



Keeping
the
lights on



FEEDER AUTOMATION SYSTEM



around
the
world.





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.

FEEDER NETWORKS ARE DIRECT LINES TO YOUR CUSTOMERS

Power outages are more than inconveniences. Businesses go down. Customers complain. Your crews work overtime. Every minute is critical and costly.

Whatever the cause, feeder service disruptions create strong, long-lasting impressions in your customers' minds. How quickly you restore power to your customers following a disruption can be the single most important factor in their evaluation of your service.

1

Retain customer loyalty, by keeping the lights on.

Reduce the frequency and duration of service disruptions by minimizing downtime and improving your response time to critical situations.

2

Improve your strategic position, by keeping the lights on.

Improve your strategic position by maximizing customer satisfaction, retaining existing customers and attracting new ones. With a solution that allows you to resist competitive pressures.

3

Build community recognition, by keeping the lights on.

Create positive political and public awareness by providing a higher quality of service and responding to regulatory pressures... with a solution that is environmentally friendly.



Customer Profiles



Auto-restoration wins award for best utility product.

From the very small . . . to the very large

City of Lakeland, Florida

The Project

The Department of Electric & Water Utilities for the City of Lakeland (LEW) needed to improve the reliability of electric supply to their largest account – a large retail chain called Publix™.

The Requirements

The Publix™ complex consists of offices, food processing plants, dairy farms and warehouses occupying 250 acres. The complex runs 24 hours a day 7 days a week.

To maintain and improve its relationship with Publix™, LEW needed to provide a distribution system that would minimize outage duration in an environment that is plagued by lightning. Outage time was specified to one minute or less for any fault contingency.

The Solution

The new automated feeder control system that GE Energy Services provided to LEW integrates six pole-top switches with DARTs, and a subremote unit consisting of a D20 automation platform with programmable logic control.

The D20 acts as a data concentrator and polling engine for the system. It polls the six DARTs for status and analog information. The DARTs provide fault detection information in the form of pseudo status points to the D20.

The programmable logic application running on the D20 employs algorithms and logic developed jointly by GE Energy Services and LEW. It automatically determines the location of faults along the network, initializes fault isolation and executes load restoration.

Should a fault occur on the distribution network, this automatic fault isolation and load restoration scheme is able to remotely operate the overhead switches to isolate the faulted section of the line and reroute power from an alternate feeder to unaffected sections.

The Outcome

The new automated system has operated successfully during lightning activity with restoration times being reduced to 42 seconds or less.

Keyspan Energy, New York

The Project

KeySpan Energy serves more than one million electric accounts on Long Island, New York. When one of KeySpan's 600 overhead distribution circuits locks out, as many as 3000 households can lose power. KeySpan, faced with mounting regulatory and public pressures, needed to reduce outage frequency and outage duration.

The Requirements

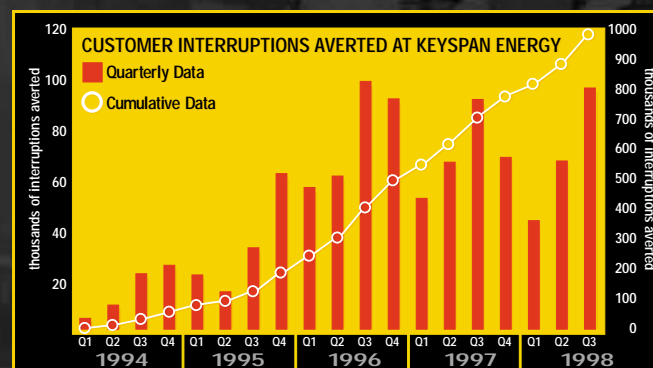
KeySpan had the highest outage frequency in New York. The goal was not only to improve this performance but also to improve employee productivity and work satisfaction.

The Solution

The solution consists of an automated system that senses overcurrent faults, isolates faulted sections and provides electricity supply through alternate feeders. The solution used as much of the legacy KeySpan infrastructure as possible to defer capital expenditures. A DART-based auto-sectionalizing algorithm reduces outage frequency and a D20-based auto-restoration algorithm locates faults, carries out any necessary isolation, qualifies the ability to restore load without overloading any circuit segments and operates the necessary switches to reduce outage duration.

