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The customer magazine
of the ABB Group
in New Zealand

source



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Ewan Morris
Managing Director
ABB
New Zealand

Helping our customers achieve power supplies that are stable and resilient, in a sustainable way, is a key focus for ABB.

In this edition of Source we highlight several examples where ABB technology and solutions have helped provide both local and international companies with stable and resilient power. This includes helping PowerNet with its continuity of supply (page 11), assisting Wellington Electricity with a safe and energy efficient compact secondary substation solution (page 6), and providing reliable power to a port in China (page 13). It's important to highlight that some of these solutions are locally-produced here in New Zealand, showcasing our kiwi ingenuity and manufacturing expertise.

In other areas, ABB's latest microgrid solutions – see our feature article on page 14 – are providing power supply resilience, power quality, sustainability and cost-effectiveness in a broad range of applications. In developed countries these include ensuring the availability of resilient power across increasingly complex grids with an ever-growing number of diverse, distributed energy sources and a high penetration of renewables. For emerging countries there is the need to provide access to cost-effective, reliable and high quality electricity in remote locations. These challenges continue to create significant opportunities for the development of innovative and flexible technologies and solutions.

I hope you enjoy the read!



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Book this in your diary now

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Deloitte Energy Excellence Awards 2017

ABB was a proud award sponsor at this year's Deloitte Energy Excellence Awards.

ABB congratulates Trustpower's Tauranga-based Manager of Strategy and Regulation, Dr James Tipping, for being the recipient of the ABB Young Energy Professional of the Year award.

More than 650 guests from the energy sector, heavy industry, consulting firms and community groups attended the awards dinner at SkyCity in Auckland. The Deloitte Energy Excellence Awards provide an opportunity to recognise excellence and achievement across the electricity, oil, gas and petroleum industries. Founded in 2010, the awards are now the industry's annual black-tie gala event and are attended at an influencers and decision-maker level.



Left to right: John Hancock (Management Consultant, Signature Consulting), James Tipping and Ewan Morris (Managing Director New Zealand, ABB)

Plugshare.com – for the EV charger network

ABB has now supplied and commissioned over 50 electric vehicle (EV) fast chargers in New Zealand; helping create a more sustainable transport system.

Many of our chargers are located in picturesque places, as shown on www.plugshare.com, a useful website that highlights EV chargers across the country. The website and mobile app includes

addresses, and allows users to upload images of the various sites.

Below are some images of ABB's chargers as loaded onto the Plugshare site.



Napier/Taupo highway



Graphic highlighting the network



Te Kauwhata



Whakatane



Oamaru



Taupo

ABB's safe and compact solution for Wellington Electricity

ABB's latest locally-produced compact secondary station provided a safe and swift answer to a request from Wellington Electricity.



Background

During a storm event in July 2017, a situation developed such that Wellington Electricity required an additional point of supply within the Central Business District. The network within this area had been previously impacted by the November 2016 earthquake with interim supply arrangements in place while a project aimed at improving the resilience of the local network was underway.

Wellington Electricity had already ordered ABB's UniPack 2 (750 kVA/1 MVA) compact secondary substation (CSS) for a later project, but the risk to the area's supply presented by the severity of the storm accelerated their need for a solution that would meet the requirements for this particular situation. With a special effort by ABB, the CSS was installed and connected in this location within one week of their request. The location of the installation was tight for space and very public, therefore the compact, all-in-one UniPack solution met the brief well.

Safety assured

Although the UniPack CSS has been previously installed on the New Zealand (NZ) network, the next generation UniPack 2 has even more added safety, providing arc flash protection on both the medium voltage (MV) and the low voltage (LV) sides; a first for the NZ grid.

The MV side of the substation is managed to a "B Classification" Public Safety level and the addition of ABB's Emax 2 air circuit breaker is providing safety for arc flash exposure and electrocution of personnel on the LV side.

ABB's UniPack technology help meets the arc flash safety certification under IEC 62271-202 A (worker with PPE) & B (general public) classification.

In addition to these safety features, the Emax 2 is capable of providing real time energy management and power quality information back to a supervisory system. It can also manage peak load demands and introduce energy storage or generation inputs to an industrial site or a geographic area, with the control of up to 15 loads.

Tight time constraints

Wellington Electricity said, *"By immediately responding to our request, ABB assisted us in supporting approximately 600 of our valued customers. We appreciate the collaborative and responsive effort from ABB in working with us to bring forward the production of the UniPack unit in a quicker than normal turnaround time."*

ABB was able to meet all the project criteria for amenity and safety, but critically, was able to meet the accelerated project time scale.

