

power



Outlook for power protection

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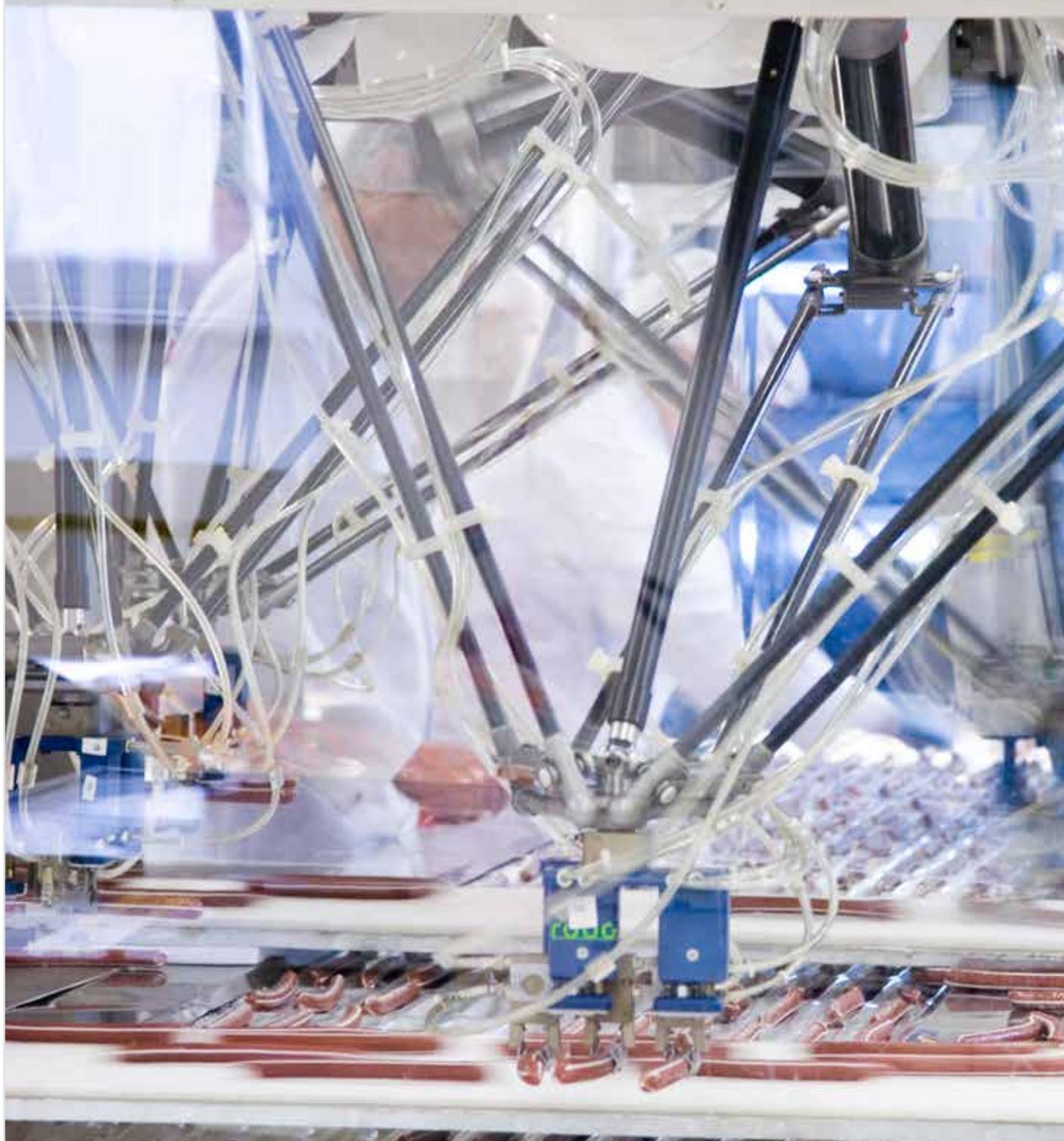
Medium voltage UPS is the new “black” amongst large power users

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Protecting a stock exchange datacenter from power disruptions

The increase in the usage of electrical equipment is amplifying the demand for power protection systems globally. To understand the importance of power protection, we must first think what would happen without it.

Learn more at www.abb.com/ups



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power



Pedro Mendieta

General Manager
Power Protection, North America
Discrete Automation and Motion division

I believe 2015 to be a key year for ABB Power Protection. We have a strong line-up of legacy power protection products and have invested significantly in new product development across our businesses. We are now poised better than ever to take advantage of the opportunities within the markets we serve. Our colleagues in Quartino and New Zealand are both active contributors and leaders in the supply of medium and high-power UPSs and large scale power conversion respectively. When combining the US-based industrial UPS, datacenter power distribution and critical power service offerings, we build on a strong foundation and position ourselves as leaders in power protection worldwide.

In this edition of Power you will get a preview of this year's new

product development initiatives which include modifications to the PCS100 Active Voltage Conditioner (AVC) product line, a complete new line of light industrial UPSs called PowerLine PDA, as well as expanded power ranges and compliancy updates to the Cyberex® PowerBuilt™ Industrial UPS. On the services front, we are committed to strengthening the Critical Power Multi-brand Services business, formerly known as JT Packard, and will continue to ensure that our customers' critical power equipment is maintained and serviced with trained and experienced field service technicians.

How important is power protection today? Read further in this issue to get an in depth perspective of how to ensure continuous operations from the utility to the grid and how to choose the right power protection solution for your business. Learn how the PCS100 Industrial UPS (UPS-I), PCS100 AVC and Medium Voltage UPS (MV UPS) are a perfect fit in protecting the present and future production of the semiconductor and electronics industries. Also covered in this issue are the advantages of integrating a medium voltage UPS system to provide large scale, secure power for plant-wide and mission critical datacenter applications.

Highlighted in this issue is a noteworthy article on how ABB Power Protection gained the trust of the Taiwan stock exchange. When the exchange needed quality and capability, they chose the DPA 500 high efficiency modular UPS. The system's modular slide-in and

online-swap architecture was an ideal solution, providing up to 3 MW scalability, high power density, and nearly 99.9999 percent availability. Modules can be inserted and removed with power on, ensuring ease of maintenance and avoiding downtime, too.

Also, a follow-up article on ABB's success with dairy manufacturing giant, Fonterra. How does the world's largest dairy manufacturer maintain continuous operations throughout their production lines? Since its installation in September 2014, a PCS100 AVC paid for itself in a fraction of the expected time by maintaining operations during five known power quality events.

Did you know that ABB Power Protection has a UPS test center for medium-sized and large UPS systems that is named "GREEN test bay"? The GREEN (Generating Recycled Ecological Energy Network) test bay was designed and built entirely in-house in Quartino. It is used for the final test of high power UPSs (>300 kW) and for executing factory acceptance tests (FAT) with customers. See the article within to learn more about this eco-friendly UPS testing center.

