Dear readers,

The last few months have been busy in ABB’s network management business unit. In October, we saw the publication of the ABB Review special report on IEC 61850, which was well received by the communications standards community. The report contains 12 articles discussing the background and development of the standard, applications and a number of case studies, some of which have been reprinted here (see pages 4-7). The IEC 61850 standard is key to effective substation automation and, since its inception, ABB has been deeply involved in its development. The standard has now been deployed in numerous projects around the world and proved its ability to improve reliability and efficiency, while reducing costs, for both large and small utilities. To read the full report on IEC 61850, visit www.abb.com/review.

We also won significant orders in the UK and in China in recent weeks. ABB will provide a new Energy Balancing Mechanism to help manage the UK’s electricity demand of more than 55,000 megawatts (see page 8). The solution was chosen for its efficiency, availability and flexibility – themes we are seeing more and more as customers move to optimize operations through increased automation. In China, ABB was chosen to supply asset-management software for a number of new-build nuclear power stations. The industry-leading enterprise asset management software, from Ventyx, an ABB company, will be used for the management of maintenance and safety operations at the plants. These orders further endorse ABB’s acquisition of Ventyx earlier this year and our strategy to bridge the gap between information (IT) and operational technology (OT) for utility and asset-intensive organizations.

Other orders for ABB included a new Network Management system for the electricity distribution system in Riyadh (see page 11) and a tender to engineer and deliver a mission-critical medium-voltage (MV) and low-voltage (LV) electrical network in Dublin Airport’s new terminal facility, T2 (see page 9).

We continue to interact with our customers and with user groups, holding a number of events in the past months, including Mindshare 2010 in the United States and our second annual customer day in Qatar (see page 12).

To ensure that our solutions remain at the forefront of technology developments, we continue to look for new collaborations that will help speed the implementation of new applications to bring enhanced performance and competitive advantage to our customers. Following a recent investment by ABB in Trilliant, a US-based provider of smart grid communications infrastructure, Salim Khan, head of ABB’s Network Management business unit in North America has taken up an observer seat on the Trilliant board. This appointment will give ABB a voice in high-level discussions at the company and ensure that our customers’ needs remain a key focus for new developments (see page 14).

I hope you enjoy reading this newsletter. As always, I look forward to your questions and comments, and to working together to meet your needs in network management.

Best regards,

Jens Birgersson,
Network Management Business Unit Manager
Since the publication of the IEC 61850 standard and the commissioning of the world’s first multi-vendor project in Laufenburg in 2004, ABB has supported numerous customers in accomplishing the paradigm change associated with introducing IEC 61850 substation automation systems. Meanwhile, more than a thousand systems and a vast number of products have been delivered to around 70 countries resulting in comprehensive experience with new installations, retrofit and migration projects.

The development of powerful tools and efficient processes simplifies the implementation of IEC 61850 across the portfolio of products, applications and systems. Full compliance to the standard is verified by an in-house system verification center, the world’s first vendor owned test laboratory to earn qualification by the UCA International Users Group.

The state-of-the-art product portfolio along with proven system integration capabilities enables ABB to realize the standard’s full potential in substation automation systems. This is equally ensured in systems with centralized and decentralized architectures, GOOSE\(^1\)-based and distributed functions as well as multi-vendor integration and latest technologies such as sensors integrated via the process bus.

The continuous commitment to the global IEC 61850 standard from the mid nineties and into the future with expert engagement in new editions as well as extensions into other domains such as power generation, communication between substations and to network control centers allows ABB to support customers wanting to benefit from these developments.

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1 GOOSE = Generic Object Oriented Substation Event

Example IEC 61850 projects around the world:

1. Teck Cominco’s Waneta 230/63 kV S/S, Canada
2. EGL’s Laufenburg 380 kV substation, Switzerland
3. EDP Distribuição Energia’s six HV/MV stations, Portugal
4. ESKOM’s seven 765 kV S/Ss, South Africa
5. ENELVEN’s and ENELCO’s Soler & Ménanos S/Ss, Venezuela
6. Eletrosul’s three 230/69 kV S/Ss, Brazil
7. EWA’s Financial Harbour, Sitra & Buqjwwah S/Ss, Bahrain
8. DEWA SA frame contracts, Dubai
9. Transco’s and ADWEA’s new 400 - 11 kV GIS S/Ss, Abu Dhabi
10. Federal Grid Company’s Ochakovo 500/220/110 kV S/S, Russia
11. NTC’s six new 161/22.8 kV S/Ss, Taiwan
12. Six new HV substations for PGCIL, India
13. SA for PT PLN’s five retrofit 150 kV S/Ss, Indonesia
14. NGCP’s Pitogo S/S and Meralco’s Amadeo S/S, Philippines
15. Rio Tinto/Hamersley Iron’s 220 kV Juna Downs S/S, Australia
16. TVA’s Bradley 500/161 kV, United States