Although Wellington Electricity had already chosen the UniPack 2 for a later project, the team based at ABB's medium voltage facility in Henderson, Auckland, were still finalising the custom design along with the customer. The technical and manufacturing teams in Auckland worked over the weekend to compress the final development work into less than three working days.

UniPack

In addition to ABB's 750 kVA transformer and Emax 2 products, the UniPack 2 CSS is fitted with ABB's locally-produced SafeLink 2, 11 kV or SafePlus 22 kV Ring Main Switch on the MV end of the unit. These are fitted with ABB's CEF MV Fuses which are designed to provide very steep TCC curves for rapid clearance of a significant fault. Fuses will clear a fault in a significantly shorter time than a conventional circuit breaker.

ABB worked with Wellington Electricity's installation contractors to ensure the correct configuration of the LV set up.



ABB motor sets world record in energy efficiency – saves half a million dollars

ABB achieves almost 100% energy efficiency with synchronous motor.

Tests carried out on a 44 megawatt six-pole synchronous ABB motor shortly before delivery showed an efficiency 0.25 percent greater than the 98.8 percent stipulated in the contract, resulting in the world record for electric motor efficiency. This efficiency improvement could save approximately US \$500,000 in electrical energy costs over the course of a 20-year lifetime for each motor.

The world record efficiency was reached by optimising the motor's electrical and mechanical features, based on ABB's application knowledge and more than 100 years of experience in manufacturing electric motors. The average efficiency for this type of synchronous motor is between 98.2 and 98.8 percent. If the motor is in continuous operation, the 0.25 percent efficiency improvement saves 1000 MWh of energy per year, which is equivalent to annual electricity consumption of 240 European households.



ABB to acquire GE Industrial Solutions

Shaping leadership in electrification.

ABB has announced the acquisition of GE Industrial Solutions, GE's global electrification solutions business. GE Industrial Solutions has deep customer relationships in more than 100 countries and an established installed base with strong roots in North America, ABB's biggest market. GE Industrial Solutions is headquartered in Atlanta, Georgia, and has about 13,500 employees around the world. As part of the transaction and overall value creation, ABB and GE have agreed to establish a long-term, strategic supply relationship for GE Industrial Solutions products and ABB products that GE sources today.

"With GE Industrial Solutions, we strengthen our Number 2 position in electrification globally and expand our access to the attractive North American market," said ABB CEO Ulrich Spiesshofer. "Combined with the long-term strategic supply relationship with GE, this transaction creates significant value for our shareholders."

World's largest floating photovoltaic power plant test-bed features ABB technology

ABB drives the energy revolution with newly emerging use of solar power in Singapore.



Land and scarcity has severely limited Singapore's adoption of solar power. Floating solar panels may be a viable alternative for the city-state surrounded by water. Floating panels could be eleven percent more efficient than solar panels placed on precious land. Pioneering technology leader ABB is providing critical components on a landmark one megawatt floating solar photovoltaic test-bed. It measures 1 hectare or 1.5 football fields. The energy generated will be fed into the national energy grid, providing electricity for up to 250 households.

"We are proud to support this important project in Singapore with our technological expertise and domain knowledge," said Tarak Mehta, president of ABB's Electrification Products division.

"This project is perfectly aligned with our Next Level strategy around the energy revolution and is an important step in collaborating with partners to bring more renewables into the future energy mix."

Located in the Tengeh Reservoir in west Singapore, the installation features multiple solar solutions from providers to study the performance and cost-effectiveness of floating solar platforms. ABB supplied 100 kW of market-leading TRIO-50 solar inverters to Phoenix Solar, one of several system integrators for the project. These essential components convert the direct current produced in solar panels into alternating current for use in electrical grids. Additionally, ABB low-voltage molded case and miniature circuit breakers protect the electrical circuits on the water.

In Singapore – a country with an area of only 719 square km and a population of 5.6 million – high average annual solar irradiation of about 1,500 kWh/m² makes solar an attractive source of renewable energy. Floating solar platforms will be naturally cooled by the surrounding water, which increases the efficiency of the energy yields significantly. A study has found that the natural cooling effect of the water beneath the solar cells makes them up to 11 percent more efficient than solar panels placed on land. In a synergistic effect, the floating platform helps reduce evaporation of the valuable water.

ABB technology in PowerNet's mobile substation



ABB's technology is part of PowerNet's latest mobile substation solution which is geared to support continuity of supply.

Early in 2017, PowerNet successfully deployed their newly designed and constructed mobile substation, which has the capability to restore electricity supply in a major event and reduce customer power outages when major equipment requires maintenance. The mobile substation will be utilised at transformer sites, temporary building sites, paddocks and roadsides and will significantly assist in supporting unplanned outages and planned shutdowns.