The Outcome

With more than 900 switches automated, KeySpan has managed to save more than one million accounts from outages and has improved its outage performance by more than 40%. It has moved from the worst performing utility in New York to the second best – an impressive achievement in light of Long Island's weather and dense forestation. KeySpan's achievements have also improved the bottom line with substantial performance incentives received from the New York Public Service Commission.



OUR FEEDER AUTOMATION SYSTEM CAN HELP YOU REDUCE YOUR OPERATING COSTS

Satisfy your management's desire to be economically "lean and mean" by reducing manpower, lowering operating costs, increasing workplace efficiency and deferring capital investments... with a solution that is packaged to give you short-term payback.

Take advantage of your installed equipment base. Improved SCADA... without the traditionally high costs.

Feeder-resident IEDs provide full-time monitoring and control of your circuits. Through functional integration made possible by advanced technology, the need for many traditional and expensive devices such as transducers, fault detectors and indicators are eliminated, resulting in substantial savings in installation, commissioning and maintenance costs.

Lower VAR demand... without the traditionally long payback periods.

You may have already invested in capacitor bank controllers with local control schemes. But do they interact in a fashion that maximizes your system's benefit potential? A substation-resident algorithm controls your existing or new capacitor banks in response to the desired VAR level of each substation transformer bank, while executing capacitor bank and transformer voltage checks... with payback periods that will make you the hero of your finance department.

Use your available operating data without installing additional devices.

Leverage the investment you have already made in Automatic Meter Reading technology. Our flexible substation platforms accept data from in-field meters to infer the state of feeder protective equipment triggering maintenance and facilitating business analysis. More information enables you to make wiser decisions.

Use industry standard technology that adapts to changing business needs.

Become a technology leader by using industry standards instead of "home grown" answers. A GE Energy Services solution has a high degree of flexibility to allow for changing business needs.

Comply with international engineering standards that have accreditation.

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.





AUTO-SECTIONALIZING AND AUTO-RESTORATION HELP KEEP THE LIGHTS ON

Auto-sectionalizing isolates the fault. Auto-restoration locates the fault, qualifies the ability to restore load and restores power to as much of the affected circuit as possible through an alternate circuit. Usually in less than a minute. Repair crews can be directed immediately to the faulted segment while restored segments operate normally.

Auto-sectionalizing: minimize outage durations... without braving the elements.

The Auto-sectionalizing application resides on our feeder IEDs. Auto-sectionalizing opens a sectionalizing switch in response to an over current fault during the breaker's open interval. Quickly and reliably with or without communications. And it can be retrofitted to existing switches. The sectionalizing can be configured to discriminate between load and source side faults for radial circuits and to sectionalize without discrimination for networks. Since the application resides on the feeder IED, communications are not required to realize outage frequency reduction benefits.

Utility field data demonstrates that auto-sectionalizing adds more than four months to Sustained Average Interruption Frequency Index (SAIFI) performance.

