# Innovation highlights

## The 11 best innovations for 2011

**ABB is continuously seeking to further strengthen and expand its product portfolio. Across the world, the company's research and development labs are hard at work creating the technologies, products and solutions that will further raise the productivity, efficiency and flexibility of its customers' operations. The successes scored every year are numerous, and selecting the most notable of these is no easy task. The current selection is a cross section of recent successes. Many of these, as well as other technological achievements, are discussed at greater length in this and forthcoming issues of *ABB Review*.**

### The slender-armed welder

**ABB has added a new model to its mid-range IRB 2600 robot family: the IRB 2600ID. The ID in the name stands for integrated dressing, meaning the arc-welding hose package is routed inside the robot's upper arm and wrist.**


Integrated dressing is about more than smart looks. Because swinging cables must no longer be taken into account, the robot's movement is totally predictable. This makes the robot easier to program and permits faster movements. With its slim arm and wrist, the robot can enter restricted spaces, taking on challenges such as circular welds without compromising on quality or speed.

With all hoses and cables firmly secured and protected, exposure to weld spatter is also reduced, increasing the lifetime significantly. Purchasing and exchange costs are reduced by up to 75 percent and up to three production stops per year can be eliminated. Complete weld packages, tailored for the IRB 2600ID, are available from several major arc-welding process equipment suppliers including Fronius, Esab, Binzel and SKS.

The IRB 2600ID has a very small footprint. Its swing base radius is only 337 mm and its base width 511 mm. For arc-welding applications, the reduced risk of interference with other robots allows for productive, high-density installations with 50 percent more robots, and up to 50 percent higher output from a production cell.

For more information on robots from ABB, please visit www.abb.com/robotics

# First commercial IEC 61850-9-2 LE installation

**IEC 61850 is a standard that supports both communication between devices and data sharing in substation automation. The IEC 61850-9-2 section of the standard describes the sharing of analog values on the process bus. ABB is currently installing the world's first implementation of a process bus according to this section.**

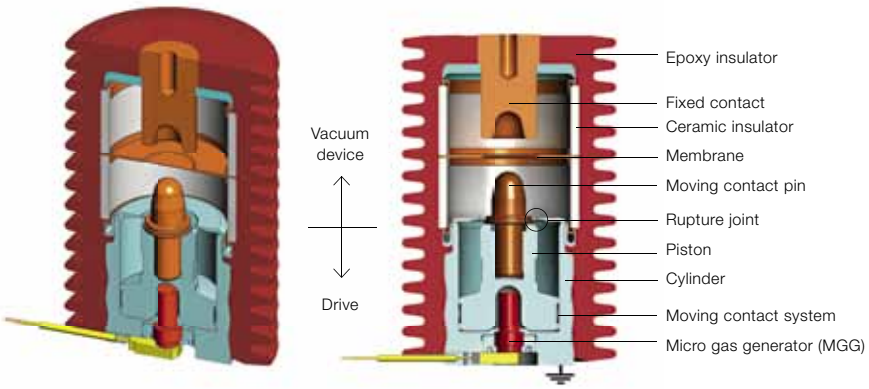
A process bus is the communication network between primary equipment (such as instrument transformers) and secondary equipment (such as protection and control devices) of a substation-automation system. It transmits analog data to the secondary equipment, where it is used for efficient protection and control of the entire substation. Prior to the emergence of the new standard, this communication would typically have required extensive copper cabling.

IEC 61850-9-2 LE has numerous advantages. As the bus is optical, risks caused by high voltage are reduced. Maintenance is also simplified as electronic components can be exchanged without having to shut down the entire system. The introduction of IEC 61850-9-2 LE is being accompanied by the introduction of a powerful testing and diagnosis toolbox.

For more information, see "Sharing values" on pages 73 of this issue of *ABB Review*.

