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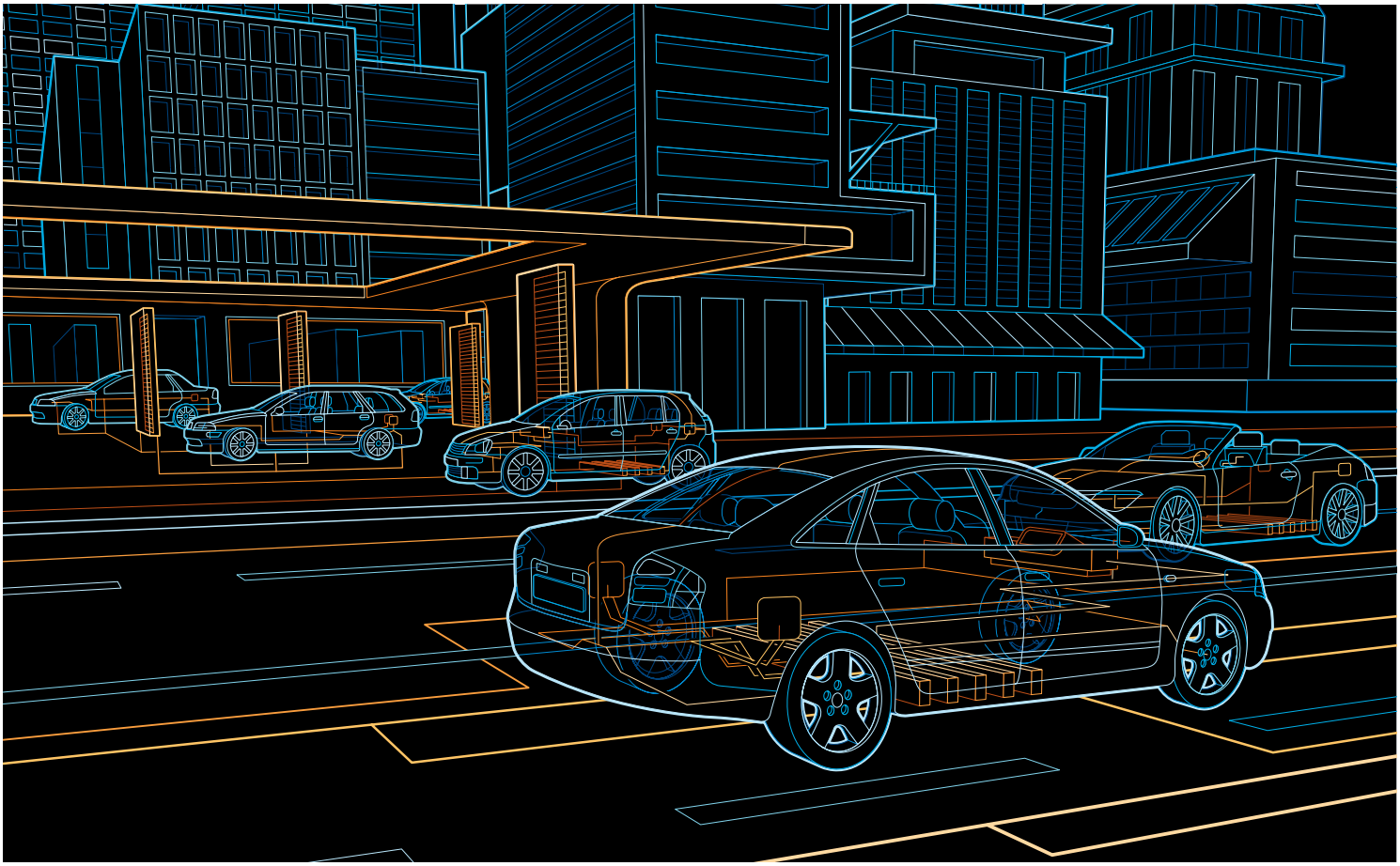
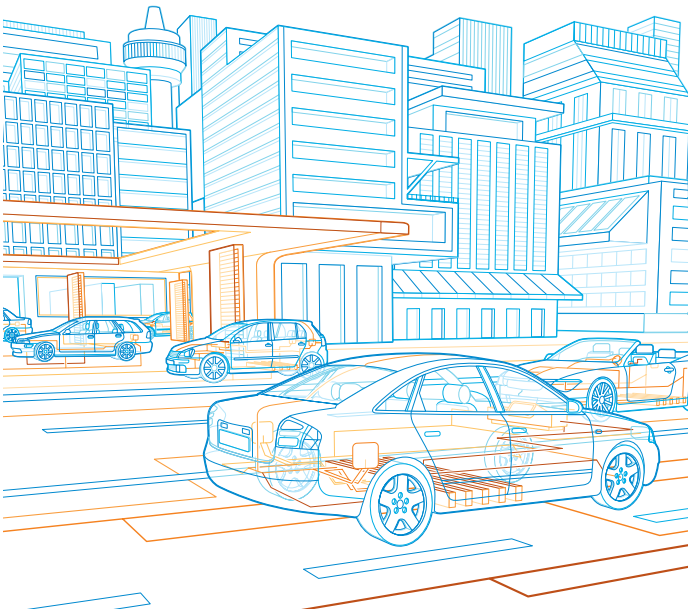
contact

