

Bringing
substations
online

iSCS

around
the
world.

iNTEGRATED SUBSTATION CONTROL SYSTEM



GE Energy Services



Our Company

At GE Energy Services, our mission is to champion our customers' success in today's dynamic energy marketplace by providing smart solutions to optimize transmission and distribution operations.

We team up with utilities worldwide to carry out the new mandates for delivering reliable and quality power using real-time information technology specifically developed for electric power applications. Through innovative substation systems and specialized engineering services – from test instruments to turnkey automation solutions – GE Energy Services helps utilities safely and efficiently automate, monitor and maintain critical transmission and distribution assets.

iSCS INTEGRATED SUBSTATION CONTROL SYSTEMS

The Business Case

The pressure on electrical utilities grows daily. Worldwide deregulation is allowing more and more competitors into the market. Margins on rates are being squeezed. Regulatory changes are becoming more demanding. The drive for corporate efficiencies steers into every corner of your operations. Sound familiar?

The integrated Substation Control System (iSCS) is the smartest weapon to help you fight these challenges. Around the world, our iSCS is providing the answer for cost-conscious electrical utilities in three important ways:

1. By improving the quality of service
2. By reducing operational and maintenance costs
3. By deferring capital expenditures

1 Improved Service

An iSCS can help you improve the power quality of your system. It can correct system problems as needed, enhance system reliability and safety, and monitor the status of all station primary equipment, protection, and control devices.

GE Energy Services can also help you with reducing customer outages by implementing fault detection, auto-sectioning and auto-restoration, and other advanced automation applications unique to your requirements.

2 Reduced Operating & Maintenance Costs

You can realize significant savings in operating and maintenance costs through remote access to our iSCS. Predictive maintenance, Volt/VAR control, self-diagnostic programs, substation automation programs, and integration of all substation data into one common database with Web enabled remote access all help you reduce costs.

3 Deferred Capital Expenditures

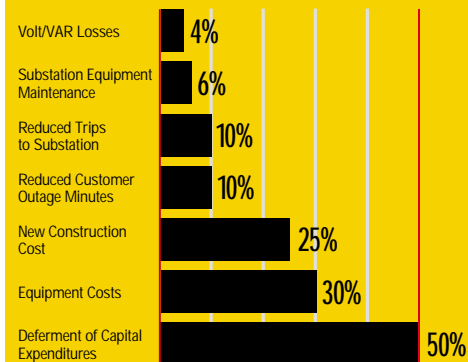
Your utility can reduce capital equipment spending by implementing transformer and feeder load balancing and defer equipment upgrades with tighter system control.

Better equipment monitoring can extend the economic life and capacity of your primary equipment. You'll experience reduced capital costs with more integration of functions.

The iSCS can also eliminate redundant equipment, panels, displays, and switches by implementing a local User Interface; resulting in further capital cost savings.

The list of service improvements and cost savings is indisputable. Automating your substation with an iSCS can radically improve your bottom line.

TYPICAL BENEFITS (% REDUCTION)



Customer Profiles

Tacoma Power, Washington

GE Energy Services is helping Tacoma Power utilize their new fiber-optic telecommunications network to implement substation LANs and integrate them into a utility-wide SCADA WAN.

This northwest utility has installed D200 and D25 based Ethernet LANs in their transmission and distribution substations. "This evolution from substation LAN to an enterprise-wide SCADA WAN is a significant step in the system design," said Joe Orth, Tacoma Power SCADA Project Manager.

In addition to being used for high speed communications between substations, the WAN enables remote access to all substation



IEDs from anywhere in the Utility. "The WAN provides significant benefits through the efficient transfer of information to operations staff," added Mr. Joe Orth. "This helps us improve operational efficiency and increase system reliability."

GE Energy Services continues to supply automation equipment to increase the efficiency and reliability of Tacoma Power's delivery system that includes 64 substations and 3400 km of transmission and distribution lines. Future projects include a distribution automation program to implement automatic fault isolation and restoration on their distribution feeder network.