# Speed and safety in switchgear

**The technologies from ABB's well-known and fast-acting vacuum interrupter and the world's fastest limiting and switching device, the Is-limiter, have been cleverly combined to form an arc-fault protection system for new (internal arc classified) and older generation medium-voltage switchgear that operates in the ultrafast range.**




The system operates on the principle that the uncontrolled release of energy from an internal arc fault is prevented by rapid metallic 3-phase earthing. Characterized by a significantly low impedance, this type of connection causes the short-circuit current of an arc fault to commutate immediately to the fast-acting and innovative earthing switch and extinguish the arc.

The new ultrafast earthing switch (UFES) contains three complete primary switching elements (each consisting of a two-part vacuum chamber embedded in epoxy resin), and a quick release electronic unit for the rapid and reliable detection of fault currents and arc light intensity in the compartment. With an extremely short switching time of less than 1.5 ms, this device will ensure all arcs are extinguished almost immediately.

In technical terms, system availability and operator safety are greatly enhanced for rated voltages up to 40.5 kV and rated short-time withstand currents (1s) up to 63 kA. From an economic point of view, downtime and repair costs resulting from faults will be drastically reduced while system availability will increase.

For more detailed information about ABB's ultrafast earthing switch, please see "S3 – Speed, safety and savings" in *ABB Review* 2/2010, pages 84–87.

# Compact and green GIS

**ABB has launched its 72.5 kV ENK series of gas-insulated switchgear (GIS). Notable attributes include a 25 percent smaller footprint compared with existing products with similar performance, and a 50 percent reduction in the amount of $SF_6$ gas used.**

The ENK series features advanced plug-and-switch technology and an intelligent secondary interface to meet future smart grid requirements. Further notable new features include its greater ease of operation, such as ready access to the operating mechanism from the front panel, and the current transformers located outside the gas compartment.

With its plug-in busbar connections and shipment of complete, factory-tested bays, the ENK GIS can be easily and quickly installed on-site. It is rated for a nominal voltage of 72.5 kV, is available for up to 2,500 A rated current and 40 kA short circuit in versions conforming to IEC and IEEE standards.


The compactness and modularity of GIS makes it ideal for installation in locations where space is constrained, such as in cities. Even indoor installations are possible. ABB also offers GIS for offshore and mobile applications. The company pioneered the first high-voltage GIS in 1965 and is the global leader in high-voltage GIS technology, with more than 20,000 bays installed and in operation around the world.

# Wireless and autonomous

**In the process industry, sensors relay information that is used to help maximize reliability and availability. Sensors require wiring for power and communication, a factor that adds to the cost and complexity of installation. While batteries are used to power many wireless devices, exchanging them at regular intervals may offset the savings of having wireless sensors in the first place. Here energy harvesting (EH) can provide a solution.**

EH is the process by which energy derived from sources external to the device is captured and converted into electrical energy to supply low-power electronics. Typical energy sources include hot and cold processes, solar radiation, and vibration and kinetic energy from flowing media or moving parts.

EH can be a discontinuous process or there may be times when the EH system supplies more energy than is actually needed. In any case buffers (eg, special capacitors, primary or secondary cells) are needed to overcome times when the harvesting device is unable to supply enough energy for the sensor node. An appropriate power management system is also required for a truly autonomous power supply.

Research at ABB has realized a complete autonomous temperature transmitter using a fully integrated EH system. Thermoelectric generators have been integrated into the device, which also includes a smart energy management solution when the process temperature is insufficient to generate enough energy.

For more information about energy harvesting please refer to “Harvest time” on page 47 of this issue of *ABB Review*.

# System 800xA version 5.1

**Since being first released in 2004, ABB's Extended Automation System 800xA has been adopted by more than 6,000 customers. The system has improved operator effectiveness, achieved seamless control solutions and integrated diverse and usually separate systems. Version 5.1, released in 2010, introduces further enhancements, improving performance, usability and operator effectiveness.**

One area where Version 5.1 presents notable advantages is in engineering and change management. The Task Analysis Tool permits the evaluation of an application prior to its downloading, showing, among others, latency and conflicts. The Detailed Difference Report highlights modifications made in control applications and graphics.

