SUBSTATION AUTOMATION SYSTEMS (SAS):

PROTECTION & CONTROL

AUTOMATION SYSTEMS

COMMUNICATION SOLUTIONS

GLOBAL ENGINEERING SERVICES

IEDs, systems and services designed to meet utilities, industry and EPCs’ requirements worldwide
CG is a global organization with a broad portfolio of products and services, ranging from high-end Power and Industrial Solutions to lifestyle Consumer products. CG is present in 85 countries with more than 16,000 employees across the world.

CG Automation BU is dedicated to the design, manufacture and marketing of digital protection, control, metering, communications equipment and systems for generation, transmission and distribution electric utilities, industries and EPC contractors worldwide; and automation systems for transit and water utilities.

CG Automation headquarters located in Bilbao, Spain, host the center of excellence for the development of CG’s smart grid solutions commercialized under ZIV® brand.

CG Automation business unit offers to the market a complete Substation Automation System portfolio (ZIV SAS).

A portfolio based on in-house developed technologies and a unique mix of knowledge and experience in protection & control, communications and metering technologies.

- References in over 85 countries
- For Generation, Transmission and Distribution Utilities, Industries and EPC Contractors.
SUBSTATION AUTOMATION SYSTEMS (ZIV SAS)
PRODUCT LINE PORTFOLIO FOR HV AND MV POWER SYSTEMS:

1. Integrated PROTECTION AND CONTROL SYSTEMS including a variety of supervision and automation functions


3. AUTOMATION SYSTEMS: an intelligent information platform: Modular RTUs, SAS gateway & SCADA.

4. GLOBAL ENGINEERING SERVICES: system integration, commissioning and training

Making the Smart grid real
Intellitool is ZIV’s new software application, user friendly and capable to configure all ZIV IEDs:

- Intelligent Electronic Devices (IEDs)
- Substation Central Units (RTUs)
- GPS clocks
- Switches
- Terminal Servers
- Merging Units
- RIO modules

Key features:
- Multiprotocol (IEC 61850, DNP3, IEC 101/104, Modbus)
- Graphic Interface (drag & drop mode)
- Graphic Editor for Logics (IEC 31131, function block diagram)
- Project mode /stand alone mode
- Partial insertion of elements
- Automatic mapping of user signals
- Third-party IEDs integration.
## PROTECTION & CONTROL IEDS

<table>
<thead>
<tr>
<th>MAIN FUNCTION</th>
<th>I61850</th>
<th>PROTECTION</th>
<th>CONTROL</th>
<th>GRAPHIC HMI</th>
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<tbody>
<tr>
<td><strong>LINE PROTECTION</strong></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>ZLV        Distance</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>DLX        Differential</td>
<td>X</td>
<td>X</td>
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<tr>
<td><strong>BUSBAR PROTECTION</strong></td>
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<tr>
<td>DBC + DBP   Differential</td>
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<td>X</td>
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<tr>
<td>DBC + DRV   Differential</td>
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<td>X</td>
<td>X</td>
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<td><strong>TRANSFORMER PROTECTION</strong></td>
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<tr>
<td>IDV        Differential</td>
<td>X</td>
<td>X</td>
<td>X</td>
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</tr>
<tr>
<td>IDX        Differential</td>
<td>X</td>
<td>X</td>
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<tr>
<td>AEGIS T     Differential</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RTV        Voltage regulator</td>
<td>X</td>
<td>X</td>
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<tr>
<td><strong>FEEDER PROTECTION</strong></td>
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<tr>
<td>IRV O/C     Multifunction</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>IRX O/C     Multifunction</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AEGIS F O/C Multifunction</td>
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<td>X</td>
<td></td>
<td></td>
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<tr>
<td><strong>CAP. BANK PROTECTION</strong></td>
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<tr>
<td>BCV        O/C+unbalance + switching logic</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td><strong>BAY CONTROL UNIT</strong></td>
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</tr>
<tr>
<td>MCV        Bay control unit</td>
<td>X</td>
<td>X</td>
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<td></td>
</tr>
<tr>
<td>SmartBay   Bay control unit</td>
<td>X</td>
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<tr>
<td><strong>BREAKER</strong></td>
<td></td>
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</tr>
<tr>
<td>IRV        Breaker protection</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>SCT        Trip coil supervision</td>
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<tr>
<td><strong>SINGLE FUNCTION RELAY</strong></td>
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<tr>
<td>CPI        O/C</td>
<td>X</td>
<td></td>
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</tr>
<tr>
<td>CGI        O/C</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPI        U/V + O/V</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CGV        U/V + O/V</td>
<td>X</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>FGI        Frequency</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WDI        Reverse Power</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MXI        Motor</td>
<td>X</td>
<td></td>
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<tr>
<td>CGI 14S    Self-powered O/C</td>
<td>X</td>
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<td></td>
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<tr>
<td>SCI        Synchro-check</td>
<td>X</td>
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</tbody>
</table>

