nevado LATAM

CRITICAL POWER

DATA CENTRE APPLICATION GUIDE

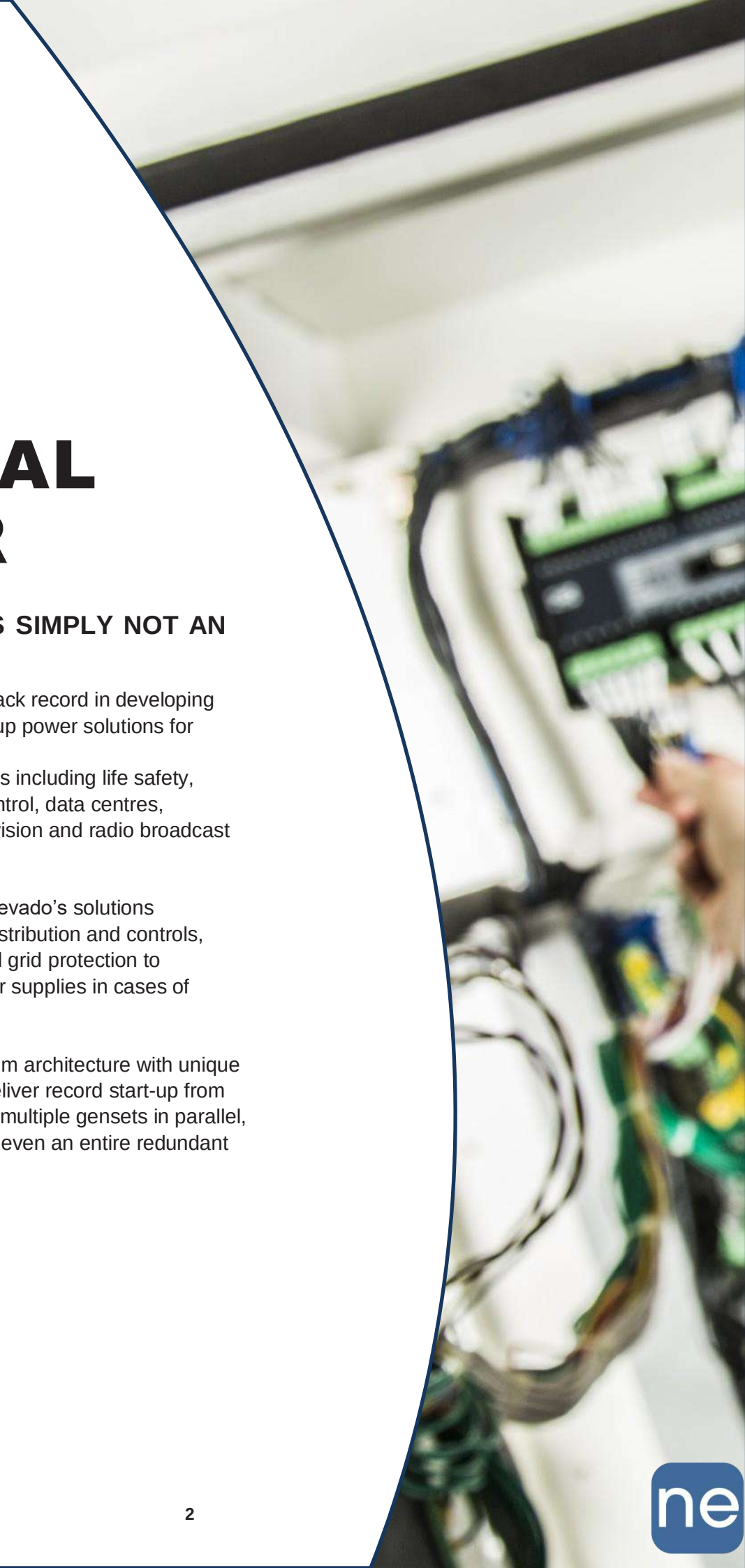
CRITICAL POWER

WHEN DOWN-TIME IS SIMPLY NOT AN OPTION

Nevado Latam has a strong track record in developing emergency,standby and backup power solutions for mission-
critical facilities and businesses including life safety, medical, industrial process control, data centres, telecommunications, and television and radio broadcast systems.

Resilient turnkey packages, Nevado’s solutions incorporateintelligent power distribution and controls, switchgear, and generator and grid protection to guarantee uninterrupted power supplies in cases of mains failure.

We design and integrate system architecture with unique standby capacities and can deliver record start-up from an impressive six seconds for multiple gensets in parallel, redundant control systems, or even an entire redundant power plant.



WHY RUN THE RISK?

RELIABLE POWER MANAGEMENT IS CHEAPER THAN AN OUTAGE

Did you know that the average cost of a data centre outage has steadily increased from $505,502 in 2010 to $740,357 today? That’s an increase of 38 %!

Outages have many causes, some of which are very hard to avoid. A surprise to many, however, the root cause of a stunning 22 % of all unplanned outages is human error. Human error today is the second-largest single cause of error, only surpassed by UPS system failures.

Nevado counters this with fully automatic and redundant critical power managament solutions for uninterruptedpower supply.

The products and solutions we deliver undergo strict testing procedures in our own test centre. The tests are carried out by specialised engineers. Part of our ISO 9001 certified quality management system, the test centre houses some of the most advanced testing facilities in the world. They allow us to carry out all relevant tests for various classification approvals, CE marking, MED approvals, UL, etc. – under our own roof.

