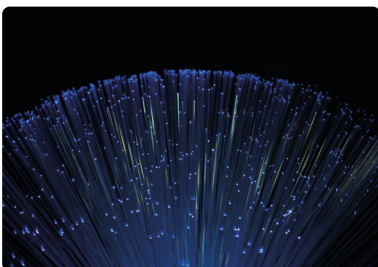
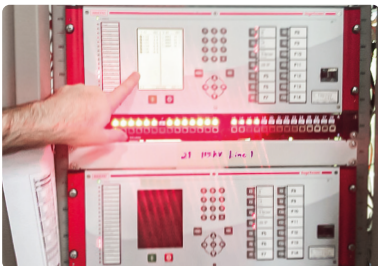


# CASE

# STUDY

IEC 61850 communications laboratory  
Thailand



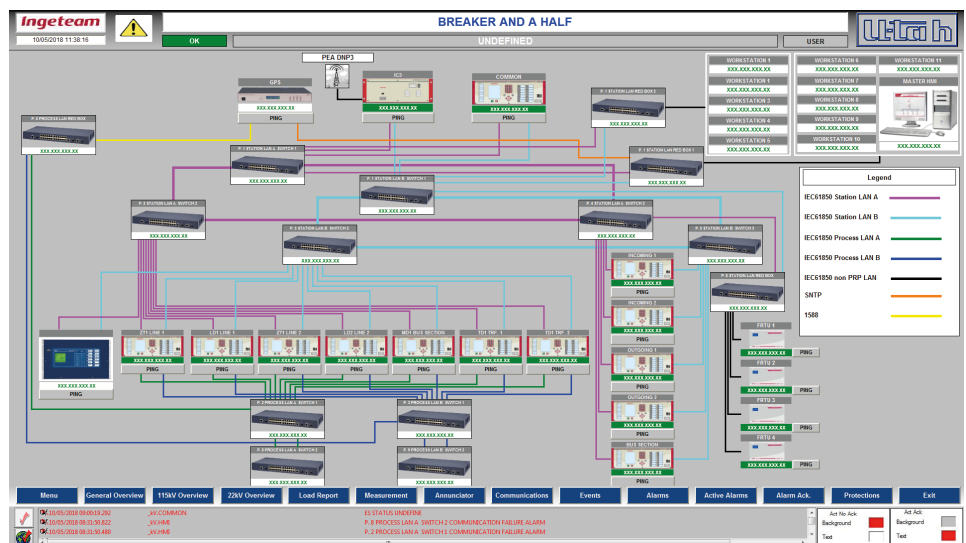
The IEC 61850 Communications Interoperability Laboratory is a major project developed by our local VAR (Value Added Reseller) in Thailand, **Power Utah Group Co. Ltd.** This new laboratory belongs to PEA, the public electricity company in Thailand.

The laboratory will allow to **simulate** the behavior of control and protection systems with different topologies and schemes, such us: Breaker and a half, H Scheme, Double busbar, Double busbar with double breaker and Main and Transfer.

These new facilities will serve as a platform for the study, testing and validation of protection and control systems based on the IEC 61850 standard with different communications architectures and features.

## Applications

- Interoperability testing
- Control systems simulation
- Training
- Fault and data analysis



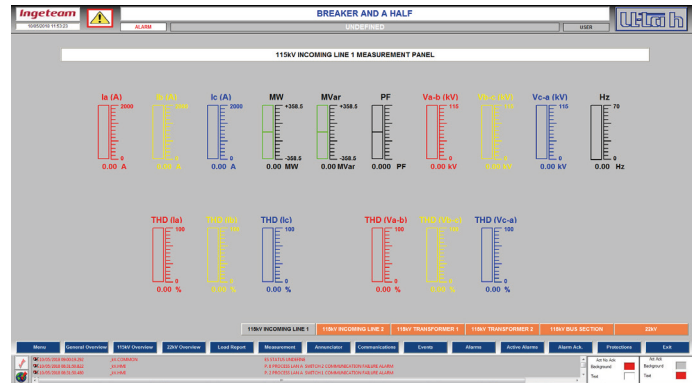
# Digital substation

The evolution of the electrical grid in recent years and the advancement in the field of communications allow an ever greater **digitization of the network**. The smart grid needs information to draw from, and this **information** is obtained from the substations and the equipment installed in it. This concept of information exchange has been called a **digital substation**, and everything that surrounds it is what will allow it to be evaluated with the new laboratory