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



Sustainable mobility

Power and productivity
for a better world™



contact 2|14

Bazmi Husain
Managing Director
ABB India Limited

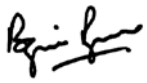
Dear friends,
Motorized transportation has come a long way. Today, we are able to travel faster with more comfort and greater efficiency. With limited natural resources such as oil getting more expensive, a need for sustainable and highly efficient modes of transport is gaining prominence. It is about providing smarter and more sustainable ways to travel – making it accessible, affordable and non-polluting.

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, individual or mass transport. Between 2012 and 2013, the global sales of electric vehicles almost doubled. However, the opportunities for electric mobility infrastructure in India, are still a few years in the making. The boom in urbanization is becoming a major catalyst for the evolution of sustainable means of mass transportation.

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 is an insight into the future. We recently announced the roll out of the world's largest EV infrastructure in China. We at ABB believe that electricity will have a significant role to play in the future of mobility. Sustainable mobility is clean, it is green. Enjoy the read.

Best regards,



Bazmi Husain

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News

Sustainable Mobility

For a better world

Product news

Close up

Fortune's most-admired companies – ABB tops industry

Fortune magazine named ABB the most admired company in the Industrial Machinery category in the 2014 edition of its annual global survey. The company moved up from sixth place last year.

Fortune surveyed 15,000 senior executives and industry analysts who rate companies on nine attributes. ABB ranked first within its sector on five (global competitiveness, quality of products/services, quality of management, people management and innovation) of the nine attributes, as well as overall. The international Fortune survey covers 25 industry sectors.

"We are pleased to be recognized by our peers and Fortune magazine," said ABB CEO Ulrich Spiesshofer. "We will continue to create value for our customers, employees and shareholders by realizing the opportunities in our key strategic focus areas of profitable growth, business-led collaboration and relentless execution."

Mobility for all – Auto Expo 2014, New Delhi

The twelfth edition of the biennial India Auto Expo from February 7-11, 2014, witnessed a slew of new launches. Themed "Mobility for All", the expo showcased the next generation of offerings for one of the world's largest markets for small cars.

The past few quarters have not been great for the Indian automotive industry - orders have been slowing as customers shirk big investments in a weak economy. Market leaders are pushing innovation to spur sales - Maruti Suzuki for example, unveiled the competitively priced gearless small car Celerio. Datsun, Nissan's low-cost brand, made an entry with a cheap-car push, launching "Go".

Mahindra Reva, the electric mobility division of Mahindra & Mahindra, unveiled the Mahindra Halo, a two-door, two-seater electric sports car concept. Electric vehicles in India have a long way to go before being termed as a budding industry even.

Renault showcased Kwid - a unique concept car jointly developed with Indian engineers, for young urban customers in new markets like India, Russia and Brazil.

Mahindra Halo, an all-electric sportscar concept – another small step towards electric mobility in India

In brief

Namma Metro Phase 2

The second stretch (10.3km) of the Bangalore Metro, or the green line, came into operation on February 28, 2014. ABB is responsible for the design, supply, installation and commissioning of four substations that receive and distribute electricity, each rated at 66/33 kilovolts, as well as the auxiliary and traction substations for the city's metro network.

