

Using zenon for extra-high and high-voltage substation automation

Substation Automation Systems for the Greek IPTO

Independent power transmission operator IPTO SA needed to build an air-insulated 400/150kV substation in Megalopolis, Greece, and modernize some of its older high-voltage substations. Using the zenon software platform for substation automation from COPA-DATA, IPTO's implementation partner, PROTASIS, realized these projects ahead of schedule.



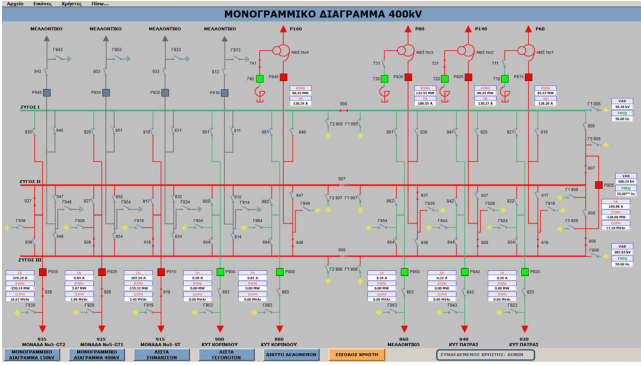
Contrary to what the name might suggest, Megalopolis is a small town. With fewer than 10,000 inhabitants, it derives its significance from criteria other than size. It is the site of power units fired with locally mined lignite coal. This is supplemented by two 400-MW combined-cycle gas turbine (CCGT) blocks and, thus, it is a vital source of electricity for southern Greece. Located in the center of the Peloponnese peninsula, Megalopolis is a vitally important junction in the country's power grid.

CLOSING ELECTRICITY TRANSMISSION GAPS

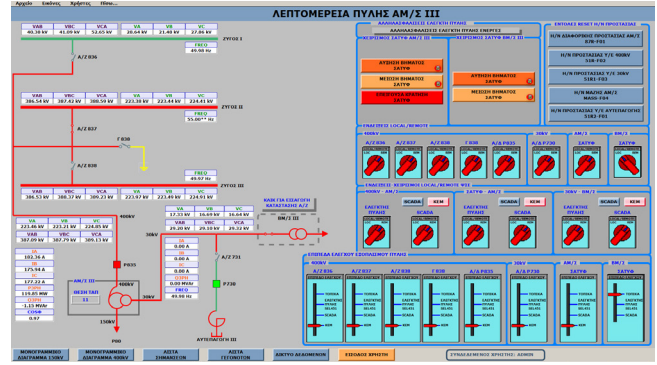
The Greek electricity transmission system is operated, maintained, and developed by the Independent Power Transmission Operator (IPTO) SA. It consists of more than 11,500 kilometers of high- and extra-high-voltage (EHV)

transmission lines and more than 350 substations. It features submarine connections to the Greek islands as well as links to five neighboring countries.

The system's backbone, three double-circuit 400 kV lines, transmits electricity mainly from Western Macedonia – where 70% of the country's generation capacity is located – to the major electricity demand centers of Central and Southern Greece. As part of a long-term plan to improve the reliability of electricity supply throughout Greece, the 400 kV network is being extended to the Peloponnese. The two lines crossing the Corinth Canal and the Gulf of Patras meet at Megalopolis. This made it necessary for IPTO to build a new 400 kV / 150 kV substation there.



IPTO’s MEGALOPOLIS is the first 400 kV substation in Greece with a zenon-based automation and visualization system.



The zenon-based SAS provides operators with an life-like, ergonomic representation of the automatic transformer bay.

A CRITICAL NODE IN THE TRANSMISSION SYSTEM

As a critical node of the Greek transmission system, the newly erected Megalopolis 400 kV extra-high-voltage air-insulated substation features 36 bays with 400 kV, 150 kV and 30 kV equipment, making it a very large and complex installation.

“The aim was to get an EHV substation that meets the highest standards with regard to automation and flexibility,” states Athanasios Georgopoulos, director of IPTO’s Transmission New Projects department at the time. “As the gas-fired unit was approaching completion, the project was of strategic importance for IPTO and it was critical for it to be commissioned and in service as soon as possible.”

IPTO is a member of ENTSO-E (European Network of Transmission System Operators for Electricity). When it comes to building transmission projects and substations, the company has ample skills and experience required for the engineering and construction of the required structures and primary equipment. For the implementation of a digital substation automation system (SAS), however, IPTO decided to outsource the project to a contractor and consultancy with the appropriate qualifications and experience.

