HYBRID POWER

APPLICATION GUIDE

REDUCE CO$_2$ AND COSTS

HYBRID POWER PLANTS HELP REDUCE ENVIRONMENTAL IMPACT

Projected global energy requirements and the resulting increase in harmful emissions provide more than ample arguments for moving towards cleaner energy technologies.

To that end, reducing the environmental impact from decentralised power plants powered by diesel in full or in part can really mean a difference. And it's good business too.

For years, DEIF has worked to develop energy-efficient solutions and products that reduce the consumption of fossil fuel as well as costly maintenance intervals. Our power management solutions are capable of handling hybrid stations combining for instance solar and diesel power. Most recently, we've even added solar production forecasting capabilities to our long list of offered functionalities.

This brochure tells you much more about what a DEIF hybrid plant management can do for your business.

For more, go to deif.com/hybrid.

SUN OR SHADE?

SKY IMAGER ENABLES ADVANCED SOLAR PENETRATION TO YOUR MICROGRID APPLICATION

In PV/diesel hybrid applications, the intermittency of the PV source poses a stability challenge for the system when the installed PV capacity reaches a significant size.

Three types of spinning reserve

In order to avoid overloading the genset(s) - potentially causing a blackout - the system has to be capable of withstanding a drop in PV production, for instance due to clouds casting shade on the PV panels. To counter that, the system needs to maintain a sufficient amount of spinning reserve.

1. Extra gensets

One way of securing sufficient spinning reserve is to keep an excessive number of gensets online, enabling them to pick up the additional load whenever PV production declines. The security provided by additional spinning reserve comes at the price of a decreased PV penetration ratio.

2. Batteries

Another way of obtaining spinning reserve is using energy storage systems. Typically battery-based, these storage systems will pick up the load dropped by the PV source, giving your system sufficient time to start the additional genset(s) necessary to handle the increased load. This prevents running with too many gensets and therefore results in a higher PV penetration.

3. Sky imager

A third alternative solution is minutes ahead solar production forecast that feeds data into the ASC-4 to drive maximisation of sustainable power penetration. Using a sky image camera, the forecast for the coming period is delivered to the PV/diesel control system. This enables it to start up the required number of genset in due time before clouds reduce PV production. In addition, the forecasting enables the system to keep excessive genset(s) running, for instance if it shows that PV production will drop again shortly. This eliminates unwanted start/stop cycles of the genset(s).

DEIF's ASC solutions are compatible with the leading short-term forecasting systems of the industry. The forecasting is directly coupled to the existing spinning reserve routine and will generate automated start/stop of genset(s) accordingly.
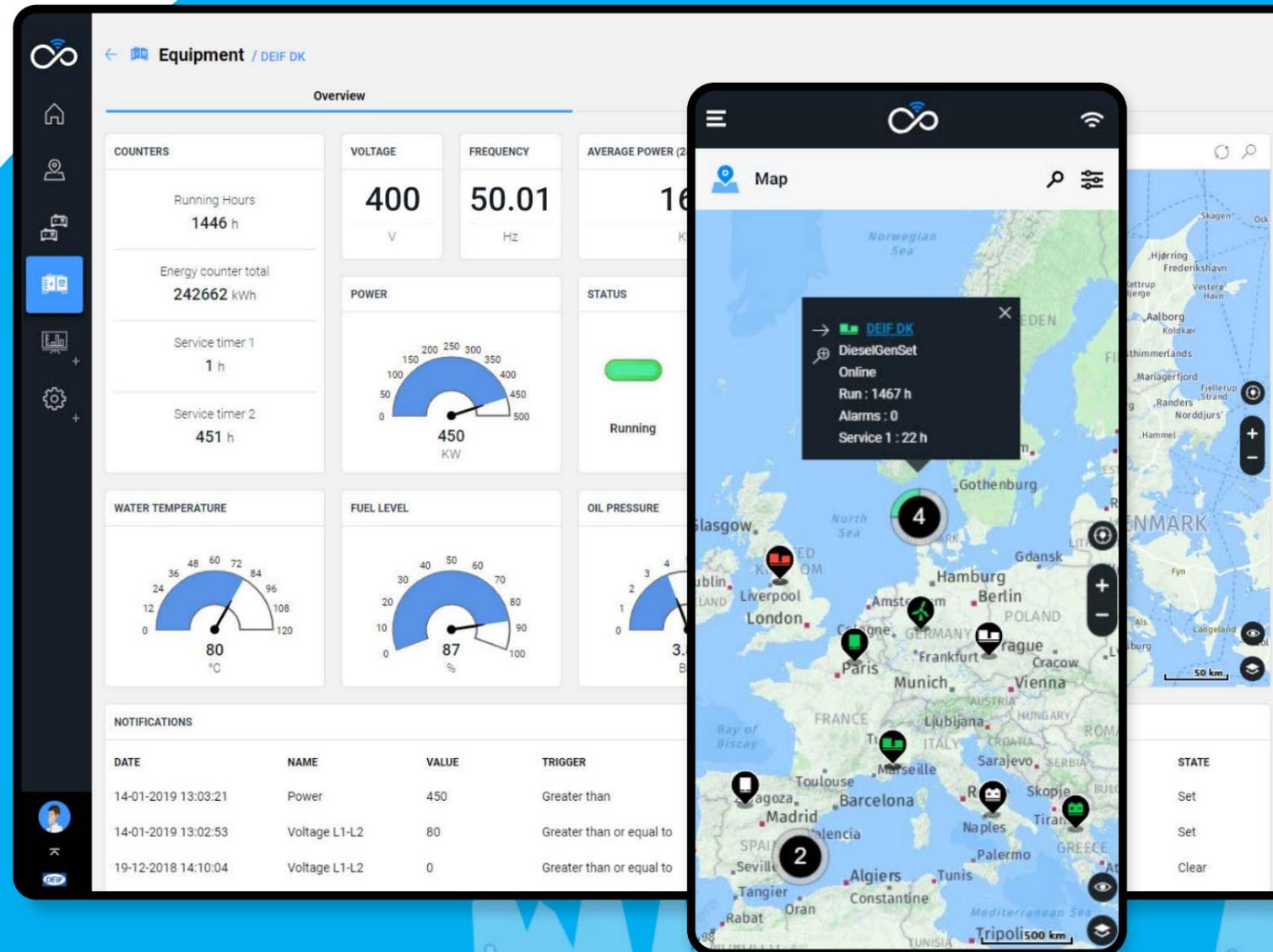
INSIGHT