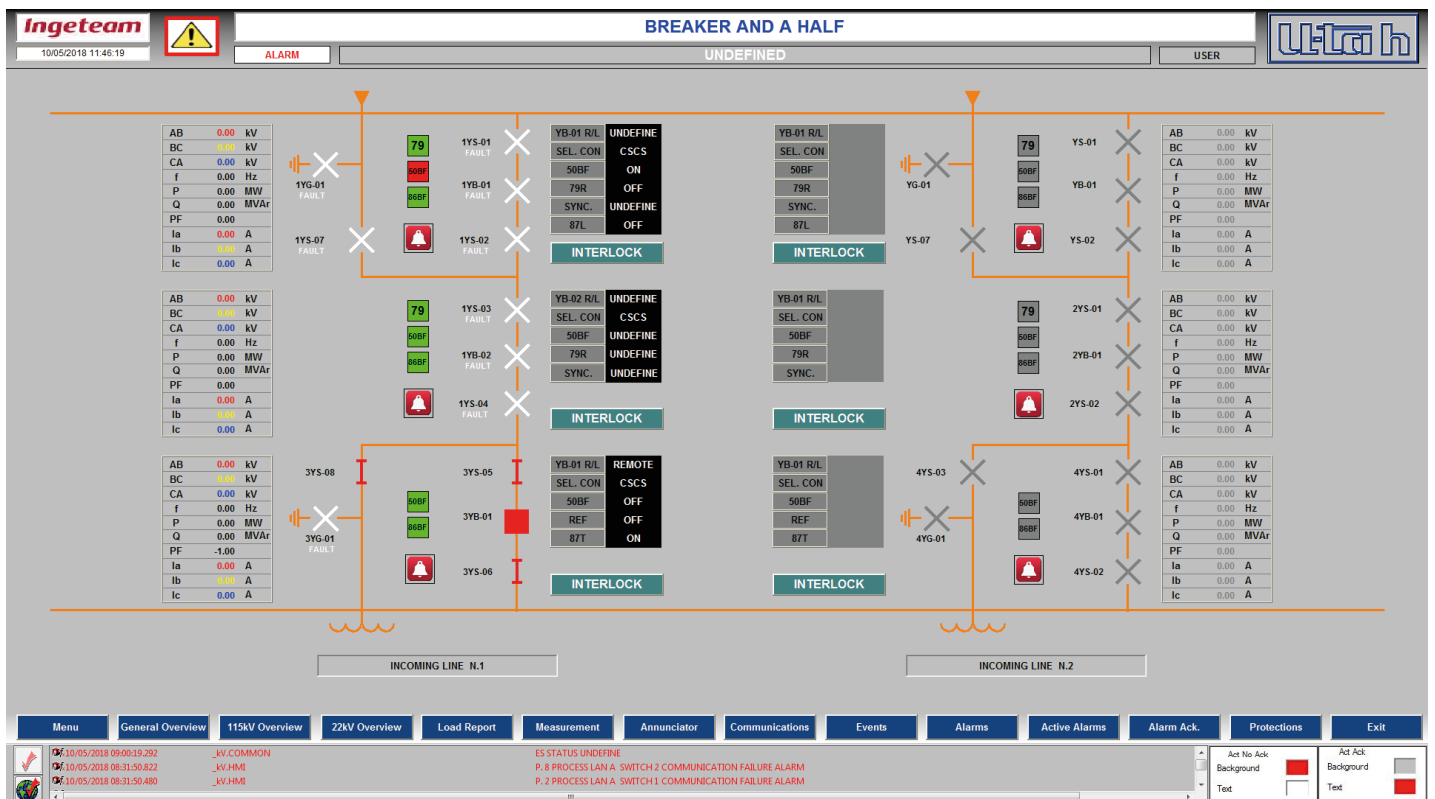
Digital substations introduce a series of improvements in the management of facilities: **centralization** and **ease of access** to all parameters and values in real time, which allows easier monitoring and analysis of data, **reduction of copper cabling** and related interference, the creation of **safer facilities**, the **reduction of installation times**, etc.