The new version also includes a new member of the AC800M controller family, the PM891, with approximately three times the clock speed (450 Mhz) and four times the memory of its predecessor, making it the most powerful controller in its class. Virtualization reduces the physical number of PCs by as much as 75 percent. This significantly lower footprint also reduces energy consumption and maintenance requirements.

Improvements in alarm-management capabilities include new alarm shelving and analysis features and improvements in alarm share functionality. Security and connectivity are also enhanced.

These changes reflect but a small part of the overall improvements introduced to System 800xA with Version 5.1.

System 800xA Version 5.1 will be discussed in greater depth in an upcoming edition of *ABB Review*.

# eVolving breakers

**New and advanced technologies are enabling the development of highly integrated and versatile products. One such device, the eVD4 automatic circuit breaker, enables easy, flexible and reliable medium-voltage switchgear projects. This breaker is a major step forward in terms of performance, simplicity (it is characterized by a small number of highly reliable components and can be customized with a wide range of easily and rapidly installed accessories) reliability in a vast range of applications, safety and cost effectiveness.**

The eVD4 is based on ABB's VD4 mechanically actuated vacuum MV

circuit breaker, and features the specially designed Relion®-based RBX615 intelligent electronic device (IED) as well as modern current and voltage sensors. The RBX615 unit guarantees the general protection of overhead and cable lines and distribution substation busbar systems, and is suitable for any radial distribution network. The technology used to develop the sensors has helped to reduce equipment size, improve performance and increase standardization. This combination of sensors and IED enables the accurate and reliable monitoring and registering of network parameters while providing better protection for both operating personnel and the substation equipment.

The eVD4 circuit breaker is fully compliant with the IEC 61850 standard and GOOSE functionality, which in turn ensures compatibility with new substation communication systems.

For more detailed information about the eVD4 breaker, please see "The smart eVolution" on page 18 of this issue of *ABB Review*.

# ABB's DC fast charger

**DC (direct current) fast chargers are becoming widely acknowledged as a key enabler for e-mobility. Unlike AC charging, which relies on a smaller charging converter inside the car and is suitable for charging overnight, DC fast chargers move the charging converter out of the car and into the infrastructure where it can be shared between many vehicles. This allows high-power charging without burdening individual vehicles with significant additional weight and cost, and has the added benefit of several means to manage the utility grid impact.**


ABB's activities in e-mobility infrastructure took a significant step forward with the successful certification of ABB's CHAdeMO-compliant DC fast charger in early November 2010 and the subsequent installation at the first pilot site, the Hong Kong Science and Technology Park, with utility partner China Light and Power.

The CHAdeMO standard is the most widely accepted for DC fast charging. It has been endorsed by numerous large vehicle manufacturers, and the first mass-market DC fast-charge-capable vehicles based on the standard were released in 2010, with more to come in 2011 and 2012.

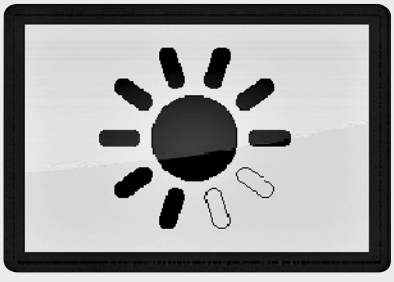
ABB worked together with CHAdeMO certification engineers from the Tokyo Electric Power Corporation to achieve this milestone. Through this group effort, certification was achieved in record time, and the pilot installation completed only two days later.

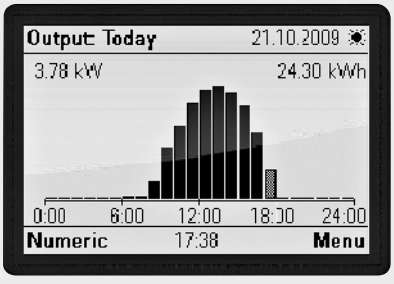
The new ABB DC fast charger proved its performance immediately as the primary fast-charging point for the vehicles of the Hong Kong EV parade following EVS-25 (the World Electric Vehicle Symposium and Exposition) in Shenzhen, fast charging seven of China Light and Power utility's Mitsubishi "i MiEV" vehicles in a row.