Efficiency at WEF

At the kick-off of the 2014 edition of the World Economic Forum (WEF) at Davos, ABB Ltd shared with industry leaders the results of an energy efficiency survey conducted across the globe. The survey, in conjunction with Economist Intelligence Unit, suggests that many firms do not fully appreciate that being more efficient can be a competitive advantage, which in turn leads to profit.

Elecrama 2014

The eleventh edition of Asia's largest biennial conference and exhibition on transmission and distribution, Elecrama, was held from January 8-12, 2014 at Bangalore, India. The event saw significant participation of representatives from Middle East and Africa, and the ABB stall registered over 1,700 visitors from OEMs, panel builders, end users, government officials and media.

FACTS to improve grid reliability in Saudi Arabia

Saudi Electricity Company (SEC) placed an order worth around $30 million to refurbish FACTS systems in the Eastern Operating Area to improve voltage stability and strengthen transmission network. ABB will refurbish two 380 kilovolt (kV) Static Var Compensators (SVC) located at the existing Shedgum and Faras substations, about 300 kilometers east of Riyadh.

The refurbished SVCs will operate in parallel with other SVCs and generators in close proximity. They will provide reactive power support to limit temporary over voltages and mitigate voltage instabilities at low load conditions. The project is scheduled to be completed by 2016.

"This refurbishment project will help reduce outages and mitigate the risk of blackouts" said Oleg Aleinikov, head of ABB's Substations business, a part of the company's Power Systems division. FACTS solutions allow more power to reach consumers through the existing transmission network. This results in lower investment, shorter implementation times than building new power plants and transmission lines, and lower environmental impact.

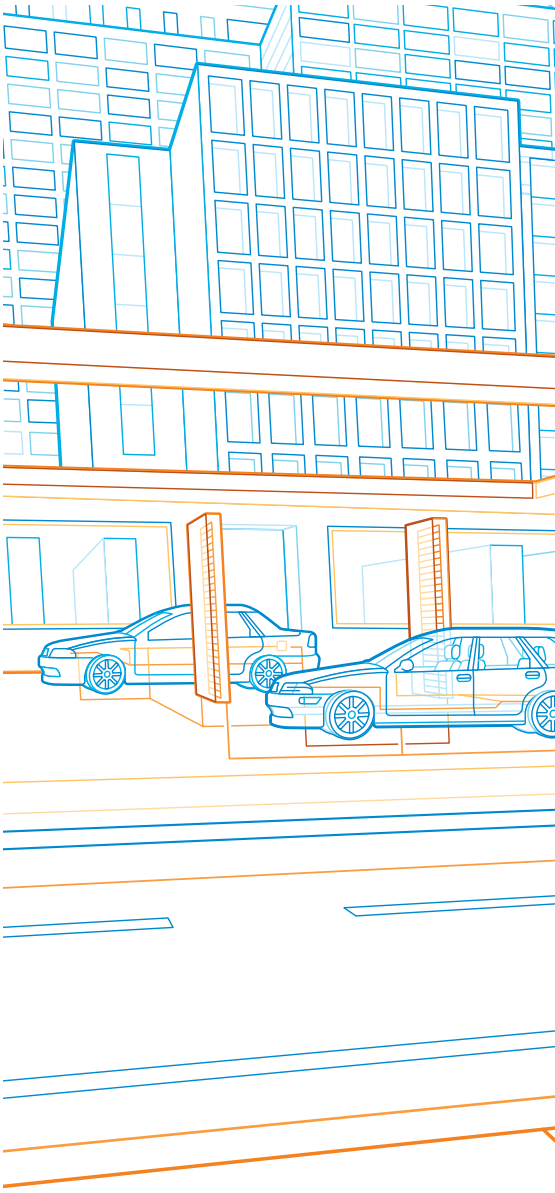
ABB showcases offerings in Myanmar

Since the elections in November 2010, Myanmar's government has undertaken a series of political and economic reforms. The country has undergone transformation and as per IMF estimates, received close to US$ 40 billion in foreign investments FY13, especially in power, oil and gas and development of SEZs.