MONITORING JUST GOT A LOT EASIER

Access your gensets from anywhere with DEIF Insight - a remote monitoring service that keeps an eye on your assets and provide you a complete overview of the operation. No matter how high the quality of your power equipment is, malfunctions can happen. Remote monitoring your assets enables you to react immediately and quickly bring things back on track.

PC, tablet, or smartphone – the choice is yours. Install Insight on various devices and approach your assets anywhere, anytime.

Customise your dashboards so they display the most important parameters and make smarter data-driven decisions.

Your equipment is one of your most valuable business assets. Import your Insight data to your business management system and manage your even business better.

Scan QR code to see Insight presentation video

Equipment / DEIF DK

Overview

COUNTERS
Running Hours
1446 h

Energy counter total
242662 kWh

Service timer 1
1 h

Service timer 2
451 h

VOLTAGE
400
V

FREQUENCY
50.01
Hz

AVERAGE POWER
16

POWER
450
KW

STATUS
Running

WATER TEMPERATURE
80
°C

FUEL LEVEL
87
%

OIL PRESSURE

NOTIFICATIONS

DATE	NAME	VALUE	TRIGGER
14-01-2019 13:03:21	Power	450	Greater than
14-01-2019 13:02:53	Voltage L1-L2	80	Greater than or equal to
19-12-2018 14:10:04	Voltage L1-L2	0	Greater than or equal to

STATE
Set
Set
Clear

Map

DEIF DK
DieselGenSet
Online
Run : 1467 h
Alarms : 0
Service 1 : 22 h

Get the data

Checklist

Modbus TCP / Serial ✓

Event based data logging ✓

GPS and Cellular ✓

3rd Party Devices ✓

✎ Personalise

● User Roles
● Teams
● Branding

Indicator
Indicator
Indicator

Card Designer
Layout
Visuals

⊕ Add Indicator

▤ Save

Report

CSV PDF

28/06/2018 02:00:00 28/06/2018 10:00:00 28/06/2018 06:00:00 29/06/2018 02:00:00 29/06/2018 10:00:00 29/06/2018 06:00:00 30/06/2018 02:00:00 30/06/2018 10:00:00 30/06/2018 06:00:00

A solution for any type of application

Truly integrated hybrid control systems

DEIF

Designed specifically to serve as a reliable, fully integrated and optimising link between sustainable power plants and genset power plants, DEIF's Automatic Sustainable Controller, the ASC, is a new, market-leading solution for the industry.

Fully compatible with DEIF Power Management system technology, the ASC is scalable, flexible and modular, supporting multiple operating modes including Off-grid, Grid-tied, and Combination (Off-grid/Grid-tied).

It interfaces to PV inverters and even weather stations from well-known makers using the industrial SunSpec standard/OEM-specific protocols.

Safety features include breaker control, quick shutdown of sustainable power sources, directional power protection, and loss of mains protection according to local grid codes.
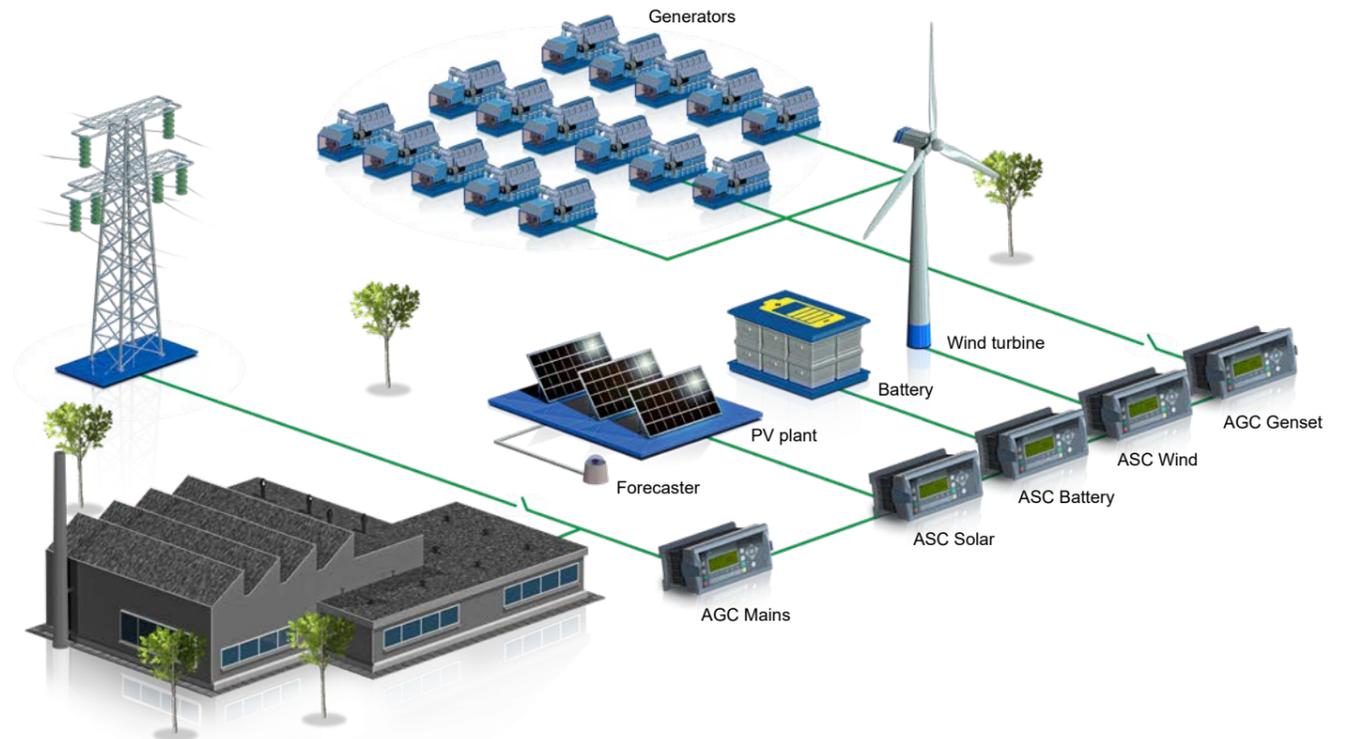
Simplicity above all

