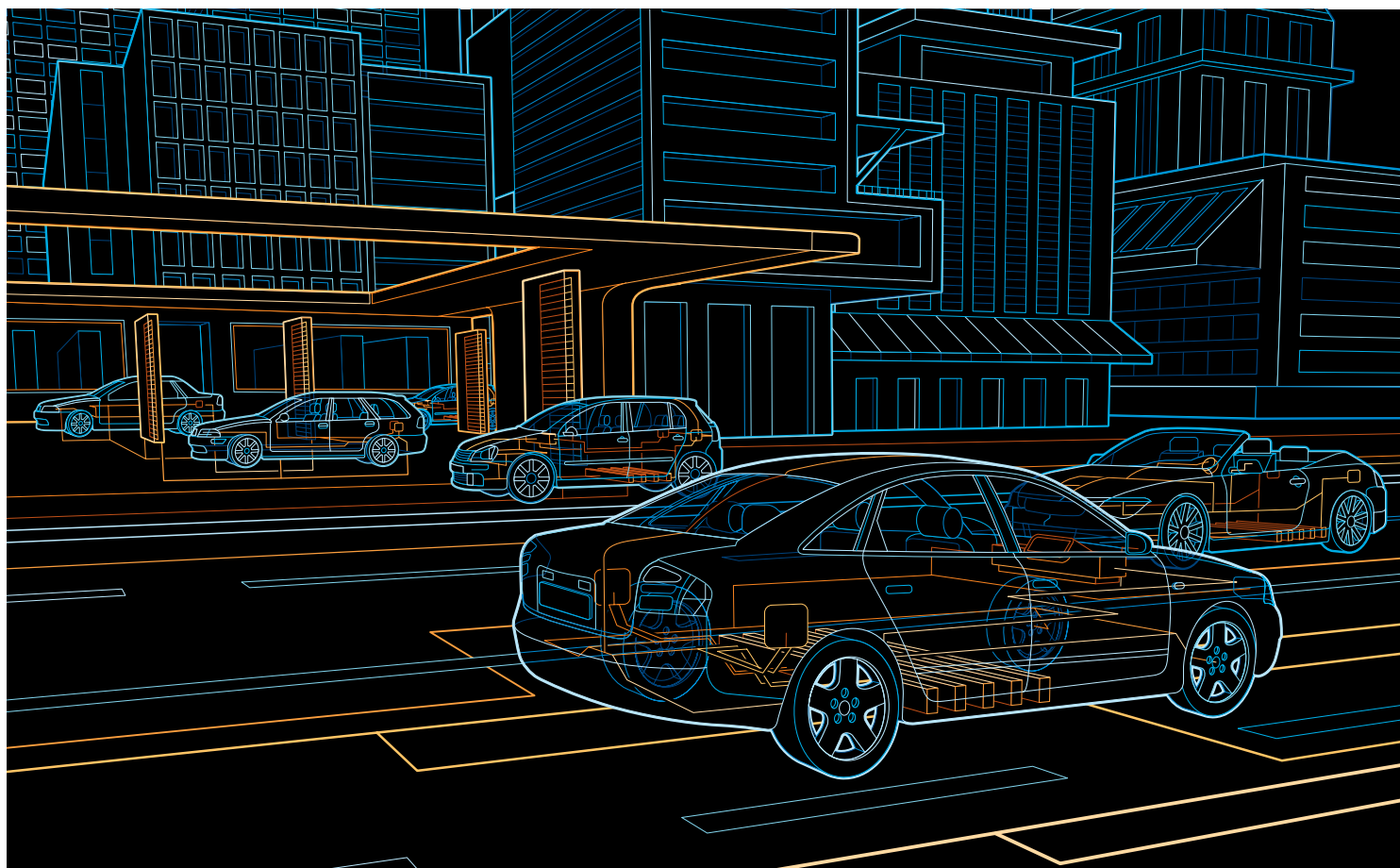


2|14

The customer magazine  
of ABB in India,  
Middle East & Africa

# contact



## Sustainable mobility

**Sustainable mobility on the road to green 06**

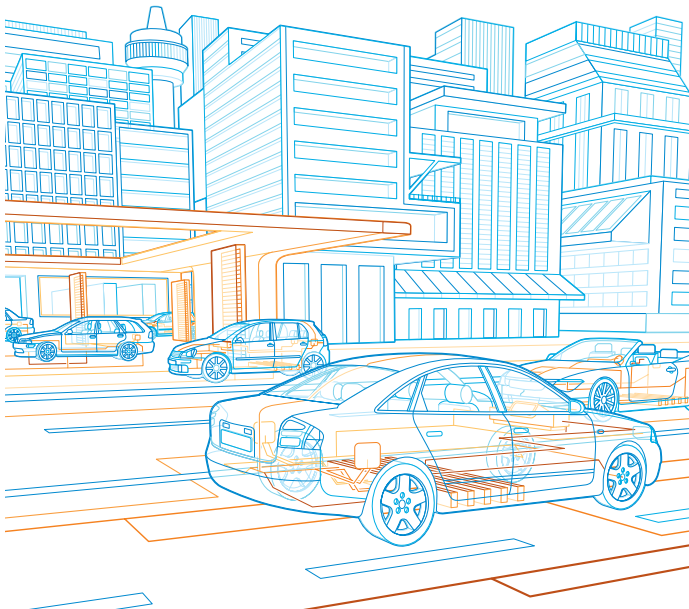
Working towards reduced dependence on natural resources

**Solar Impulse and ABB form technological partnership 16**

The world's first round-the-world flight powered by the sun

Power and productivity  
for a better world™





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**Carlos Poñe**

Chief Executive Officer  
ABB in Southern Gulf, Kuwait and  
Pakistan

Dear friends,  
Motorized transportation has come a long way. Transport today is not just about getting us from one place to another, it's doing that but with greater comfort, speed and efficiency. With natural resources becoming scarce, the need for sustainable yet highly efficient modes of transport is gaining prominence.

ABB is playing a vital role in the development of sustainable mobility, providing innovative and efficient technologies for urban infrastructure. This could take any form, be it rail or the bus. We do feel the opportunities for electric mobility infrastructure is still a few years in the making, at least in the Middle East. However, urbanization has created opportunities for rail, buses and electric cars. Also we believe that some countries in this region could well be pioneers of modern sustainable mobility.

We are part of global projects across the mobility platform and are adapting our electric infrastructure as it grows smarter and bigger. We are conversing with leading car OEMs on smarter and efficient energy storage systems.