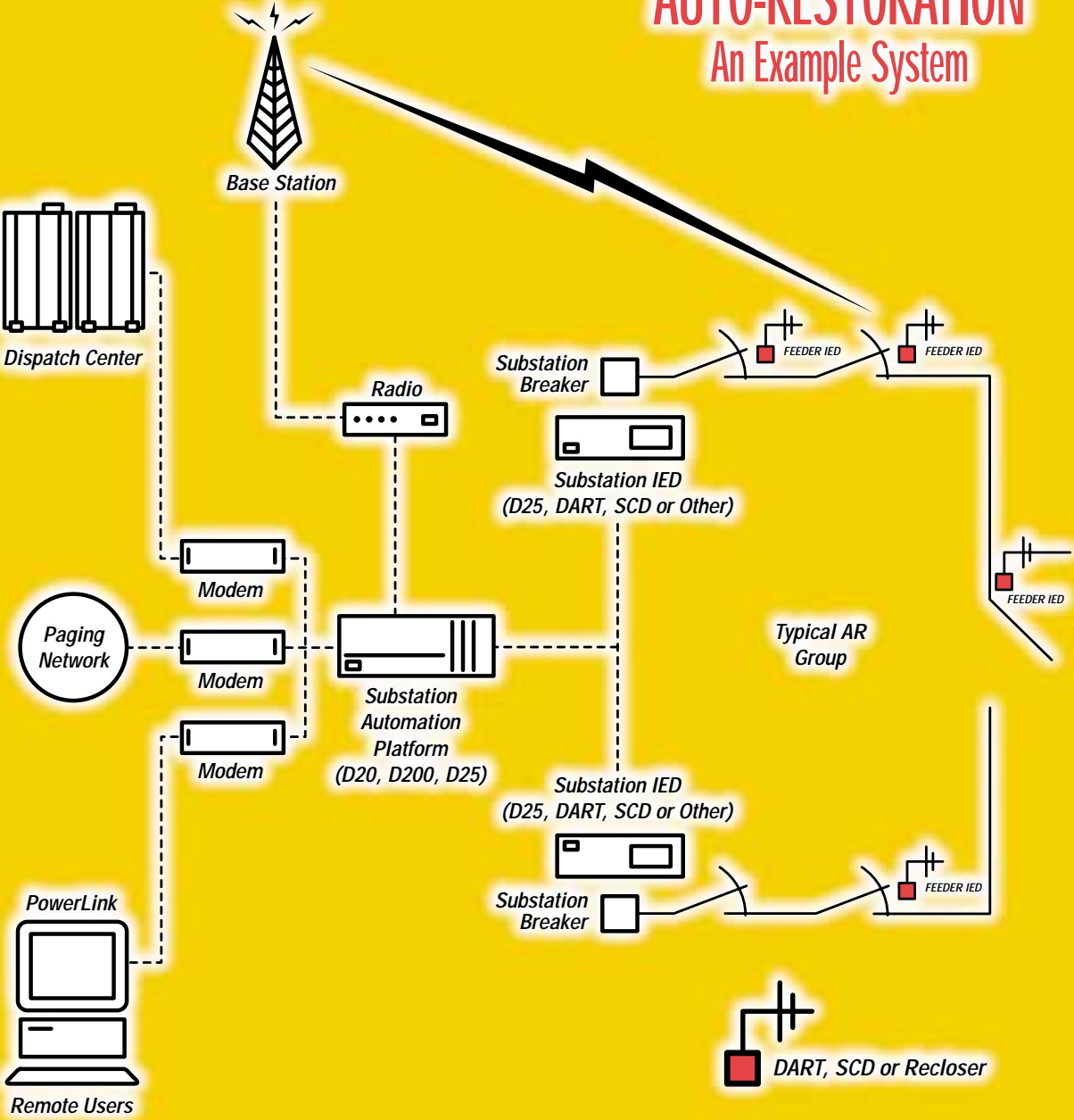
Auto-restoration: minimize outage frequencies and durations... with or without reclosers.

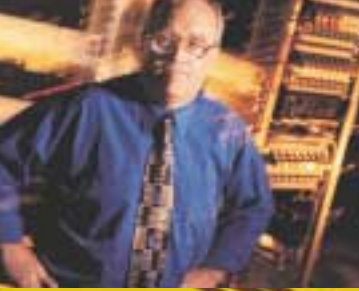
Auto-sectionalizing opens a sectionalizing switch in response to a fault. The auto-restoration application resides on our D20 and D25 platforms. These platforms can be located within the substation (in an integrated Substation Control System or in traditional communication architectures) or in a more central location such as a dispatch center. Auto-restoration identifies a fault condition, qualifies the ability to restore load, develops a proposed isolation and restoration solution and executes the appropriate control actions to supply power from an alternate feeder. Auto-restoration can be configured for fully automatic, operator acknowledgement, or manual modes on a per circuit group basis. Individual seasonal ratings are assigned for each circuit segment to allow the application to qualify the ability to restore load. The operators are kept in the loop through data that can be mapped into operator displays. The application can also be configured to examine breaker data to determine if an operation was protective or manual in nature. Operators have fewer critical decisions to make reducing the number of switching errors.

Outage duration reduction usually occurs in well under a minute which means that a large percentage of your customers may never experience an outage - even when faults occur on multiple circuits concurrently!