Use patent-pending DEIF Emulation to design and plan your plant with true verification but no risk to your equipment. Install production-ready control hardware and commission your hybrid control system with confidence using DEIF Utility Software (USW).

Train your own engineers to become hybrid control engineers, or benefit from DEIF's turnkey and project management expertise.

Off-grid

Minimised fuel consumption – maximised PV penetration

Generators · Wind turbine · Battery · AGC Genset · ASC Wind · ASC Battery · PV plant · ASC Solar · Forecaster · AGC Mains

Securing uptime with intelligent spinning reserve features, this automated solution guarantees minimum fuel consumption by maximising PV penetration without compromising minimum genset load requirements.

The DEIF power management automatically optimises the number of gensets connected to the busbar. In plants with different size gensets, the system even rotates the gensets automatically to ensure the most fuel-optimised genset match in accordance with the load request. Using CAN bus links between each power source, the reactive system boasts fast response times to changes in load demand or weather conditions.

The system is available as a Power Management or stand-alone solution for retrofits or existing plants.

Power management solution

► ASC-4 applicable with AGC-4/AGC 200 controls up to 32 gensets
► ASC PM appl. with AGC PM controls up to 32 gensets
► Applications up to 16 sustainable power plants
► Minimum genset load for optimal performance
► Spinning reserve to ensure uptime
► Maximise sustainable power penetration

Relevant products

ASC Plant Management · ASC-4 · AGI 400

AGC Plant Management · AGC-4 · AGC 150

AGC 200 · MIC · MIB

Stand-alone solution

► Applicable with all genset controls up to 16 gensets
► Maximum 1 sustainable power plant
► Minimum genset load for optimal performance
► Maximise sustainable power penetration
► MIC/MIB for detection of genset production

Grid-tied

Automatic adjustment of power & reactive power

Main grid

Battery

PV plant

ASC Battery

ASC Solar

AGC Mains
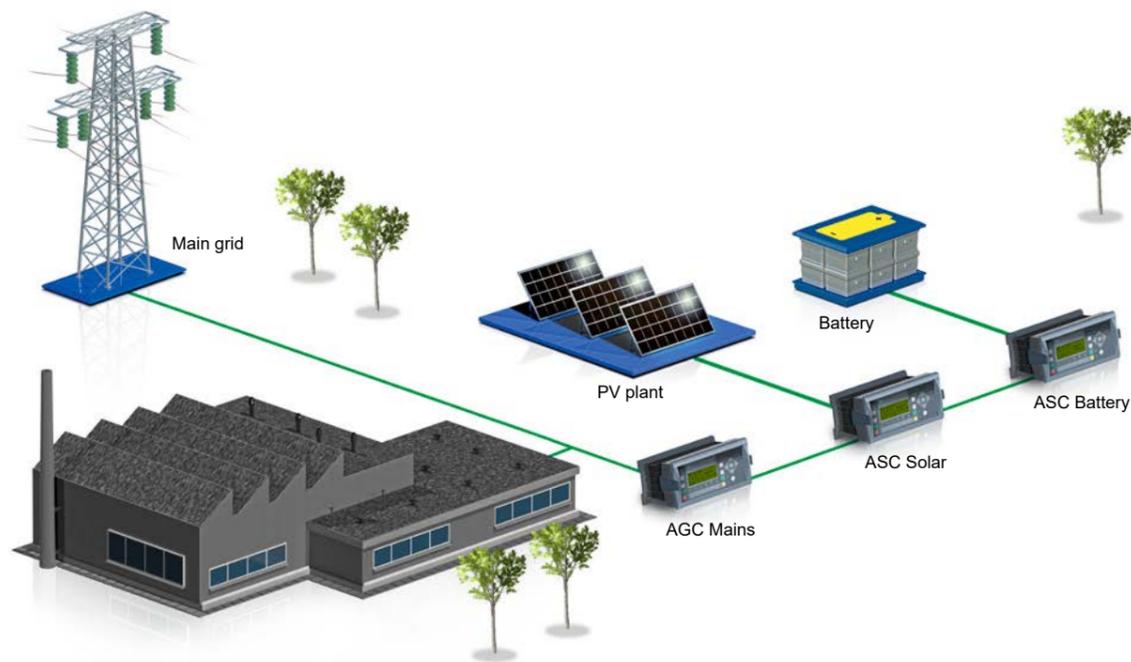
The system secures fixed power to grid at a fixed PF as per customer requirement. This is applicable for self-consumption applications with or without sanction load, and IPP applications.

Automatically adjusting power and reactive power references in accordance with frequency and voltage abnormalities, the system is able to provide grid support.