Pacific Gas & Electric Company, San Francisco

To prepare for the coming changes in the utility business, Pacific Gas & Electric Company identified several key parameters they would like to implement in their ideal substation of the future. According to Brian Pace, PG&E Supervisor of Asset Management:

- It would be unmanned, fully automated;
- Its communication and data management system would incorporate multiple vendor IEDs;
- It would provide real-time and historical information with regard to substation apparatus to help anticipate and avoid catastrophic failures in the substation;
- High value software applications running on the D200 would provide for automatic



switching to isolate system faults and reduce the duration of outages;

- Key components would perform multiple functions and require fewer parts, less maintenance, and lower costs.

To move towards this vision, PG&E selected Stellar Dynamics to provide integrated substation automation equipment for its pilot projects. In the first project, Stellar Dynamics, now a division of GE Energy Services, installed a data concentrator to integrate existing IEDs. The second pilot saw a completely modular control room that utilized the D200 and other vendor IEDs. The third project is similar to the second, yet includes some of the industry's latest technologies. PG&E doesn't have all the answers for the future as business and technology changes, but with the help of forward looking companies like GE Energy Services, it can cross the threshold with confidence.

Comisión Federal de Electricidad, Mexico

After participation with CFE in a successful substation project in 1994, GE Energy Services won a worldwide competition to make CFE's substation automation systems some of the most advanced in the world. "The system provides application and primary equipment monitoring programs plus a better distributed processing architecture using their new D25," said Mr. Durán Mendéz, Sub-Manager at CFE.

The systems are required to interface with over 35 different substation relays and meters and include the GE Harris PowerLink graphical user interface, D200 substation server, D25 bay level controllers, and Ethernet



local area network. "The systems also provide a friendlier operation and configuration venue using newer versions of software with remote access for the monitoring of the substation through the CFE corporate intranet," Mr. Durán Mendéz added.

CFE is the national utility of Mexico and one of the largest in the world with almost 67,000 km of transmission lines, and over 227,000 km of distribution lines.



HOW THE iSCS WILL IMPROVE YOUR PERFORMANCE

By Bringing your Substations Online, Across Town or Across the Country

Automation brings your substation operations online, into a central office or remote control room, from across town or across the country. Immediate Web access allows a local or remote user to connect transparently from a single physical location and connection, to a configuration or programming port on any LAN node or supported IED. This virtual connection is user friendly and secure. Because the iSCS is flexible, you can add one substation this year, another next year, and five more down the line. It's your choice – and your business decision.

By Decreasing your Reaction Time – from a Central Site, or even from a Laptop Computer

With Web access, the integrated Substation Control System gives your staff the ability to fine-tune operations from a remote location. Staff can spend more time at the office managing the complete picture. Operators can be stationed in central locations, instead of scattered at different substations. Reaction time and down time decrease because your operators can adjust the voltage, transformer loads, and feeder loads by personal computer from the office or even from a laptop computer, rather than just at the substation.

By Providing Better Information, Instantly

You can gather information that needs to be extracted and analyzed. Information is accessed quickly – key information on load management, load shedding, reactor and capacitor switching reaches you almost instantaneously. Historical information can be stored or overwritten.

With Open-Architecture that Saves Money

We've opened our system and made it possible for you to adapt other substation components. Although our Substation Control System is fully-integrated, you are not locked into proprietary protocols because we have implemented industry standards such as Ethernet, TCP/IP, DNP 3.0, IEC 60870-5 and UCA 2.0.

With GE Energy Services Reliability

GE Energy Services has hundreds of satisfied customers across six continents. Our proven technology and commitment to on-going research and development have placed us at the forefront of our industry. Our durable equipment works and keeps working – in conditions that range from the Egyptian desert to the Canadian North.