Finally, in this issue of Power learn how you can ASK ABB. The online platform gives you a direct line to our power protection experts. Just ask by visiting our online community today.

I look forward to an exciting year and I hope you enjoy this issue of Power.



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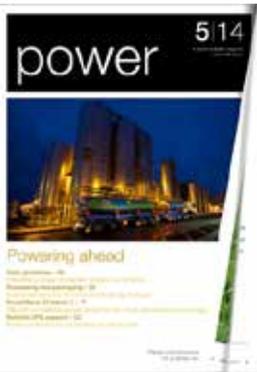
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Outlook for power protection



New products and modifications to improve your business's power quality – what will 2015 bring?

A new year brings new products and modifications for power protection systems. New products, such as industrial light UPSs and modifications to voltage conditioning systems, will assist in enhancing power quality to new levels of efficiency and reliability.

This year, the PCS100 Active Voltage Conditioner will be split into two products (PCS100 AVC-40 and AVC-20), specifically engineered to fix different types of common utility power supply problems. The PCS100 AVC-40 will be designed for sag correction where the network is stable but affected by external factors such as the weather. The PCS100 AVC-20 will provide continuous voltage regulation where the network is weak and unstable.

The PCS100 AVC-20 will cater to businesses with smaller power protection requirements or protect villages in developing countries from voltage disturbances. Rated at up to 3 MVA, the PCS100 AVC-20 will ensure continuous voltage regulation to 100 percent for voltage fluctuations of ± 20 percent of the mains voltage.

The PCS100 AVC-40, rated from 150 kVA to 1.8 MVA, will ensure quick and full correction of three-phase voltage sags down to 60 percent of the nominal voltage and of single-phase voltage sags down to 45 percent of the nominal voltage for 30 seconds.

Both PCS100 AVC-40 and AVC-20 products will feature a large LCD touch screen, through which the device can be operated and detailed event logs accessed. An integrated web server allows remote access, and emails can be sent to those concerned when a power quality event occurs.

An entirely new product line of industrial light UPSs called PowerLine DPA will be revealed in the second half year of 2015. The UPS will be an online double conversion UPS (uninterruptible power supply) system that will secure the power supply to critical industrial control processes and avoid downtime costs, lost data, damaged product or instabilities in, for example, the supply of chemicals and steam.

The Powerline DPA is engineered to comply with project specific requirements. Its pre-configured options, tailored for industry, allow agile implementations with short lead times. Its robust design is suitable for industrial plant environments that have high ambient temperatures, dust, moisture and corrosive contaminants. The modular architecture of the PowerLine DPA allows high availability, easy serviceability, flexible scalability and a low total cost of ownership (TCO).

The Powerline DPA will cover a range of applications, from automation and control systems energy management systems through to communication and security systems. The new product line will also provide benefits such as high reliability, robust design, and safe and easy maintenance that will reduce the mean time to repair.

Additionally, the Cyberex® PowerBuilt™ Industrial UPS portfolio will be expanded to provide protection up to 80 kVA, both UL and IEC compliant. This online double-conversion industrial UPS is designed to support the continuing demand from downstream refining and petrochemicals, upstream oil and gas, power generation, and the growing regulatory and safety needs of today's industrial complexes.

On the service front, we are committed to strengthening the Critical Power Multi-brand Services business, formally known as JT Packard, and will continue to provide mission critical



ABB's PCS100 AVC products are designed to protect industry from voltage events, allowing them to do what they do best

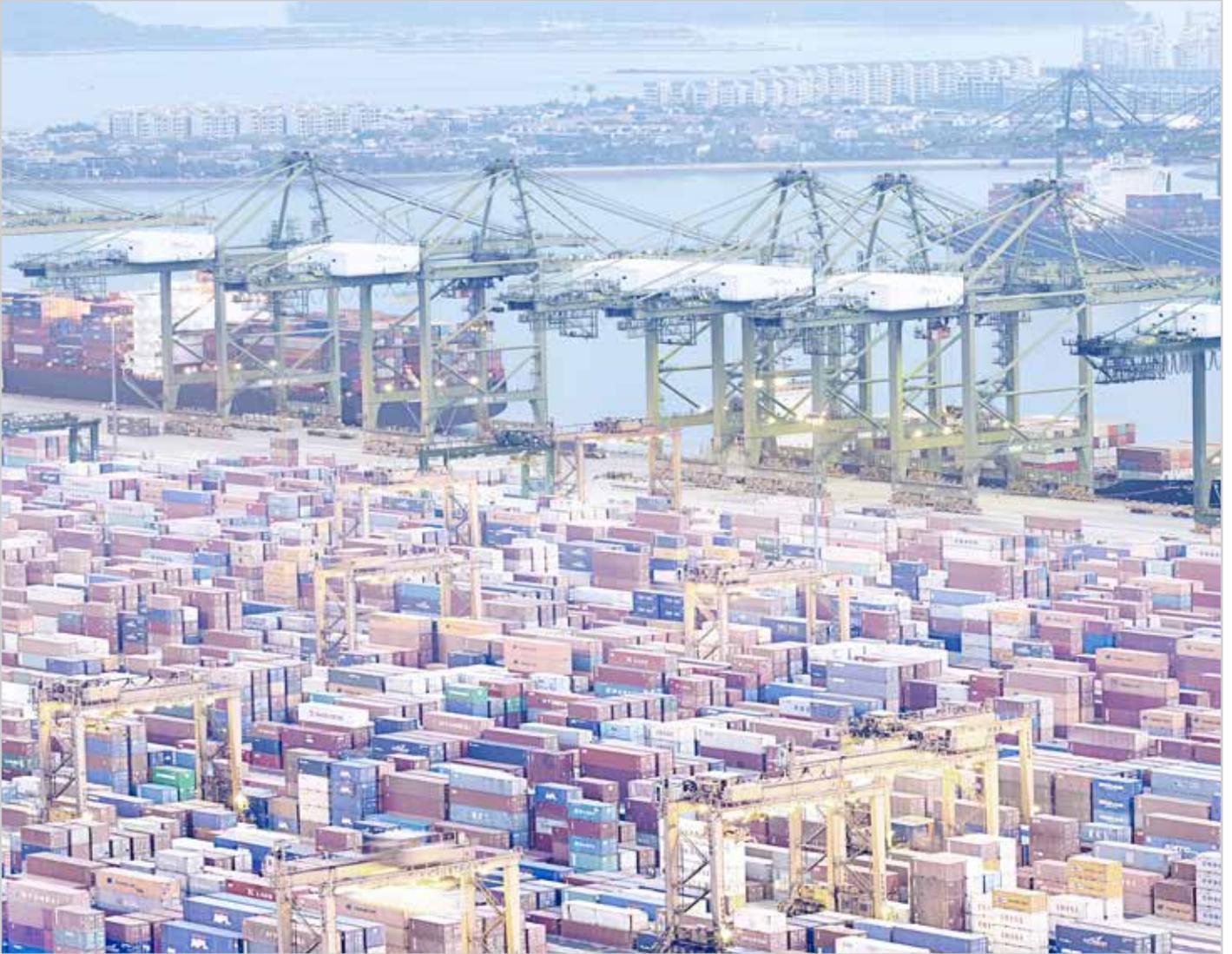
power and facility management services for datacenters, hospitals, telecommunications and commercial buildings.