IEC 61850 – a success story all around the world

Substation automation systems pave the way to a smarter grid
The goal of IEC 61850 is to facilitate interoperability of substation devices while simplifying engineering and maintenance. The examples described in the following articles present just some of ABB’s projects using the standard and have been taken from ABB’s recent special report on IEC 61850. To read more about the standard and ABB’s role in its development and deployment, visit www.abb.com/review and click on the icon for the IEC 61850 special report.

Retrofitting for the future

It is inevitable that as substations age, their parts will need to be replaced. The 380/220 kV air-insulated substation (AIS) located in the Alps in Sils, Switzerland was one such case. Its secondary infrastructure – ie, protection, control and metering – and parts of its primary equipment at the 380 kV level – ie, switchgear, power transformers and circuit breakers – had reached the end of their useful lives. The operator KHR (Kraftwerke Hinterrhein) thus turned to ABB for an economically feasible, standardized and forward-looking solution for one of the most important nodes in the Swiss transmission network. The answer: a substation automation retrofit using IEC 61850 technology.

Implementing the IEC 61850 standard enables availability of all necessary information – which supports extensions, replacements or upgrades of all or part of the substation automation system – and enables the integration of products from different suppliers. It also ensures data consistency within the complete system and defines the engineering processes, helping to keep data and data flow consistent for the whole substation. In this project, the horizontal bay-to-bay communication model GOOSE was used to reduce copper wiring between the bays. All information for interlocking between bays is now exchanged between the ABB Relion® 670 series IEDs (intelligent electronic devices) on the IEC 61850 bus via GOOSE messages.

Although testing was a major part of the retrofit, the greater challenge was to avoid a shutdown during commissioning. Outage time of individual feeders had to be minimized and coordinated with the grid operator months in advance. The complete system was manufactured and delivered to the site where, except for the connection to the AIS (air-insulated switchgear) interfaces, it was installed. Once the dedicated bay was commissioned, the new IEDs were connected to the primary equipment. The substation was configured to enable concurrent operation of the existing and new equipment during the transition phase.

After successfully retrofitting the 380 kV substation, the 220 kV part was integrated into the new control system. The existing IEDs were equipped with a new IEC 61850 communication interface, allowing communication with the new MicroSCADA Pro control system and ensuring that both the 380 kV and 220 kV switchyards could be operated and monitored from the central control system. A hot standby system was put in place to provide backup should a failure occur.

Contributed by Marcel Lenzin
ABB Substation Automation Systems Baden, Switzerland

Challenges build partnerships

In 2006, ABB supplied a pioneering substation-automation project to the Brazilian government power transmission utility, Eletrosul. This utility is responsible for electrical transmission in the south of Brazil. The projects delivered were based on the IEC 61850 standard, with applications using messages between IEDs, GOOSE (Generic Object Oriented Substation Event), redundant control units and featuring interoperability between systems from different vendors.

The first project consisted of three substations, “Atlântida 2”, “Gravataí 3” and “Osório 2”. These are 230 kV and 138 kV transmission substations. “Atlântida 2” uses 60 IEDs (14 with redundancy and 32 without) for protection, acquisition and control. These are mapped to 13,683 dynamic objects from a total of 28,786 objects available in the IED. About 3,300 of these were distributed to centers of higher hierarchy

Redundant control was one of the special challenges of this project. This philosophy, used by Eletrosul for many years, requires two control terminals. These have exactly the same functionality in
terms of control logic, interlocking and automatisms for controlling a certain number of bays. Both units are active, but just one is monitored by the supervisory system. In case of unavailability of a terminal, the SCADA system switches to the other IED.

Based on this philosophy, Eletrosul clearly defines how a system should react, for example, in contingency situations. Briefly, the terminal managed by the supervisory system is monitored and executes remote commands. In case of interlocks, the two redundant terminals send signals to external bays. This affects the philosophy of treatment of these redundant signals by the receiving logic.