REDUCE CO_2 AND COSTS

HYBRID POWER PLANTS HELP REDUCE ENVIRONMENTAL IMPACT

Expected to consume three times the 416.2 terrawatt hours of electricity globally consumed by data centres in 2015 in the next decade, the world's data centres already now consume more power than the entire UK.

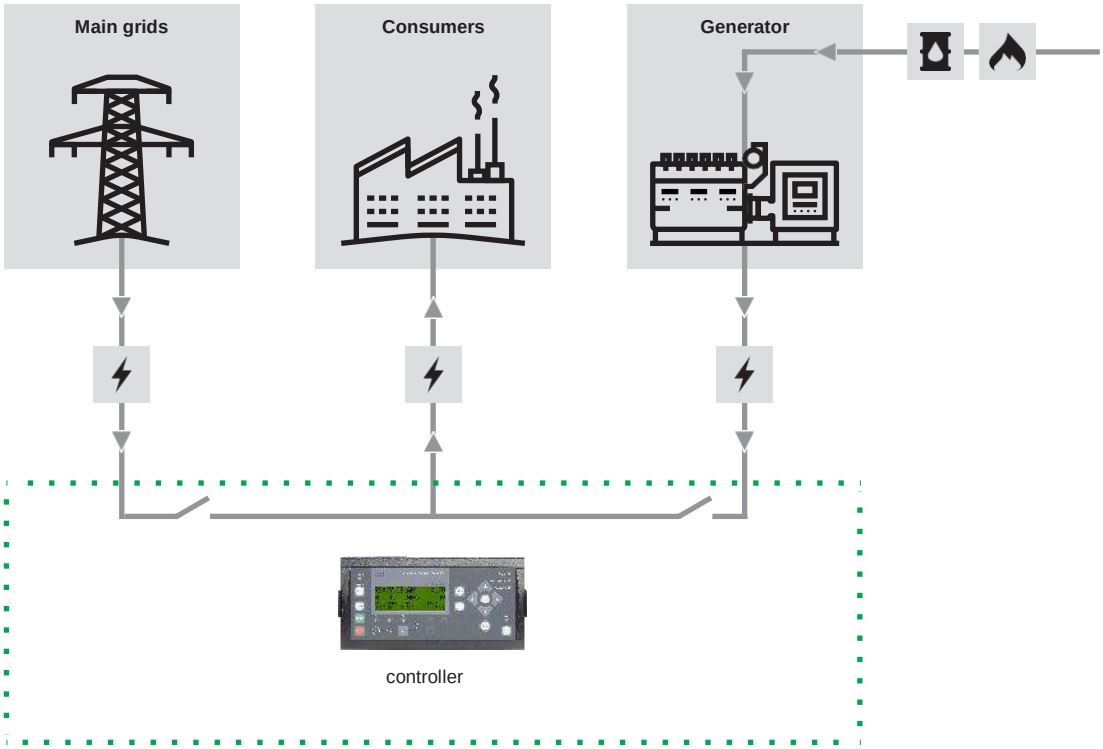
So reducing the environmental impact from backup solutions powered purely by diesel can really mean a difference. It also reduces your fuel costs. With the aim for data centres to be at least 80 % powered by renewable energy sources by 2020, the EU further supports this green transition.

To that end, Nevado power management solutions are capable of handling hybrid stations combining for instance solar, wind and diesel power.

See what a Nevado hybrid plant management can do for your business on page 11 or 13 or visit nevadolatam.com

Grid connection

With or without synchronisation



Automatic Mains Failure (AMF) applications

In the event of a significant loss of mains power or total blackout, Automatic Mains Failure (AMF) performs an automated power switch to emergency standby generators, preventing possible data loss and potential damage to electrical equipment.

AMF with synchronisation

With synchronisation preventing at least one blackout when switching from generator to mains grid supply, this is the most common AMF variant.

Select immediate opening of breaker, or with load across before opening.

You can also select overlap to make short-time parallel of generator to grid possible for, for instance, 0.1 second.

Controllers: AGC 200 / AGC-4

AMF without synchronisation

This application is mainly used for simple systems intended only for AMF control. In both cases, switching from mains to generator supply and back is performed with a short-term blackout.