ABB's Power Protection Research and Development team are constantly improving the technology of the platform. Setting trends for hardware and control platforms, ensuring the highest reliability, efficiency and the smallest footprint, will shape the future of power protection in commercial and industrial applications.

To find out more about ABB's power protection solutions:

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Protecting your business's future

How important is power protection really?

circumstances (such as motors and drives causing vibrations in a production facility). These everyday occurrences can play havoc on a business's daily operations, resulting in economic and operational setbacks. A study conducted by J.D. Power and Associates found that the average business experiences 5.7 outages per year. Without protection, production cannot continue during these events. Furthermore, the Electric Power Research Institute found that, on average, a one second power outage costs a business US \$1,477, and a one hour outage equates to US \$7,795. Overall, this costs the global economy between US \$104 and \$164 billion annually.

Is power protection really that important?

Regardless of the size of a business, it can never be too small to have a power protection plan in place. Any amount of downtime will result in a cost to the company. There are also reported savings that go along with energy efficiency steps. Some believe that investing in power protection systems that add just a little efficiency isn't worth the expense. However, the costs of inefficiency add up, and in a year's time, companies are finding that their upgrades are well on the way to paying for themselves.

There are also many who believe that the energy they receive from their utility is clean and reliable just because they're on the grid. The reality is that, utility power can wreak havoc on IT equipment. Some say that if utility power is 99.9 percent effective, then that's close enough. But when it comes to super critical processes in a datacenter, for example, that 0.1 percent can equal up to nine hours of outages every year.

Those who are aware of the issues with utility power sources might invest in a generator and perhaps a series of surge suppressors to deal with any issues that crop up. While a generator provides cover during a blackout, it can't address a number of other issues that can occur with utility power. These issues include under-voltage, a problem that can be just as damaging as a surge.

Datacenters that aren't monitoring their power are risking their systems in more ways than one. If an uninterrupted power supply is overloaded for any length of time, it could fail.

But what does this mean for businesses, datacenters and industrial sectors that need constant power for optimal performance? It means adopting a power protection plan by installing equipment to keep things running smoothly and efficiently in the event of an interruption or total outage, which can sometimes last hours. If this situation were to occur to a business, it would likely have devastating effects on the business's ability to continue operating, even after power has been restored. Statistics show that a business that is reliant on power will cease to recover from an extended power outage of three days or more.

By turning to power protection products, businesses can save thousands of dollars that would otherwise be wasted when a sag, surge or spike occurs. The power grid hasn't changed at the same rate as technology in general, which is why many businesses make power protection a high priority. Businesses that survive and thrive are businesses that plan ahead, and power protection should be part of that planning process.

The increase in the usage of electrical equipment is amplifying demand for power protection systems globally. Among all application segments, the industrial sector currently holds the largest market share in power protection systems, whereas the commercial sector is expected to be the fastest growing application segment due to the increase in internet users in emerging nations.

The need for power quality protection equipment has grown significantly over the past few years due to increased reliance upon sensitive microprocessor-based applications, which have become more susceptible to power problems such as sags, surges, brownouts, line noise, high-voltage spikes, frequency variations and harmonic distortion. Adoption of high technology equipment in emerging countries is a major factor in the growth of the power protection systems market globally. As factories strive to meet the demand for electronic devices and other popular products, the need for continuous and improved operations increases.

Ensuring continuous operations

Continuous operation requires good quality power from the utility to the grid. In some cases, this can be compromised by uncontrollable factors, creating unnecessary stress to a business. To understand the importance of power protection, we must first think what would happen without it. A power quality event can be caused by a range of factors, including environmental conditions (such as weather) or internal



A business can experience 5.7 outages per year. Without power protection, production cannot continue during these events, leading to loss of valuable resources.

How do I choose a power protection solution?

Power protection products can be used for a variety of applications, including datacenters, mission-critical equipment and sensitive tooling and machinery. Today, more than ever, companies are reliant on power to keep their systems cooled, data available, and production lines running.

Voltage conditioners respond to the most common utility problem – voltage sags – along with swell protection and continuous voltage regulation. They are able to cater to weak, unreliable networks or networks that are stable but still suffer from voltage sags caused by external factors, such as weather. A recent project involving the world's largest dairy exporter, Fonterra, was able to override a power quality event with a [PCS100 Active Voltage Conditioner](#) installed. As well as saving Fonterra money and preventing the need for the re-sterilization of equipment, the investment was paid back in a fraction of the time expected.

Another conditioning system that focuses on internal power quality events is the [PCS100 Reactive Power Conditioner](#). Power conditioners are designed for correcting the power factor, low order harmonics and imbalance issues often created by some semiconductor tool loads or motors and drives. They reduce system current, thus enhancing energy efficiency and power system capacity.

Over the years, UPS systems designed for critical process control (CPC) applications have earned the name “Industrial UPS”. In these types of applications, the interruption of AC power may cause dangerous chemical process instability, or cause expensive damage to processing systems. Because of the risk resulting from the loss of control power, UPS systems intended for industrial applications must be designed and performance-tested to a more rigorous level than commercial equipment. Industrial UPSs tolerate moderate amounts of non-conductive dust and high ambient air temperatures of at least 40 degrees celsius. They provide protection during deep sag and swell events, and outages lasting between seconds and minutes, depending on storage (super capacitors or batteries) and system loading. General process control (GPC) processes are light industrial applications, such as those found in the pharmaceutical and food and beverage

industries. In these processes, the failure of the UPS to supply continuous AC power may result in loss of finished product or hundreds of work-hours resetting the production equipment.

In contrast, for commercial applications such as IT, the environment is almost always temperature controlled at 30 degrees celsius, and kept very clean. However, with datacenters now growing in size and taking on a somewhat industrial approach to power consumption, the environment is beginning to change. Some operators are allowing temperatures to rise inside the datacenter as a method of reducing cooling costs, while others are using ambient air from outside to cool equipment. Either way, the job of the UPS is to filter and transform incoming AC power so that it is “clean” and stable, as well as to supply emergency power from a string of batteries until a backup generator comes on line and reaches operating speed. This occurs over a period of usually less than 10 seconds – a timeframe mandated by fire protection standards in many countries. Short circuit fault levels in large datacenters can also be high, making the design of circuit breaker protection difficult.