To facilitate India's participation in this new growth phase, CII organized a three-day "Enterprise India" conference cum exhibition in Yangoan. On the occasion, ABB showcased its solutions at its stall themed "Strengthening a stronger grid". Several local and global delegates visited the ABB stall, including the Prime Minister of Myanmar, Thein Sein.

ABB has been a part of several projects in Myanmar, "Myanmar presents new opportunities as the market opens up. We are committed about this market and will be opening an office here soon," said Karthik Krishnamurthy, Exports Manager, ABB India.

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.

Much 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

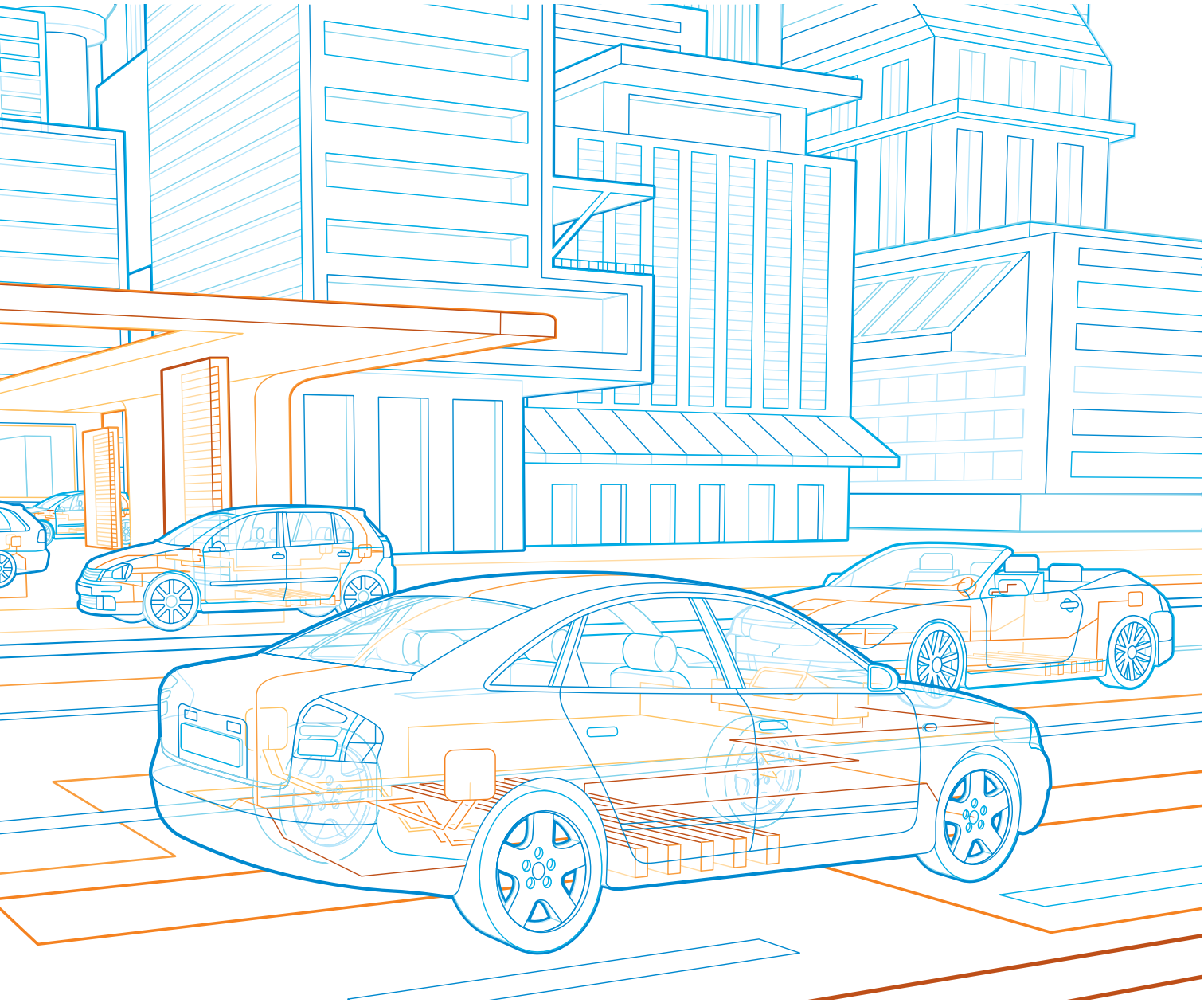


ABB turbochargers have been boosting the performance of the Indian Railways since 1975.