Controllers: AGC 100/GC-1F/CGC 400

Relevant controllers


AGC 200


AGC-4

Also consider these products

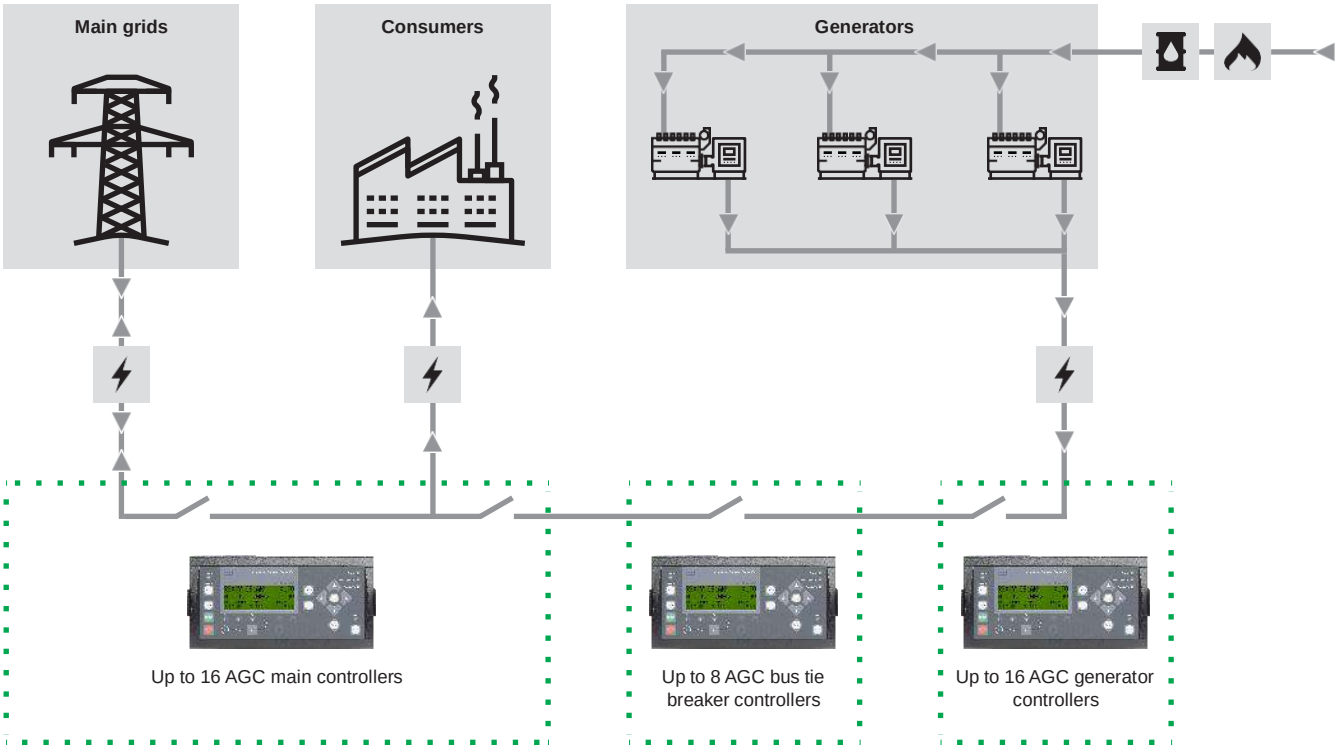

DBC-1


ASK


EQ

Parallel to grid

Multiple generator sets



Combined power plant and parallel to grid system; up to 56 breakers in one plant

Plant management parallel to grid typically runs in semi-automated and fully automated modes, using priority routines like fuel optimisation, running hours, multi-master, and plant modes like AMF, peak shaving, mains power export.

Use Nevado's free-of-charge PC Utility Software to construct the specifics of your plant layout within the AGC system.

The software is simple to use with explanatory graphic presentation.

The position of generators and bus tie breakers in the system can be selected freely.

Communication between the controllers is made using a single or double (redundant) CAN bus.