In this project, GOOSE was widely used both for monitoring the active terminal and for interlocks and automatic logics. This permitted a considerable saving of cables as twice as many signals are generated and received in this philosophy versus a philosophy of simple control. Eletrosul uses SAGE (an open-source energy-management system) as SCADA software, developed by CEPEL, a Brazilian government research center. The MMS protocol defined in IEC 61850 was implemented in SAGE in 2006. The ABB project was thus a test of the standard’s interoperability. This test was passed successfully.

Another request from Eletrosul was to minimize the number of hours required for the preparation of texts in the system database. For this, it encouraged minimal use of generic signs. Even so, in the control terminals that use many monitoring aspects not defined in the standard (mostly complex interlocks and automatic logic) the use of GGI0s is still very high. It is hoped that as the IEC 61850 standard evolves, more standard signs will be provided. In IED protection, it was found that the use of GGI0s was reduced because of the standard, and because ABB IEDs use standards for all protection functions.

The three substation projects fostered a spirit of partnership between Eletrosul and ABB, resulting in new projects being carried out together delivering the benefits of IEC 61850.

Contributed by Maurício Pereira
ABB Power Systems Guarulhos, São Paulo, and Gonzalo Humeres Flores, Eletrosul

Wuskwatim transmission system

In order to strengthen the existing 230 kV network, Manitoba Hydro, the main utility in Manitoba Canada contracted ABB for the design, engineering, supply and commissioning of Wuskwatim Transmission System Complex, comprising three new stations and the expansion of four existing ones. The new stations featured distributed control, bay protection and a bay controller concept. The entire control and communication process used the IEC 61850 standard.

Protection devices were sourced from three different manufacturers. In fact the use of different suppliers was a requirement of the protection redundancy concept. Prior to IEC 61850 such integration would have been challenging if not impossible, especially for large systems due data and engineering inconsistencies.

The IEC 61850 engineering approach and data structure using SCL language significantly facilitated the engineering of interfaces between different units. The descriptive power of the SCL language enabled part of the integration to occur without having access to all devices or bay-level information.

ABB and Eletrosul worked in partnership to implement the IEC 61850 standard in substations in Brazil. Redundant control was a key requirement in this project.

The entire control and communication process on the Wuskwatim project used IEC61850.

The IEC 61850 engineering approach and data structure using SCL language significantly facilitated the engineering of interfaces between different units. The descriptive power of the SCL language enabled part of the integration to occur without having access to all devices or bay-level information.

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2 MMS = Manufacturing Message Specification
Because design, manufacturing and testing of the two SA systems was completed in close collaboration between ABB and Manitoba Hydro, an attuned and future-proof system was delivered. The IEC 61850 standard made it possible to combine and integrate protection IEDs from ABB, Siemens and Areva within the SA and thus to fulfill safety requirements. The use of GOOSE messages for bay-to-bay interlocking and intertrip reduced the amount of copper wiring required. The complete communication of the substations are now described and documented in SCD (Substation Configuration Description) files, which is an advantage for the future maintenance and extension of the stations that are now in service.

Contributed by Mansour Jalali
ABB Substation Automation Systems, Burlington, Canada

The Star of Laufenburg shines
The 380 kV Laufenburg substation – one of the largest and most important in Europe – boasts several world firsts. Staying abreast of the development and extension of IEC 61850, its owners, the Swiss utility EGL AG, were the first to equip a high-voltage substation with an IEC 61850 automation system, doing so shortly after the release of the standard in 2004, and even opting for a multi-vendor solution. Two years on, the utility issued the very first open tender based on a SCD (substation configuration description) file, and most recently implemented the 9-2 process bus.

The Laufenburg substation is one of the largest and most important in Europe.

When built in 1967, at the inception of the European grid, the Laufenburg substation, with its key position in terms of interconnection and metering, was dubbed the "Star of Laufenburg". It was extended and upgraded between 1979 and 1981. From 2004 to 2009, EGL undertook the following refurbishment work:

- **Step 1**: retrofit of primary and secondary equipment
- **Step 2**: replacement of old station HMI
- **Step 3**: pilot project for IEC 61850-9-2

**Step 1: Bay retrofit**
Both primary and secondary equipment of the 17 feeders was replaced in a bay-by-bay manner, warranting an almost interruption-free retrofit. The migration was supported by a compact hybrid solution that connects new gas-insulated switchgear (GIS) modules to an existing air-insulated switchgear (AIS) busbar using silicon bushings. The GIS modules comprising circuit breaker, disconnector, earthing switch and instrument transformers were pre-tested to enable short installation times. They offer maximum operational safety and high immunity to environmental conditions. They also require less space and simplify maintenance as replacement of a complete pole can be performed in less than 24 hours.