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.

The Delhi Metro helps reduce the city's traffic woes

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.

Earning credit

Besides providing efficient mass transport system, the Delhi Metro has also won awards for environmentally friendly practices from United Nations, International Organization for Standardization (the second metro in the world, after the New York City Subway to be certified ISO 14002). Stations in the network conduct rainwater harvesting and plans are in progress for harnessing solar energy. It is the first railway project in the world to earn carbon credits (through the use of regenerative braking system) under the UN Clean Development Mechanism.

A five century old contributor to modern sustainable mobility

The zero-emissions bicycle has come a long way – from an aid to short commutes to an urban recreational activities.

In India, bicycling has been part of Indian mobility story since the early 1930s. There have been many images associated with cycles since - be it a milk vendor precariously balancing his day's reserve or the relief of the hand-drawn rickshaw-walla. While electric scooters, and most recently, electric three-wheelers, have replaced some of the classic uses of cycles, the two wheeler has held its ground - evolving from a mode of transport, to competitive sport, and a recreational activity.

For all of the last century, cycle manufacturers focused on the commuter cycle segment. However, over the last decade or so, cycling in the urban areas, has been driven by a choice of lifestyle, rather than a means for commute. “India is becoming younger and lifestyles are changing. Consumers are becoming conscious about having to proactively introduce exercise in their otherwise sedentary (read desk-job) lives. Penetration levels of bicycles has plateaued in the rural areas; semi-urban and urban areas on the other hand, have growing interest,” observes Rajesh Mani, Head – Marketing at TI cycles, one of the biggest cycle manufacturers in Asia.

Over the years, the proportion of commuter cycles to TI’s sales has declined from 70 percent to 45 percent, giving way to special categories such as recreational cycles, ladies’, kids’ and mountain biking. Mani sees public transport in India eventually becoming an integrated sustainable provision – including cycling. Using this, city planners can not only reduce traffic congestion and carbon emissions but also improve personal fitness while reducing expenditure on fuel – for both, the individual and the government.

Bicycle rentals is becoming brisk business as distances of commute are shortened by metro lines and city centers are cordoned off for four-wheelers to prevent congestion. While several pilots are running across India, other regions have successfully implemented this mode of public transport. The MIBISI Automatic Bicycle Rental System offers a sustainable means of urban transportation around Dubai's popular tourist and residential areas, including mixed-use developments, resorts, parks, malls, and Dubai World Central, the venue for World EXPO 2020. Bases at different locations, with upto 20 bikes each are at the disposal of pre-registered users who pay by the hour.

The benefits are immense but at the end of the day, the choice is personal. A choice that impacts the future of the planet.

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.

SJ, 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 -20ºC to more than 55ºC, 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

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.

ABB 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.

Zayed Future Energy Prize 2014

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

The 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

It 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_2) 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_2) 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 the country were connected into one; and ABB helped see this through to the end.

At the start of the year, 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 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, in month, 2014, ABB commissioned the 765/400 kV substation at Sholapur for Power Grid Corporation of India Limited (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.

The 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

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 Products

Air Circuit Breakers

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

SACE Emax 2 is a new series of low voltage air circuit-breakers up to 6300 A. The breaker contains a protection trip relay with integrated power controller that evaluates energy consumption, then manages the loads to maintain or reduce the peak power usage as determined by the user. Prevents blackouts caused by demand outstripping supply.

Advantages

- Available in four sizes; enables high performance compact structure with optimally sized busbars
- Protection trip units have large color touch-screen display
- Conforms with EC “Low Voltage Directives” (LVD) and “Electromagnetic Compatibility Directive” (EMC), and international standards

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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Contact is published in English for circulation among ABB customers and stakeholders with an interest in ABB offerings, products and technologies.

