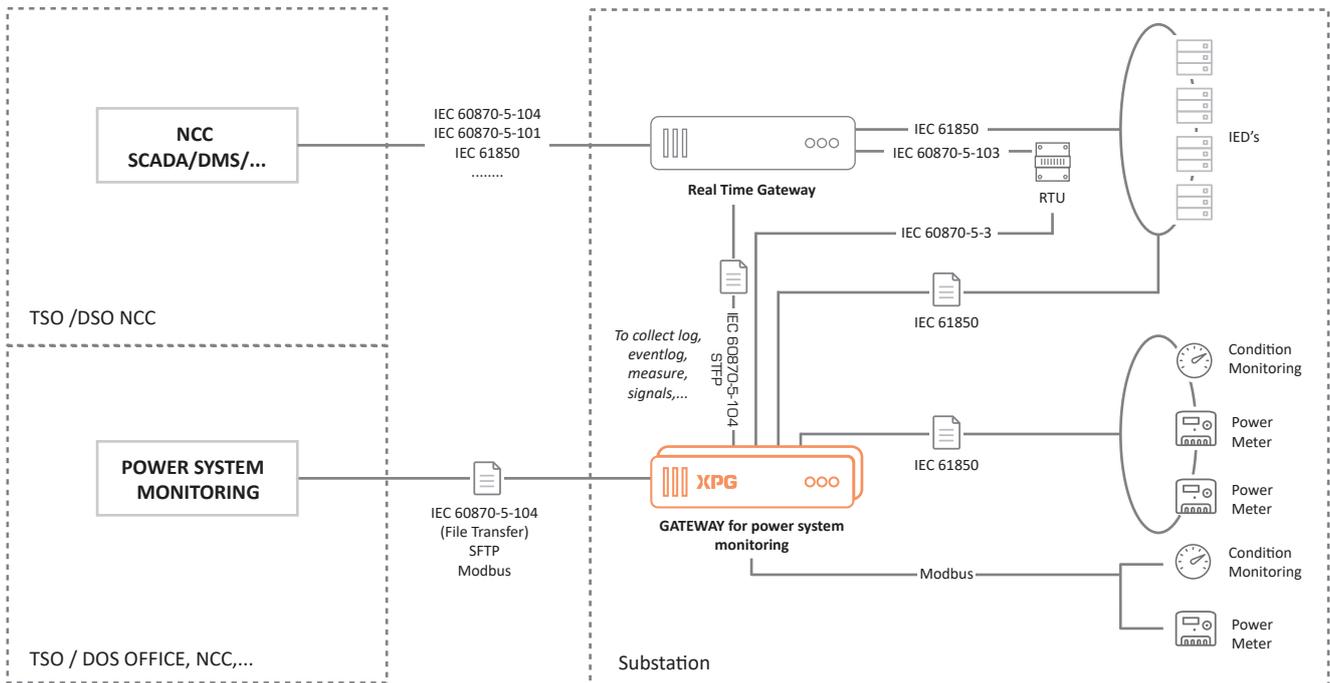
4.1.2 | XPG gateway multi-application

- Unique XPG gateway that covers the real time and power monitoring system needs
- XPG gateway can be single or redundant



4.1.3 | XPG gateway to complement a real time gateway

- Real-time gateway from another supplier (e.g. in an existing substation where a power system monitoring solution should be added)
- XPG gateway dedicated to power monitoring system
- Exchange with IEDs, RTUs, Power Meters, Condition monitoring devices, etc.
- Possible exchanges with the real time gateway according to its characteristics