HOW THE iSCS WILL FIT INTO YOUR OPERATIONS

As a Component of New Installations or Retrofits

Our integrated Substation Control System can be incorporated easily into a substation retrofit or as part of a new substation. iSCS is scalable to any size of substation from the smallest distribution substation to the largest transmission substation. The system can also be used for one substation, or a hundred – depending on your needs and budget, today and tomorrow.

By Working with Existing Devices

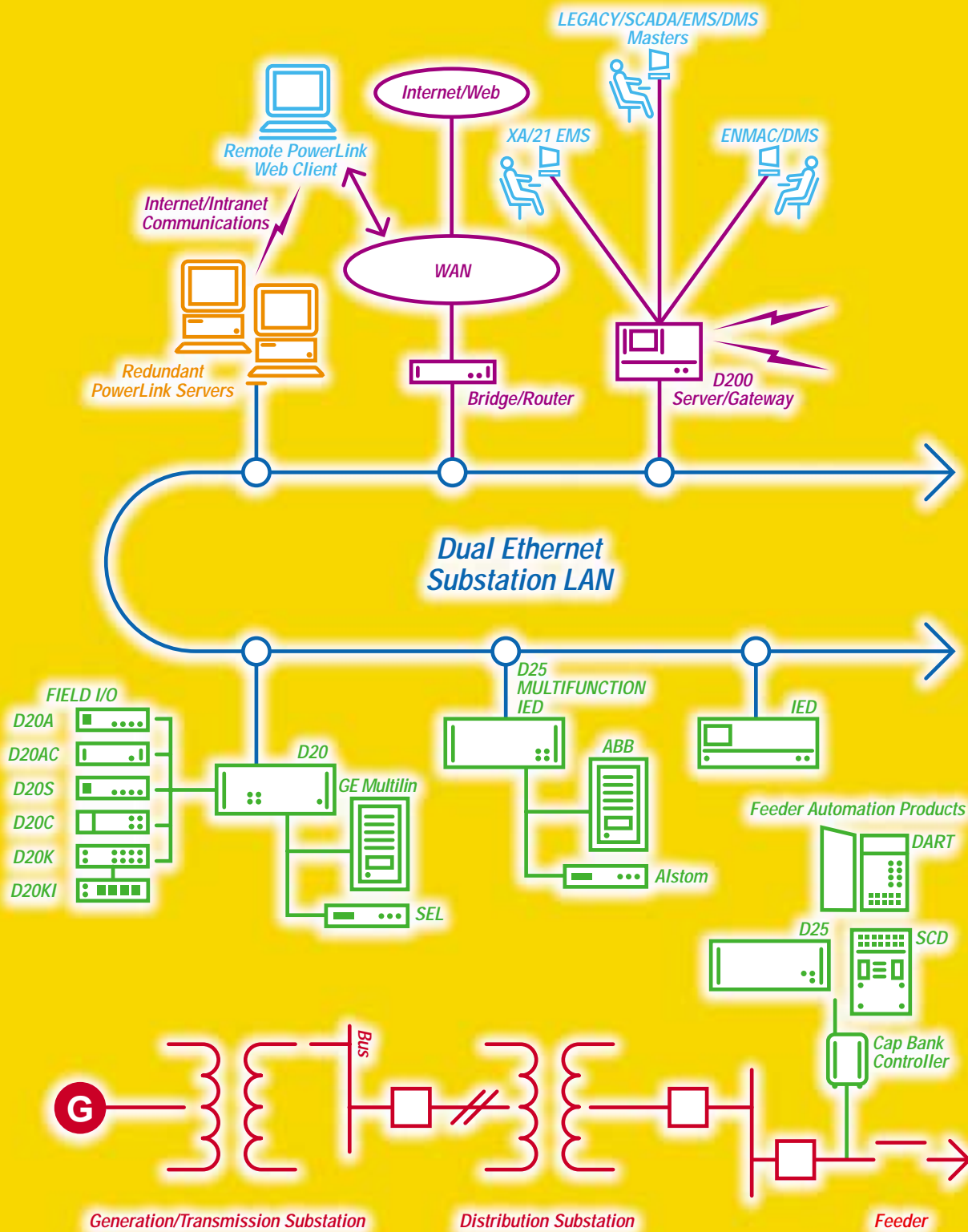
To enhance the integrated Substation Control System's flexibility, GE Energy Services has developed a library of communication programs that allows the components to speak to the system (and the system can speak to each of the components). Our library of IED and SCADA protocols is considered to be the largest of any substation automation supplier in the world, and we continue to develop these as needed. This means you do not have to replace legacy devices when upgrading to the iSCS – they just continue to work as they always have, but now the information they produce can be tapped into, online.