This issue of Contact features an insight into the future. We recently announced the roll out of the world's largest EV infrastructure in China. Mobility of the most basic nature has ingenious automation embedded into it. We, at ABB, believe that electricity will have a significant role to play in the future of mobility. It's clean, green and sustainable.

Enjoy the issue!

Best regards,

Carlos Poñe



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# Powering King Tutankhamun's final home in Egypt

The Grand Egyptian Museum (GEM), the largest archaeological museum in the world, will be equipped with ABB's reliable power and automation technologies when it opens in 2015.

Envisioned as an architectural masterpiece, the GEM is spread over 48.6 hectares (120 acres) of land and borders the timeless Giza pyramids. In fact, the overall framework for the design is a set of visual axes that emerge from the pyramids to the site of the museum. The museum will pay homage to over 100,000 pieces of ancient Egyptian art and artifacts including the famous golden mask of King Tutankhamun.

ABB was awarded the GEM project by the Orascom Construction/BESIX joint venture to furnish the complete electrical package including an Extended Automation



The Grand Egyptian Museum will be powered by ABB.

System 800xA to manage the power, transformers, medium-voltage switchgear, ring-main units, low-voltage panels, a Supervisory Control and Data Acquisition

(SCADA) system, and retractable supply post panels, installed for the first time in Egypt.

For more information: <http://www.abb.com/800Xa>

## Making life sweeter in Pakistan

Sugar manufacturing is integral to Pakistan's economy. The South Asian country is the world's sixth largest producer of sugarcane in terms of acreage, and the 12th largest producer of sugar. Pakistan's JDW Sugar Mills is the first mill in Pakistan to have a bagasse based, high-pressure cogeneration power plant which has an extraction cum condensing steam turbine with 67 bar (kg/cm<sup>2</sup>) boiler. The excess power generated in the sugar mill is supplied to the national utility grid.

The sugar boiler needed an energy efficient solution with higher reliability. After due inspection of the requirement and consultation with the local team, ABB recommended the ACS 850-04 drive to the customer.

ABB won the contract and has given the customer a complete solution from a single supplier with on-site training included in the package. This will help cut production costs typically by up to a 30%.

For more information: <http://www.abb.com/drives>



ABB recommended the ACS 850-04 drives to Pakistan's JDW Sugar Mills.

## In brief

### Reducing risk on offshore platforms



Producing oil and gas offshore is recognized as one of the most challenging tasks in the hydrocarbons industry, with added costs and risks compared with operations onshore.

ABB and Ventyx, an ABB company showcased solutions for 'innovation and energy efficiency for offshore platforms' at the MENA offshore platforms 2014 event in Abu Dhabi. ABB's flagship system, PEMS - Predictive Emission Monitoring System: a monitoring system that uses artificial intelligence to reduce environmental impact was the point of focus during the event.

### Most number of patents

ABB registered more patent applications with the European Patent Office (EPO) in 2013 than any other company based in Switzerland. Of the total 6,651 patent applications from Switzerland, 455 were made by ABB, followed by Nestle, Alstom and Roche. Every year, ABB invests around \$1.5 billion in research and development and is considered a technology innovation leader in its main fields of activity. Its 125-year heritage of innovation was further underlined in 2013 when Thomson Reuters and the MIT Technology Review recognized ABB as one of the world's top innovators.

## Ensuring quick turbocharger service to customers in the shipyard



ABB has opened two new Service Points for marine turbochargers in Dubai and Bahrain to support its customers in one of the world's busiest maritime regions.

Despite tough conditions across much of the world, the shipping industry in the Middle East continues to see growth. Driving demand is the increasing industrialization of Saudi Arabia, as well as upcoming events like the Dubai Expo

2020 and the Qatar World Cup, for which variety of construction-related materials are needed. For shipping companies, the opportunities are big but so is the pressure to meet tight delivery times.

To help ensure the reliability of ships in the Gulf region, ABB recently inaugurated Turbocharging Service Points at the Dubai Drydocks World and ASRY shipyard in Bahrain.

## Fifth factory in Sao Paulo, Brazil to generate 1000 jobs

ABB has recently inaugurated its fifth factory in Brazil. The new plant is part of a \$200-million investment to expand ABB's technology development and production capacity to serve increasing domestic demand from industries such as petrochemicals, pulp and paper, oil and gas, and mining, as well as energy. The new greenfield plant, located in the city of Sorocaba in the state of São Paulo, began operating in the second half of 2013 and by 2015 is expected to have generated 1000 jobs directly and indirectly, in the region. ABB will for the first time assemble in one location compact power substations ( "e-houses") as well as manufacture motors, generators, drive systems, measurement equipment and



low-voltage products.

Brazil is boosting its industrial production, power capacity and enhancing its transmission and distribution infrastructure to meet the needs of its expanding economy as well as for the 2014 FIFA football World Cup and the 2016 Olympic Games.

# Sustainable mobility on the road to green

Working towards modes of transportation that reduce dependence on natural resources and create a healthier planet; the future of mobility is electric.

**M**uch like countries, which at different stages of development require different policies to further their growth viz. agricultural, manufacturing and financial, implementing sustainable mobility policy follows a similar trajectory. The first step is to reduce emissions in current technologies, second, to extend new technologies to large number of people thereby assisting the growth of the technology and third, encourage individuals to adopt tested technologies. In other words, in the first phase sustainable mobility takes the form of multi-modal public transport - be it intra-city bus network or inter-city railways. It is then followed by electric public transport (metro rail, electric busses) and finally private electric vehicles.

Transportation accounts for 23 percent of global carbon dioxide emissions, making

the final stage of sustainable mobility desirable. However, establishing a country-wide infrastructure and shaping carefully balanced policies are sobering realities - making a stepped way, better than taking none at all.

By providing solutions for all stages of sustainable mobility deployment - railways, metro rail, flexible charging infrastructure for electric busses and vehicles, ABB is an integral player in building a sustainable mobility landscape.