Industrial UPS devices are designed with higher overload ratings, not only making them more rugged and safer, but also providing design engineers with more opportunities to implement protection discrimination. This means a fault is more likely to trip the circuit breaker protection without damaging the UPS. Traditional large industrial UPSs have often been rotary systems, offering rugged performance but with the downside of having moving parts to maintain and providing less than optimal efficiency. However, a new generation of large single conversion static industrial UPSs is appearing on the market.

ABB have a range of [low and medium voltage UPSs](#) designed for both commercial and industrial applications that can either provide complete power protection of a facility or just protect a selected sensitive load from voltage sags. With benefits such as high reliability and efficiency, lowest total cost of ownership (TCO) and small footprint in design, ABB's UPS portfolio controls voltage instability so that a stable power output is achieved.

Ensuring your business's future

Studies indicate that the industrial segment led the power protection demand in 2014, accounting for US \$763.2 million. The dominance of this segment is due to growing industrialization in emerging countries around the globe. Increasing automation in both the manufacturing and processing industry has increased the demand for power protection systems in industrial machines and equipment. Furthermore, studies show that power protection products have generated the most revenue in Asia, at an annualized rate of 15 to 20 percent.

Investing in systems such as UPSs or voltage and power conditioners will play a huge role in keeping the quality of operations at the highest levels. It appears most businesses are beginning to embrace the importance of power protection.

To find out more about ABB's power protection solutions:

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Email: powerconditioning@abb.com



Do you have a question about power protection?



The ASK ABB online platform gives you a direct line to our power protection experts. Just ask...

The worst question is the one that's unasked. Many make the mistake of thinking their question is irrelevant when in fact it could be a very common concern.

ASK ABB is a place where questions are answered. Think of it as a crowdsourcing knowledge platform, directly connecting people who know and people who want to know.

You can ask a question or search our range of answers. Using a voting system has helped to cut down on duplicate entries, making ASK ABB a valuable resource to people who want to learn about power protection.

Do you want answers on power protection? All you need to do is ASK...visit the online community today.

Web: <http://ask.abb.com/products/ups-and-power-conditioning>





Semiconductor and electronics

Protecting the present and future
production of the semiconductor and
electronics industry.

ABB's new semiconductor and electronics segment outlines power protection solutions best suited for the industry.

Semiconductors are all around us. They control the computers we use to conduct business, the phones and mobile devices we use to communicate, the cars and planes that get us from place to place, the machines that diagnose and treat illnesses, the military systems that protect us, and the electronic gadgets we use to listen to music, watch movies and play games. Simply put, without semiconductors, the technology that we count on every day would not be possible.

In order for semiconductor facilities to produce highly technological devices, systems are put in place to ensure continuous improvement and output is reached. The cost of lost production, downtime, quality, and ultimately lost profit, can be extremely significant for semiconductor manufacturing fabrication plants (FABs) that are not adequately protected. Investing in the best power protection solution will future-proof your equipment from the devastating effects of a power quality event. ABB has now developed a semiconductor and electronics segment, designed to assist you in selecting the best power protection solution to suit your facility's specifications.

Typical problems semiconductor facilities encounter and how to solve them

The semiconductor industry has some of the most demanding applications in motion control. A combination of extreme accuracy and precision makes for super critical power protection.

Semiconductor segments can be divided into two sequential sub-processes commonly referred to as front-end and back-end production. The entire process, both front-end and back-end, is complex and requires sophisticated technology to protect the most sensitive stages. Typical problems facing semiconductor facilities are:

Voltage sags: Semiconductor processes are extremely sensitive and are dependent on a stable and well regulated electrical power supply to tools and equipment. The most common and costly power quality problem is voltage sags. The PCS100 Active Voltage Conditioner (AVC) is specifically designed to correct voltage sags. It does not contain energy storage, instead taking power from the remaining electrical grid. As a result, it has a very low cost of ownership due to having no batteries to maintain and very low electrical loss. It has a small footprint, making it suitable for effective use inside plants where floor area is limited.

The PCS100 Industrial UPS (UPS-I) is an ideal complement to the PCS100 AVC. The PCS100 UPS-I incorporates energy storage, often in the form of ultracapacitors. This provides the energy to ride through very deep voltage sags and short



power outages, and makes the PCS100 UPS-I suitable for direct connection to many semiconductor tool loads.

Current issues: Many of the connected loads in semiconductor plants draw current from an electrical supply that is rich in harmonics, imbalance and poor power factor. Conventional capacitor-based power factor correction can cause switching transients on the supply and be overloaded by harmonic resonance. The PCS100 Reactive Power Conditioner (RPC) is an electronic power factor correction system that uses an insulated-gate bipolar transistor (IGBT) inverter to correct power factor, imbalance and low order harmonics (5th and 7th). It is an ideal solution in a semiconductor manufacturing environment where many sensitive loads are present.

Limited space: Space for power protection equipment is often very limited in semiconductor plants. The PCS100 Medium Voltage UPS (MV UPS) provides a high level of power protection at medium voltage levels and is an ideal application for photolithography, ion implantations and etching tools, wafer testing, die cutting and air handling.

The statistics – outlook for the economy

A strong semiconductor industry is vital to the global economy. Semiconductors are a foundational technology in virtually all sectors. As the building blocks of technology, semiconductors will continue to enable the world's greatest breakthroughs. From aerospace and consumer electronics to energy and medicine, entire industries will be transformed. Semiconductors have revolutionized the way we work, communicate, travel, entertain, harness energy, and treat illness. Semiconductor Applications Forecasters (SAFs) estimates the compound annual growth rate (CAGR) will be

3.4 percent from 2013 to 2018, reaching US \$384 billion in 2018. Furthermore, World Semiconductor Trade Statistics (WSTS) predicts the global semiconductor market will be up 3.4 percent to US \$345 billion in 2015. For 2016, the market is forecasted to be US \$355 billion, up 3.1 percent. By end market, automotive and communications markets are expected to grow stronger than the total market, whereas consumer and computer are assumed to remain almost flat.

Regionally, Asia-Pacific will continue to be the fastest growing region for production of semiconductors and is expected to reach US \$209 billion in 2016, which is already a share of almost 60 percent of the total semiconductor market.

Securing the future of semiconductors

[Power protection](#) systems have been at the forefront of some of the world's biggest semiconductor production companies. From substations through to sensitive tooling and machinery, power protection systems offer reliable and efficient solutions, eliminating voltage disturbances and improving productivity. This year, the world's largest provider of independent semiconductor manufacturing services in assembly and testing, ASE (Advanced Semiconductor Engineering) based in Taiwan, ordered nine PCS100 AVCs. From 2013 to 2015, ASE has ordered a total of 14 PCS100 AVCs, to protect the packaging and testing of silicon chips, a total power protection plan consisting of 20 MW.