By Securing Sites and Securing Systems

Web access is secure. Only people within your company with the correct passwords will be able to access the substation. At the operations level, it means that control room operators can guide the process, answer alarms, and monitor the operations of one or more substations, within the control system parameters. At the maintenance level, operators can configure devices from a remote location, much as they would be able to when onsite. We even have sites where multiple customers share one system with the security of discrete ownership of data.

By Complying with International Engineering Standards

Our equipment meets demanding international engineering standards, including European IEC, CE Mark, and North American IEEE impulse and surge standards. Our ISO 9001 accreditation confirms our commitment to quality.



Enterprise Users

Enterprise Communications

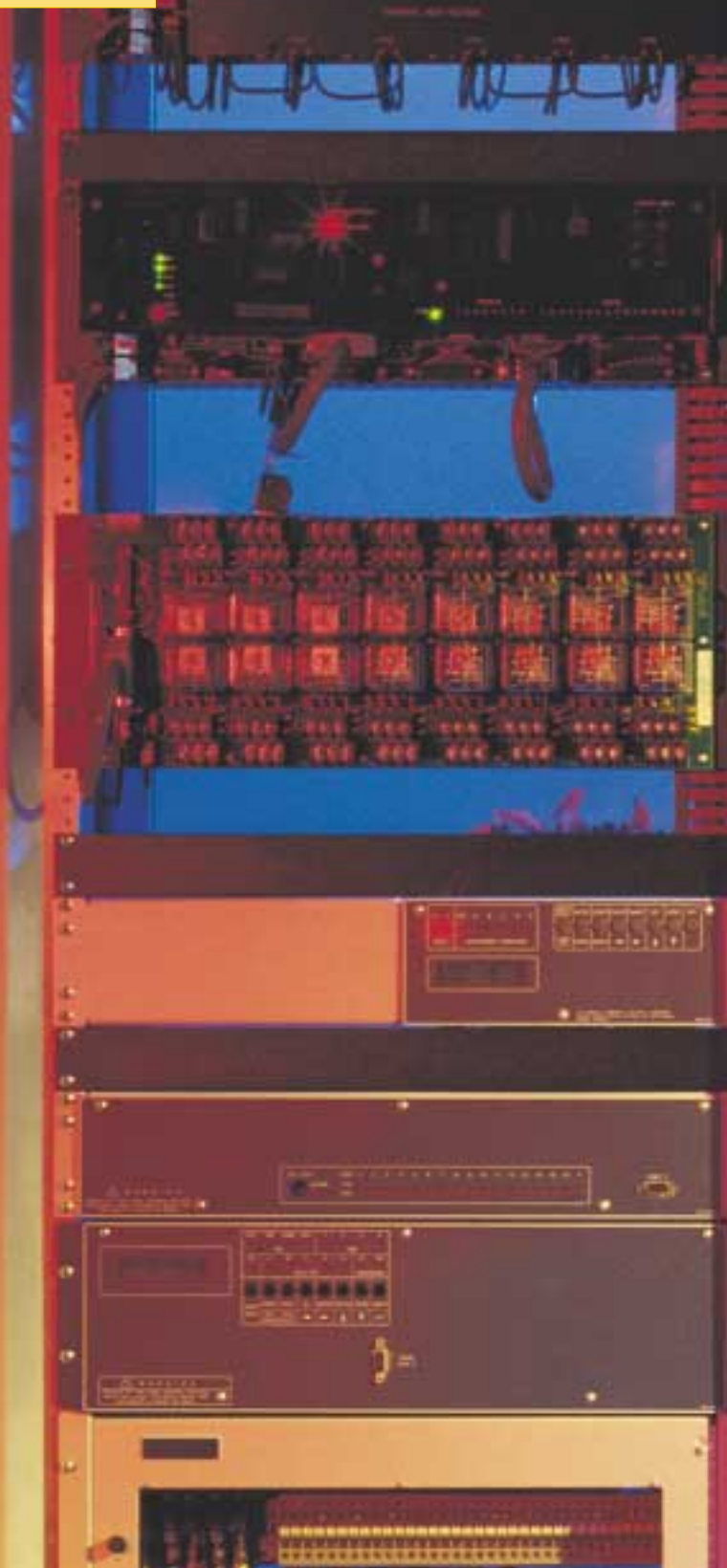
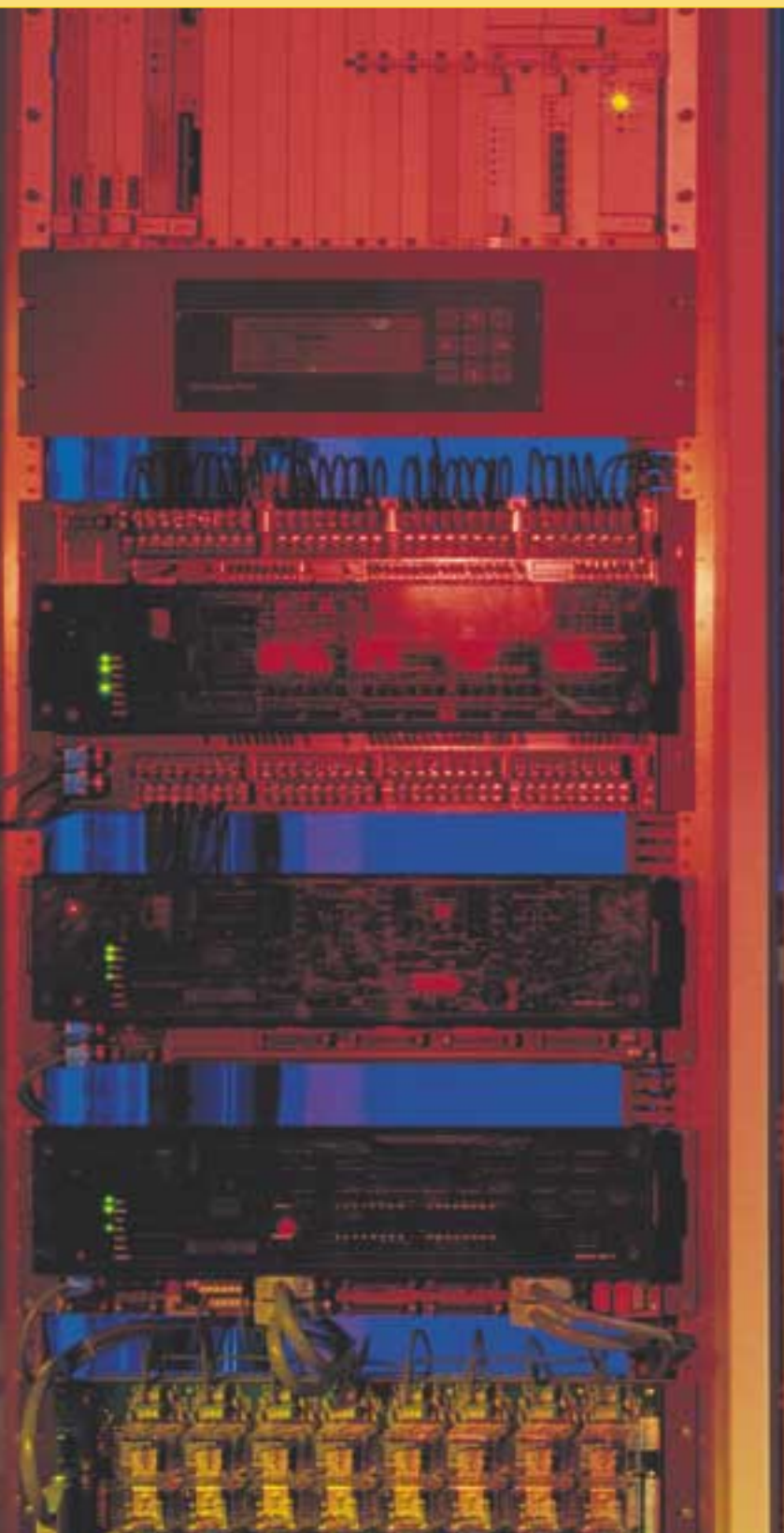
Local HMI