**Making the Smart grid real**

- **DLX**
  - Line Protection
  - Differential
- **IRX**
  - Feeder Protection
  - O/C Multifunction
- **DBC + DBP / DRV**
  - Busbar Protection
  - Differential
- **CGI 14S**
  - Self-powered
  - Overcurrent Protection
COMMUNICATION SOLUTIONS

Multiple communication technologies

ZIV telecom solutions make possible the integration of all the available automation functions, enable communications between substations, control centers and even allow data to be exchanged between different distribution load centers.

Standards

We believe that the main challenge for electrical utilities is the seamless implementation of communications networks using multiple technologies, and combining a variety of systems with different capacities and security levels.

Security

The combination of communications + security + standards will be essential for successfully implementing the electrical distribution grids of the future.

ZIV Communications Engineering services will make sure you have the right communication solution at the right cost.

More than 11,000 Power-Line Carrier Systems installed worldwide.

Around 13,000 Teleprotection systems for Renewable Industry and transmission/distribution substations.

Several thousands of Switches deployed. Industrial Ethernet switch for electrical substations, IEC 61850 compliant.
Communication solutions, teleprotection and couplings units for power utility companies. Since 1967 (as former DIMAT) we are able to develop the best solutions for our customers.

<table>
<thead>
<tr>
<th>POWER LINE CARRIER SYSTEMS</th>
<th>ANALOG</th>
<th>DIGITAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPU-1 · Universal Terminal</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>OPC-2 · Multi-function platform</td>
<td>X</td>
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</tr>
<tr>
<td>OPL-1 · Compact Terminal</td>
<td>X</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TELEPROTECTION SYSTEMS</th>
<th>ANALOG</th>
<th>DIGITAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TPU-1 · Universal Terminal</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>CTP-1 · Compact Terminal</td>
<td>X</td>
<td>X</td>
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<tr>
<td>ABIT &amp; CDIT modules for Power-Line Carrier Systems</td>
<td>X</td>
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</tr>
<tr>
<td>F2MUX · Universal Fiber to MUX converter</td>
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<table>
<thead>
<tr>
<th>LINE-MATCHING UNITS &amp; ACCESSORIES</th>
<th>OUTDOOR</th>
<th>INDOOR</th>
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<tbody>
<tr>
<td>UAPA-1 · High-Pass / Band-Pass Unit with integrated Hybrid Circuit</td>
<td>X</td>
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</tr>
<tr>
<td>UAMC · Compact Band-Pass Unit with integrated Hybrid Circuit</td>
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</tr>
<tr>
<td>UAM-4 · Band-Pass Unit with low impedance tuning</td>
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<tr>
<td>CHD-4 · Differential Hybrid Circuit</td>
<td>X</td>
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</tr>
<tr>
<td>HPFA · Differential Hybrid Circuit</td>
<td>X</td>
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<tr>
<td>CIAV-1 · Attenuator</td>
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</table>