Considering challenges of limited space, New Zealand road conditions and vibration, PowerNet also required the 5 MVA substation to be utilised throughout

their extensive network at all their sub-transmission (66 kV and 33 kV) and distribution levels (22 kV and 11 kV).

Design and construction was kept within New Zealand, with the former by Mitton ElectroNet and the latter by ElectroNet Services. Both companies have had prior experience with developing mobile substations and through this experience, ElectroNet Group has developed techniques to overcome the constraints of maximum transit dimensions, rapid deployment at site and the requirements for making the sites ready to accept the mobile substation connection.



ABB's technology

ABB supplied the majority of equipment – including a small power transformer (SPT), deadtank circuit breaker, and HV surge arrestors – to ElectroNet's West Coast depot in the South Island for the construction of the mobile substation.

The application called for a 66/33/22/11 kV transformer of 5 MVA capacity, which was manufactured in ABB's factory in Vietnam. PowerNet's preference was for an Oil Directed (OD) cooled transformer for increased overload rating. Oil Natural (ON) was considered for its benefits of less componentry and likely lower total cost of ownership, but would require more copper and increased weight for a similar overload rating.

PowerNet selected ABB's 72PM40-C deadtank circuit breaker given its small footprint of 5 m² compared to competing products of 6 m². Innovation comes from ABB's advanced torsion spring design for opening and closing using the same mechanism, minimising the number of components and reducing size. Reduced tank sizes and tapered bushings minimize the amount of SF₆ required to 10 kg, a 30 percent reduction compared to other 72 kV deadtank breakers.

ABB's PEXLIM gapless Metal Oxide (MO) surge arrestors were specified for protection of the transformer against overvoltage transients. The supplied transformer was provided with different sets of surge arresters, which will be installed based

on the voltage configuration required. Benefits include a direct molded silicone and fibreglass weave for optimal release of gas during short circuits, and prevention of moisture ingress.

A bespoke project with space and weight constraints for New Zealand conditions will have its challenges. PowerNet were fully aware of these challenges and had a significant input into the design and equipment selection for their mobile substation. The new mobile substation will ultimately benefit the Southern Region of New Zealand.

ABB Customer World 2018

Following successful ABB Customer World (ACW) events this year in Hamilton and Dunedin, ABB is bringing its updated programme back to Auckland for 2018. The event will be held on Tuesday 8th May 2018 at SkyCity Convention Centre, Auckland.

The programme and live product exhibition will highlight ABB's latest digital technologies and solutions for a variety of applications, including asset health, microgrids and food and beverage.

We will have real examples of how ABB Ability, our unified, cross-industry digital capability connects our customers to the power of the Industrial Internet of Things and, through our services and expertise, goes further by turning data insights into the direct action that "closes the loop" and generates customer value in the physical world.

The agenda is full of both local and international industry experts, and there will be three concurrent streams running during the day to allow participants a choice to attend the areas that interest them the most.

For more information and to register, visit <http://new.abb.com/nz/customerworld2018>



Successful shore-to-ship power link in China

ABB's static frequency converter (SFC), manufactured in Napier, is providing reliable power infrastructure for a greener and more efficient ports.



ABB stock image

ABB has commissioned an advanced shore-to-ship (S2S) power supply for vessels in the Nansha terminal in the Guang-zhou Port, which is located at Longxue Island in South Guang-zhou city, China. This solution enables ships docking at the port to plug for power instead of running on polluting diesel generators and using expensive power. In early April 2017, the Nansha terminal successfully provided 60 Hz, 6.6 kV shore power to a container vessel named COSCO Africa.

The Nansha Terminal is the only deep-water container terminal on the west Pearl River Delta (PRD) region. Nansha Terminal covers 14 dynamic city clusters including Guangzhou, Foshan, Zhongshan, and Jiangmen. It provides international shipping services to Europe, America, Middle East, and the Mediter-ranean Sea and provides the most advance shipping hardware and equipment.

The project was to construct one 3 MVA S2S substation for Nansha Port Phase 111 container terminal, which was listed as one of seven demonstrative S2S projects during 2015-2016 by the Ministry of Transport (MOT) in China.

ABB's ship-to-shore technology

ABB's PCS100 static frequency converter (SFC) solution was selected to meet the regulation of emission reduction from the MOT, which is to achieve zero emission in port, and reduce around 1500 tons of CO₂ emission and 600 tons fuel consumption per year.

As a technology pioneer in low voltage installations for marine applications, ABB's PCS100 SFCs, are a safe, economic and highly efficient solution for converting grid electricity to the appropriate load frequency. This leading-edge frequency conversion technology guarantees a seamless automated power transfer of the ship load from the onboard power plant to the onshore source and back.