Local Area Network

I/O Equipment

Primary Equipment

The D25



THE COMPONENTS OF THE iSCS

Beneath the comprehensive, easy-to-read control system that the iSCS displays on a computer screen, exists a finely-tuned combination of high-speed Local Area Network (LAN), Intelligent Electronic Devices (IEDs), protocols, Graphical User Interfaces (GUIs) and substation computers. This is the heart of the system – the base or platform from which all products run.

THE LAN

The iSCS LAN allows software and hardware applications to connect and communicate with each other. Its open-architecture design provides an ability for future expansion and change, while providing performance and responsiveness today. We have chosen Ethernet (IEEE 802.3) as our standard because it has easily-obtained hardware and software that can be supplied by numerous vendors.

The LAN includes Distributed Network Protocol (DNP), the industry-standard SCADA (Supervisory Control and Data Acquisition) protocol. DNP is a robust, flexible, non-proprietary protocol and has been adopted around the world. Its benefits include easy system expansion, long product life, and major operations savings. We're also supporting UCA protocols as they become adopted by utilities.

Our LAN is also flexible enough in design to support multiple types of cable: coaxial, twisted pair, or fiber optic, so that it can meet the stringent demands of any substation environment.

COMPATIBLE INFORMATION GATHERING DEVICES

While the LAN makes it possible for all the components of the substation and iSCS to work together, it is the individual hardware pieces or software components of the system that gather and generate the information to be captured.

Supporting Over 70 Intelligent Electronic Device Protocols

The iSCS communicates with all the intelligent devices at the substation, including protection relays, meters, remote terminal units, digital fault recorders, sequence-of-event recorders, and programmable logic controllers used in traditional substation control panels. GE Energy Services has developed the world's most complete library of IED protocols, solving the problems associated with non-standardization in the IED industry – we can support protocols such as ABB SPA-BUS, DNP 3.0, UCA 2.0, Alstom Courier, ModBus, and more than 70 others.

The D25

While most IEDs cannot connect directly to a LAN, the D25 "Super IED" allows this connection, solving one of the biggest challenges in integrating relays from the existing substation into a new substation system.

SCADA and Logic

The integrated functionality of the D25 gives you a powerful and flexible communications capability including SCADA functions, power and energy metering, power quality, digital fault recording, and true RMS measurement. D25 Bay Level Sequential Control integrates Programmable Logic Control (PLC) functionality which ensures proper sequencing, interlock safety checks, and single "Button Execution" from PowerLink.





Digital Fault Recording

With the D25's digital fault recording capability, fault records can be automatically transferred via the LAN to the substation computer or directly to a remote PC via Email. Protection engineers can then analyze these recordings to ensure that the relay settings are correct.