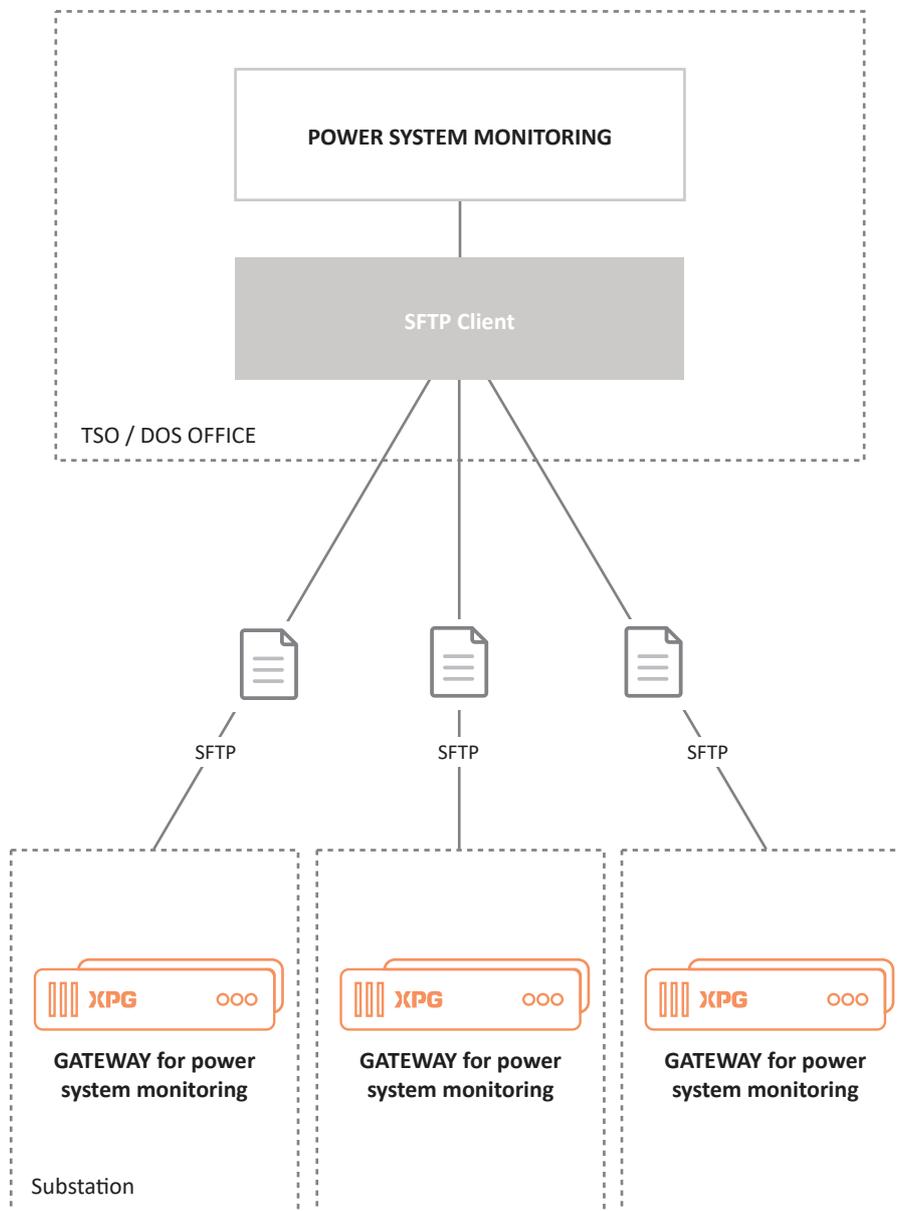


4.2 | Between substation and DSO/TSO Office

4.2.1 | File transfer only via SFTP

Direct file exchange (COMTRADE, PQDIF, Event log...) between the substation XPG gateways and the SFTP client of the power monitoring system.

No collection of measurement and indication in real time.