The system is available both as a Power Management solution for systems with multiple sustainable power sources, or as a stand-alone solution for retrofits or existing plants.

Power management solution

► ASC-4 applicable with AGC-4/AGC 200 controls up to 32 utilities
► ASC PM applicable with AGC PM controls up to 32 utilities
► Applications up to 16 sustainable power plants
► Maximise sustainable power penetration

Relevant products

ASC Plant Management (Solar)

ASC-4

AGI 400

AGC Plant Management

AGC-4

AGC 150

AGC 200

MIC

MIB

Stand-alone solution

► Applicable with 1 utility
► Maximum 1 sustainable power plant
► Maximise sustainable power penetration
► MIC/MIB for detection of mains production

Combination

Automatic changeovers between off-grid & grid-tied

Generators

Main grid

Battery

PV plant

ASC Battery

AGC Genset

ASC Solar

AGC Mains
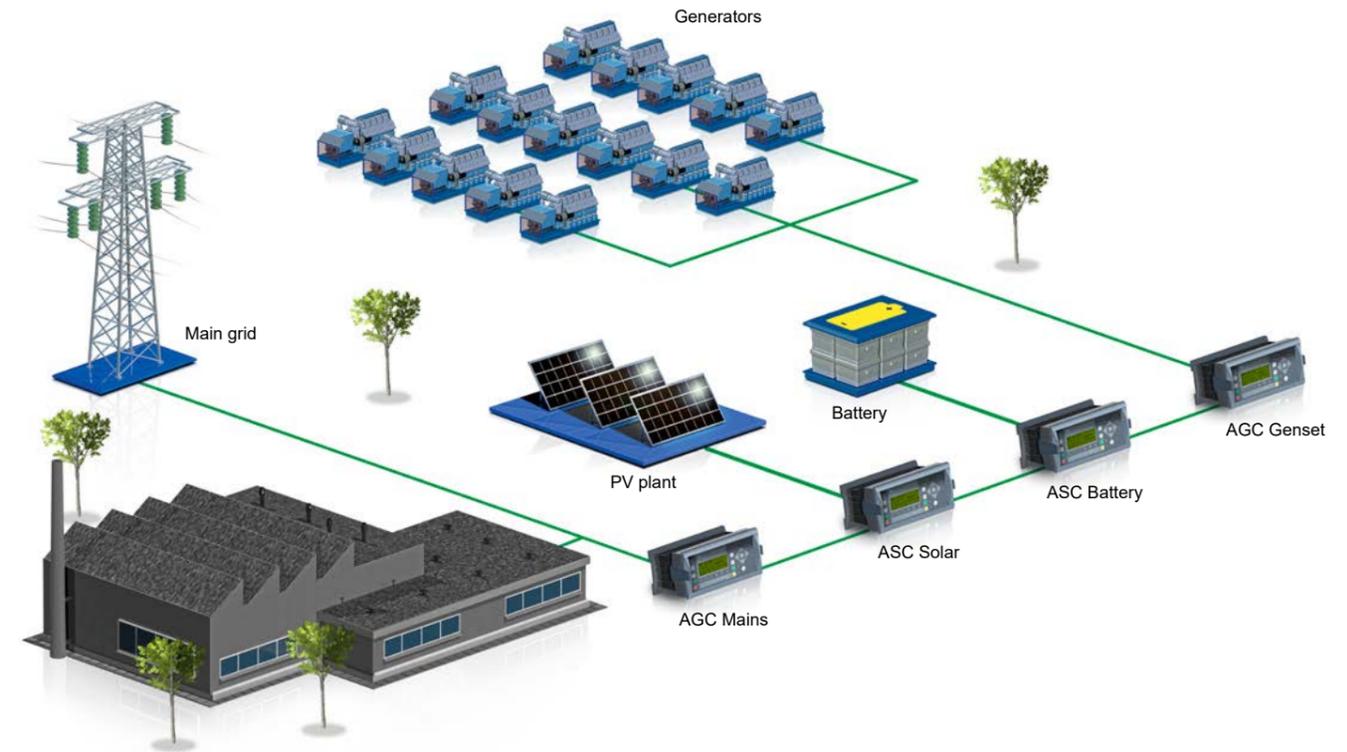
Off-grid/Grid-tied

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. Automatic changeovers between grid-tied and off-grid in case of mains failure are possible, even during operation. The system is available both as a Power Management solution for systems multiple sustainable power sources, or as a stand-alone solution for retrofits or existing plants.

Power management solution

► ASC-4 applicable with AGC-4/AGC 200 controls up to 32 gensets/utilities
► ASC PM applicable with AGC PM controls up to 32 gensets/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 Plant Management (Solar)

ASC-4

AGI 400

AGC Plant Management

AGC-4

AGC 150

AGC 200

MIC

MIB

Stand-alone 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
► MIC/MIB for detection of genset/mains production

Livø - Danish off-grid island
Security of supply with DEIF power management

»When everything is running as it should, you forget that the controllers are there. When something goes wrong, you are thankful that you have all these control options at your disposal!«

Martin Olsen
Forest Guard
Livø

Green ambition

Using DEIF AGC-4 and ASC-4 controllers, the off-grid Danish island of Livø has acquired a power management solution that ensures security of supply despite significant load variations, and with several renewables in the energy mix. The target is for the island to achieve 100% renewable energy self-sufficiency.

The ambition is to showcase how off-grid communities can achieve energy self-sufficiency and create the foundations for continued habitation. To reach this target, security of supply is all-important, and finding the right control solution is therefore key.

When the new setup becomes fully operational in the autumn of 2019, the island is expected to achieve 50% renewable energy self-sufficiency. There have been no operational issues; in fact, the DEIF controllers have given the island utility staff less to worry about.

Read full case story

Livø

Located approximately 4 kilometres from the coastline, the 320-hectare island of Livø is not connected to the mainland grid, and reliable power and heat must be generated locally.