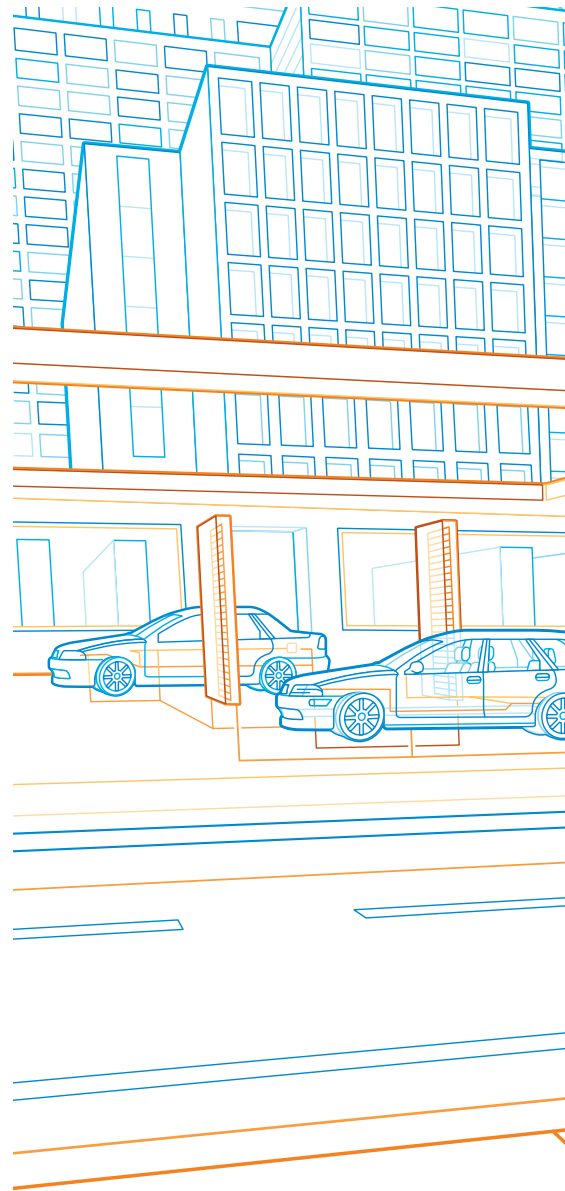
## **Railways - economically driven, economically imperative**

It was ultimately the great failure of the cotton crop in America in 1846 that nudged the still mulling British government in India to lay down a rail network in India. Till then, all proposals for connecting the vast country had been ignored citing topographical

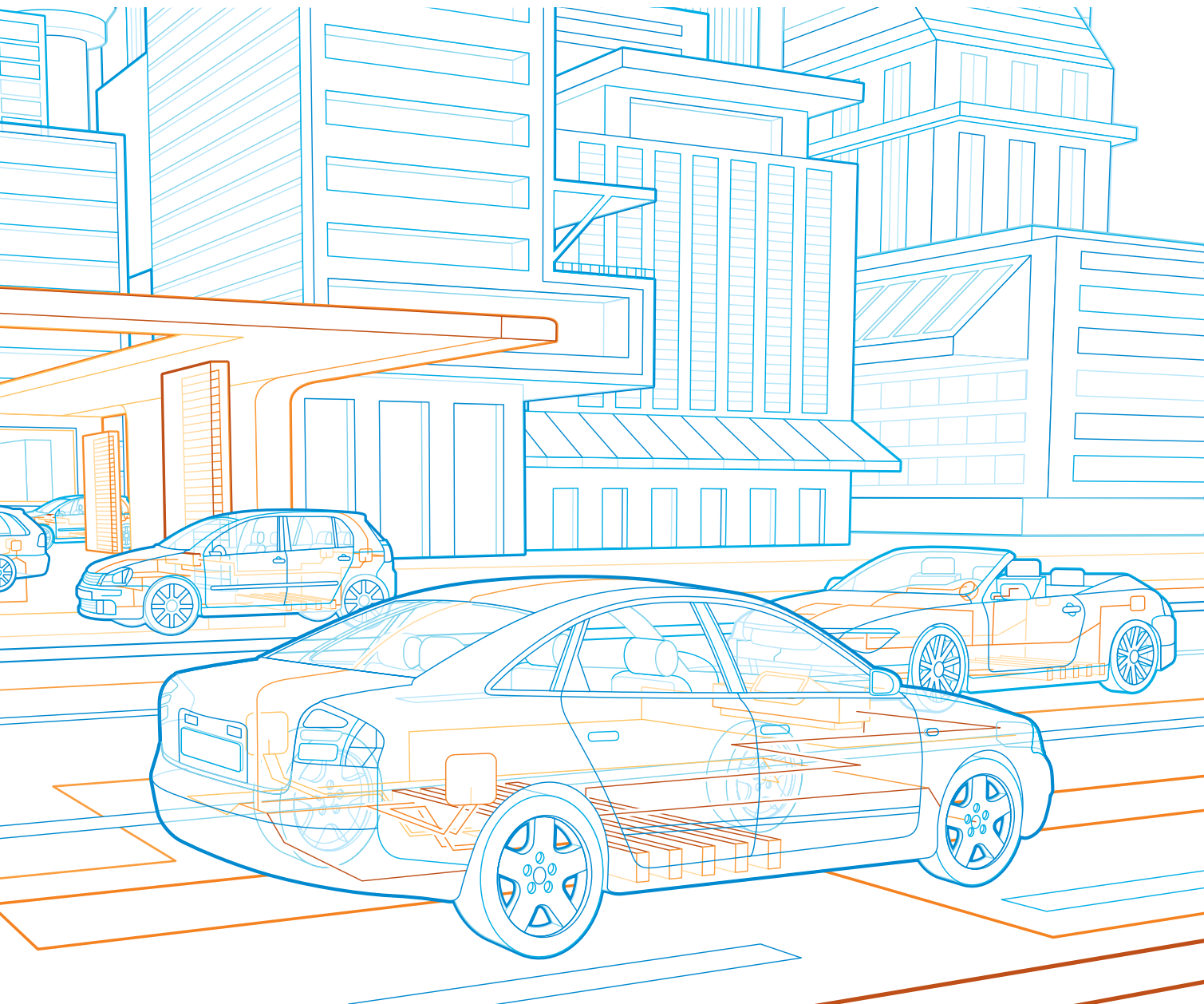
impossibilities and financial feasibility. In light of the crop failure in America and consequent soaring demand, the British (and the East India Company) had to build a link from the hinterland to India's major ports for quicker transport of cotton and other goods.

Today, the Indian Railways (IR) is the largest rail network in Asia. With a huge workforce of about 1.65 million, it runs some 11,000 trains everyday, including 7,000 passenger trains. From steam engine to engines running on electricity, the railways not only provides access to economic independence for several million Indians, it does so reliably, with low emissions.

