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do it your way

ENERGY E-BOOK



# Attain automated substations ergonomically, with zenon

Engineering – implementation – operation

*zenon Energy Edition offers the entire palette of functionality for automated substations. Connection to all typical field equipment and protection relays of known and unfamiliar vendors, via standard protocols, allow for freedom of choice. Implicit security through integrated command input for simple creation of command processes with or without enhanced security. Rapid creation of command objects through simple mapping of interlocking.*

# Ergonomic engineering of an automated substation

The creation of a local control system for a substation must be a simple and rapid process. Depending on the purpose of the local control system (from simple operation during communication breakdown, right up to the control points for luxurious operating and analysis) zenon can be assembled with various modular components in order to fulfill the network operator's requirements.

## ERGONOMIC VISUALIZATION THROUGH REUSABILITY

Drawing feeder and transformer bays is a recurring task in the creation of one-line diagrams for the local control system. For this zenon offers a pre-defined library of graphical objects which can be pulled into the screen per Drag&drop and substituted with the corresponding variable. The clear advantage: central object management delivers rapid results and eases maintenance considerably.

The excellent reusability of graphical objects, screens or entire projects, allows for extremely quick generation of follow-up projects. Furthermore, screens can be saved as templates in the zenon Editor (development environment). For complete automation of the project creation process, so-called Wizards can be programmed which can then automatically generate entire projects or parts of it.

## CONFIGURATION OF CONNECTIONS

In order to speed up configuration of connections e.g. based on IEC 60870, DNP3 or IEC 61850, data points can be easily imported online (from the connected device) or offline (from a description file) in zenon.

## INTERLOCKING CONCEPTS

For a proper local-remote concept, a system is needed which can influence the power of control for equipment parts or the entire plant. A thought through and consistently integrated interlocking concept which can also be combined with the user administration, offers maximum freedom for the realization of equipment according to the requirements of the plant operator.

## COMMAND INPUT

It is simple and quick to proceed with the engineering of the command input. Whether double, single, pulse or any other special command is needed, the zenon command input covers every request. It is quick to compile sets of commands in a command group and then make them available to the user via a pop-up window or context menu.



*I set up the 61850 driver, imported variables through the driver and browsed for RCB like the help files described. 2 minutes later we had the variables working spontaneous, only polling one variable.*

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## DISTRIBUTED ENGINEERING

The best scope for efficient work distribution during the creation of SCADA applications in substations lies in the distributed engineering functionality. Tested processes known from software development, are also available in zenon. Checking-out project sections prevents changes from taking place while an engineer is working with it. Only through the subsequent insertion into the complete work is it released for other engineers, so they can see and use the changes in the project. Associated with this is the seamless logging of the carried out work and version management.

## ZENON AS A GATEWAY

zenon's own gateway function enables the transmission of data or the receiving of commands from a superordinate level (e.g. control center). This software based solution can serve as a replacement for a specifically installed RTU (Remote Terminal Unit). The gateway function can be installed, also on redundant zenon servers, for critical substations.

## FAST FACTS

- ▶ Integrated command input
- ▶ All standard protocols (e.g. IEC 60870-5-101, 103,104, DNP3 or IEC 61850, GOOSE)
- ▶ Topological coloring
- ▶ Import mechanism
- ▶ Automated project creation
- ▶ Interlocking and user administration are combinable
- ▶ Distributed engineering
- ▶ Replace screens and symbols
- ▶ Structured text and CSV variable import
- ▶ DNP3 device profile and variable import
- ▶ Gateway function for soft RTU





## Ergonomic implementation of an automated substation

Commissioning, Factory Acceptance Test (FAT), Site Acceptance Test (SAT) and trial operation are phases of a SCADA application, which need to be looked at with particularly critical eyes. It is therefore important for a system integrator to have the correct tools available to achieve the required results even in highly stressful situations.

### DRIVER SIMULATION

zenon offers the programmed driver simulation – in order to present a customer with the entire functionality of the SCADA application for a FAT, even when there are only parts of the substation available to start with. It is therefore possible to simulate the performance of devices and processes, as if they were really existed. One can carry out the demonstration with the defined data points, which are based on the correct driver. It is therefore possible to show customers the screens and functionalities in the way which they will look in the real equipment, and it is not necessary to present switching elements which are marked with INVALID.

### NETWORK TEST

For the SAT the standard communication is normally tested first, and after that each variable is checked. Via SNMP and a system driver the entire network infrastructure can be monitored on a system overview screen. By means of corresponding variables the connection status with the individual devices is determined, before the data point test is carried out. At first the variable status screen is used for the data point test. This is an own screen type with which a list of variables according to filter settings can be connected. Alternatively several variable overviews can be created whereby a symbol with variable name and value are composed and used in a screen as often as desired. Proper representation of the screens can be started once it is ensured that all variables have the correct connection to the devices.