School campus with own microgrid
'DEIF is the brains of the system,' says the contractor

»With DEIF's help we've been able to do strategic management of all these resources.«

Arash Habibi-Soureh
Distributed Energy Resources Manager
Johnson Melloh Solutions

Ease of resource management

The school wanted to save on its electricity bill, so a solar and natural gas generator hybrid system was installed – the first renewable microgrid of its kind in Indiana.

The system consists of a 2 MW solar field, two 750 kW national gas generators, and a connection to the local utility. A peak shaving system controls the school's power supply. As the demand reaches a certain set-point beyond the solar supply, the system will start the gas generators to take the load. This caps the power from the local utility, explains Brent Beissler, Engineering Manager at Girtz Industries.

A DEIF AGC-4 mains controller monitors the school's power demand and utility power use from a utility pole a short distance from the solar field, explains Brent Beissler. It communicates to the main controls room onsite via fiber link. There, two DEIF AGC-4 automatic genset controllers manage the peak shaving function. They communicate with an additional two ASC-4 solar hybrid controllers, which monitor the solar arrays.

Read full case story

Ben Davis High School

Ben Davis High School in Indianapolis, Indiana, USA, has about 4,500 students in several buildings over 1.2 million square-feet (110,000 m2).
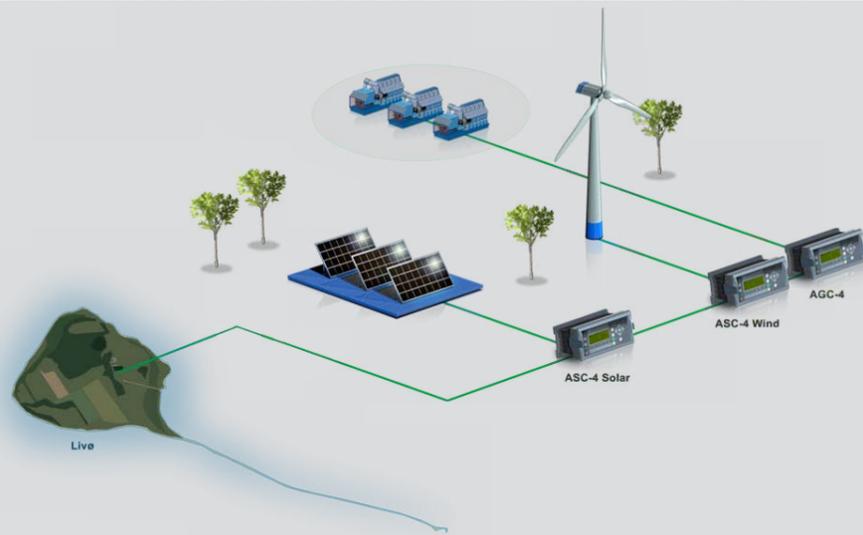
Automatic Sustainable Controller, ASC-4 Solar

A new link between PV & genset power plants

Designed specifically to serve as a reliable, fully integrated and optimising link between sustainable power plants and genset power plants, DEIF's automatic sustainable controller, ASC-4 Solar, is a renowned, market-leading solution for the industry.

Maximising sustainable power penetration

The ASC-4 Solar will in any operation mode automatically maximise sustainable power penetration, depending on the total load demand to the hybrid without compromising constraints such as minimum genset load demand.

Minimum genset load in island operation

Minimum genset load constraint is available in the ASC-4 Solar. The constraint applies in island operation only. This constraint will cause the sustainable power penetration to decrease in case it is compromised. This is to secure a certain amount of load on the gensets, eliminating the risk of reverse power situations and impure combustion and exhaust problems.

Spinning reserve

The ASC-4 Solar offers spinning reserve support as a percentage of the produced power, as part of an existing superior system (for instance an existing PLC system) or by means of short-term cloud detection functionality, depending on your application and requirements.

Ideal for self-consumption applications

While in grid parallel mode, the ASC-4 Solar is capable of feeding surplus PV energy to the grid and generate profit in accordance with grid operator feed-in tariffs. Alternatively, the ASC-4 Solar can regulate the PV production to match the self-consumption, thereby preventing any feed-in of PV power to the grid if permitted by grid operator regulations.

Power management applications

DEIF's Power Management system fully integrates the sustainable power plant and the genset plant into a unity. The ASC-4 is connected to the CAN bus constituting the internal DEIF Power Management communication link. For that reason, this approach is only applicable for plants equipped with AGC-4 or AGC 200 controllers.

ASC-4 Solar 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
- ► Simple graphical configuration
- ► Record time commissioning with DEIF Emulation – uses and verifies the functions of the real system for test, production and design
- ► Suitable for power management solutions fitted with AGC-4 or AGC 200 genset controllers
- ► Suitable for stand-alone solutions using multi-instruments such as DEIF's MIB or MIC

Stand-alone applications

In stand-alone applications, the ASC-4 knows little about the surrounding environment in which it is placed. Based on power readings and breaker positions, the ASC-4 Solar determines the power references to the sustainable power plant. This approach is applicable for integrating sustainable power in already commissioned genset plants, whether they are equipped with DEIF controllers or not. Stand-alone applications support up to 16 gensets. The ASC-4 Solar for stand-alone applications also comes in a cost-effective version without the powerful M4 power management module.

Plug'n'play HMI touch screen

For improved user-friendliness, we've even created a plug and play touch screen display for hybrid projects. It'll present all relevant data to you in real time, for instance power metre and inverter readings, PV penetration/performance ratio and much, much more.

Automatic Sustainable Controller, ASC-4 Battery

Seamless energy storage integration

Designed specifically to serve as a reliable, fully integrated and optimising link between sustainable power plants and genset power plants, DEIF's automatic sustainable controller, ASC-4 Battery, offers seamless energy storage integration in hybrid microgrid applications.