Since 1980, IR has been automating its substations with microprocessor-based Supervisory Control and Data Acquisition (SCADA) systems. However, on many of







## ABB reliably powers Istanbul's longest metro line.

its electrified lines, IR faces problems of voltage variation (between 17 and 31 kV), poor power factor (in the range of 0.7 to 0.8) caused by the inductive nature of the traction load, and inadequate compensation of dynamic loading and low-order harmonics injected into the traction network by conventional locomotives using direct current (DC) traction.

These issues result in high system losses, reactive power absorption, and interference with sensitive electronics in signaling and telecommunication equipment. ABB technologies are addressing these problems, and improving efficiency and

availability. ABB's traction transformers with variable sizes, shapes and power ratings, permit installation in different parts of the train and help run high-power electric locomotives. Retrofitting conventional DC charged traction systems with ABB's customized on-board auxiliary converters (BORDLINE M180), enhances tractive effort and improves overall power-converter efficiency due to lower semiconductor losses. The converter is often deployed along with ABB's STATCON to reduce losses and load on power transformers, switchgears and cables.

Every year, IR rolls out approximately 300 new diesel locomotives. ABB turbochargers have been boosting the performance of these locomotives since 1975. High-efficiency turbochargers - ABB's TPR 61 and VTC 304 - improve reliability and reduce fuel consumption by 5 percent.



**ABB's Substation Control and Monitoring Systems and low-voltage products deliver reliable power to the Dubai Metro.**

The company is active in various facets of the railways across the globe. A good example is Sweden where ABB will supply the electrical systems for all 36 'SJ 2000' next generation high-speed trains for SJ, Sweden's state-owned rail operator. The entire power conversion and control systems on the SJ 2000 trains will be deployed by ABB, delivering modern technology for the coming decade.

### **Metro rail development**

Over half of the global population is already concentrated in urban areas, with nearly 60 million being added each year. City governments will have to adapt existing space and infrastructure to reduce strain on resources while accommodating larger populations.

After a gap of almost twenty years – the last metro project commenced operations in 1984, in Kolkata - Indian cities have seen some pick up in development of metro-rail transport systems. Delhi, followed by Bangalore, Chennai, Mumbai and Jaipur, have begun construction, albeit land acquisition and middle-men have provided significant interference. Delhi's metro system has both elevated and underground sections and serves close to 1.1 million passengers everyday. When transport systems are efficient, they provide economic and social opportunities and benefits that result in positive multipliers effects such as better accessibility to markets, employment and additional investments.

In these metro rail projects ABB will

design, supply, install and commission four substations that receive and distribute electricity, auxiliary and traction substations, electrification of overhead lines, third rail, monorail, and Supervisory Control And Data Acquisition (SCADA) system. The system interconnects all stations and ties the main receiving and traction substations to a central control center and a back-up control center. SCADA monitors field equipment and systems in the rail network, so operators can take proactive measures to avoid major repairs or service interruptions, enhancing performance and cutting costs. Other products like switchgear and distribution equipment have also been provided by ABB.

In Middle East and North Africa (MENA) region, ABB power products were selected to electrify the traction and power distribution systems for Istanbul's newest and longest metro line. ABB's Substation Control and Monitoring Systems (SCMS) and low-voltage products are working together to deliver reliable power to Red Line stations of Dubai Metro - a driverless metro network that is pegged as the world's longest fully automated metro system to be completed in one phase. ABB will also provide electrical equipment for the first electric rapid transit project in the Gulf countries - installed at King Saud University in Riyadh.

Towards developing the ecosystem around the metro lines, ABB also provides low voltage switchgear components (and ArTu panels), as across 45 stations in Dubai, and smoke and fresh air ventilation

system for underground metro stations, like in Turkey's award winning mass transit metro in Busra.

### **Electric-city-transport**

In keeping with the next stage of sustainable mobility, several governments are testing the use of electric buses for intra-city public transport. Bangalore's city transport body is currently testing an electric bus by China's BYD Auto. The bus can accommodate 32 people and can travel 250 km on a single charge of four to six hours. Despite an electric bus being twice as expensive as a comparable diesel run vehicle, consensus is positively inclined as running cost of electric buses are sharply lower. But in this developing nation, the key issue of reliable power supply lingers.

Lack of infrastructure – roads, charging station networks – and unpredictability of congestion on roads have limited the implementation. A fast charging solution by ABB and its partners in Geneva, however, effectively tackles issues of frequent charging. With overhead lines replaced by laser connectors, the flash charging technology allows the onboard batteries to be fed with a 15 second boost of energy at stops along the route. At the end of the bus line a 3 to 4 minute ultrafast-charge is made to fully recharge the batteries. This silent, flexible, zero-emissions mode of urban mass transportation is currently in pilot phase across Geneva.

On a smaller scale, campuses across the world are leveraging electric buses for emission-free transportation for students,





**TOSA - an attempt to address city mobility issues through clean energy solutions**

staff and visitors. Along with providing charging points for such systems, ABB also engineers the source of power, as in the case of King Saud bin Abdulaziz University for Health Sciences, Riyadh, Saudi Arabia. Here ABB has constructed three converter substations that transform the alternating current power from the local utility network to direct current power needed to run trolley buses across the 5 km square campus.

### Change the oil-burner

Governments in developed countries have the will and ability to implement the next generation of personal transport – the electric vehicle (EV). Players like Tesla are challenging the way Americans view automobiles, while incentive programs in geographically smaller nations such as Netherlands and Norway have helped to imbibe a culture of EV. The market is nascent and many players with multiple competitive charging formats are testing the ground. To accommodate this issue, ABB supplied multi-standard fast chargers to more than 200 electric vehicle fast-charging stations in the Netherlands. The chargers are web-connected and can provide remote assistance, management and servicing, and smart software upgrades.

While 200 charging stations were enough to bring an EV charging station within 50 km of all of Netherlands' 16.7 million inhabitants, in China it is only the first step. To reduce dependence on foreign oil and cut back on heavy smog, the Chinese government recently included

the EV plan as one of its seven pillars of growth. China's government wants 500,000 hybrid and electric vehicles on its roads by next year and five million by 2020. As several auto players from Benz to Tesla, with multiple charging formats, seek to gain market share in the country, ABB's multi-standard charger will provide infrastructure. Shenzhen BYD Daimler New Technology, for example, recently chose ABB to supply direct current fast chargers over the next six years for their EV DENZA.