### DRIVER CONNECTION ANALYSIS

If the project happens to not function as it should, the Diagnosis Viewer can support you. This offers the excellent opportunity for analysis of driver connections which are not delivering what they are expected to.

### MANUAL DATA HANDLING

What can you do when the test operation should have started but not all equipment parts have yet been set up in the automation and control components? No problem: With zenon all variables can be displayed and simulated on the screen, even before they are connected to the process and only known in zenon.

### USER RIGHTS IN ENGINEERING

To clarify the liability question from the start regarding changes in the system: the zenon Editor (zenon's engineering tool) can be provided with access rights. It is therefore ensured – even during test operation – that only authorized users can undertake changes.

#### FAST FACTS

- ▶ FAT: Process simulation via programmed driver simulation
- ▶ SNMP- and system driver for system overview
- ▶ Variable diagnosis window
- ▶ Own variable overviews made easy
- ▶ Diagnosis Viewer, if driver connections are not working as they should
- ▶ Manual correction for not yet reported variables in the system
- ▶ User administration in the Editor: only in areas where change is permitted

# Ergonomic operation of a substation

Operation of a substation is then ergonomic, if everything is working like clockwork and the substation can stay unmanned. Yet it is still possible that it is necessary for the plant to be staffed. It is important in such cases, to give even untrained employees a tool with which they can intuitively work.

## INTERLOCKING AND USER RIGHTS

At first, a possible operating error should be prevented by the system itself. For this a switch gear protection is used to call the user's attention to this. Here interlocking and topology check for command input can support. The system detects, independently or via preconfigured rules, that a certain (switch) handling can have a negative impact on the equipment.

To be sure that only authorized employees can edit commands, the user administration verifies if the user has the necessary access rights. The zenon based user administration which is also combinable with Windows Active Directory, is also used in the pharmaceutical and food industries due to its security benefit.

## WATCHDOG TIMER

Critical events often involve many switch operations to be carried out directly one after another. The user can, however, not wait at every disconnecter to reach its final end position, but must proceed directly to the next action. So that intermediate positions are not overseen, zenon can bring the user's attention to it via alarm or a blinking symbol. The so called watchdog timer is an integral part of zenon's command input.

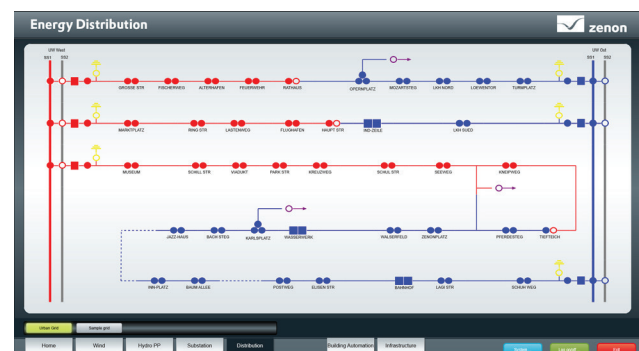
## SECURITY RULES

The five security rules for running tasks with electrical equipment:

1. Disconnect completely;
2. Secure to avoid re-connection;
3. Verify that the installation is dead;
4. Carry out earthing and short-circuiting;
5. Provide protection against adjacent live parts.

## SWITCH LOCK / COMMAND

In order to fulfill the second of the five security rules "Secure to avoid re-connection", the switch lock is an integral part of the command input modul. Per locking code a switch is put into a condition in which it is no longer possible to control the switch. Only after taking various steps, including entering an lockout code entry, can the switch be used again, and that being across the zenon network. The locking and unlocking of the switch is logged in the chronological event list.



zenon's command input is capable of much more than the standard commands of ON and OFF: Switches and variables of entire branches can be switched to revision (no alarm), decoupled from the process (no data transfer) or switched to a replacement value (no data transfer and new value for the system).