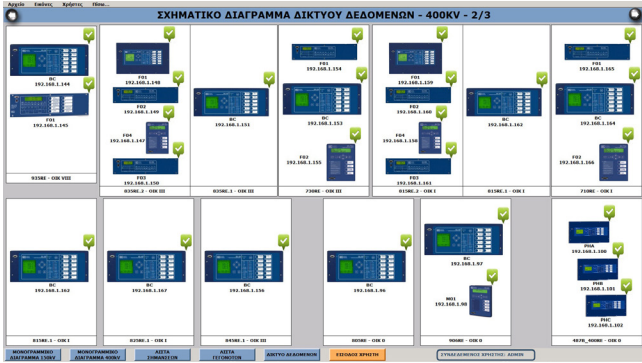
A STATE-OF-THE-ART DIGITAL EHV SUBSTATION IN GREECE

IPTO issued a public tender for a flexible, reliable, fail-safe, ergonomic, and feasible SAS solution. The contract was awarded to PROTASIS, an engineering and consulting company that provides services and solutions for transmission

and distribution utilities, power generation companies, and industrial facilities. PROTASIS is considered one of the leading companies in power systems analysis and consulting and a qualified solutions provider of electrical protection, control, automation, and metering systems in the international market.

PROTASIS is a silver partner of the global COPA-DATA Partner Community (CDPC), a global network of specialists in the fields of industry and energy automation with a successful installation record of more than 25 HV substation automation systems. In search of a cost-effective and stable solution, the Athens-based company used intelligent electronic devices (IEDs) for power grids from Schweitzer Engineering Laboratories (SEL). PROTASIS specialists created the substation automation system (SAS) using zenon, the software platform from COPA-DATA for manufacturing and the energy industry that is used to control, monitor and optimize equipment.

zenon software is widely used to control substations around the globe. Projects using zenon are highly scalable. The software can be implemented as an on-site control system, as process visualization in the control room or as a gateway to higher-level control systems. One of the software platform’s particular strengths is its open and reliable communication with installed equipment through open interfaces and over 300 native drivers and communication protocols. Another strength of zenon is its principle of setting parameters instead of programming; making it easy to create comprehensive projects with complex functions. The software platform also provides seamless redundancy in several different ways for a guaranteed uninterrupted electricity supply.



zenon’s flexible engineering environment enabled system integrator PROTASIS to create an extremely cost-effective, easy to use and reliable EHV SAS ahead of deadline.

“ Due to the seamless redundancy of the system, IPTO’s operators feel confident they are working on a system that will not fail at critical moments. Superior ergonomics provide them with all the required information accurately and in an easily readable form. ”

ATHANASIOS GEORGOPOULOS, DIRECTOR OF THE NEW TRANSMISSION PROJECTS DEPARTMENT, IPTO S.A.

EFFICIENT, RELIABLE SAS AHEAD OF SCHEDULE

Using the “seamless redundancy” functionality within zenon, PROTASIS provided IPTO with a reliable SAS based on two powerful servers operating with hot standby redundancy. It guarantees zero data loss even in the short time period between the breakdown of one processor and the take-over by the backup.

The solution features two separate remote terminal units (RTUs) for the 150 kV side and the 400 kV side. They provide all communication between the substation and the remote control center (RCC) of the Hellenic Transmission System. While the IEC-61850 suite of protocols is used for communication with the substation IEDs, communication with the RCC uses the

HNZ protocol, a proprietary CEGELEC protocol. This topology ensures the reliability of communications with the RCC without the need for extra interface panels.

The MEGALOPOLIS EHV substation is the first zenon-installation in an EHV substation in Greece. Not only this, it is the first 400 kV SAS PROTASIS has implemented using zenon for automation and visualization in combination with IEDs from SEL. “The size and complexity of the project inspired us to discover powerful functions of zenon of which we were unaware before this project,” says George Arvanitis, project manager at PROTASIS. “With zenon, we delivered an ergonomic and powerful substation automation and visualization system in the form of an extremely cost-effective, complete solution that is both easy to use and reliable.”



The superior ergonomics of the zenon-based substation automation and visualization system provides operators with all the required information accurately and in an easily readable form.

“Due to the seamless redundancy of zenon, operators feel confident that they are working on a system that will not fail at critical moments,” Athanasios Georgopoulos agrees. “The superior ergonomics of the zenon Runtime environment provides all the required information accurately and in an easily readable form.”

“zenon’s IEC 61850 driver configurator and wizards, as well as its bay replication capabilities, allowed us to provide the SAS in a very short time,” adds Arvanitis. “Thanks to the software platform’s flexible engineering environment, we created an application that is both intuitive and robust – all ahead of the contractual deadlines.”

Following this project, PROTASIS has signed a contract for the retrofit of the existing 150 kV “MEGALOPOLIS I” substation with new protection and control IEDs. It will be the first substation in Greece featuring IEC 62439-3 PRP network topology and, of course, its SAS will now also be based on the versatile zenon software platform.

HIGHLIGHTS:

- ▶ First 400 kV SAS in Greece using zenon for automation and visualization
- ▶ Integration of digital hardware
- ▶ IEC 61850 communication with IEDs
- ▶ Communication with the grid using a proprietary protocol
- ▶ Hot-standby redundancy guarantees zero data loss
- ▶ Cost-effective, complete solution that is both easy to use and reliable