To find out more about ABB's solutions for the semiconductor and electronics industry visit:

Web: new.abb.com/ups/ups-and-power-conditioning/industries/semiconductor

Email: powerconditioning@abb.com



Semiconductor trends

- Japan accounted for 22 percent (with discretely) of the global total installed fabrication capacity in 2014, and leads other regions including Korea and Taiwan, which account for 17 percent and 18 percent respectively.
- The automotive and industrial markets for semiconductors offer significant growth potential.
- The automotive market will be driven by the number of vehicles produced in Brazil, Russia, India and China, and by an increase in the average semiconductor content per vehicle.
- Japan is the second largest semiconductor materials market, as measured by revenue, accounting for 17 percent of the 44.7 billion global materials market.
- Japan was expected to spend US \$3.65 billion on new equipment in 2014 accounting for 9 percent of the global equipment market. This growth will continue in 2015 to reach US \$4.22 billion. In these two years, the Japan equipment market will grow by 25 percent.
- Among the top 10 worldwide semiconductor manufacturing equipment vendors by revenue (as reported by Gartner), five companies are headquartered in Japan. With these and other equipment companies, Japan supplies around 35 percent of new equipment to the global market.
- The industrial sector is growing because of increasing energy demands, a continuing trend toward renewable energies and the expansion of high-speed rail transportation.
- The data processing application market is driven by accelerating tablet sales, and the communications market by the still-strong unit sales of smartphones. Consumer electronics also benefit from a growth in units sold, particularly in digital set-top boxes.
- China will cement its dominant position and increase its market share of global semiconductor sales to half of the worldwide market by 2015.
- To meet global demands, global production capacity for semiconductors will increase.
- Overall production capacity is sustaining progress toward smaller feature sizes and larger wafer diameters.
- Operating profitability is back on the positive side of the ledger, except in the memory and back-end processes subsectors, which face strong competition and cycles of overcapacity.

Source: SEMI.org, PWC

Speedy return on Fonterra's new protection system.

The world's largest dairy manufacturer, Fonterra, has seen record results from an ABB power protection system installed at their Takanini plant to protect the processing and packaging lines. Since being installed in September 2014, the PCS100 Active Voltage Conditioner (PCS100 AVC) has paid for itself in a fraction of the expected time, and is the biggest system of its kind installed in New Zealand.

Production lines used at the Takanini site are sensitive to voltage sags and short term outages, which can jeopardize the sterility of the ultra high temperature (UHT) milk and cream being produced.

Fonterra Brands New Zealand (FBNZ) Group Automation and Control Manager Peter Williams says there have been five power quality events since the system was installed and the UHT area of the plant managed to maintain operations throughout each one.

He says initial forecasts were for the system to pay itself off within 12 to 18 months. He says the three-month return on investment is "pleasing". "To have that impact on our operating costs is a bonus."

Investment

Williams says plans are in development for potentially installing more power protection systems as part of another FBNZ project. "I have put the amount of money for those into the budget," he says. "In terms of planning for this project, it's been taken into account very early on."

The Takanini plant underwent an US \$6 million upgrade in 2010 so it could meet the growing demand for UHT products from South-East Asia and the Pacific. More than 90 percent of UHT milk and cream produced at the Takanini facility is exported to international markets.

Due to expanding and upgrading processing and packaging capabilities, the plant now draws 30 to 40 MW of electricity.



Williams says having the PCS100 AVC installed means there is more surety that production targets will be met.

Ongoing projects

ABB is currently installing a PCS100 Reactive Power Conditioner (RPC) at Fonterra's milk powder plant at Pahiatua, New Zealand.

The [PCS100 RPC](#) helps to mitigate power quality problems caused by production equipment within the facility. The Pahiatua site operates from August to June and processes 1.4 million liters of milk each day, producing 55,000 tonnes of whole milk powder each year.

Fonterra is midway through construction of a new US \$177 million drier at Pahiatua. The project, which includes a new 35 MW gasfired boiler, will increase the current production capacity by 2.4 million liters in 2016.

To find out more about ABB's power protection solutions:

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Additional information

Project article: [http://www05.abb.com/global/scot/scot232.nsf/veritydisplay/59d2b17394c39489c1257d8c00813bd2/\\$file/2UCD401191-P_a%20Fonterra.pdf](http://www05.abb.com/global/scot/scot232.nsf/veritydisplay/59d2b17394c39489c1257d8c00813bd2/$file/2UCD401191-P_a%20Fonterra.pdf)

Project video: https://www.youtube.com/watch?v=sU9uMLX9pIw&index=40&list=PL-Q2v2azALUPKFQqIbhFgabb_6df26fqU

Food and beverage brochure: [http://www05.abb.com/global/scot/scot232.nsf/veritydisplay/f78a040f785bd3bdc1257d9b006adfe6/\\$file/2UCD301133-P_a%20Power%20protection%20food%20and%20beverage%20brochure.pdf](http://www05.abb.com/global/scot/scot232.nsf/veritydisplay/f78a040f785bd3bdc1257d9b006adfe6/$file/2UCD301133-P_a%20Power%20protection%20food%20and%20beverage%20brochure.pdf)

Big data equals big power – why medium voltage UPS?

The tendency towards mega datacenters in the internet and IT sectors requires an increasing demand for stable power at single locations. With more demand for data storage (largely due to frequent uploads of photos to Facebook or other social media accounts), datacenters are becoming bigger and consuming larger amounts of power. They are beginning to take on a more industrial approach to power consumption. That said, more and more large critical industrial processes rely on a power quality level that cannot be provided by the public grid. The distribution of the electrical power within many of these large facilities is realized at medium voltage (MV) level.

Medium voltage distribution reduces losses and space by a simple reduction in current. As voltages increase, the current required reduces for the same power level. The modular design of a Static UPS simply allows a replacement of the grid-to-load interface from low voltage to medium voltage components, keeping the basic parts of the UPS and storage the same as for LV applications. In this way, the proven and familiar experience of working with the functionality and maintainability of a reliable LV UPS is maintained but the advantages of medium voltage are realized.

Mission critical applications that require safe and reliable power

Fast-growing online activity over the last decade has forced a rapid rise in both the space and electrical power required to operate datacenters. Accordingly, power density becomes higher, and cooling of these datacenters becomes critical. Industrial enterprises, such as semiconductor fabrication, and chemical and food industries, more often require a safe power supply, because major production losses caused by mains interruptions cannot be tolerated. Economies of scale mean single locations have grown larger, with the demand for a safe power supply reaching well into the tens of mega watts for many facilities. In addition, the production area is often widespread and distribution of a high level of electrical power throughout the location is necessary. Long distances in power distribution also have to be overcome in applications such as large airports or in electronics manufacturing facilities where the scale of the operation is vast.