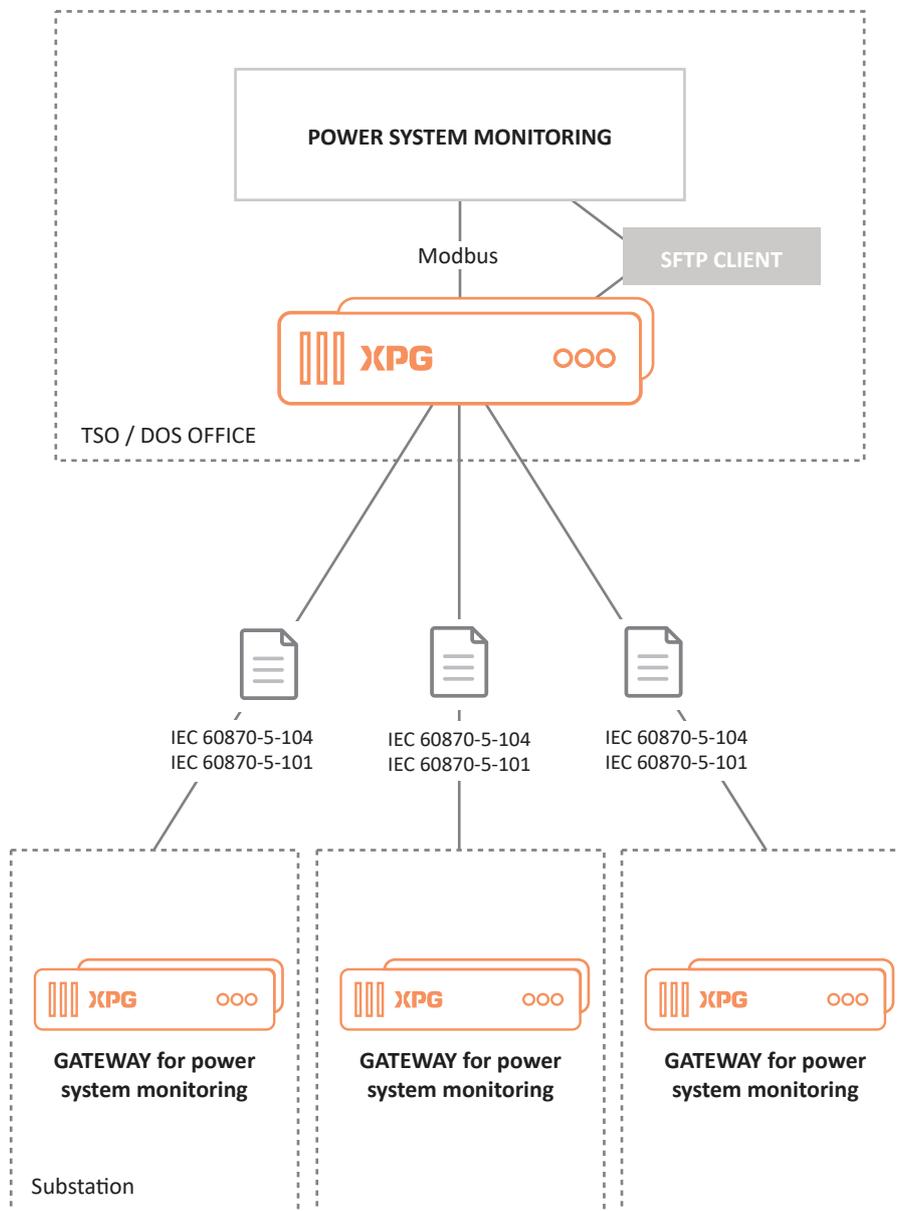


4.2.2 | File transfer + real time measurement and indication

With SFTP

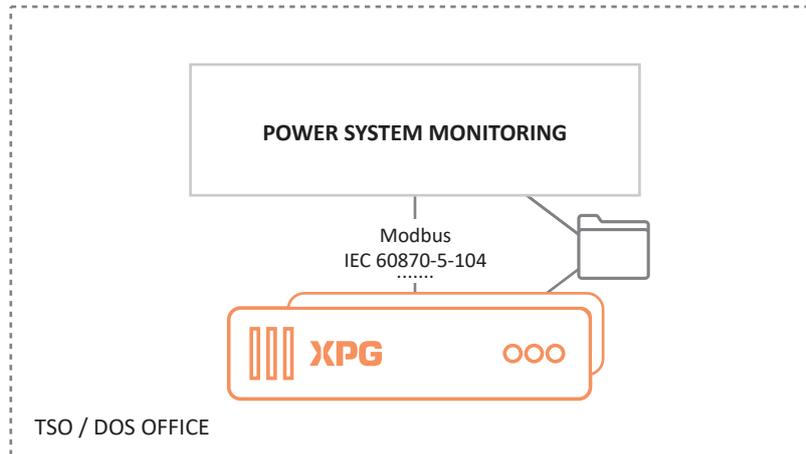
An XPG gateway concentrates the data from the substations XPG gateways. This gateway allows to have a single point linked to the power monitoring system. It can transmit the files via SFTP and the measurements and indications via a standardized protocol.

This solution allows the use of IEC 60870-5-104 or 101 standard protocols with their file transfer functionality between the substation and the office. It also allows to limit firewall rules.



With folder sharing

Same as previously but with folder sharing for file transfer



5 | Vocabulary

IEC 60870-5-101 / IEC 60870-5-103 / IEC 60870-5-104 are secured standard protocols for power system monitoring, control & associated communications for telecontrol, tele protection, and associated telecommunications for electric power systems.

IEC 61850 is an international standard defining communication protocols for IEDs within electrical substations. These protocols can run over TCP/IP networks or substation LANs using high speed switched Ethernet to obtain the necessary response times below four milliseconds for protective relaying.

Modbus is a serial communications protocol used with programmable logic controllers (PLCs). Modbus has become a de facto standard communication protocol and is now a commonly available means of connecting industrial electronic devices.

SFTP (Secure File Transfer Protocol) is a network protocol that provides file access, file transfer and file management over any reliable data network.

COMTRADE (Common format for Transient Data Exchange for power systems) is a file format for storing oscillography and status data related to transient power system disturbances.

PQDIF (Power Quality Data Interchange Format) is a binary file format that is used to exchange voltage, current, power, and energy measurements between software applications.

6 | References

TSO/DSO



POWER SYSTEM MONITORING



6.1 | Use case SIG

XPG gateway receiving COMTRADE files from IED and events logs from the real time gateway. XPG Gateway transmits the files via SFTP to the central storage server. Data is automatically available from for analysis.

SIG needed a gateway and a transmission network separate from its real-time network (IEC 60870-5-101).