This solution contributes to a significant reduction of fuel and lubrication oil consumption, which means less pollution and improved financial benefits. S2S power is especially applicable to ships operating on dedicated routes, and vessels that consume large amounts of power while in port or at a shipyard. This could bring real benefits for terminal operators whose ships berth each day for a fixed number of hours.

Microgrids provide solutions to today's energy challenges

ABB delivering stable, sustainable power: anytime, anywhere. The examples are plentiful:



Microgrids have brought sustainable power to one of Australia's remotest, hottest towns – and to an Antarctic research station in one of the coldest spots on earth.

In Kenya, a microgrid is providing a reliable electric supply for an International Red Cross center that could no longer rely on the mainland grid, while another has harnessed wind energy for a remote village that never had the option of connecting to a central grid.

Whether it's a matter of keeping the lights on, or turning them on in the first place, microgrid technology from ABB is providing stable, sustainable power as stand-alone systems or as back-up alternatives to central utility grids. And while an installation on Robben Island, South Africa, (see picture above) is the newest of the company's microgrid projects, it is but one of nearly 40 ABB microgrids now in place around the world.

"We're out on our own here in the Gulf of Alaska, so we take care of a lot of stuff ourselves," said Darron Scott, president of the Kodiak Electric Association, an energy co-op that uses ABB microgrid technology to harness and manage its energy – 99 percent of which now comes from wind and other renewable sources. The co-op provides power to Kodiak, an island with a population of nearly 14,000 and industry that includes fisheries, logging and mining.

What is a microgrid? Essentially it is a small-scale power network – or a self-contained, local electrical system that can operate equally well whether or not connected to a central grid. Microgrids, which often incorporate on-site renewable energy sources like wind and solar, as well as customised battery storage systems, can help a community reduce or eliminate its use of diesel generators or other fossil-fuel sources.

Because microgrids are typically located at or near the place where energy is used, they are inherently efficient. And because



1.

the components of a microgrid – including the automation technology, batteries, power converter and control systems – can easily be transported by container, they can be standardised, pre-tested and quickly installed.

ABB's power-management technology performs the vital function of coordinating, integrating and stabilising the energy from a variety of sources – and conducting the hand-off between sources, as when the sun sets on a solar-panel array and the grid switches seamlessly to storage batteries. So, whether the energy is coming from wind, sun, hydro, or diesel back-up generators, ABB microgrids can ensure a stable, reliable flow of electricity at all times of the day, all seasons of the year.

With such capabilities, microgrids are helping integrate renewable energy into the global power supply as the world grows increasingly concerned about the environmental impact of fossil fuels. That's a key consideration for the world, as communities and businesses seek

reliable, sustainable alternatives to carbon-emitting energy sources. It's an even more crucial consideration in emerging-market countries, whose growing demand for reliable power will place new burdens on the environment unless they adopt clean-energy solutions.

ABB's experience in Kenya shows the vital role that microgrids can play in emerging markets, in either a remote village or an urban setting.

In Marsabit, a windy north Kenya oasis town of 5,000 people that has no connection to the national grid, ABB created a microgrid that integrates the energy from two wind turbines with back-up power from a diesel generator.

In Nairobi, the challenge was different. There, a central utility grid serves the city, but it is plagued by frequent power outages. That's why the International Committee of the Red Cross retained ABB to provide a microgrid to power the Red Cross's global logistics center in Nairobi.

The center employs 170 people and delivers food, medicines and relief supplies across the African continent. The ABB system integrates solar and diesel power to provide a steady supply of power.

"Reliable power is essential for our staff to continue their life-saving work uninterrupted in the field," said Peter Mauer, president of the ICRC.

ABB's CEO, Ulrich Spiesshofer, sees microgrids playing a vital role in sustainable modernisation. "Microgrids have enormous potential in Africa, where more than 600 million people live without access to electricity. This is true of many other parts of the world like the Indian subcontinent or remote and island communities," Spiesshofer said. "Reliable access to electricity is essential to speed up economic development."

1. ABB's microgrid and wireless technologies are powering the World Heritage Site on Robben Island in South Africa.



Improving network availability...

...through enhanced power quality.

Enhancing power quality for a stronger electrical network.

Power quality is key to improving grid availability and reliability. It enables the optimization of operating costs and secures grid code compliance. Power quality supports the integration of renewables into the grid and enhances energy efficiency, leading to lower carbon emissions and minimizing environmental impact. ABB is a technology leader with a wide range of products, systems and services that improve power quality including capacitors and filters, power electronics-based compensators and software solutions, across the power value chain for low, medium and high-voltage applications, helping to shape a stronger, smarter and greener grid. <http://new.abb.com/grid>

ABB