Relevant controllers


AGC 200


AGC-4

Also consider these products

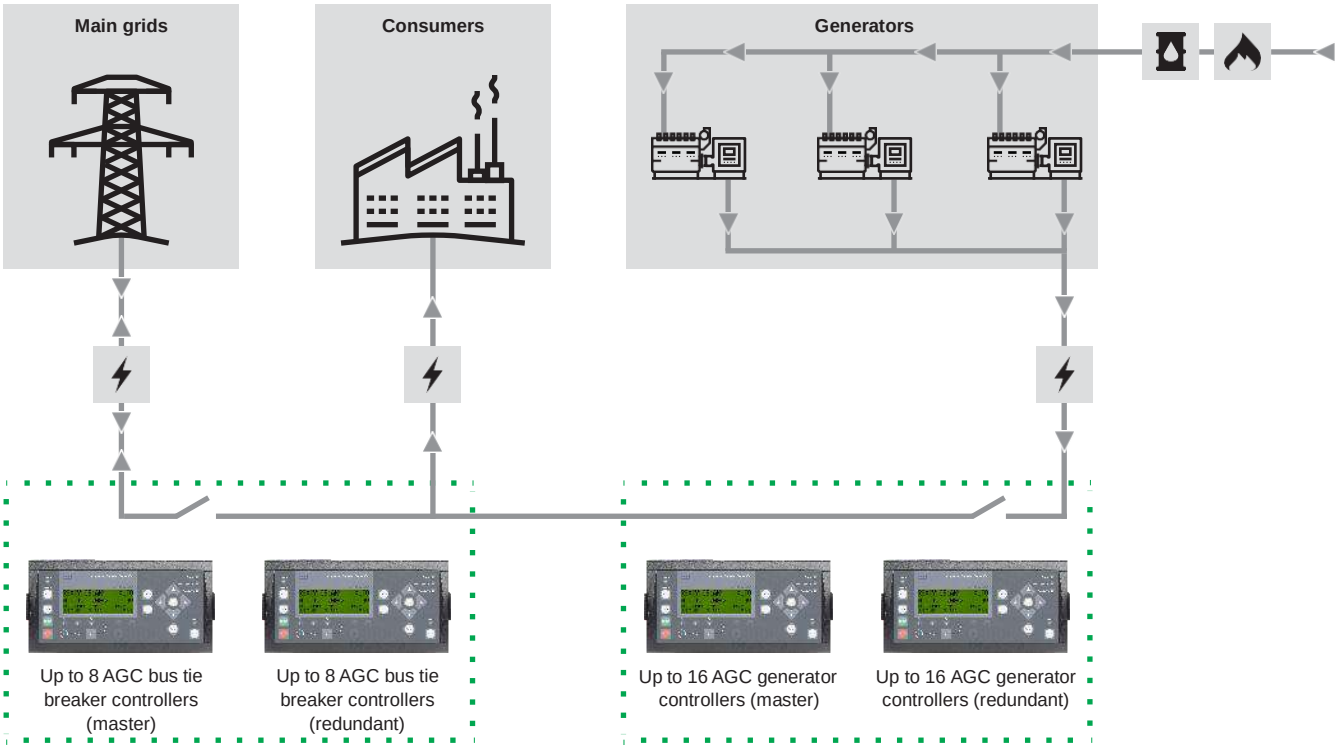

DVC 310


AGI 300


CIO

Redundant systems

Hot standby controllers



Combined power plant and parallel to grid system, fully redundant control system

Up to 16 grids, eight bus tie breakers and 16 generator controllers.

On top of the grid, bus tie and generator controls, the Nevado AGC-4 controllers carry out full power management, eliminating the need for PLCs.

Nevado's AGC-4-based power management systems also offer the option of having doubled (redundant) controllers on all positions. In case of failure from a master controller, Hot Standby kicks in immediately, protecting the rest of the system from interference.

Relevant controllers

AGC 200

AGC-4

Also consider these products

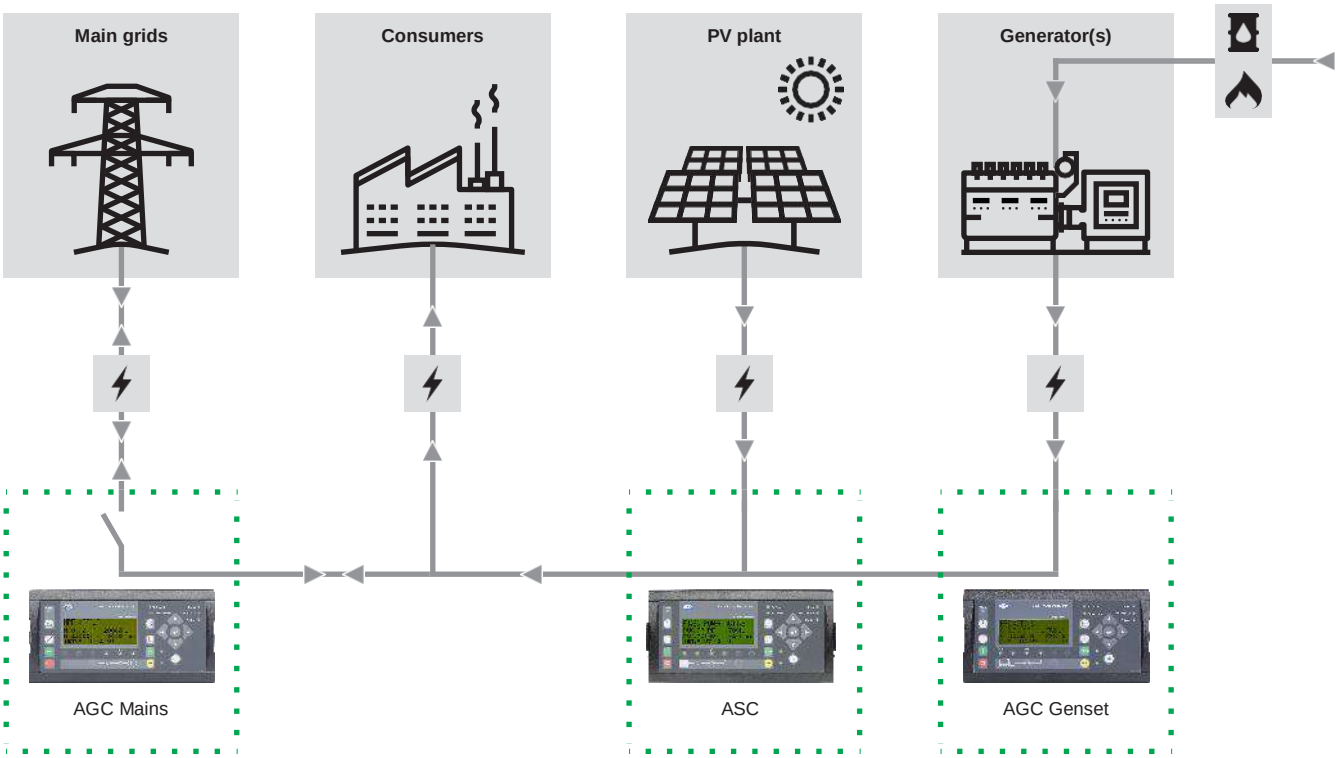
DVC 310

AGI 300

CIO

Combination

Automatic change-overs between grid-tied & off-grid



Off-grid/Grid-tied

In combination applications, the system incorporates features and functionalities of both our off-grid and grid-tied technology, automatically adjusting power and reactive power references with grid support if frequency or voltage drops, or rotating the genset to automatically ensure the most fuel-optimised running mode through various load demands.

Supporting fuel-saving in grid-tied operations, all gensets can be stopped to maximise the penetration from sustainable sources if no spinning reserve is needed. Automatic change-overs between grid-tied and off-grid are possible during operation. Island modes include island, Automatic Mains Failure, and load take-over.