Laufenburg was the world’s first IEC 61850 installation in a high-voltage substation, delivered by ABB in 2004.

The future-proof secondary retrofit concept addressed the varying lifecycles of bay- and station-level equipment. With the latter being retained, ABB integrated its new IEC 61850-compliant bay control and protection IEDs (Intelligent Electronic Devices) into the third-party control system using a gateway converting IEC 61850 to IEC 60870-5-101. ABB also successfully integrated a third-party main protection device with an IEC 61850 interface. Consistency of bay data during the stepwise upgrade was supported by pre-configuring and pre-testing using an SCL-based tool.

**Step 2: Station-level replacement**
In 2007, ABB won an open tender for the replacement of the old station HMI (human-machine-interface). ABB installed a new IEC 61850 HMI fully re-using the engineering data from the SCD file generated for the bay retrofit.
Step 3: Introduction of process bus
The pilot installation contains a selection of products and systems ready for the IEC 61850 process bus.

On the primary side, there is a combined and fully redundant CP-3 current and voltage sensor with merging units for protection and metering. On the secondary side, a REL670 line distance protection IED and a REB500 busbar protection system with three bay units are in operation. Metering is performed by an L+G energy meter. For supervision and easy access, a substation automation system using IEC 61850 station bus completes the pilot installation.

ABB has its own IEC 61850 testing facility in which the system aspects of every product, system component application and tool is verified and validated in a real-life system.

The pilot is running in parallel to the conventional control and protection system and enables collection of long-term real-life experience as well as comparison of behavior. Since its commissioning in 2009, the system has been in continuous operation.

Contributed by Petra Reinhardt
ABB Substations Baden, Switzerland
and Stefan Meier
ABB Substation Automation Systems Baden, Switzerland

Complete systems are verified to ensure that they meet full requirements in terms of communications, integration, functionality, security and performance.
ABB wins major network management order in the UK

ABB won a major order last month from National Grid in the UK to provide a market management system to help balance supply and demand for electricity in the country.

The Network Manager™ Market Management System (MMS) will replace National Grid’s current system for managing the UK’s total electricity demand of more than 55,000 megawatts. It is a reliable, robust, secure, and flexible solution that enables the integration of renewable energy sources. It also improves the performance of applications such as automated dispatch and transmission security, while minimizing the impact on market participants. The solution will support scheduling, real-time management, external interfaces and overall systems integration.

“This is another example of ABB’s contribution toward the evolution of more flexible and reliable grids,” said Jens Birgersson, head of ABB’s Network Management business, a part of the Power Systems division. “With Ventyx on board, ABB is uniquely positioned to bridge the gap between information technology and operational technology and meet our customers’ diverse needs from a single source.”

MMS is part of the Network Manager suite offered by Ventyx, which was acquired by ABB earlier this year. Ventyx provides enterprise software, energy markets data and professional services that enable energy, utility, communications and other asset-intensive organizations to optimize operational efficiency and productivity.

National Grid is a leading international electricity and gas utility. It owns the high-voltage electricity transmission network in England and Wales and operates the system across the UK.

ABB software to enhance performance of new power plants in China

In November, ABB signed an agreement with China National Nuclear Power (CNNP) to provide enterprise asset management (EAM) software solutions for the company’s extensive new-build nuclear power plant program. Our enterprise asset management software solutions, to be provided by Ventyx, an ABB company, will support CNNP’s ambitious nuclear power program.

The EAM software solution from Ventyx is the industry-leading solution for the management of operations and maintenance in the nuclear power sector, and helps customers generate electricity safely and reliably.

This significant order further validates ABB’s recent acquisition of Ventyx to bridge the gap between information technology and operational technology. It demonstrates that ABB can meet the diverse needs of its clients—including those in the most demanding environments—from a single source.

“ABB’s extensive technology portfolio and experience, combined with Ventyx’s successful track record of implementing power plant management software systems, provides a unique value proposition for our clients,” said Jens Birgersson, head of ABB’s Network Management business within the Power Systems division.

ABB is a leading provider of solutions to the power generation sector. A significant number of the major nuclear power stations in North America use Ventyx software to manage their plant operations and maintenance programs.