In India, the cost of lithium ion batteries remains high, while technology is yet to be developed to make them light enough for car makers to pack in more battery units in cars. Also, the cost of batteries make electric cars more expensive than cars powered by petrol or diesel and unattractive in the absence of government subsidies. Local automaker, Mahindra & Mahindra is testing various payment schemes like reducing prices of its EV, E2O offering the battery pack at a monthly rental EMI etc. But the EV has found higher acceptance in countries like United Kingdom and Netherlands.

Issues of availability of electricity remain in India and with nearly 70 percent of electricity being thermally generated, the essence of an EV is lost. Hybrids maybe the first effective step Indian automakers can take towards targets set in the National Electric Mobility Mission Plan 2020.

To achieve truly sustainable mobility we thus need the long-term involvement by various stakeholders in the ecosystem – manufacturers, policy makers for energy and

for auto, R&D. ABB will strive to continue playing a vital role in the development of sustainable mobility, providing innovative and efficient technologies for EV charging infrastructure, rail and metro.

### Saudi's clean bus ride

ABB has commissioned three traction substations that will deliver electricity to a bus network that enables emission-free transportation for students, staff and visitors at the King Saud bin Abdulaziz University for Health Sciences (KSAU-HS). KSAU-HS is the first public university in the region, specializing in Health Sciences and is located in the eastern part of the capital city Riyadh. Electric vehicles is now rising in popularity, thanks to low cost batteries.



Electric vehicles are now rising in popularity, thanks to low cost batteries.

# Affordable batteries could change the future of electric cars

Tesla-S – a 300-km range electric vehicle is outselling Porsche and Audi in California at the moment.

**W**e are now in a transition period where battery prices are dropping by 20-30% each year. The consequences for the automotive industry are mindboggling.

About a century ago the nascent automotive industry started out by producing electric vehicles. Even big names such as Porsche started their business on a pure-electric basis. In the hundred-year hiccup that followed we have burned billions of tons of fossil fuel, but the clean times of pure electric are returning.

The trigger to this all is simple: affordable batteries. Just as the television business was turned upside-down by the prices of flat-panel TVs in the 90's and similarly the solar business by plummeting panel prices in the decade thereafter, we are now in a transition period where battery prices are dropping by 20-30% each year. The consequences for the automotive industry are mindboggling.

Battery prices are the main cost drivers of electric vehicles. Last year Volkswagen stated that it would be possible to

manufacture a 100% electric vehicle more cheaply than a car with a combustion engine within three years.

Three years ago it was a challenge to produce an electric vehicle with a 300km range for an affordable price. Well, we have seen what happened to the stock price of Tesla Motors after the successful introduction of the Tesla-S – a 300-km range electric vehicle, which is outselling Porsche and Audi in California at the moment.

With the arrival of long-range affordable electric vehicles the challenges to the charging infrastructure increase proportionally. Charging power must go up, both at home and in public charging stations.

Over the last 5 years the e-mobility industry has converged around three global fast charge standards. Europe/USA have selected the "Combo" standard, China has selected the "GB/T" standard and Japan has selected the "Chademo" standard. The selection of standards is the result of a five year political and strategic dance

among governments and automotive players, but the dust has settled and the markets can begin to takeoff.

ABB is contributing to this critical stage in the market with its Terra 53 charging platform, the world's first to meet all DC fast-charging standards. With its multi-standard architecture and near-term option to cascade the stations to higher power, the Terra 53 is ideal for highway and city centers, fueling stations, fleets, and other infrastructure investors who are interested in the growing EV charging market. In addition to that, ABB is launching high-power DC home chargers to enable overnight charging of large-battery vehicles, which would otherwise take a weekend or two to charge from an ordinary home-socket – times are changing.

The automotive industry has to switch, and switch quickly. Batteries will do to the automotive industry what flat panels did to TV and PV-panels to the solar business.



# Equipping the next generation of Sweden's high-speed trains

Record project for the electrical system of all of SJ's 36 high-speed trains will improve punctuality, reliability and energy efficiency.

**S**J, Sweden's state-owned rail operator, is investing around US\$510 million in a comprehensive program for high-speed SJ 2000 trains. ABB has been selected to supply and install energy efficient electrical systems for all 36 next generation SJ 2000s - an order of \$200 million.

ABB will supply the entire power conversion and control systems on the SJ 2000 trains, delivering modern technology for the coming decade. The first retrofitted train will be delivered in 2015. After successful testing and evaluation, the remainder of the trains will be built incrementally through 2019. The trains, which were launched in the late 1980s (built then by one of ABB's predecessor firms, ASEA), will also be newly equipped with a fresh-looking interior design. Disassembly and assembly will be done in Sweden

together with a local partner.

The SJ 2000's upgraded electrical systems will ensure more reliable power supply while reducing energy consumption in a significant way. Punctuality, reliability and higher comfort are key factors to further improve customer satisfaction. This project follows ABB's successful refurbishment of high-speed InterCityExpress (ICE 1) trains operated by Deutsche Bahn, Germany's national rail operator.

"Equipment for high-speed trains is a growing market for ABB's rail business for which we are very well positioned, building on our company's combined power and automation solutions," said Ulrich Spiesshofer, CEO of ABB.

"With a comprehensive portfolio of traction solutions, power electronic packages and project management expertise globally and in Sweden, we are a reliable partner for world-class train

operators including SJ here in Sweden."

"The need and demand for environmentally friendly and comfortable travel will keep increasing. Passenger train journeys went up by 59 percent from 1997 to 2010. All signs point to a further strong increase, not least in terms of business travel as companies live up to their sustainability commitments", said Crister Fritzson, CEO of SJ. "This initiative will enable SJ to offer the most comfortable train journeys on the main inter-city lines in Sweden for a long time ahead."



ABB solutions will improve punctuality, reliability and comfort



# From Mecca to Medina in two hours

Traction transformers to power world's first high-speed inter city train to operate largely on desert sands.

People are travelling more today than ever and with a global trend towards greater urbanization, countries are investing in high speed rail (HSR) so that passengers can enjoy minimum journey times in comfort, while remaining considerate to the environment. In Saudi Arabia a 450 km long high-speed line is under construction that will provide a safe and comfortable alternative for travel.

The Haramain high-speed intercity line is expected to carry three million passengers a year, reducing travel time between Medina and Mecca to two hours, and Jeddah and Mecca to half an hour. Mecca has a population of 1.7 million and attracts 2.5 million Hajj pilgrims and more than two million Umrah performers every year during the month of Ramadan and seasonal holidays.