AC- or DC-coupled

ASC-4 Battery is ideal for both AC- and DC-coupled applications. For AC-coupled systems, you can define battery charging and discharging scheme. Using the chargeScheme, you'll also be able to define the energy sources (gensets, PV or Mains) you allow for charging purposes.

Energy or power source

The ASC-4 Battery handles applications that use battery power as the primary power source (instead of gensets) as well as applications that use battery power for short-term support (for instance to support gensets for a short period of time) equally well.

Energy source: The battery is intended to supply a load being the only source connected to the AC bus. Generating capacity will be subtracted the spinning reserve requirement for the diesel genset plant. This may result in all gensets stopping depending on load demand.

When the state of charge falls below the predefined power source threshold, the ASC will automatically switch into power source operation and startup the required number of gensets.Once the state of charge is above the energy source threshold, the ASC will return to energy source operation.

Power source: The battery is not intended to supply a load being the only source connected to the AC bus. Power source is used to take peak loads until genset start and improving power quality. The power reference is zero per default.

The reference will be set equal to the excessive loading only if the gensets are overloaded. The generating capacity will be subtracted any spinning reserve requested from PV, suppressing excessive diesel gensets on the busbar.

ASC-4 Battery features

- ► Automatic shift between grid forming/following operation
- ► Charging/discharging
- ► Power Conversion System (PCS) control
- ► Batter Management System (BMS) monitoring
- ► Control of breaker
- ► Simple graphical configuration
- ► Record time commissioning with DEIF Emulation – uses and verifies the functions of the real system for test, production and design
- ► Suitable for power management solutions fitted with AGC-4 or AGC 200 genset controllers
- ► Suitable for stand-alone solutions using multi-instruments such as DEIF's MIB or MIC

Automatic Genset Controller, AGC-4

The world's most comprehensive & robust genset controller

The Automatic Genset Controller, AGC, is a flexible control unit containing all necessary functions for protection and control of a genset. It can be used as a single unit for one genset, or a number of AGCs can be connected in a complete power management system for synchronising projects, islanded or paralleled to the mains.

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

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.

Critical power applications
With its integrated close before excitation feature, the AGC-4 secures backup power availability from an impressive six seconds. Combined with the option of having doubled (redundant) controllers on all positions, the unit is ideal for all types of critical power applications, such as data centres, hospitals, airports and fish farms.

Rental genset applications
Rental companies will benefit from the standardised user interfaces of all DEIF controllers. The controllers have been designed with ease of operation in view, and rental companies can easily set and lock parameters to ensure full protection of their equipment.

Hybrid applications
AGC-4 is plug'n'play compatible with DEIF's ASC-4 hybrid controller for easy integration of diesel genset applications into a variety of hybrid installations. The market-leading solution maximises sustainable power penetration while always securing a sufficient amount of spinnning reserve in case PV production drops.

AGC-4 features

- ▶ Up to 32 gensets in one plant
- ▶ Synchronisation of up to 56 breakers in one plant
- ▶ Multiple operating modes in one software
- ▶ Multi-master power management
- ▶ Load-dependent start and stop
- ▶ Load management
- ▶ Emulation for fast training and I/O test
- ▶ Automatic Mains Failure sequence
- ▶ Approved by TÜV and UL
- ▶ Hot standby for full system redundancy
  – change to backup genset controller on the fly
- ▶ Redundant CANbus for power management
- ▶ Close Before Excitation
  – synchronisation from 6 seconds
- ▶ Fully compatible with AGC 200 controllers
- ▶ Suitable for hybrid power solutions fitted with ASC-4 controllers

Available standard modes:
Island mode: Power plant with synchronising generators or a stand-alone generator. Also applicable in critical power plants.

Automatic Mains Failure: Critical power/emergency standby plants, black start generator.

Fixed power: Power plant with fixed kW set point (including building load).

Peak shaving: Power plant where generator supplies peak load demand paralleled to the mains.

Load takeover: Plant mode where the load is moved from mains to generator, for example peak demand periods or periods with risk of power outages.

Mains power export: Power plant with fixed kW set point (excluding building load).

Remote maintenance: Used when the generator has to supply the load while a distribution transformer is disconnected for service.

All modes are configurable, and it is possible to change the plant mode on the fly both in single and in power management applications.

Advanced Genset Controller, AGC 200

Cost-effective & scalable controller platform

DEIF 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 DEIF 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.

Critical power applications
With its integrated load and power management functionality, the AGC 200 secures backup power availability when you need it. An ideal solution for critical power applications, such as data centres, hospitals, airports and fish farms.

Rental genset applications
Rental companies will benefit from the standardised user interfaces of all DEIF controllers. The controllers have been designed with ease of operation in view and rental companies can easily set and lock parameters to ensure full protection of their equipment.

Hybrid applications
AGC 200 is plug'n'play compatible with DEIF's ASC-4 hybrid controller for easy integration of diesel genset applications into a variety of hybrid installations. The market-leading solution maximises sustainable power penetration while always securing a sufficient amount of spinnning reserve in case PV production drops.

AGC 200 features

- ▶ Up to 32 gensets in one plant
- ▶ Synchronisation of up to 56 breakers in one plant
- ▶ Multiple operating modes in one software
- ▶ Multi-master power management
- ▶ Load-dependent start and stop
- ▶ Load management
- ▶ Emulation for fast training and I/O test
- ▶ Automatic Mains Failure sequence
- ▶ Approved by TÜV and UL
- ▶ Hot standby for full system redundancy
  – change to backup genset controller on the fly
- ▶ Close Before Excitation
  – synchronisation from 6 seconds
- ▶ Lifetime logging stored on SD card
- ▶ Fully compatible with AGC-4 controllers
- ▶ Suitable for hybrid power solutions fitted with ASC-4 controllers

Available standard modes:
Island mode: Power plant with synchronising generators or a stand-alone generator. Also applicable in critical power plants.