ABB will implement software and training programs at the CNNP power plants in partnership with the Research Institute of Nuclear Power Operation (RINPO) and Computer Application Institute, Nuclear Industry (CAINI), both subsidiaries of the Chinese National Nuclear Corporation.

CNNP, also a subsidiary of the China National Nuclear Corporation, has one of the most ambitious nuclear power plant construction programs in the world. The potential of nuclear power as a clean alternative to traditional fossil-fuel plants has made it a centerpiece of China’s energy development strategy.
As part of DAA’s (Dublin Airport Authority) ‘Transforming Dublin Airport’ investment program to deliver new and improved customer facilities at Dublin Airport, Ireland, DAA recently invested in a second international terminal, namely “Terminal 2” or more commonly known as “T2.”

ABB won the tender to engineer and deliver the mission-critical medium-voltage (MV) and low-voltage (LV) electrical network in T2, which comprises 11 interconnected substations at various locations across the T2 site. The new substations are equipped with ABB’s UniGear MV switchgear, including ABB REF543 protection relays for electrical protection, monitoring and control.

To ensure maximum availability of the network, which is essential for the airport’s operations, an ABB MicroSCADA (Supervisory Control and Data Acquisition) Pro software system has been installed. This system will facilitate remote monitoring and control of the entire network.

A major benefit of the MicroSCADA Pro system is that it allows the DAA to monitor its substations remotely. It automatically sends an alarm to system operators in the event of a fault. The software is able to send text messages to DAA staff, warning them of an event, current or even impending, which allows them to take prompt corrective and/or preemptive action, thereby reducing the probability of outages. This would simply not be possible without the MicroSCADA Pro system. Another huge advantage to the DAA is the safety it affords their staff by allowing them to operate switchgear from the safety of a workstation, well away from the switchgear itself. In addition to monitoring and control of switchgear, the MicroSCADA Pro system delivers a number of other benefits.

The DAA operators can also use the MicroSCADA Pro to monitor and control a combined heat and power (CHP) plant, which is used by the Authority to generate its own power. This enables the airport to reduce the amount of energy it needs to purchase from the local utility, which results in cost savings. The savings are particularly important during periods of high electricity demand, when electricity from external sources is expensive. The MicroSCADA Pro system enables the CHP operations to be optimized, controlling the timing of start-ups and shutdowns, and regulating the amount of electricity it produces in line with the airport’s needs.

CHP operations and power sourced from the utility are monitored in real-time alongside the power demands of the airport facilities. A demand-response system balances supply and demand to achieve the most efficient use of resources. And, as its name implies the CHP plant also generates heat, which is used by new terminal, further reducing the DAA’s energy costs.

Terminal 2 at Dublin Airport, Ireland. Due to open in November 2010, the new terminal is equipped with a range of ABB substation equipment and a MicroSCADA Pro network control system to safeguard mission-critical power supplies to the terminal and its surrounding infrastructure.
The MicroSCADA Pro system is used to monitor and control T2’s emergency power equipment: two stand-by diesel generator sets, which can reduce the terminal’s peak electricity demands and to provide “black-start” capability, i.e., the ability to restart T2’s power systems in the event of a complete loss of mains electricity. In the unlikely event of a complete power outage, the MicroSCADA Pro system is able to detect the loss of mains supply and automatically start, synchronize and load the diesel generators, providing emergency power to essential T2 services.

In the event of a partial loss of mains supply, e.g., if one of the terminal’s two grid connections was to fail, the MicroSCADA Pro system would automatically reconfigure the T2 network to receive power from the remaining supply, coordinating the restoration of power to equipment as the system returns to normal. In total, the MicroSCADA Pro system can implement six automated sequences, each consisting of up to thirty discrete steps.

The building of T2, in conjunction with the extension of the existing Terminal 1, required the installation of a new on-site high-voltage to MV electrical substation, the Bardstown substation. The role of this substation, which is already in use, is to provide the airport campus with a more reliable and robust connection to the local electricity grid. Before this substation went into operation, the entire airport was supplied by a single 38 kV connection from the utility. It now has two independent 110 kV connections, fed by two separate utility substations, which hugely improve the reliability of the airport’s power supply.

The airport improvement works also included upgrading the existing “Campus” electrical network, which serves Terminal 1 and its peripherals. This included upgrading all Campus MV switchgear and the replacement of a legacy SCADA system with a new MicroSCADA Pro system, relying on ABB’s REF543 protection relays, mentioned previously, and the RTU560, a remote terminal unit used as a communications gateway on the T1 network.