### MANUAL DATA HANDLING

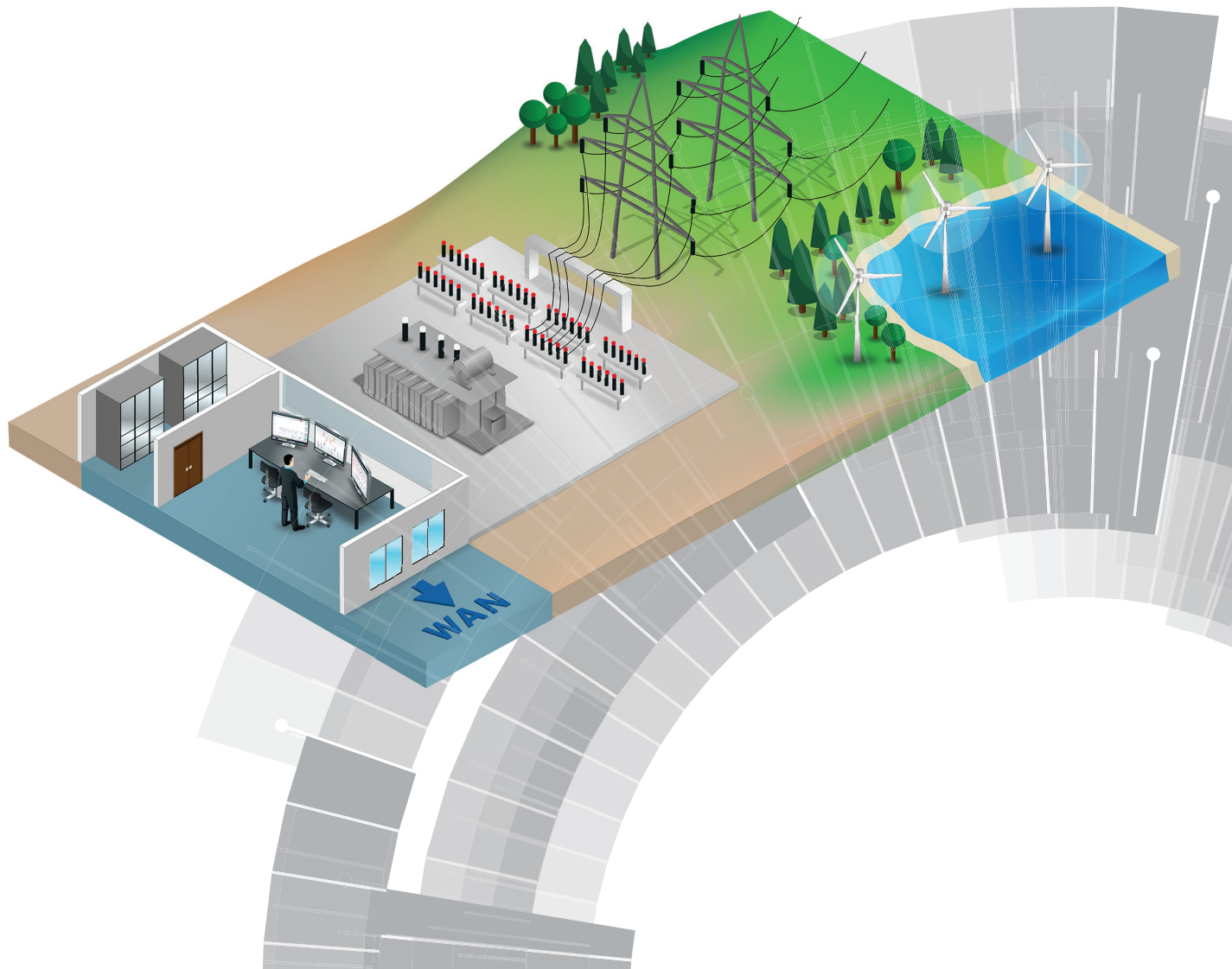
Switches that are only available in the screen but not (yet) transmitted, can be brought into the according position with so-called manual correction.

### BREAKER TRIP DETECTION

Immediate information regarding an independently triggered circuit breaker is then important when for e.g. the protection relays aren't reported yet. zenon can let the user know in the form of alarms or special display of symbols. Furthermore it is possible to suppress the switch operation detection, for example through the connection with a place/remote control switch.

### LOGGING VIA CEL, AML AND ARCHIVE

For automatic and timely accounting of the equipment operation the Chronological Event List (CEL) delivers information. This displays all configured messages as well as messages on the system itself. The required information for analyses and reports are put together via filters. The list is stored in the system in a binary format, so that it cannot be manipulated with afterwards. Furthermore, the operator can comment on the list entries for more efficient traceability.







Other than the Alarm Message List (AML) in which numerous and filtered alarms and their status are displayed, zenon also recognizes so-called alarm areas. This can lead the on-site employees from the aggregated alarm overview to the detail view of the actual problem. A further component which makes up an ergonomic process control system.

Besides the events which are displayed in the Chronological Event List or in the Alarm Message List, the data can also be logged in a measured-value archive. Therefore all data from the process are made available for analyses and reports. The measuring curves can be precisely assessed in the trend display and compared with binary signal states or other measuring curves. Typically counter values are evaluated in reports, displayed in tabular or graphical form, stored, printed or forwarded via data transfer.

Fault records from protective relays can be read manually or even automatically and stored in the system or passed on to the superior instance (control center). Such automatism is made possible thanks to the appropriate fully implemented IEC 61850, IEC 60870, DNP3 or FTP protocols.

### FAST FACTS

- ▶ Automated unmanned substation but also user friendly
- ▶ Topology check
- ▶ Command input – interlocking
- ▶ User administration
- ▶ Command input – watchdog timing
- ▶ Alternative value, revision, Off
- ▶ Manual correction, switch locking
- ▶ Breaker tripping detection
- ▶ Chronological Event List
- ▶ Alarm management – user guidance
- ▶ Archiving, trend analysis
- ▶ Reports
- ▶ Disposal and forwarding of fault records



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