According to a study by the Ministry of Hajj, the number of pilgrims to Mecca is expected to increase to more than three million over the next 25 years, while there will be over 11 million Umrah performers. Until the Haramain high-speed intercity line was conceived, travel was restricted to road, either by private vehicle, taxi or buses, or air.

Saudi Railways Organization (SRO), the state-owned company that operates Saudi Arabia's rail network, has ordered 35 Talgo 350 electric trains, which will operate on the line at 300 km/h. The trains will use ABB traction transformers, a well-proven technology that is already deployed onboard Talgo Avril high-speed trains, which operate at speeds of 380 km/h. ABB traction transformers are designed to withstand desert temperatures that can range from -20°C to more than 55°C, and in harsh desert conditions such as blowing dust, scalding sand with altitudes ranging from sea level to over 1,200 m.

ABB has supplied two identical static Var compensators (SVCs) to maintain the stability of the power grid when the HSR system is in operation. It will also supply 72 traction transformer sets (and two

spares), as well as 72 battery chargers to the Spanish train manufacturer Talgo for the SRO.

"ABB traction transformers are critical components in the traction chain, affecting both train performance and operator services," said Markus Heimbach, head of ABB's Transformers business. "We are proud to be able to provide our advanced and proven technology to this prestigious rail project."

The Haramain high-speed intercity line is not only a safe and comfortable option for travel, but it is also expected to boost local businesses and tourism.



A quicker alternative than road, at a price cheaper than air

ABB has been manufacturing traction transformers for 130 years. More than half of the world's trains are powered by ABB transformers, and most of the world's train manufacturers and rail operators rely on them.

ABB traction transformers have accumulated massive running hours worldwide, from dusty hot winds to icy winters



The fully electric DENZA car is designed for more than 200 kms.

# World's largest EV fast charger network in China

Being one of China's seven emerging strategic industries will provide a critical step-up for the electric vehicle segment.

**A**BB entered into a strategic collaboration with Shenzhen BYD Daimler New Technology Co., Ltd. (BDNT), to supply direct current (DC) fast chargers for DENZA over the next six years. This collaboration will also make China the global leader in electric vehicle (EV) fast charging.

The wall-mounted chargers will have a number of innovations designed for user convenience and safety, such as a mobile app that allows remote monitoring and control of charging sessions, with the option of charging status change notifications. First deliveries are expected in mid-2014 and the charging solution will be sold through DENZA dealerships.

The fully electric DENZA car is designed for journeys of more than 200 kilometers and is among the first long-range EVs to go on sale in China. Market research shows that consumers value long-range EVs, but expect short charging times. DENZA will offer its customers the convenience of fast charging at home, at work or at public charging stations.

"The DENZA represents a significant

step in sustainable transportation for the Chinese automotive market. It was vital that we had the right partner to support this innovative concept," said Arno Roehringer, Chief Operating Officer of BDNT. "ABB is the ideal technology partner for us, and – equally important – it has the service expertise to install this solution."

EVs are one of China's seven emerging strategic industries. The Chinese government has introduced a DC fast charging 'GBT' standard to encourage technical innovation and stimulate market acceptance of EVs. The urban charging infrastructure will be a key driver for EV adoption. The GBT standard will give Chinese consumers the opportunity to conveniently charge their vehicles at home or at public charging stations.

"We are honored to be a partner in this venture to move urban transportation forward in a more sustainable way. By combining car sales with fast chargers, DENZA is taking a bold step to address a key obstacle for potential buyers of EVs," said Ulrich Spiesshofer, CEO of ABB Group. "ABB's EV charging solutions have

been expanding rapidly worldwide as the underlying technology combines our key strengths in power electronics, software, service and power distribution."

China's EV market is expected to quickly gain momentum in the coming years due to technology and market innovations, the GBT national fast-charging standard and favorable incentives. ABB has worked on pilot projects with local OEMs and utilities in China since 2010. In 2013, it began to build up a local EV organization to support this growth including R&D, manufacturing, logistics, and service.

# Winner of Zayed Future Energy Prize 2014

The UAE's award for best solutions in renewable energy and sustainability was conferred on ABB by the crown prince of Abu Dhabi.



Ulrich Spiesshofer, ABB CEO receives the award

**T**he Zayed Future Energy Prize in the 'Large Corporations' category was presented to ABB Chief Executive Officer, Ulrich Spiesshofer by His Highness General Sheikh Mohammed bin Zayed Al Nahyan, Crown Prince of Abu Dhabi and Deputy Supreme Commander of the Armed Forces of the United Arab Emirates at a glittering awards ceremony in Abu Dhabi, the capital city of the UAE.

"It is a great honor to have won the Zayed Future Energy Prize 2014," said Spiesshofer. "ABB stands for power and productivity for a better world. This prize underlines our relentless drive for innovation to create new offerings and value propositions for our clients in the renewable energy and energy efficiency fields."

The Zayed Future Energy Prize was launched in 2008 to recognize and reward the very best solutions in renewable energy and sustainability. It was named in honor of the late Sheikh Zayed bin Sultan Al Nahyan, who was a founder of the UAE, ruler of Abu Dhabi, and the UAE's first president from 1971 until his death in 2004.

"This award brings with it the responsibility to spread the vision and environmental stewardship of the late Sheikh Zayed bin Sultan Al Nahyan," Spiesshofer added. "Winning this prize will strengthen our belief and make us even more determined to pursue our vision, mission and strategy towards sustainable energy and towards a sustainable future."

## 125 years of technology innovation

ABB pioneered HVDC (high voltage

direct current) technology nearly 60 years ago, enabling large volumes of power to be transmitted over thousands of kilometers, with minimal losses and environmental impact. This technology is being extensively deployed to bring power from remote renewable energy sources to major consumption centers. ABB has been awarded around 90 HVDC projects representing a total installed capacity of more than 95,000 megawatts (MW), which accounts for about half of the global installed base.

ABB is also a leader in technologies that improve energy efficiency, which is the fastest, most sustainable and cheapest way to reduce energy consumption, lower carbon dioxide (CO<sub>2</sub>) emissions and enhance energy security. ABB drives can help lower energy consumption by adjusting the speed of electric motors to match the actual demand of the application thereby reducing motor energy consumption by typically 20 to 50 percent.

In the solar industry, the company is constantly striving and innovating to develop solutions that efficiently transform the sun's energy into reliable power. By converting solar energy into electrical energy, carbon dioxide (CO<sub>2</sub>) emissions can be reduced by 600 grams for each kilowatt per hour generated (kWh).





# One nation, one grid

A vision, over two decades old, was fulfilled this year as electricity grids from across India was connected into one; and ABB helped see this through to the end.