Integrated solution

- ASC-4 applicable with AGC-4/AGC 200 controls up to 16 gensets and 16 utilities
- Applications up to 8 sustainable power plants
- Minimum genset load for optimal performance
- Spinning reserve to ensure uptime
- Maximise sustainable power penetration in all operation modes

Relevant products


ASC-4 (Solar)


AGI 300


AGC-4


AGC 200

Add-on solution

- Applicable with all genset controls for up to 16 gensets
- Maximum 1 utility
- Maximum 1 sustainable power plant
- Minimum genset load for optimal performance

Reliable power is central to business

Putting Nevado critical power to the test

»We know it works, because we test it the hard way.«

Tore Heide Villund,
GlobalConnect

Mission-critical solutions
Nevado's critical powersolution is central to GlobalConnect's business case because the company's customer portfolio includes server hosting for critical business institutions like banks and media organisations demanding comprehensive redundancy and tier classifications.

When customers ask, if they can be sure GlobalConnect's back-up power systems work, Senior Group Manager Tore Heide Villund's confident reply owes a great deal to his faith in Nevado's power management system: "We know it works, because we test it the hard way."

"As well as monitoring operation rigorously and performing and documenting simulation tests, we put the entire system to the ultimate test twice a month by cutting our connection to the grid. As the UPSs kick in and the gensets start up, synchronising and identifying a reliable, quality power production level for our premises, you can't get greater certainty, and that is the level we maintain."

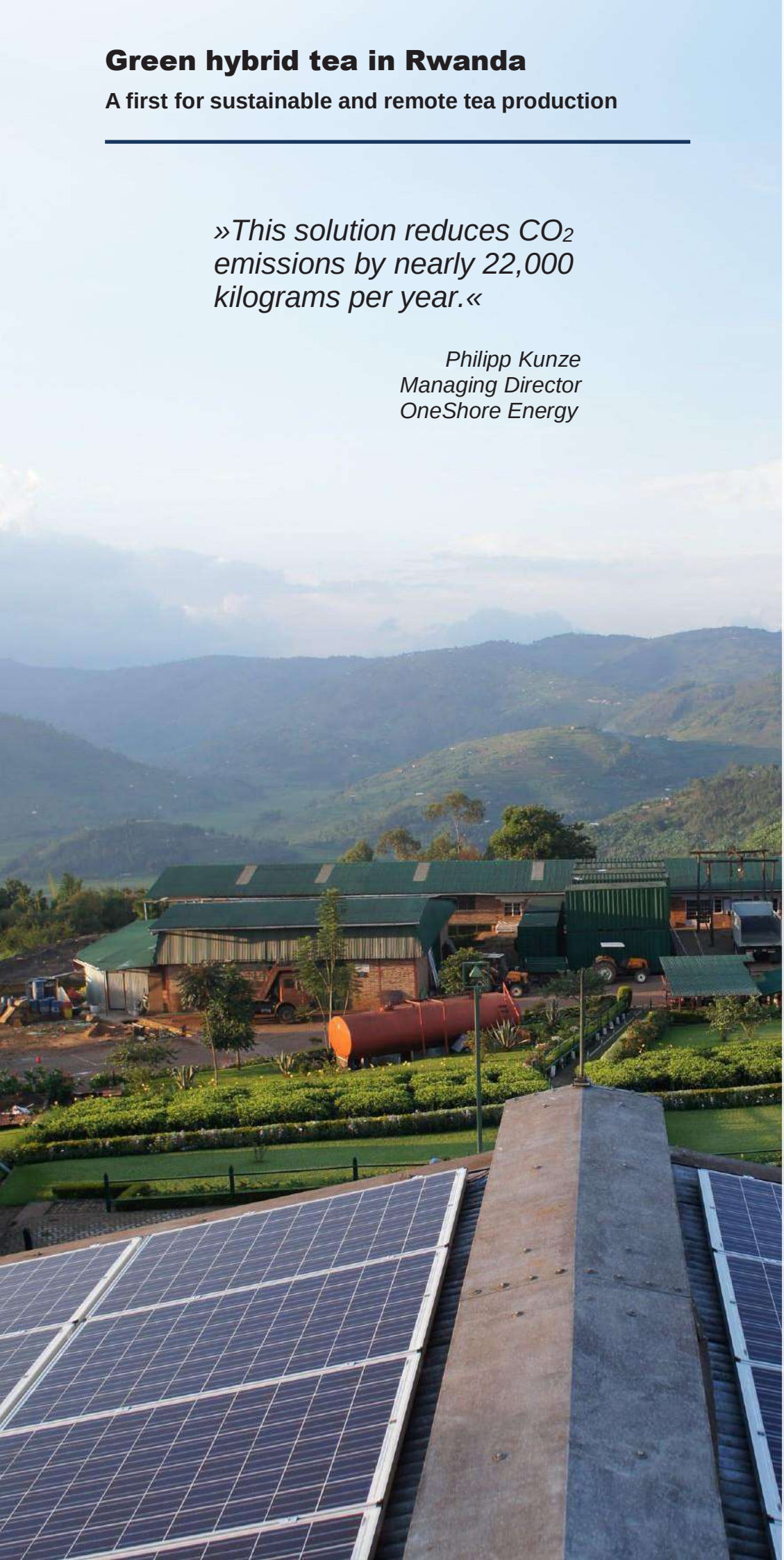
GlobalConnect
Is Denmark's leading alternative provider of fibre network, data centres and cloud solutions.