Advantages of MV UPS technology

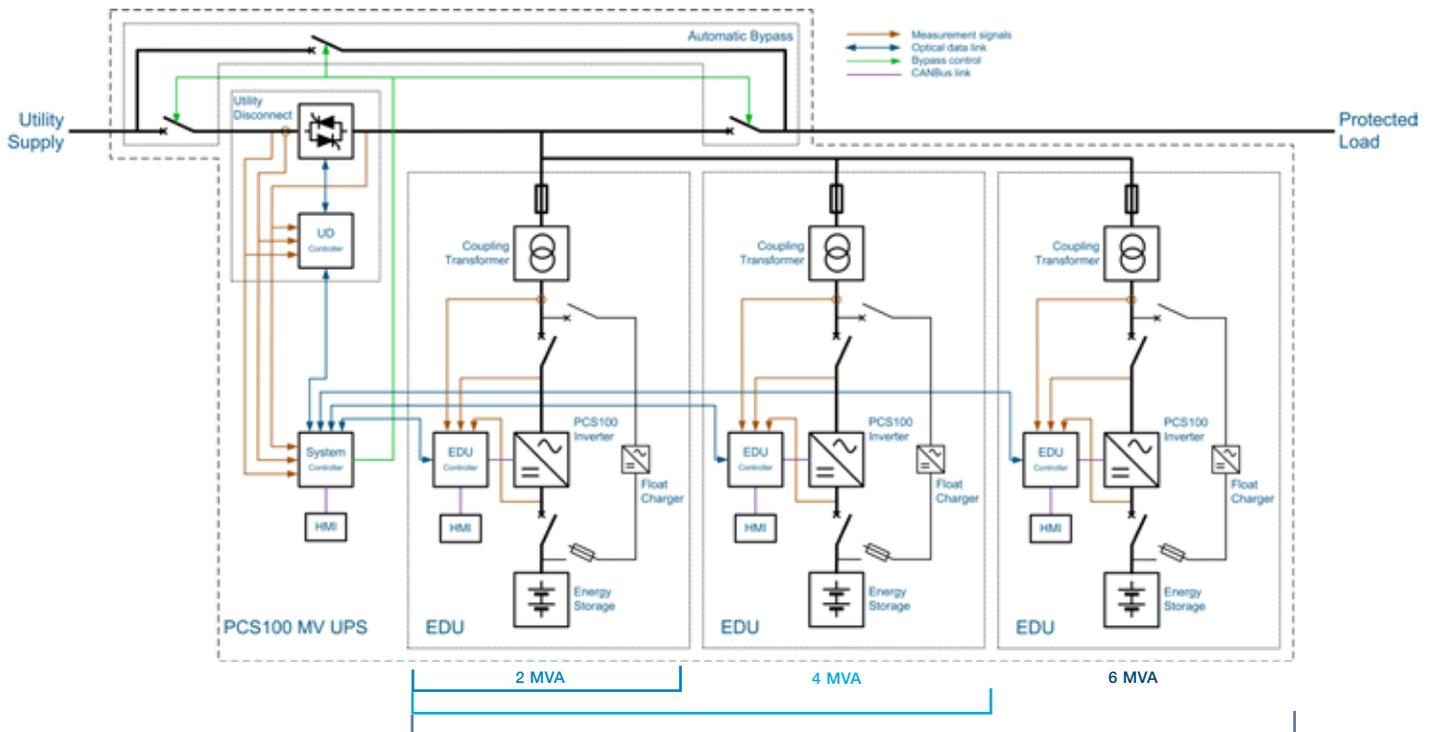
Integrating a medium voltage UPS system to protect these critical applications will reduce feeder ampacity. For example, 1 MW in 400/230 VAC system means 1443 A current per phase. If the voltage is 15 kV, the current for 1 MW power is only 115 A. Another feature of the MV UPS is that the system can be centralized, which helps manage floor loading and gives freedom in the floor plan. One of the major cost issues in a datacenter or a production facility is efficient use of floor space. Reducing the space for infrastructure equipment results in additional space for IT or manufacturing equipment.

Often the available area for the UPS system is limited, particularly in existing buildings, but the required power is increasing. High power, compact MV static UPS products are well suited to overcoming this challenge. Modern static MV UPS systems also make extensive use of low voltage components, including the entire power electronics, energy storage and control systems, taken from standard and proven low voltage units.

Besides the footprint, electrical losses are an important point to consider. Particularly at long distribution distances, in large industry facilities or wide spread areas such as airports, distribution losses can become significant. For longer distribution lengths, the influence of the cable will rise, which will give a better result at medium voltage.

Typical MV applications now seen in today's economy

In large high technology manufacturing facilities, such as those used for semiconductor fabrication, the role of MV UPS systems is well established. The MV UPS provides plant-wide secure power, protecting from all grid disturbances and providing a buffer period before switching to local generation (in the case of a major outage). More frequently, the UPS is required to condition the incoming power, removing the sags



The PCS100 MV UPS can start at 2 MVA and grow in size as the factory or datacenter develops

and short duration micro-cuts caused by faults in the external power network.

In mega datacenters, the philosophy is quite similar. Many design options are possible, including performing the UPS function at medium voltage and having MV distributed to the individual floors of the datacenter. Transformers, complemented by static transfer switches close to the IT equipment, can be used to create an isolated redundant back-up line with two alternative power supply paths to the loads [1].

MV UPS may well be behind every large scale critical application in the future

Increasing power density and total power demand at single sites, combined with rising requirements for high reliability power in IT, business and production facilities, are today's trends. The power supply system has to respond with suitable UPS and distribution designs. High power low voltage systems lead to current limitation in the distribution and, often, long distances need to be bridged, but the step to medium voltage level is a suitable technical solution. MV systems reduce cable size and losses, which increases the efficiency of the distribution network. Additionally, the utilization of integrated high power MV UPS systems can reduce the number of components, such as switchgear and cabling. The basic parts of modern static MV UPSs, including the power electronics and energy storage, are taken from standard and proven low voltage equipment.

[ABB's PCS100 MV UPS](#) is available in multi megawatt ratings and enables tailored solutions to large IT, business and production facilities. The PCS100 MV UPS has been designed to provide clean, reliable and efficient power at a lower total cost for customers consuming high levels of power. Perry Field, ABB's General Manager for Power Conditioning,

outlines one of the main features of the MV UPS. "The PCS100 MV UPS can start at 2 MVA and grow in size as the factory or datacenter develops. As well as EDU modularity, the PCS100 MV UPS has inverter modularity, giving extremely high levels of availability through inverter redundancy. The advantage is that the customer does not need to invest as much money at the start and they can be flexible – growing their infrastructure as their business grows."

The single-conversion topology used is a natural choice for medium voltage as losses are extremely small, meaning efficiencies well in excess of 99 percent can be achieved. The PCS100 MV UPS can be installed to protect a complete supply or just selected sensitive loads.