AUTO-RESTORATION

An Example System





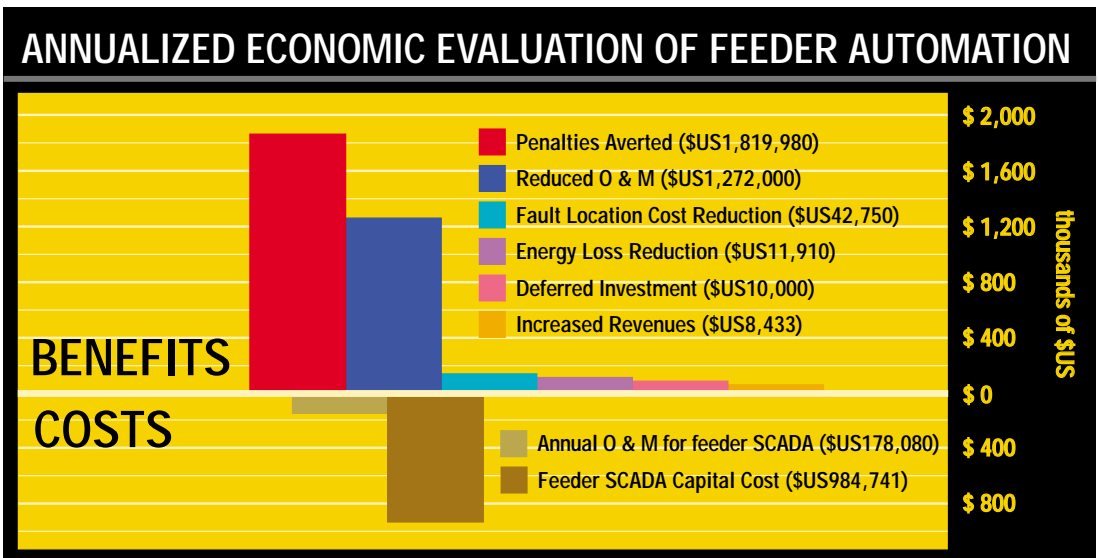
OUR FEEDER AUTOMATION SYSTEM CAN DEFER CAPITAL INVESTMENT

Incorporate step-up systems with communication gateways and data concentrators.

Defer investment in a new master station through the use of our CPM (Communication Processor Module) and D20 communication gateways/data concentrators. Chances are, we already speak your language from our library of over 70 protocols. If your existing master station is not feasible, but you are not in a position to afford a Distribution Management System, our PowerLink small SCADA host gives you the ability to start off small. Or if you are in a position to take advantage of the latest generation control room technology, our ENMAC® DMS/TCS/SCADA product will launch your company into an "information-driven" future. *(for more information refer to the GE Energy Services ENMAC® brochure).

NOT JUST BENEFITS BUT COST JUSTIFICATION

A recent GE Energy Services analysis into the fiscal justification of feeder automation revealed that a utility in the "wires business" can save \$US1.1 million in annual maintenance expenses solely through the implementation of remote control switching for feeders outside the substation fence. When all the feeder benefits are tallied, this utility can essentially pocket \$US1.9 million annually. When the costs are compared to the benefits, for every \$US37 this utility spends, it will get \$US100 back. These are bottom line figures that you can take to the bank!



ADDING VALUE TO YOUR EXISTING SYSTEM

The Feeder Automation System's flexible and scalable architecture makes the most of your installed base. Add value to your existing system by retrofitting our IEDs to your pad-mount, pole-top or underground switches, capacitor banks and legacy reclosers or integrate later generation, communication-ready IEDs. Fully integrated switch controller packages are also available for Ring Main Units and pole-top gear.



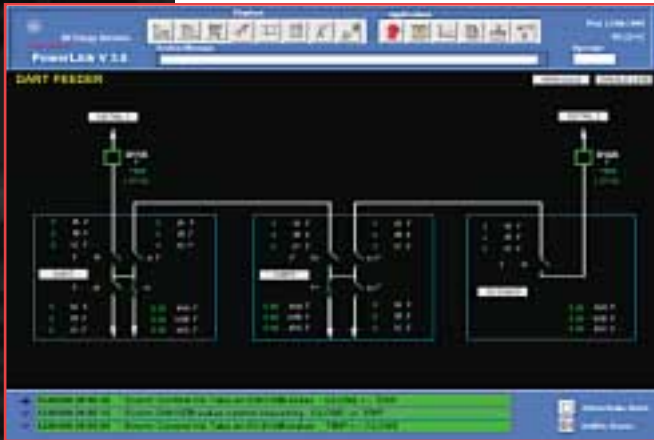
OPERATE IN THE HARSHTEST CONDITIONS WITH THE DART PRODUCT FAMILY

DART (Distribution Automation Remote Terminal)