Again the DAA contracted ABB to deliver the switchgear and MicroSCADA Pro systems for use in both the Bardstown substation and the existing Campus network. The three MicroSCADA Pro systems provided for the upgrade collectively handle over 10,000 input and output signals.

In order to meet all of the DAA’s requirements, ABB established and led an integrated team comprising experienced project managers, low-, medium-, and high-voltage electrical-design engineers, commissioning engineers and software engineers. The project drew on expertise from both local operations and ABB’s centers of excellence around the world, enabling the customer to deal with a single supplier for all of the network and substation refurbishment work.

As the project nears completion, the customer has praised ABB of its performance and its ability to deliver such a complex system on time, while also proposing many enhancements. The new terminal is due to open in November 2010.
Ventyx highlights network management solutions at client summit

Ventyx, an ABB company, wrapped up its Mindshare client summit in the United States last month to a record crowd of more than 500 customers in San Diego, California. The summit began on October 18 with an opening reception in the demonstration pavilion, where clients were invited to explore the available software and data demonstrations -- including the new additions to Ventyx’s lineup, the ABB Network Manager solution.

Solutions were segmented by industry: Asset Suite, eSOMS, and Network Manager in the Generation Pavilion; Service Suite in the Communications and Workforce Management Pavilion; Network Manager and Service Suite in the Transmission & Distribution Pavilion; and Energy Portfolio Management for operations and analytics.

The opening keynote reception took place on Tuesday morning. Ventyx COO Steve Carpenter addressed the promising future of Ventyx and its solutions that help each of our clients focus on key needs (e.g., managing critical infrastructure, repowering the future, and managing source-to-socket: smart grid deployments). Afterward, Enrique Santacana, Manager of ABB in North America, outlined how the combined resources of ABB and Ventyx can help energy efficiency and optimization along the entire energy value chain. Author Joel Kotkin also challenged the crowd with interesting statistics on the US population from his book, The Next Hundred Million: America in 2050.

The following two days included more than 160 sessions dedicated to product strategy, roadmaps, and current best practices including a full track highlighting the capabilities of the Network Manager suite. For more information on Mindshare, send an email to mindshare@abb.ventyx.com.

Enrique Santacana, manager of ABB in North America outlined how the combined resources of ABB and Ventyx can help energy efficiency and optimization along the entire energy value chain.
ABB customer day, a success in Qatar

Over 600 key customers participated in ABB’s second annual customer day in Doha, Qatar in late October. The event presented ABB technologies, in theory and in practice, through a series of seminars and exhibits. This format, which also provided opportunities for interaction with ABB experts, proved popular with our customers.

At the event, 16 ABB speakers gave presentations and good use was made of the 1200 sq m exhibition space at the Ritz-Carlton hotel in Doha. Customers came from all around the Gulf and included delegations from major oil-and-gas and utility companies in the region. The ABB portfolio, including integrated products, systems and solutions from across the Group, was well presented, with additional information being provided by knowledgeable ABB staff. Customers were able to take a close look at ABB’s extended automation platform, System 800xA, alongside telecommunication equipment, a compact substation, medium-voltage drives, low-voltage switchgear, and Ventyx, an ABB company, displayed its range of software solutions for the utility industry.

“The response to this customer event underlines the importance of Qatar as a growing market and the opportunity that ABB has in the country,” says Johan de Villiers, country manager for ABB in Qatar.

Customers gathered in classrooms throughout the day to learn about ABB technologies. Speakers made also themselves available during breaks and meals for additional questions.

Over 600 key customers participated in ABB’s second annual customer day in Doha, Qatar in late October.

Among the ABB speakers were Jim Kelly, head of Energy Efficiency at ABB, who gave an insight into how ABB’s products and systems can help customers to use electricity more effectively, and Alper Akdag, an ABB global product manager, who gave a presentation entitled “How green is your Transformer?” promoting ABB’s range of environmentally friendly products. Thomas Schmager, a specialist in medium-voltage drives presented a case study on the advantages of upgrading gas turbines with electric drives. Customers were able to register online in advance for the seminars, which generated a steady flow of traffic throughout the event.

In the run-up to the customer event, ABB hosted its first-ever University Day in Qatar, which gave local students a preview of the event’s exhibition material and technical seminars.

Engineering students were invited from three local universities: Qatar University, Texas A&M, and College of the North Atlantic in Qatar. Close to one hundred students visited the exhibition, learning about ABB’s technologies and gaining an understanding of what ABB can offer promising engineering graduates.