Green hybrid tea in Rwanda

A first for sustainable and remote tea production

»This solution reduces CO_2 emissions by nearly 22,000 kilograms per year.«

Philipp Kunze
Managing Director
OneShore Energy



Sharing the load
In rapidly developing countries like Rwanda, electricity supply from the grid is often not sufficient so companies often use diesel generators. Cooperating with Nevado, OneShore has engineered a hybrid solar system for the Sorwathe Tea Factory which utilises power from the grid, factorydiesel generators and the photovoltaic plant.

'Aiming to reduce the factory's carbon footprint by saving 22,000 kg of CO_2 emissions annually, the PV diesel-hybrid solution also reduces cost for diesel and grid electricity.', Philipp Kunze, Managing Director of OneShore Energy, explains'.

A central element of the system is the Nevado Automatic Sustainable Controller which enables the intelligent integration of the 50 kWp photovoltaic plant and the optimal operation of the diesel generators with a 1.7 MVA capacity. Because the use of grid electricity and diesel can be reduced, significant cost savings are achieved for Sorwathe.

OneShore Energy GmbH
Global market leader in the design of solar diesel hybrid systems. OneShore's thorough knowledge of diesel generators and planning and realisation of solar PV systems are the foundation for the development of optimised hybrid systems.

Advanced Genset Controller, AGC 200

Cost-effective & scalable controller platform

Nevado advanced Genset Controller, AGC 200, meets and surpasses OEM needs for synchronisation. A cost-effective, compact, scalable and all-in-one product, the AGC 200 comes in several variants.

The advanced controller series integrates all necessary functions for genset protection and control, stands out for its reliability and operator-friendliness, and features patent-pending Nevado Emulation to speed up design, testing and commissioning, saving man hours and costs.

Applying asymmetric load sharing to ensure optimal load on the genset, the AGC 200 also cuts operating costs and reduces harmful emissions. With temperature-dependent cooling, the AGC 200 arrests cooling at pre-programmed cool-down temperatures and features automatic priority selection, setting the optimum combination of gensets for optimised fuel consumption.

AGC 200 options

- AGC 212: single genset in island operation
- AGC 213: single genset for automatic mains failure operation
- AGC 222: multiple genset with advanced power management in plants up to 16 generators (limited I/O)
- AGC 232: multiple genset in island applications with digital load sharing
- AGC 233: single genset for automatic mains failure, peak shaving, load take over and mains power export operation
- AGC 242: multiple genset with advanced power management in plants up to16 generators
- AGC 243: control of single or multiple gensets
- AGC 244: bus tie breaker
- AGC 245: mains breaker control
- AGC 246: mains and tie breaker
- AGC 252: multiple gensets with advanced power management in plants up to 256 generators
- IOM 200: analogue interface for AGC 200 family

AGC 200 features

- Multiple operating modes in one software
- Synchronisation of up to 56 breakers in one plant
- Multi-master power management
- Load-dependent start and stop
- Load management
- Priority selection (manual, relative running hours, absolute running hours, fuel optimisation)
- Compatible with your existing AGC-3 and AGC-4 gensets
- User-programmable logic (M-Logic)
- Configurable inputs/outputs
- Engine, generator and load protection
- Voltage measuring range: 50 to 690 V AC (UL/cUL Listed 50 to 600 V AC)
- J1939 engine communication, supporting 11 different engine brands with the ability to easily handle other engine brands
- Readout of engine diagnostics in clear text
- Remote control via high speed TCP/IP, RS-485 Modbus or GSM modem
- High speed USB connection
- Multi-language interface
- -40ºC operation temperature
- IP66 protection
- Lifetime logging stored on SD card

AGC 200 type approvals

Automatic Genset Controller, AGC-4

The world's most comprehensive & robust genset controller

Nevado's Automatic Genset Controller (AGC-4) is the most comprehensive and flexible power management and protection unit on the market today. A further development of Nevado's AGC-3, the new generation controller is fully compatible with its predecessor and has been designed to allow for easy, intuitive, and smooth switch-overs for those looking to upgrade.

Suitable for a wide range of applications, the AGC-4's standard sequences include back-up power, start/stop, synchronisation, and load sharing.

The AGC-4 is simple to incorporate into both new and existing designs, customising the application to fit your needs, for instance dedicating specific functions or logic conditions to different inputs and outputs.

Technologically sophisticated, the AGC-4 is also the world's most robust power management controller, successfully tested to maintain reliability and durability in extreme weather and hazardous conditions. Approvals include TÜV and UL.

Patent-pending Emulation

A standard in the Automatic Genset Controller, AGC-4, using Nevado's Emulation Solution, all you need to do to perform a complete test of your Power Management Systems is turn on your controller and connect communications.

The Emulations Solution's focus on exact reproduction of behaviour improves your planning, commissioning and training. It is all done in a safe environment without the costly and excessive need of gensets and switchgear and without the risk of equipment damage and human injury. The innovative solution gives you a critical market advantage and guarantees your customers a cutting-edge, finished result.

Remote communication and control

The AGC-4 supports serial communication protocols including Modbus (RS-485, USB, and TCP/IP) and Profibus. This feature allows you to supervise and control your genset/plant from a remote location and minimise downtime or take immediate action on genset alarms or warnings.