<table>
<thead>
<tr>
<th>MODEMS</th>
<th>ASYNCHRONOUS</th>
<th>SYNCHRONOUS</th>
<th>STAND ALONE</th>
<th>MODULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAFP · Asynchronous Narrowband Modem</td>
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<tr>
<td>MAS-2 · Asynchronous Narrowband Modem</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>MQBT · Modem with Programmable Modulation Scheme</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>AVDM · Serial into E1</td>
<td>X</td>
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<td>X</td>
<td></td>
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<tr>
<td>VDM – 1 · Serial into E1</td>
<td>X</td>
<td>X</td>
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<tr>
<td>MDD-3 rack for MAFP/AVDM modules</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>NETWORKING</th>
<th>KEY FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPS</td>
<td>Both IRIG-B and NTP available models</td>
</tr>
<tr>
<td>Real Time Router</td>
<td>Modular IP router with several available communication interfaces and specific telecontrol applications (embedded GateWay IEC 60870-5-104/60870-5-101)</td>
</tr>
<tr>
<td>Switches</td>
<td>Modular IEC 61850 Ethernet Switch with high flexibility in the type and number of ports.</td>
</tr>
<tr>
<td>Concentrator / diffusser</td>
<td>Serial device server that allows secure connection of up to 9 serial devices to an IP network. Optional WAN interface (GPRS/EDGE/UMTS...) with single/dual SIM</td>
</tr>
</tbody>
</table>
An intelligent information platform for centralized & decentralized control systems:
- Transmission RTUs
- SAS server
- Substation Control Systems
- SCADA
- Gateway & Protocol Conversion IEDs
- Data Concentrators

Transmission RTU

Xcell is a modular platform with features including protocol conversion, substation communication, I/O data monitoring and physical automation. XCell can be fitted to new substations or retro-fitted to existing substations and can be fully integrated with other substation equipment. It provides flexibility and scalability to accommodate power utilities of varying scale.

IEC 61850 SAS Server / Gateway. Modular.
By coupling the Bay Control Unit (BCU) and RTU system to Local HMI facilities, data links to system IEDs, and communication links to remote EMS or DMS Control Centers we can provide elegant **Substation Control Systems** providing full system information, both current and historic, simultaneously to all of the interested parties.

The systems can be simple stand alone through to redundant, multiple site, multiple master systems merely by the provision of additional equipment and functionality.

**General features:**
- Multiprotocol (61850, DNP3.0, MODBUS, IEC101/104, OPC, ICCP, (master & slave)
- Multilanguage (Spanish, English, French, Portuguese, ..)
- Redundancy
- Cibersecurity
- Fault recording and visualization (oscillograph)
- Multiple Substations
- 61131 logic
- Web support (client / server)
- Reports & Trends
- Real Time Data Base
- Synchronization IEEE1588, SNTP, IRIG-B
- Alarms & Events Module
- Multilevel
- Zooming, declutering, overlaying, …
- Dynamic Symbol Library
- Automatic Line Colouring

**Substation Control Systems**

- 4CCT Data Concentrator Comm Port Expander
- ePAQ/9410/9430 Multifunction Gateway
- BCU+RTU Substation Control Systems

Making the Smart Grid real
Recent 61850 SAS projects

SUBSTATION AUTOMATION & COMMUNICATION SYSTEM FOR RENEWABLE PLANTS
400/220kV Thermosolar Substation. Logrosan, Spain.
EPC: Inabensa. Spanish company SENER was the designer of the complete system and specifications.
This system is located in the Spanish region of Extremadura. It is a group of substations that collect all the power from several Thermosolar plants in the area and deliver it to the REE (Red Electrica de España, Spanish transmission company) system.

The system included an integrated protection and control system for the substations Termosolar-1, Termosolar-2, Colectora and Nodal. (10 P&C pannels and 2 metering pannel fully equipped).

It also included the communication system via fiber optic, including ZIV Teleprotection system, and the integrated communication system to connect to REE Valdecaballeros Substation and to the collateral Solaben TV Plant system (six substations).
CG’s Automation Business Unit is a global provider of Distribution Automation Solutions and Substation Automation Systems. References in over 85 countries in main Generation, Transmission and Distribution Utilities, Industries and EPC Contractors.