“One of the cornerstones of Qatar’s development strategy is educating and developing the next generation of students. ABB University Day has given us the opportunity to show our commitment to this country-wide initiative,” concluded de Villiers.
ABB wins Network Management order in Saudi Arabia

ABB has won an important contract to supply and install a new control system for the Saudi Electricity Company’s (SEC) distribution network in Riyadh, Saudi Arabia. The new system, along with a comprehensive training program, will be delivered in only 12 months time.

ABB will design, deliver, install and commission a new Network Manager SCADA/DMS (supervisory control and data acquisition/distribution management system) for the city. The system will include advanced functions for load calibration and estimation, load flow, contingency calculation and short-circuit analysis. ABB will also transfer existing data from the company’s previous installation to the new system, securely and reliably, within the 12 month plan laid down by the customer.

The new Network Manager SCADA/DMS will be a key component of the 33 kV distribution network supplying the Saudi capital. This is a relatively large network, including approximately 200 substations, serving the city’s 4 million residents and a number of regionally important centers.

The new system will enhance performance and merge the network’s two existing SCADA systems, which were delivered by ABB some years ago. Combining the systems will enable the entire distribution network to be operated from a central control room, which will feature graphical display screens and a large wall display. This will replace the existing outdated mimic board, extending the scope of the operating environment and significantly enhancing system visibility for operators. Improving the situational awareness of the operators will lead to improved operation of the network.

ABB’s application package for network state estimation (real-time load calibration) and load flow calculations was specially developed to make maximum use of existing data, which can save a lot of time in network management. The availability of load profiles for different seasons, day length, etc. can be used to complement missing information and to improve the visibility of the network. This raises the accuracy of applications in distribution networks to levels comparable with traditional load flow and estimation programs, without full instrumentation and P- and Q-measurements.

The Short Circuit Analysis (SCA) function enables system operators to gather information on simulated electrical faults in the system and to test the ability of circuit breakers to operate properly under fault conditions. The results of short-circuit analyses can also be used to design protective relays for system planning and to study critical states of the network. Contingency Analysis (CA) evaluates the potential consequences of outages in the power system network. It can be used to simulate single and multiple outages of the system’s 33 kV lines, transformers, generators, sources, busses or electrical nodes. It enables potential overloads and voltage/VAr-problems caused by such outages to be identified by the operator.

The DMS functions that are part of ABB’s delivery for this project will contribute to SEC’s goal of having a top-of-the line control system for its distribution network. SEC’s existing RTUs (remote terminal units) comprise three models from ABB, as well as third party devices. These will be connected to the new system using existing communication lines equipped with a new front-end computer and communication modules.

“This new control system will enable the customer to manage and control the distribution network more effectively, minimizing outages and supporting stable operation,” said Jens Birgersson, head of ABB’s Network Management business unit. “We are particularly pleased that we are able to meet the customer’s very short delivery time for the system.”

Future development plans in central Saudi Arabia include additional distribution control centers and SEC is also considering integrating the distribution control center into its 13.8 kV network. This would require a large number of ring main units (RMUs) to be motorized and equipped with RTUs and GPRS modems.

ABB is the world’s leading supplier of high-end network control systems for power generation, transmission, distribution and central market management. More than 400 ABB SCADA-based systems have been installed to provide monitoring and control functions, resource optimization, fault diagnosis, outage management and energy trading capabilities for networks around the world. The systems are important enablers of smart grid developments.
ABB invests in Trilliant

As recently announced, ABB has made an important and strategic investment in a leading smart grid company – Trilliant Networks, located in Silicon Valley, California, in the United States. ABB’s investment, made through the Group’s venture capital arm, ABB Technology Ventures, gives ABB a link to the Trilliant offering for smart grid communications, including advanced metering infrastructure. In turn it provides Trilliant the benefit of ABB’s expertise in grid infrastructure and network management.

Who is Trilliant?
Trilliant is a smart grid communications company. It supplies utilities with wireless mesh equipment and software to enable two-way communication networks throughout the electric grid. However, unlike typical smart grid vendors, Trilliant provides solutions that have much broader capabilities than simply reading electric meters. Trilliant focuses on providing electric utilities with end-to-end communications networks that span from the head-end operations center to all devices on the grid – not only meters and in-home energy management devices, but also feeders, substations and grid devices such as transformers and capacitor banks. Trilliant’s smart grid solutions help utilities deploy smart grid networks throughout their territory to improve energy efficiency, integrate renewable resources, and optimize grid operations.