References

[1] Frank Herbener, Iso-Parallel UPS Configuration

To find out more about ABB's power protection solutions:

Web: www.abb.com/ups

Email: powerconditioning@abb.com

PCS100 MV UPS Video: https://www.youtube.com/watch?v=g6oUfmZh3ml&index=1&list=PL-Q2v2azALUPKFQqlbhFgabb_6df26fqU





Investor protection

Conceptpower DPA 500 uninterruptible power supply for the stock exchange datacenter in Taiwan.

The DPA 500 is a high efficiency modular UPS for high power applications – up to 3 MW.

On the world's trading floors, all kinds of financial entities are bought and sold at lightning speed. Millions of dollars' worth of business is conducted in the blink of an eye. A typical stock exchange will be supported by a vast IT infrastructure and it is essential that this equipment keeps running. The financial consequences of any power interruption could be serious indeed. This is why when Taiwan's stock exchange needed the very best in uninterruptible power supplies (UPSs), they turned to the ABB Conceptpower DPA 500.

The basic element of ABB's Conceptpower DPA 500 UPS is a 100 kW slide-in module. Five of these can be installed in a single frame and five frames can be configured in parallel – giving a maximum rating of 3 MW. The Conceptpower DPA 500 is the only modular UPS on the market that can be easily up-scaled to provide 3 MW of clean, reliable power. Modules can be added to the UPS as power requirements grow, thus avoiding the need to oversize the original configuration. Jackson Tsai from ABB Taiwan says, "the modular architecture is ideal for the customer in Taiwan and we have equipped them with a significant number of Conceptpower DPA 500 UPSs, containing each several modules of 100 kW. This set-up provides the high power density they were looking for and they can simply add modules to this initial set-up as power requirements grow."

Uptime is obviously a major factor for the stock exchange datacenter, so ABB's online-swap technology is very important, helping to achieve the so-called six nines availability (99.9999 percent) that is highly desirable for datacenters in pursuit of zero downtime.

Because the modules can be inserted and removed with the power on ("online-swap"), routine maintenance is simple and related downtime is avoided. "The online-swap modularity not only improves availability but also reduces our costs as service engineers spend less time on-site, and any risks of data or production loss are minimized. And our inventory levels of specialist spare parts are reduced," says the customer's project manager.

As would be expected in a datacenter located downtown, space is limited – and very expensive. The modular architecture of the [Conceptpower DPA 500](#) lends itself well to keeping the UPS footprint small. A modular UPS rack has a small footprint and when extra modules are added, no extra floor space is taken up.



ABB's DPA 500

Previous positive experience with ABB and good service from Harry and King, ABB's business partner in Taiwan, as well as the recognition of the product's Swiss quality and capability, played a major role in the customer's decision to choose the Conceptpower DPA 500.

For more information visit: www.abb.com/ups





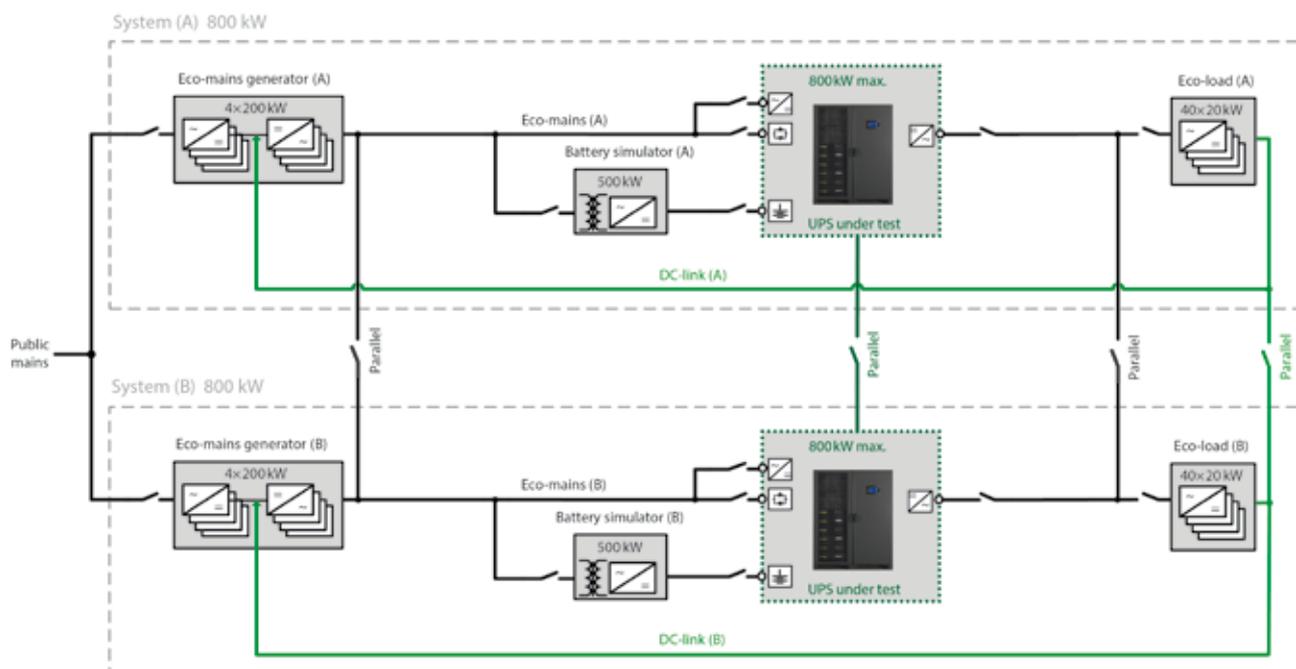
Green operations

Eco-friendly UPS testing center.

ABB's center of UPS excellence (Newave SA) was founded in Ticino, Switzerland in 1993 to market innovative UPS technology. From the very start, the company not only developed eco-friendly UPS products (Newave has been a trendsetter in terms of modular and transformerless UPSs), but also knew how to go green on the product line. The company strived to adapt eco-friendly operations and sustainable practices in all aspects of their production process. Eco-friendly industrial practices were also top-priority when the testing center for UPS was put in place.

The ABB UPS test center is named "GREEN test bay" and is an advanced testing center for medium-sized and large UPS systems. It provides customers with performance, interoperability

GREEN test bay 1.6 MW



and efficiency testing for ABB's UPSs under various conditions. The test facility offers the ability to test individual UPS modules as well as complete power systems, including large UPS units such as the [Conceptpower DPA 500](#).

The GREEN (Generating Recycled Ecological Energy Network) test bay – designed and built entirely in-house at ABB Quartino – recycles the greater part (91 percent) of the energy used during a UPS test. Often, test facilities will waste this energy by turning it into heat. In ABB's facility, it is used for two things:

- In production, for the final test of high power UPSs (>300 kW)
- For executing Factory Acceptance Tests (FAT) with customers.