At the start of the year, Power Grid Corporation of India Limited (PGCIL) completed a key node substation connecting the southern grid –the fifth and last grid – to complete India's 'One Nation – One Grid – One Frequency' vision, defined in the 1990s. Grids across the country now run at a single frequency - allowing for seamless transmission and providing all states access to 234 giga watts of installed capacity. Historically, traded electricity prices in the South of India during the summer, were two to three times the average in other regions. 'One grid' makes it possible for such disparities to be a thing of the past.

This opens up a nation-wide market where regions can purchase power to address deficits, which should eventually help balance the distribution of power. Like all resources, this network must be used efficiently to gain its maximum benefit. To be technologically equipped for this, ABB designed, engineered, supplied, installed and commissioned some key

gas-insulated and air-insulated substations to develop and strengthen the network. Ahead of schedule, ABB commissioned the 765/400 kV substation at Sholapur for (PGCIL), India's central power transmission utility. This key node enabled the completion of the Raichur-Sholapur transmission line, linking the southern grid to the national transmission grid.

ABB recently won an order worth around US\$ 18 million from PGCIL to reinforce the Indian power grid with the construction of a 400 kilovolt (kV) gas-insulated switchgear (GIS) substation at Kolhapur, in the western Indian state of Maharashtra. The new substation will help strengthen the inter regional grid between the western and southern regions.

"This substation will boost power transmission to the southern region and increase the inter regional transfer capacity" said Oleg Aleinikov, head of ABB's Substations business, a part of the company's Power Systems division "ABB's latest GIS technology will help reduce the

substation's footprint significantly, while ensuring efficiency and reliability."

ABB's project scope includes design, engineering, supply, installation and commissioning. Key product supplies include the 400 kV GIS, shunt reactors, control and relay panels based on IEC 61850 platform. ABB's latest generation GIS has a compact, modular and eco-efficient design, enabling reduction in product volume, footprint and weight, while enhancing eco-efficiency. The project is scheduled for completion in 2016.

# Solar Impulse and ABB form technological partnership

ABB's heritage of technology innovation in renewables, sustainable transportation and energy efficiency makes it an ideal partner for Solar Impulse, which is attempting the first round-the-world flight powered by the sun.



Gliding the skies using the power of the sun





Swiss pioneers Bertrand Piccard (Chairman) and André Borschberg (CEO) are the founders, pilots and the driving force behind Solar Impulse, the first airplane that can fly day and night without fuel or polluting emissions. Solar Impulse is a unique adventure that aims to bring emotions back at the heart of scientific exploration - a flying laboratory to find innovative technological solutions for today's challenges.

Solar Impulse 2, a revolutionary carbon fibre airplane has the wingspan of a Boeing 747 (72 m / 236 ft) and the weight of a car (2,300 kg / 5070 lbs). It is the result of ten years of intense work, calculations, simulations and tests by a team of about 80 people, 90 partners and approximately 100 advisors. A plane so big and light has never been built before. The 17,248 solar cells built into the wing provide four 17.5 HP electric motors with renewable energy. By day the solar cells recharge the 633 kg / 1,395 lbs lithium batteries which allow the plane to fly at night.

The first-ever flight through the night with a solar airplane as well as record-breaking missions across Europe, the Mediterranean Sea and the United States brought worldwide attention to Bertrand Piccard and André Borschberg with their Solar Impulse endeavor, demonstrating the enormous potential of clean technologies and showing how a pioneering spirit can achieve the impossible.

Now the Solar Impulse team is preparing for the ultimate technological challenge: to circumnavigate the globe in a plane powered only by the sun's energy in 2015 and ABB will support this attempt. "It was my dream to have ABB as technology partner of Solar Impulse," said Bertrand Piccard, Initiator, Chairman and Pilot

of Solar Impulse. "We have the same goal of improving the world by using energy more efficiently and conserving natural resources."

"This partnership brings together two Swiss-based global leaders that are passionate about pushing the boundaries of technology and innovation to achieve a better world," said ABB CEO Ulrich Spiesshofer. "We are convinced that by pioneering innovative technologies we will be able to de-couple economic growth from energy consumption and environmental impact."

"Solar Impulse and ABB are technology innovators and pioneers," said Andre Borschberg, Co-Founder, CEO and Pilot of Solar Impulse. "We both want to motivate people to use clean technologies; ABB and Solar Impulse will work together on key technologies like power electronics for our mutual benefit."

ABB invested more than \$1.5 billion in research and development in 2013 and has 8,500 technologists worldwide. It is one of the world's largest supplier of solar inverters and suppliers to the wind-power industry, and a leader in integrating renewables into power grids.

ABB's breakthrough innovation of high-voltage direct current circuit breaker in 2012 will enable the grid of the future. In March 2014, ABB announced the plans for the world's largest network of new-generation, fast chargers for electric cars in China.

ABB improves energy efficiency across the entire value chain from exploration to consumption. Its installed base of drives for motors alone saved around 400 TWh in electricity in 2013, equivalent to the annual power consumption of 100 million European households.



# Making engines more efficient

Combining two technologies to create a powerful turbocharging solution that cuts fuel consumption and NOx emissions.

**T**he solution consists of two ABB turbocharging technologies that mesh together perfectly to provide a highly potent solution for two- and four-stroke gas and diesel engines.

Investigations for the power generation, marine and heavy-duty vehicle sectors show that the solution has reduced fuel consumption by up to 10 percent, slashed nitrogen oxide (NOx) emissions by as much as 60 percent, and improved engine performance, flexibility and stability.

These are truly impressive achievements that demonstrate that the two technologies really do deliver fuel efficiency, low emissions and engine stability.

The solution consists of ABB's variable valve train system – Valve Control Management, also known as VCM® - and two-stage turbocharging system, Power2®.

VCM is an electro-hydraulic cam-supported valve train system that automatically provides the engine with the optimal amount of air for different

speeds, loads and operating conditions. This enables, among other things, the turbocharger to take the engine from idling to full load in at least half the time it usually takes.

As a result, a turbocharged engine equipped with VCM operates with optimal air supply and maximum efficiency at all times, even those engines that require large operating ranges and fast load responses. This, in combination with Power2, reduces engine fuel consumption, NOx emissions and the engine's thermal load.

Power2 is a two-stage turbocharging system that uses two turbochargers in series to create pressure ratios higher than the best single-stage turbochargers. High turbocharging pressure ratios enable the engine to operate continuously at its most efficient point in terms of power output, fuel efficiency and minimal emissions.