AGC-4 features

- Multiple operating modes in one software
- Synchronisation of up to 56 breakers in one plant
- Multi-master power management
- Load-dependent start and stop
- Load management
- Emulation for fast training and I/O test
- Hot Standby – change to backup genset controller on the fly
- Close Before Excitation – synchronisation in less than 10 seconds

AGC-4 type approvals

TÜV NORD TÜV SÜD UL LISTED

Automatic Sustainable Controller, ASC-4

A new link between PV & genset power plants

Serving as a link between photovoltaic (PV) power plants and genset power plants, Nevado's Automatic Sustainable Controller (ASC-4) is a safe and reliable control solution for PV/genset hybrid plants.

Stand-alone and Power Management applications

In stand-alone applications, the ASC-4 knows little about the surrounding environment in which it is placed. Based on transducer power readings and hardwired feedbacks alone, the ASC-4 determines the PV plant power references. This approach is applicable for integrating PV power in already commissioned genset plants with or without Nevado controllers. Stand-alone applications support applications containing up to six gensets.

The Nevado Power Management system fully integrates thePV plant and the genset plant into a unity. The ASC-4 is connected to the CAN bus constituting the internal Nevado Power Management communication link. This requires your genset plant to be equipped with AGC controllers from Nevado.

Maximising PV penetration

TheASC-4 Plant Management automatically maximises PV penetration in all operation modes according to the total genset/PV hybrid's load demand without compromising constraints such as minimum genset load demand.

Minimum genset load in island operation

Minimum genset load constraint applies to island operation only. It causes the PV penetration to decrease if compromised. This secures a certain amount of load on the gensets, eliminating the risk of reverse power situations and impure combustion and exhaust problems.

Spinning reserve

Defined as a percentage of the PV plant power production, the spinning reserve ensures sufficient genset plant reserves to compensate for potential PV production decreases. Available for power management applications only.

ASC-4 features

- Maximising PV penetration
- Spinning reserve demand
- Minimum genset load requirement
- Suitable for self-consumption and IPP applications
- Support of SunSpec and other relevant protocols
- Monitoring and supervision
- Meteorological measurements
- Fully integratable in AGC Power Management applications
- Simple graphical configuration
- Record time commissioning with Nevado Emulation – uses and verifies the functions of the real system for test, production and design

Advanced Graphical Interface, AGI 300

Touch screen monitoring & control of your system

The AGI 300 has been designed as an intuitive and user-friendly HMI for visualisation and active control for multiple applications and is available in 4.3”, 7” and 15” sizes with a quality screen readable even in direct sunlight and at sharp angles, making it a safe and ideal choice for bridge installations.

Featuring touch screen system control and monitoring functionalities which eliminate the need for other instruments and save you both space and wiring, the AGI 300 connects both to all Nevado Multi-line controllers and other brand controllers via standard communication protocols.

Data-sharing ability via Ethernet connections effectively enable the Nevado HMI to be used as a small SCADA system. Built-in Ethernet port switch functionality lets you connect the panels to small control systems without incurring extra costs for external switches. Connect to multiple serial devices with the multi-standard serial port or use the USB host to provide access for external storage devices.

Application examples

- Power Management Systems – Control and Supervision: one point management, control and supervision of multiple gensets and bus tie breakers.
- Alarm – Handling and Monitoring: view historical alarm data and accept active alarms.
- Energy Monitoring System (EMS): track your energy consumption to optimise and implement the energy awareness on board your vessel.
- Graphical Interface – Mechanical and Electrical Systems: system overviews for mechanical and electrical equipment. Trend measured values to monitor operation performance or when carrying out fault-finding procedures.

AGI features

- State-of-the-art HMI
- Unique design tool
- Control and monitor your system
- Data-logging and alarm handling
- Designed for harsh environments

Digital Voltage Controller, DVC 310

Improve your genset performance

Designed for alternators with SHUNT, AREP or PMG excitation, Nevado's Digital Voltage Controller, DVC 310, is a digital automatic voltage regulator, which monitors andregulates the alternator output voltage. The controller can improve genset performance, delivering up to a 10 % increase of load impact capability and is suitable for any application in the critical power, IPP and rental segments. Critical power applications in particular will be benefit from the improved control on the Close Before Excitation sequence, increasing safety & allowing faster start-up.

No generator oversizing required

Due to high inrush currents during start-up, generators for electric motor starting and transformer magnetisation are often oversized by up to 200%. Featuring inductive motor starting and magnetisation boosting, Nevado's DVC 310 reduces oversizing requirements to a minimum.

Increased performance

Compared to analog AVR's, Nevado's Digital AVR handles larger load-steps within the same frequency/ voltage boundaries. Typically, the gensets will accept 10% additional nominal load. With the embedded help features, this increases performance.

Protect your generator from humidity

Condensation build-up during idle time is a common problem in tropical climates. With its dedicated ventilation mode, the DVC 310 removes humidity in windings using the alternator fan and only allows for power generation when it is safe to do so.

Genset control solution

The DVC 310's built-in J1939 based communication offers an exclusive communication channel to Nevado's advanced controllers. Providing a high number of alternator data for display, broadcast or predictive maintenance, this feature is unique on the market. Using CAN bus-based communication for voltage regulation reduces the potential number of failure sources. Use the DVC 310 together with our, AGC-4, AGC 200 or GPC-3 controllers to maximize your benefits.