Functioning principle

Instead of being powered directly from the public mains, the UPS under test is supplied by the Eco-mains. The Eco-mains generator takes 91 percent of the energy from the Eco-load through the DC-Link (recycled energy) and only 9 percent from the public mains. The Eco-load is an active power converter able to re-inject energy back into the system, once it has been converted from AC to DC. This is, of course, more beneficial than having a traditional resistor load that merely wastes energy by turning it into heat.

How it works

The GREEN test bay comprises two identical parts (System A and System B) that can work separately or in parallel. Each part is rated at 800 kW. When configured singly, each test bay can test a UPS system up to 800 kW. When configured in parallel, the GREEN test bay becomes a single test bay able to test UPS systems up to 1.6 MW.

The function of the Eco-mains generator is to combine the energy taken from the public mains with the recycled energy coming from the Eco-load. The Eco-mains generator comprises four special standalone UPS systems – namely, four PowerWave 33 200 kW devices with modified hardware and software.

A battery simulator provides DC voltage to the UPS under test to simulate backup batteries during mains failure tests. When the Eco-mains is disconnected from the input of the UPS under test, the UPS automatically goes into battery mode, taking its power from the battery simulator. The battery simulator includes an AC to DC converter (rectifier and booster), and a transformer that lowers the voltage and provides galvanic isolation.

The Eco-load is made out of a modular parallel system of active power converters (rectifiers). Up to 40 modules can be turned on or off according to requirements. This rectifier system normally behaves as a linear load (resistor), so that the UPS under test sees a resistive load. If needed, the Eco-load is also able to modify its power factor (adjustable) and/or to connect an additional non-linear load. This is used for special tests upon request. The Eco-load's main advantage is that instead of wasting the energy, as resistors would do, it allows the energy to be recycled by feeding it back into the Eco-mains generator as DC.

Advantages and benefits

- Significantly lower power consumption
 - Smaller electricity bill
 - Less energy wasted, factory is more environmentally friendly
 - Good argument (also for ISO 14001)
 - No plant overload when testing high power UPSs
- Capability to test UPS systems up to 1.6 MW
- Flexible testing (more tests possible)
 - Load is easily adjusted (free scale)
 - Adjustable input voltage
 - Frequency sweeps possible
 - Variable load power factor
 - Prepared for non-linear load testing
- Simple and safe control of the test bay

For more information visit: www.abb.com/ups



Powering ahead



Power protection

06. Dairy goodness

Providing a power protection solution to Fonterra

08. Processing and packaging

Quality solutions for the food and beverage industry

11. PowerWave 33 Series 3

Power protection for small and medium sized organizations

23. Reliable UPS support

Power protection for an Indonesian datacenter

On a global scale



Power protection

06. Big is beautiful

Datacenter power trends

12. Downtime eliminated

Modular UPS can prevent costly downtime in datacenters

16. New generation energy storage

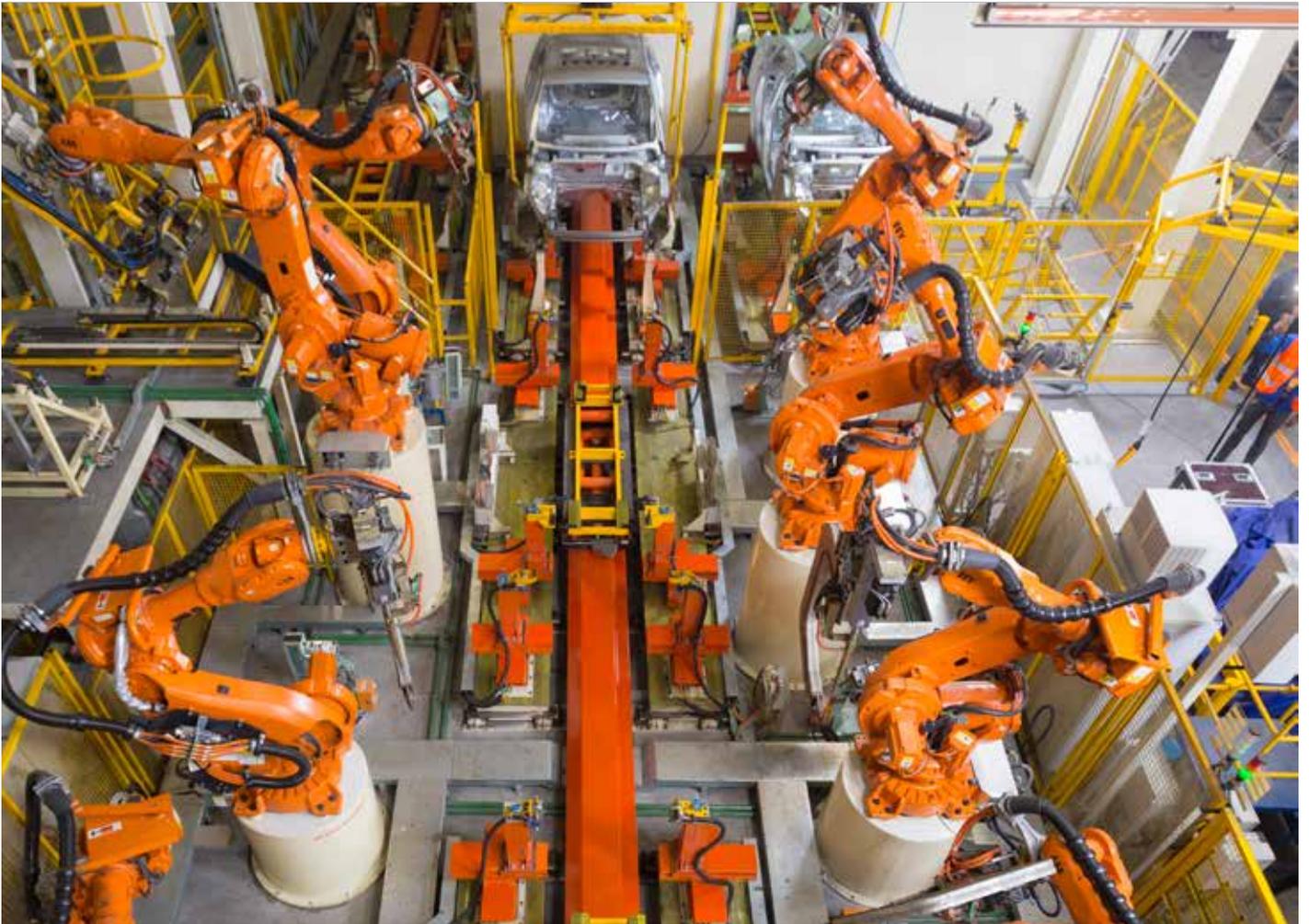
Applications and opportunities for energy storage

20. Critical processing

ABB supply a power protection solution to a boutique semiconductor company

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