Together, VCM and Power2 successfully tackle one of the dilemmas of engine emissions reduction - the tradeoff between fuel consumption and NOx formation. The

dilemma is that NOx reduction methods that use internal engine processes normally increase fuel consumption. The VCM-Power2 solution does not do this. It solves the dilemma by shifting the tradeoff into a new and much lower range that boosts fuel efficiency without compromising emissions. And it does so across an extensive range of engines and applications.

Used on their own VCM and Power2 have a well-documented track record of significant and valuable engine efficiency improvements. Used together, they take engine efficiency into a new dimension and enable engine builders and end users to meet the challenges of emissions compliance and cost efficiency.

ABB Turbocharging is the world's leader in turbocharging large diesel and gas engines.



Two-stage turbocharging systems help engines to operate continuously with minimal emissions.



REC Solar ASA's Singapore Facility chose ABB solutions.

# Enhancing production of a winning Singapore factory

Comprehensive package of robotics solutions, power distribution and power quality systems to enable superlative productivity, reliability and energy efficiency at one of the world's largest integrated solar production facilities.

When REC Solar ASA (REC), one of the world's leading solar energy companies, inaugurated its new production facility in Singapore in 2010, it was the largest investment made by any corporation in Singapore's growing and government-prioritized clean technology sector.

Costing approximately \$1.96 billion (or EUR 1.3 billion) to build in 2008, the integrated solar production facility is one of the largest of its kind in the world for the manufacture of solar wafers, cells and modules. By integrating all three processes in a single highly automated and state-of-the-art production facility, REC achieves significant cost advantages, while enabling the generation of emission-free electricity.

The facility itself is a benchmark of sustainability and energy efficiency, having won a gold rating in Singapore's Green Mark Award for best practice in environmental building design and performance.

ABB's role in this world-scale project was to provide an extensive array of

automation and electrical solutions that provide the facility and its manufacturing processes with fast and accurate automated production and a constant disturbance-free supply of reliable electric power.

The solution comprised of two robotics packages for the wafer slicing and cell manufacturing plants. This is where the silicon ingots are crystalized and sliced into ultra-thin wafers a fraction of the thickness of a human hair. They are then chemically treated in the cell manufacturing plant to acquire photovoltaic properties.

The IRB 6640, which has an exceptionally large working range and high payload, and the Flexpicker™ IRB 360, a high-speed, compact and high payload pick-and-place robot were deployed. The speed and accuracy of the robots contribute to REC's production requirements of continuous flow manufacturing with high product yield and high quality.

Power is transferred to the entire site through an ABB grid connection comprising 66 kV gas-insulated switchgear and power and distribution transformers.

It is then distributed to the wafer fab plant, slurry recovery and wastewater treatment plants by ABB medium-voltage and low-voltage power distribution systems. These consist of a vast array of ABB power and automation products that provide the safe, reliable and efficient supply of electricity to each plant.

Each ABB power system is integrated with an ABB Power Quality Monitoring System with monitoring, control and protection functionalities to ensure consistent power quality and reliability for these critical production processes.

Based on ABB's flagship automation platform for process industries, Extended Automation System 800xA, the power quality monitoring system provides a number of vital requirements including real-time monitoring of circuit breakers, IEC 61850 integration, power quality analysis, energy consumption reporting, and process behavior analysis.

# Just launched

Designing from ground up or re-engineering for a custom fit, ABB products and systems consistently offer quality and energy savings.

Low Voltage Product

## SACE EMAX 2

Compact SACE Emax 2, which can handle up to 6,300 A, launched in the Middle East



Over 70 years of cutting edge research and experience in the electromechanical industry has allowed ABB SACE to create this new benchmark of air circuit-breakers. Not only does Emax 2 meet or exceed the standard performances and functions that the market demands from an air circuit-breaker, but it has evolved into a true power manager.



### Advantages

- Perfect blend of control, connectivity, performance, ease of use and safety.
- The exclusive Power Controller function monitors the power managed by the circuit-breaker, keeping it below the limit set by the user.
- Can be integrated perfectly into all automation and energy management systems.

Discrete Automation and Motion

## String inverters

Inverters that track the sun for optimal energy harvesting, launched in India



Designed for commercial use, the PVI-10/12.5, three phase inverter is uniquely enabled to control the performance of PV panels under varying weather conditions. Two high speed, precise Maximum Power Point Tracking (MPPT) algorithm provides real-time power tracking and increases efficiency to 97.8 percent.



### Advantages

- True three-phase bridge topology for DC/AC output converter
- Transformerless topology
- Each inverter is set on specific grid codes which can be selected in the field
- Wide input range
- Dual input section with independent MPPT allows optimal energy harvesting from two sub-arrays oriented in different directions



Discrete Automation and Motion

# Multi-standard DC charging station

Electric vehicle charger – the Terra multi-standard DC charging station 53 – launched in India



The Terra multi-standard DC charging station 53 combines industry standardization with fast charging technology to support all current and next generation vehicles. Its multi protocol design allows for easy tailoring to support CCS and CHAdeMO 1.0 for DC fast charging, as well as the EN61851-1 standard for AC charging (type 2, mode 3).



## Advantages

- CCS standard DC fast charging – upto 30 to 80 percent in 15 minutes
- Future proof connection via open industry standards
- Remote uptime monitoring and assistance, updates and upgrades
- Easy to use - 8" daylight readable touch screen display, graphic visualization of charging progress, RFID authorization
- Aesthetic all weather stainless steel enclosure
- Quick and easy installation
- Low operational noise

## Power in the heart of a city

ABB's hybrid switchgear technology, Plug and Switch System (PASS), has improved the reliability of 10 substations of Tata Power in the populous megacity Mumbai. All this is at lower cost of ownership and in less than half the space taken by conventional solutions – making it possible to hide a substation in plain sight.



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## Industry 4.0

Increasing digitalization and automation of industry – the so-called “internet of people, things and services” - This is enabling new solutions and taking industry to the next level of productivity. In developing countries, machines are increasingly driving productive, energy-efficient manufacturing, improving quality standards and freeing human beings from having to perform dangerous, monotonous work.

Advances in robotics are allowing humans and robots to collaborate with each other in ways that would have been inconceivable until recently.

In the next issue of Contact, read about ABB's products and solutions that are driving industries to the next level of safety and productivity.





Electric cars: recharge the battery  
in minutes instead of overnight?

Certainly.