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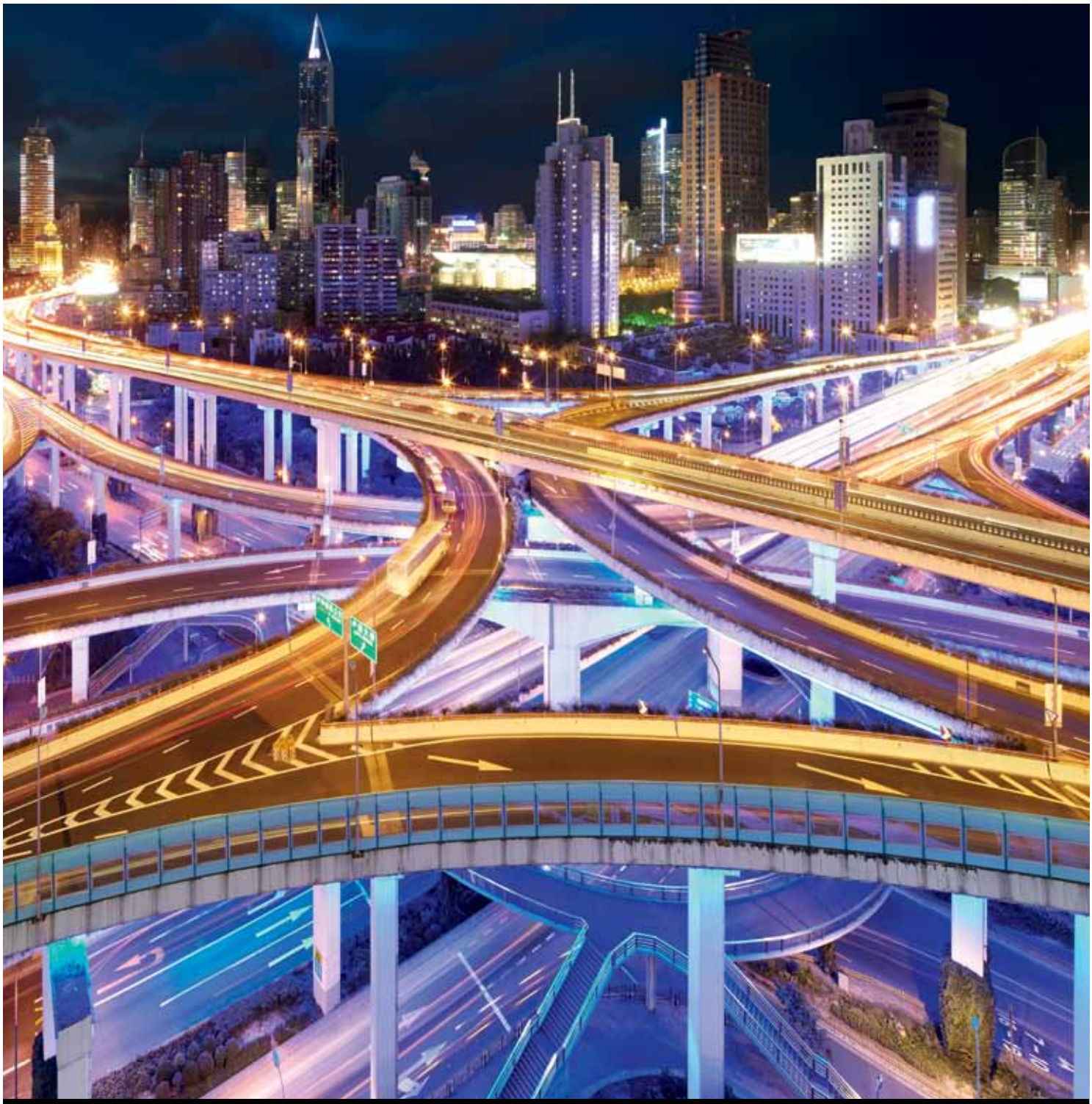
Automation

Automation, much like electricity has become a ubiquitous part of our lives. At every step, automation is improving our operations, making us more efficient. All factories that produce daily essentials like food, means of transport like cars and buses, to essential commodities like steel and cement, have something in common – automation is deep seated in their manufacturing processes.

As a global leader in power and automation, ABB has played a critical role and gone beyond automation of plants and improving processes. We are today an essential cog in the industry. The next issue of Contact will present an overview of ABB's presence in automation – case studies where our solutions and expertise enhanced customer operations.



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

Certainly.

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