Automatic Mains Failure: Critical power/emergency standby plants, black start generator.

Fixed power: Power plant with fixed kW set point (including building load).

Peak shaving: Power plant where generator supplies peak load demand paralleled to the mains.

Load takeover: Plant mode where the load is moved from mains to generator, for example peak demand periods or periods with risk of power outages.

Mains power export: Power plant with fixed kW set point (excluding building load).

All modes are configurable, and it is possible to change the plant mode on the fly both in single and in power management applications.

Automatic Genset Controller, AGC 150

Easy power management setup with user-friendly interface

The AGC 150 is an easy-to-use control unit containing all necessary functions for protection and control of a genset.

It can be used as a single unit for one genset, or it can be connected in a complete power management system with up to 32 controllers for synchronizing projects, island or parallel to the mains. The power management systems handles the load sharing between gensets and the load dependent start and stop. AGC 150 contains all necessary 3-phase measuring circuits, and all values and alarms are presented on the sun-shine proof LCD display.

Easy power management setup
The AGC 150 includes Easy Connect. This means that when gensets are connected via CANbus, the controllers automatically detect each other. If later more gensets are connected via CANbus, these will also be detected automatically. Application configuration is possible via the display.

Easy and user-friendly interface
Parameters access via the display and the Utility Software, pre-configured sensors curves, draw and play application setup via the Utility Software, and full power management compatibility with other DEIF AGC controllers.

Hybrid support
Generator controller in a micro-grid system, together with DEIF controllers ASC-4 (PV and Battery).

New design - Easy to mount
The controller features illuminated buttons that smoothly guide the operator and make it easy and intuitive to operate; only buttons relevant for a function are visible to the user. Compact design making it suitable for all applications

AGC 150 features
- ► Engine start sequences
- ► Engine and generator protection
- ► Engine communication via CANbus
- ► Run coil and crank configurable when using the Electric engine
- ► Tier 4 Final support with clear alarm indications
- ► Diesel and gas genset support
- ► 3-phase generator and busbar sensing
- ► Phase compensation for D/Y transformer
- ► Four current sensing inputs

Guided experience
Only buttons relevant for a function are visible to the user.

User levels in settings
Configure three user levels with a password for each level, customer, Service and Master, configure each parameter for a user level, and only the parameters relevant for the user are shown.

Shortcut menu
Configurable shortcuts give the user easy access to commonly used functions.

PLC functions
Programmable functions (M-Logic) in a user-friendly environment.

Alarm and Event logging
View historical alarms and events on the display and with the Utility Software (up to 500 alarms and 500 events)

Graphical Display
View important genset and/or system information on the easy to- read graphical display, shown as text, symbols, numbers, and even a graphical synchroscope.

Built-in analogue AVR and GOV control
Eliminates the need for external equipment (voltage and PWM)

CIO support
AGC 150 supports CANbus based I/Os, which increases the number of inputs and outputs.

Automatic Sustainable Controller, ASC Plant Management

A new link between PV & genset power plants

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

Maximising sustainable power penetration
The ASC Plant Management will in any operation mode automatically maximise sustainable power penetration, depending on the total load demand to the hybrid without compromising constraints such as minimum genset load demand.

Minimum genset load in island operation
Minimum genset load constraint is available in the ASC Plant Management. The constraint applies in island operation only. This constraint will cause the sustainable power penetration to decrease in case it is compromised. This is to secure a certain amount of load on the gensets, eliminating the risk of reverse power situations and impure combustion and exhaust problems.

Spinning reserve
The ASC Plant Management offers spinning reserve support as a percentage of the produced power, as part of an existing superior system (for instance an existing PLC system) or by means of short-term cloud detection functionality, depending on your application and requirements.

Ideal for self-consumption applications
While in grid parallel mode, the ASC Plant Management is capable of feeding surplus PV energy to the grid and generate profit in accordance with grip operator feed-in tariffs. Alternatively, the ASC Plant Management can regulate the PV production to match the self-consumption thereby preventing any feed-in of PV power to the grid if permitted by grid operator regulations.

ASC Plant Management 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 DEIF Emulation – uses and verifies the functions of the real system for test, production and design
- ► Suitable for power management solutions fitted with AGC PM genset controllers
- ► Suitable for stand-alone solutions using multi-instruments such as DEIF's MIB or MIC

Power management applications
DEIF's Power Management system fully integrates the sustainable power plant and the genset plant into a unity. The ASC Plant Management is connected to the CAN bus constituting the internal DEIF Power Management communication link. For that reason, this approach is only applicable for plants equipped with AGC Plant Management controllers.

Stand-alone applications
In stand-alone applications, the ASC Plant Management knows little about the surrounding environment in which it is placed. Based on power readings and breaker positions, the ASC Plant Management determines the power references to the sustainable power plant. This approach is applicable for integrating sustainable power in already commissioned genset plants, whether they are equipped with DEIF controllers or not. Stand-alone applications support applications containing up to 16 gensets.

Plug'n'play HMI touch screen
For improved user-friendliness, we've even created a plug and play touch screen display for hybrid projects. It'll present all relevant data to you in real time, for instance power metre and inverter readings, PV penetration/performance ratio and much, much more.

Automatic Genset Controller, AGC Plant Management

Fuel-optimised Plant Management for up to 992 gensets

Ideally suited for large-scale IPP plants, DEIF's AGC Plant Management solution controls systems of up to 16 grids and 992 generator breakers.