Today, Trilliant has over 200 utility customers and has helped to implement some of the most advanced smart grid networks, including the largest North American deployment for Hydro One. They have over one million smart meters deployed across 350,000 square miles to enable demand-response applications like time-of-use pricing and critical-peak pricing, providing customers with energy efficiency programs. Note a few example customers below.

Trilliant is also a winner of the “Going Green Silicon Valley Top 100” Companies and is considered part of the next generation of clean technology enterprises that will transform the global economy.

Why invest in a smart grid communications networking company?
Smart grids are modern power systems that use sophisticated monitoring and control systems to ensure an efficient and reliable flow of power through the grid. They are the next stage of evolution for traditional power systems. As demand for power rises, and concern for the environment brings increasing volumes of renewable power into the grid, the systems are changing. They are becoming increasingly automated to accommodate the large-scale introduction of renewables, and to ensure the efficiency and reliability of the power supplies on which modern societies depend.

Although smart grids are in the early stages of development, ABB’s researchers and developers have been working for some years on the technologies to support this evolution. A number of these technologies, which include network management solutions, wide-area monitoring systems and power electronics installations, are already in use and have proved their worth.

ABB’s association with Trilliant, its extensive experience in operational technologies and its recent acquisition of utility software provider, Ventyx, put the Group among the leading players in smart grid development.

ABB will continue to provide solutions for grid reliability and energy efficiency well into the future, helping to deliver the levels of performance and security that utilities and consumers demand.

Why is Trilliant’s solution critically important for utilities?
Utilities around the world are investing billions of dollars in automated metering infrastructure (AMI). This infrastructure is practically useless without an advanced, high-availability, two-way and affordable communications networking solution. This makes Trilliant’s solution critically important for utilities.

One significant benefit of working with leading electric utilities like Hydro One is getting insight into their long-term goals. Smart grid solutions’ architects envision an “energy Internet” that not only connects home devices like thermostats, appliances, solar panels, and plug-in hybrid electric vehicles (PHEVs), but also connects all other devices on the grid,
including distributed power generation, distribution substations, and a variety of other grid assets. This energy Internet requires considerably higher capacity, lower latency and broader coverage than the standard advance metering infrastructure (AMI) networks being deployed today.

**More about Trilliant’s solution and technology**
Trilliant offers long-range, high-capacity, high-availability, multi-tier, wireless mesh networks that are highly scalable and extremely secure including:

- The Wide-Area Network (WAN), which provides long-range backhaul of AMI networks as well as multi-megabit broadband capacity and millisecond latency to mission-critical grid assets.
- The Neighborhood-Area Network (NAN), which provides connectivity between smart meters and in-home demand management devices.
- Enterprise network management software to monitor and manage the entire smart grid network.

With this multi-tier network, Trilliant provides smart grid solutions unlike anything else in the industry: a secure, private, and cost-effective broadband communications network that is based on open standards and is capable of providing complete coverage across the entire utility service territory.

**Early ABB/Trilliant team success**
While the investment by ABB in Trilliant was made only very recently, there are some encouraging signs of early success. One prominent US customer has already begun negotiations to conduct a pilot- and proof-of-concept project for a joint ABB medium-voltage distribution automation solution that would initially link five enclosures with Trilliant’s communication solution.

Both ABB and Trilliant are very excited about the growing smart grid business prospects for our joint solutions around the world.

**BU PSN – Leading and managing the ABB investment**
ABB’s Network Management business unit is leading and managing this strategically important investment by the ABB Group. To this end, Salim Khan, head of ABB’s Network Management business unit in North America has taken a seat as an observer on the Trilliant board of directors. In his position as board observer, Khan will attend the company’s board meetings and participate in discussions, though he will not have voting rights.

“This position will build on ABB’s investment in Trilliant and support our ongoing collaboration on technology developments,” said Jens Birgersson, head of ABB’s Network Management business unit. “It will also bring an ABB voice to high-level discussions at the company.”

ABB’s investment in Trilliant is made through the ABB Group’s venture capital arm, ABB Technology Ventures. “The investment in Trilliant is part of ABB’s strategy to explore emerging technologies,” said Girish Nadkarni, head of ABB’s Technology Ventures, “Collaborations like this speed up the development and implementation of new technologies, which can bring a competitive advantage to ABB and its customers.”
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