Power Quality Information

The D25 is a critical analytical tool for both the business and operational aspects of the power substation. It measures and records power quality information, including total harmonic distortion, harmonic spectrum, RMS trending, RMS profiling, sags and swells, and interruptions. This allows both operators and analysts to examine the consistency of power going through your system – helping to pinpoint problem areas.

Metering

The D25 can also provide a comprehensive suite of metering functions for up to six feeders: energy metering, demand metering, load profiling – all critical data to your operation.

THE D20/200

The D20/200 is the heart of the iSCS architecture, providing substation server functionality in a mission-critical substation-hardened package. The D20/200 acts as the LAN gateway to legacy SCADA master stations as well as for IEDs in the station or on downstream substations or feeders. Distributed architecture for gathering data from, or controlling substation equipment, as well as a platform for running mission-critical automation control applications, reinforce why the D20/200 is being used in over 10,000 substations around the world.



SYSTEM MANAGEMENT TOOLS

PowerLink Full Control Software

PowerLink is a software program that gives your operators full control over all the substation devices either from the site or from a remote location. It replaces or complements traditional mimic control panels and gathers all the substation's raw data into a single database. It can feed detailed information directly into the company's business system – critical information on transformer loads, key customer power demands, and possible maintenance information. Standard and customized reports can also be generated.

PowerLink Features

PowerLink makes it easy to build one-line displays custom to your operation. We provide an intuitive configuration environment supported by a powerful graphics editor, making it easy to create and maintain all your operator screens.

Alarm Management. PowerLink logs all historical events and alarms, displays alarm summary, and configures events to generate operator alarms. Tagging locks out a point or takes it off-line, as needed. Trending graphically displays real-time and historical data.

Reliability. PowerLink supports redundant and non-redundant systems with automatic failover.

SCADA Support, including configuring and displaying standard SCADA data types, scanned or calculated data displays diagnostic statistics for each scanned device and performs supervisory control operations, as directed.

Virtual Connection allows the protection engineer or other authorized staff to work from the office or from a remote location, instead of travelling to the substation to perform functions such as adjusting relay and IED settings, retrieving an oscillographic record, or extracting and analyzing post-event data. Virtual Connection allows personnel to use existing third-party configuration tools, so there are no new tools to master. Off-site system planning and support are more convenient. And personnel can access the IEDs safely and conveniently, from a control room across the network, rather than onsite.

Webclient gives multi-user capabilities to PowerLink. It allows authorized staff members access to PowerLink from anywhere, with the same security and access that they would have if they were sitting at the console in the control room. It works using the Internet, Intranet or remote dial-up, depending on your needs.

Easy-To-Understand Graphics make the entire ICS system understandable for everyone in your company who needs access to it. Our system makes it easy to configure the different information screens so that they reflect exactly what is happening at the substation.

The Applications Editor collects and organizes the data needed to create a Graphical User Interface (GUI) or graphic screens that have been configured for operations personnel. It works like a Windows® drawing program.

ConfigPro

ConfigPro configures the hardware and software of the ICS. ConfigPro allows an individual company to customize the ICS to a substation's components. It works like a typical Windows® application, with online help and pull-down menus.

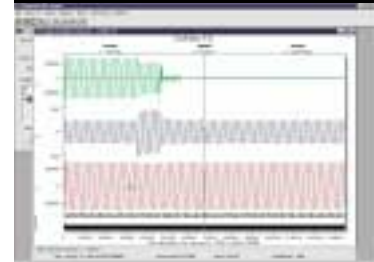
LogicLinx™

LogicLinx™ eliminates the costs of hardwiring automation schemes. LogicLinx™ allows operators to create software applications, without writing code, that link components accurately and logically. LogicLinx™ utilizes a Windows® interface and is fully compliant with the IEC 61131-3 programming standard.

Power Quality Harmonics



Digital Fault Recording



Virtual Connection Client



ConfigPro



LogicLinx™



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