This pioneer of transducerless feeder-resident IEDs has also proven to be one of the most reliable in the harshest conditions on the planet. The entire product family is composed of devices that operate from -40°C to $+80^{\circ}\text{C}$ at humidities of 100% condensing without the need for any environmental control. Meeting the most stringent, worldwide electromagnetic compatibility standards, the family core is an IED that monitors up to 12 AC inputs directly from PTs, CTs or line post sensors. In addition to voltage and current magnitudes, the DART calculates power factor, phase angle, power flow direction, power and import/export energy. A three-phase fault detector signals overcurrent, breaker operation and lockout on a per phase basis for line-to-line and line-to-ground faults. The family is powered by a 12V or 24V, high power, temperature compensated charger that permits remote battery testing and alarms loss of line voltage and battery over or low voltage. Battery life is maximized with a low voltage disconnect feature, output voltage temperature compensation and extremely low ripple. The cost/benefit ratio of the DART family remains highly favorable worldwide.



GIVE OPERATORS CONTROL OVER ALL YOUR DEVICES



With PowerLink software designed for remote and on-site use.

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

With easy-to-use ConfigPro applications.

ConfigPro configures the hardware and software of your devices and works like a typical Windows® application, with online help and pull-down menus.

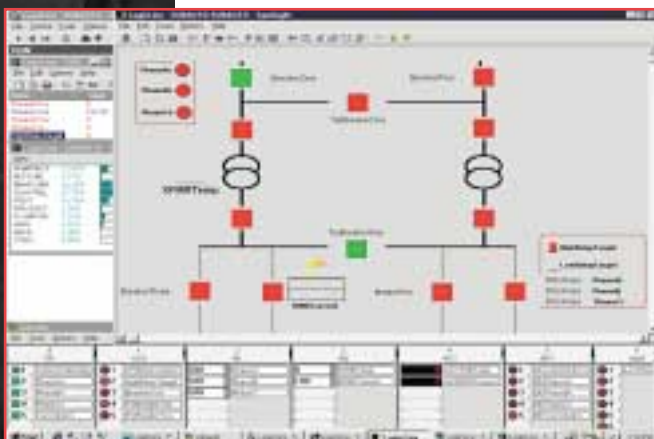


With powerful CPM protocol conversions.

The CPM is a flexible and powerful protocol translator, well-suited for substation and distribution automation applications. It provides front-end processing and site addressing which can reduce engineering and maintenance costs. The CPM supports over 70 master and IED protocols.

Eliminate hardwiring costs with LogicLinX™.

LogicLinX™ eliminates the costs of hardwiring automation schemes. LogicLinX™ allows you to create software applications, without writing code, that link components, accurately and logically. LogicLinX™ operates with a Windows® interface and IEC 61131-3 standard.



MAKE THE BEST USE OF MANPOWER HOURS WITH OUR CONTROLLERS

Reduce patrol costs with the Switch Controller.

The Switch Controller reduces line patrolling times and costs, allowing for faster and more economical repairs. The Switch Controller incorporates the battery charging system, IED, control and switch interface in a single, high quality, compact outdoor enclosure. As well as its standard features, the Switch Controller can be customized to project requirements with any communication protocol from the vast GE Energy Services library.

Reduce monitoring and control costs with the SCD Series.

The SCD series of control and monitoring equipment was designed to reduce capital and maintenance costs through rugged construction and through integration of functions. The SCD family can be installed in existing enclosures without the need for environmental control equipment or additional surge, impulse or EMI protection.

To enhance the value of the SCD series, the SCDs can incorporate existing and legacy equipment functions and communications.



SCD Switch Controller
(swingframe closed)



SCD Switch Controller
(swingframe open)



DART Switch Controller





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