The new laboratory supports the configuration of systems with **different degrees of digitization**, from protection and control systems with traditional standards to the latest requirements based on the **IEC 61850-9-2 section**. This update to the IEC 61850 standard describes, among other things, the process bus and the transmission of Sampled Values.

Likewise, it also allows simulating different types of **architectures**: from the simplest to those with different types of **redundancy**, such as PRP or HSR technologies. On the other hand, there is the option of managing various types of **synchronization** methods, from the most traditional to the newest, such as **IEEE 1588**, which handle time accuracies below the millisecond.



Measurements



Single line diagram



# Advantages and features

Sampled Values, GOOSE messages and IEEE 1588 monitoring



The main advantage of the laboratory is that it does not require a large number of different equipment to be able to implement all the different possibilities that the digitization of substations offers. This is achieved thanks to the **INGEPAC™ EF product range** of equipment, which under the same hardware allows both to be used in **conventional substations**, directly measuring voltages and currents, and in those that have the **process bus** implemented, thanks to the capture of Sampled Values, and to the transmission/reception of **GOOSE messages**.

Also, with a simple setting, the same equipment can be used in **simple or redundant (PRP, HSR) communication networks**, or with one type of **synchronization or another (IEEE 1588, SNTP)**.

Equipment is as important as having the tools to configure and analyze the data and information that is processed with them. For this, different **monitoring, operation, analysis and maintenance workstations** have been installed based on our **INGESYS™ IT and INGESYS™ eFS software packages**.

The **INGESYS™ control system** has been installed with different modules and licenses on more than **10 workstations**, in order to enable **different users**, depending on their profile, to run, analyze and configure the system in parallel. This **parallel configuration** multiplies the **options for use and application** of the installed equipment.

The entire system has the necessary **cybersecurity and access control**, which, on the one hand, avoid possible external interference in the laboratory and, on the other hand, enable the testing and validation of the most appropriate configurations prior to their installation.

# Overview

## System control

Substation gateway for SCADA/DMS (IEC 61850/DNP3)	INGESAS™ IC3
GPS (IEEE 1588)	1093B
Router / firewall	RX1500
HMI with monitoring, engineering and maintenance software	12 x INGESYS™ IT - eFS

## Protection and control equipment (high voltage)

Line primary protection (87L, 21) + BCU	2 x INGEPAC™ EF LD
Line backup protection (21) + BCU	3 x INGEPAC™ EF ZT
Busbar primary protection (87B)	487B
Busbar backup protection (multifunction)	1 x INGEPAC™ EF MD
Transformer protection (87T, REF) + BCU	2 x INGEPAC™ EF TD

## Process bus

Merging unit and digital interface	7 x INGEPAC™ EF PB
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## Protection and control equipment (medium voltage)

Feeder protection + BCU	2 x INGEPAC™ EF MD
Incoming protection + BCU	2 x INGEPAC™ EF MD
Bus section protection + BCU	1 x INGEPAC™ EF MD
Capacitor bank protection	P142
Protocol converter	INGEPAC™ TCP

## Common signals

Common signals BCU	1 x INGEPAC™ EF CD
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## Feeder automation unit

Feeder remote terminal Unit (FRTU)	4 x INGEPAC™ DA
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## Communication switches

Station bus switches	4 x MAR1040
Process bus switches	6 x MAR1040
Redbox	4 x RSP25

## Highlights

- Simulation of control systems with different types of redundancy or synchronization: PRP/HSR, SNTP/IEEE 1588
- IEC 61850 interoperability testing. IEC 61860 or serial equipment Integration tests
- Different architectures and protection schemes systems simulation: Breaker and a half, H Scheme, Double busbar, Double busbar with double breaker and Main and Transfer.