DVC 310 features

- Start management capability with start on threshold, soft start, and Close Before Excitation (CBE) functions
- Voltage regulation accuracy +/-0.25 %
- Optimise genset performance and size using exclusive engine help functions (load acceptance module, negative forcing, U/f, soft voltage recovery and stator current limitation)
- Exclusive drying and ventilation mode
- Voltage regulation via CAN bus
- Increase accuracy of settings
- Consistent control of regulation loops

CAN bus-based I/O Modules

Additional digital inputs or relay outputs for your genset controller

The CIO series is an external I/O module for Nevado's Multi-line series for those requiring a number of digital inputs or relay outputs exceeding the capacity of a range of Nevado genset controllers.

The CIO module requires a host controller to send and receive information.

Currently, the CIO series is compatible with Nevado's AGCPlant Management and AGC 200 controllers.

More controllers will be added over time – please refer to NevadoLatam.com

CIO features
► CAN bus interface
► LED indication of status and input state
► 12/24 V DC supply

Variants	Features
CIO 116	16 digital inputs Positive or negative common for 2×8 inputs
CIO 208	8 relay outputs 240 V AC or 30 V DC relay contacts 8 A relay rating
CIO 308	8 multi-functional inputs Wire break detection

FIND NEW OPPORTUNITIES

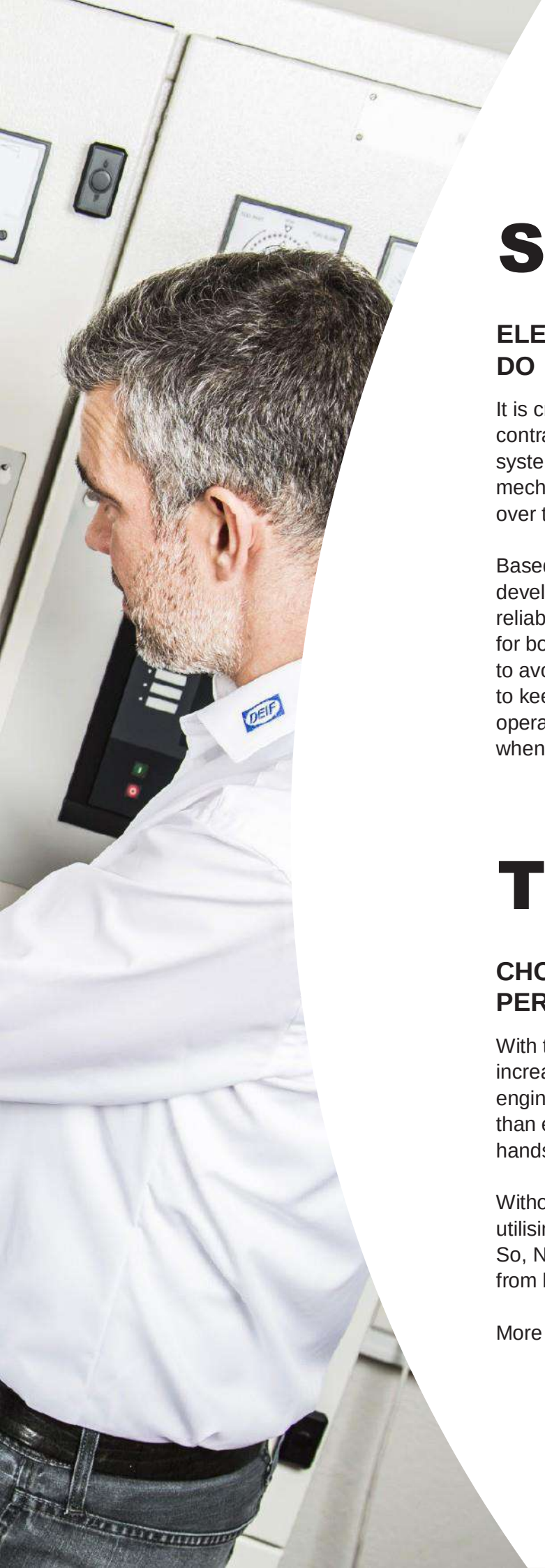
Nevado’s business ethic is based on knowledge sharing and informed by environmental awareness. Working with global experience of customer needs across the full range of power management applications, collaborating with Nevado you will find new opportunities.

WIN SUPERIOR CONTROL

20 % of Nevado’s employees work in R&D. Their focus is innovation and progress forthe industry as a whole, and in creating customised solutions with end-to-end system integrity. With Nevado, you win superior control thanks to our experienceand expertise across multiple industries.

SECURE MAXIMUM UPTIME

Our tried-and-tested equipment, advanced automation technology, training programmes, and 24/7 support will boost your business goals by providing steady, maximum uptime.



SERVICE

ELECTRONIC COMPONENTS DO NOT LAST FOREVER

It is crucial to Nevado that data centre owners and their contractors remain confident and satisfied with Nevado systems. Although electronic components contain no mechanically rotating or moving parts, they do wear out over time, and thus require regular service.

Based on more than eight decades of experience in developing, manufacturing, testing and commissioning reliable and flexible engine and genset control solutions for both new and aging systems, Nevado knows how to avoid unplanned downtime. And also what it takes to keep the systems in prime condition, securing an operational and competitive fleet at all times, including when the warranty has expired.

TRAINING

CHOOSE **TRAINING** TO INCREASE PERFORMANCE & EFFICIENCY

With the rapid advances in generator control and the increasingly sophisticated communication between engines themselves, it has become more necessary than ever for operators and service personnel to receive hands-on training.

Without the correct training, you run the risk of not fully utilising the features offered in your generator controllers. So, Nevado offers three different training levels globally – from basic operator level to advanced designer level.

More at Nevadolatam.com

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