For more information on electric vehicle charging, see "Dawn of a new age" on page 77 of *ABB Review 2/2010*.

# The power plant for at home

**ABB has already established a market presence for inverters that connect large photovoltaic arrays to the grid. But what about smaller facilities, such as panels fitted on the roofs of residential and commercial buildings? ABB's new string inverter combines an easy-to-use interface and simple installation with high performance and advanced protection, enabling users to not only contribute toward their own electricity needs, but also to feed power into the grid.**






An inverter installed at home must be so simple that all members of the household can understand it. ABB's string inverter comes with an intuitive remote display unit. This starts with the very simple sun symbol whose ray count reflects the brightness of the sun, permitting the inverter's activity to be verified instantly and at any time. For the investment-minded user, the unit can display histograms, logging production over time.

A third level of complexity is made for engineers and reports on numerous technical details. The string inverter comes with state-of-the-art surge protection and a very compact design.

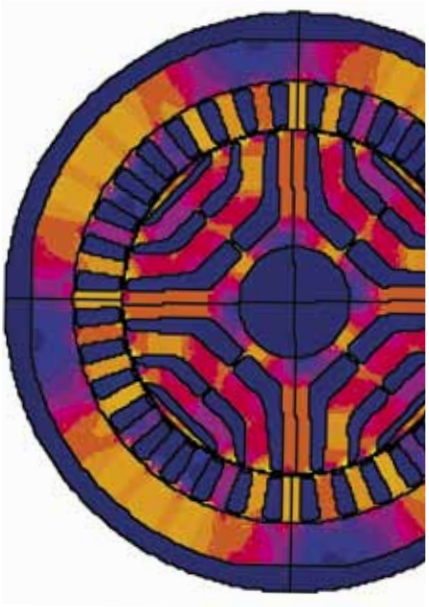
ABB's string inverter will be presented more fully in an upcoming issue of *ABB Review*.

# The low-loss motor

**The streamlined rotor structure of ABB's synchronous reluctance motors eliminates rotor cage losses, therefore increasing efficiency and compactness. The possibility of achieving standard power and torque levels at merely a low class-A temperature rise (60 K) improves the lifetime of the motor insulation, and lengthens the bearing lifetime or greasing intervals.**

Synchronous motors controlled by variable speed drives are increasing the energy efficiency of many industrial applications. What most applications have in common is the need for their motor to be as efficient as possible and to have the longest possible lifetime while simultaneously not increasing maintenance demands or failures. ABB's synchronous reluctance motors (often called a SynRM) employ the magnetic principle of reluctance. They are physically smaller in size, helping machine builders to design smaller, lighter, and more efficient equipment. The motor is inherently safe in operation since, without magnets, no back-EMF voltage is induced, and over-voltage protection of the converter becomes superfluous. Additionally, the possibility of high speed operation helps to eliminate mechanical power transmission elements such as gearboxes. This eventually enables the integration of the motor and the load equipment.

For more information, see "Motoring ahead" on page 56 of this edition of *ABB Review*.



# Busch-iceLight

**In the same way that lighting affects a photograph, so too can lighting affect the mood of a room. Equipped with innovative LED technology and a host of options for light direction and intensity as well as color temperature and appearance, Busch-Jaeger has, in collaboration with the renowned architect and designer Hadi Teherani, developed a new lighting system for both residential and office buildings.**

Busch-iceLight is a modular, versatile lighting system that can be used as an information or orientation light or to create ambience in a room. Small as a light switch and using the same style plates as light switches and power outlets, the system can be adapted to match the look of existing electrical installations.

The lighting element can be adjusted in five different directions to precisely define the light direction and beam. Two settings are available for the color temperature of the light, ie, warm white or neutral white. And light intensity can be switched to either 100 percent or 25 percent intensity using a 350 mA / 5 W converter or a 40 mA / 0.15 W night-light converter. As a directional orientation light or an illuminated building information system, Busch-iceLight ensures comfort and safety. Numerous high-quality design sheets and special pictograms are available, making the system adaptable to users' needs.

Busch-Jaeger is a member of the ABB Group.