Tried and tested at locations in Africa, Asia, and South America, AGC Plant Management solutions have been developed not just with an eye for safety but for fuel saving and optimised maintenance intervals. The system introduces fan control, black starts in both island and fixed power mode, and asymmetrical load sharing designs to cut running costs. Lifting genset control from single units to plant level, easily enabling comprehensive control and protection for large setups from one central point of intelligence, AGC Plant Management incorporates plant power and power factor control at connection points, load profile priorities routines and much more.

Cost-optimised design

The comprehensive AGC Plant Management solution uses the plant's generators to black-start large step-up transformers directly. With a proven ratio of up to 1:39 between the generator and the transformer, the solution cost-optimises black-start of plants in both island and fixed power mode, limiting the need for high voltage breakers. With a dedicated plant communication structure, SCADA systems are kept separate from the control system, limiting on-site installation to a minimum.

Reduced fuel consumption

Another key feature of the solution fixes the generators at their preferred fuel-optimised power set point. If an engine fails, the system will use the spinning reserve from operating generators until a new generator starts up.

Grid support

Designed to monitor and detect grid abnormalities automatically, the AGC Plant Management system can reduce the amount of power produced to the grid in case the grid frequency rises. These functionalities are also useful for reducing the amount of kvar passed on to the next upstream transformer: as the upstream transformer current declines, the transformer's load performance will improve.

AGC Plant Management features

► Fully scalable multi-master system of up to 992 gensets
► Simple graphical configuration
► Easy control from one central point of intelligence
► Cost-optimised design
► Reduced fuel consumption
► Grid support
► Monitoring and supervision
► Emulation Solution – uses and verifies the functions of the real system for test, production and design
► Suitable for hybrid power solutions fitted with ASC PM controllers

Hybrid applications

AGC Plant Management is plug'n'play compatible with DEIF's ASC PM hybrid controller for easy integration of diesel genset applications into a variety of hybrid installations. The market-leading solution maximises sustainable power penetration while always securing a sufficient amount of spinnning reserve in case PV production drops.

Advanced graphical interface

Multi-touch widget HMI for system monitoring & control

A comprehensive HMI solution, DEIF's AGI 400 series connects to all DEIF Multi-line controllers, as well as third party electronics, via standard defined communication protocols, featuring functionalities which eliminate the need for other instruments, thus saving you both space and wiring.

The AGI 400 series is intended for visualisation and active control in multiple applications managed on board maritime vessels or platforms, where it provides full graphical overviews and user-friendly touch screen control with a quality display that is easily readable even at sharp angles. Monitor or control multiple setups simultaneously, or share data via Ethernet connections, effectively enabling the DEIF HMI to be used as a small SCADA system. AGI 400 supports multiple users levels, and LAN clients, ensuring user control in several levels.

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.
► Ship energy monitoring system (SEMS): track your energy consumption to optimise and implement 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.
► Data acquisition and storage

AGI 400 features

► State-of-the-art HMI
► Multi-touch widgets
► Advanced programming tool
► Data-logging and alarm handling
► Complimentary DEIF app templates
► Designed for harsh marine environments
► Available in 7", 10", 15" and 21" sizes

Variant overview

AGI 407   AGI 410   AGI 415   AGI 421

Multi-instrument, MIC

Measure, analyse & monitor your energy distribution network

DEIF's multi-instruments for measurements, analysis and monitoring of 3-phase electric energy distribution networks cover readings of more than 50 parameters.

The instruments have four-quad energy measurement and built-in energy counting and come with free utility software for programming and data viewing.

Ideal for sensing production from gensets/mains as the digital inputs can be utilised for genset/mains breaker feedback, thereby eliminating the need for hardwiring between breakers and the ASC.

MIC features
► 3-phase TRMS measurements
► Voltage inputs 400 L-L AC
► Accuracy: 0.2 or 0.5
► RS-485 Modbus communication
► Digital input
► Relay and digital outputs (optional)
► Supply voltage:
► 100 to 280 V DC
► 85 to 264 V AC 50/60 Hz
► 24 to 48 V DC (optional)
► Ideal for stand-alone retrofit applications

Type	Digital outputs	Digital inputs	Relay outputs
MIC 4002	–	2	–
MIC 4224	2	4	2

Multi-instrument, MIB 7000C

Measure & monitor your energy distribution network

DEIF's MIB 7000C multi-instrument for measurements and monitoring of single-phase or 3-phase electric energy distribution networks cover readings of more than 50 parameters.

The instrument has four-quad energy measurement and built-in energy counting and comes with free utility software for programming and data viewing.

For applications with just one PV feed-in connection point, the ASC will sense the PV production using the integrated three-phase wiring.

For multiple feed-in points, installing the MIC will enable the ASC to accumulate PC contributions from each meter and show the total PV production.

MIB 7000C features
► 1- or 3-phase TRMS measurements
► Voltage inputs 690 L-L AC
► Accuracy: 0.5 or 1.0
► RS-485 Modbus communication
► Supply voltage:
► 100 to 300 V DC
► 100 to 415 V AC 50/60 Hz
► Multiple PV feed-in points

LAND POWER   MARINE & OFFSHORE   WIND POWER

POWERED BY

Automatic sustainable controller solution
Switchboard for fast and easy integration in new or existing genset and PV plants

The switchboard for the ASC Automatic Sustainable Controller is an ideal solution incorporating all necessary components needed for all combinations of grid-tied and off-grid operation. The switchboard is build to modern standards and can be used in most countries.

The versatile solution easily integrates with PV sites/genset parks be they fitted with fully automated DEIF power management system or using the originally installed power management system or genset controllers. One string of invertors or 1 central invertor can be controlled per switchboard (ASC).

Dimensions
► 600×600×350 mm

Switchboard variants
► Grid-tied, no gensets
► Off-grid, 1-16 gensets
► Combined grid tied/off grid, 1-16 gensets, 1 mains
► Power management (all combinations) – maximum 32 DGs/32 grid connections

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