Some references are listed below:

**EUROPE**
- **SP**: Iberdrola, Grupo Endesa, Grupo Gas Natural Fenosa, Red Eléctrica de España, HC Energía, EDP, E.ON España, Gamesa, Repsol, Aceralia, Ehn, Metro De Madrid; (Czech Republic) Jme-Eon; (Fr) Rte, Edf; (Italy) Enel; (Nw) Statnett, Lyse Energi As (Poland) Pse; (Portugal) Ren, Edp; (Romania) Hidroelectrica; (Sweden) Vattenfall; Svenska Kraftnät; (UK) MANX Electricity Authority; National Power Grid, Northern Power Grid, etc.

**AFRICA**
- **Algeria**: SONELGAZ;
- **Angola**: GAMEK, ENE;
- **Burkina Faso**: AES-SONEL;
- **Cameroun**: EETC;
- **Ethiopia**: EEPCO (Mali) EDM;
- **Tanzania**: TANESCO;
- **Morocco**: ONE;
- **Kenya**: KPLC.

**AMERICAS**
- **USA**: Alabama Power Co, Hydro Mississauga, Pennsylvania Electric Co, Houston Electric, Entergy, Maine Electric Co;
- **Brazil**: Ampla, Coelba, Cosern, Celpe, Coelce, Furnas, Copel;
- **Mexico**: CFE, Luz y Fuerza; (ARG) Edenor, Edesur, Edelap, Ape, Dock Sud; (BOL) Electropaz, Cre;
- **Chile**: Grupo Enersis –Chilectra, Chilquinta; (PARAGUAY) Ande;
- **Kenya**: KPLC.

**ASIA**
- **Indonesia**: PLN; (Malaysia) SESCO; (Philippines) TRANSCO; (Thailand) EGAT; (Vietnam) EVN;
- **India**: Avanaya Power, PGCL, MSETCL, UPPCL, JSEB, Power Grid India, etc.

**References in 85 countries**

**AMERICAS**
- **61850 SAS FOR PHOTOVOLTAIC PLANTS & WIND FARMS**
  - 115 kV. El Porvenir. México
  - EPC: IsoluxCorasan
  - 100 MW – 138 kV Llano de Llimpos Substation. Latin America’s largest solar photovoltaic plant
  - EPC: Isastur
  - 110 kV. Chacabuco & San Cristobal Substations.
  - Client: Endesa - Chile

**AFRICA**
- **COMPLETE COMMUNICATION SYSTEM SUPPLY & INTEGRATION**
  - Kinyerezi 150 MW Gas Power Plant and collateral substations.
  - EPC: Jacobsen Elektro AS
  - Final Client: Tanesco Tanzania

**KENYA**
- **5 SAS & TELECOMMUNICATION SYSTEM**
  - Isiolo S/S, Meru S/S Extension and Nanyuki S/S Extension
  - EPC: CG
  - Final Client: KPLC, Kenya

**EUROPE**
- **AUTOMATION SYSTEMS**
  - A Generation Management System (GMS) for a Grid Supply Point (GSP) and associated embedded generation sites (275/132/66 kV Substations)
  - Client: Northern Power Grid (UK)

**SAS FOR UNDERGROUND GAS STORAGE**
- 132 kV Yela Substation. Spain
  - Client: Enagas
  - It has two lines of 132 kV and two 40 MVA transformers, the plant is key to ensuring the supply of gas in the center of Spain.

**INDIA**
- **61850 SAS for 400 & 220/132/33 KV Substations**
  - 400 kV. RAIGARH Substation
  - India I EPC: KWPC
  - Client: Avantha Power
  - Six 220/132/33 kV ZIV 61850 SAS at Govindpur, Manoharpur, Jaduguda, Dalbhumgarh, Jamtara and Roulkela in the State of Jharkhand (JSEB)
  - Utility: Power Grid India

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