PRODUCT INFORMATION

Power and heat that don't run out

EHM – Energy Hybrid Module combines solar PV, the grid, batteries, fuel cells and an electrolyser with safe metal hydride hydrogen storage. The result is renewable power and heat around the clock – even during power outages.



EHM and GRZ hydrogen storage at the resilience centre in Häradsbäck, Sweden.

24/7 operation

Automatic backup power and island mode – no diesel generator.

Low pressure

Hydrogen is bound in a solid – not held in high-pressure tanks.

Power and heat

One system delivers both from local, renewable energy.

THE SYSTEM

One module that controls the entire energy chain

EHM is an intelligent hybrid system. An advanced algorithm controls the interplay between solar PV, the grid, batteries, fuel cells, electrolyser and hydrogen storage – ensuring a robust, renewable, safe and enduring supply of both power and heat during power outages.

01
Solar PV
Primary energy source

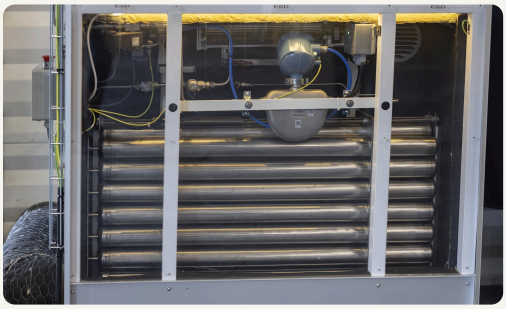
02
Grid
Support when solar is not enough

03
Batteries
Fast response and daily balancing

04
Electrolyser
Converts surplus power into hydrogen

05
Fuel cell
Delivers power and heat from hydrogen

06
Hydrogen storage
Metal hydride by GRZ Technologies



The hydrogen store is the system's energy reserve. Its size determines how long EHM can supply power without sun during a power outage.

GRZ metal hydride storage in the Swedish installation.

Two operating modes

The EHM algorithm is configured for one of two supply options:

Off-grid operation
OFF-GRID / ISLAND MODE

The system runs entirely without a grid connection and supplies the site autonomously around the clock.

Grid-connected operation
TRIPLE-USE

The system is connected to the grid and solar PV and uses one of three functions: normal mode, building operation or backup power.

TRIPLE-USE

Three functions in one system

The same installation covers normal mode, building optimisation and backup power during outages. The investment works every day – not just on the day the power goes out.

01 Normal mode

- Solar is the primary energy source; the grid is used only when solar is not enough.
- Continuous 24/7 operation through optimised interplay between solar PV, grid and energy storage.
- Supplies power, shaves peaks, charges batteries and produces hydrogen.
- Automatic function and backup power test every week.
- Monitors the hydrogen store and automatically refills it after each fuel cell run.

02 Building operation, energy communities and ancillary services

- Optimises the building's operation around the clock across solar PV, grid, batteries and energy storage.
- Enables participation in energy communities and sharing of locally produced renewable power.
- Can improve operating economics through participation in the ancillary services market.

03 Backup power and island mode during outages

- Switches automatically to backup power for critical community functions – e.g. elderly care homes, health centres, childcare, communications and resilience centres.
- 24/7 operation without the grid through the interplay of solar PV, batteries, fuel cells and hydrogen storage.
- Predictable endurance for power and heat – e.g. 14 days in winter – based on hydrogen stored safely in metal hydride.

OFF-GRID · AUTONOMOUS ISLAND MODE

Energy supply around the clock without a grid connection, through the interplay of solar PV, batteries, fuel cells and hydrogen storage. **The size of the hydrogen store determines how long power can be supplied.**

SYSTEM PRINCIPLES

Two ways to secure backup power

A diesel generator sits idle until the power fails and is only connected during the outage. Backup power from EHM is always ready – and supplies power around the clock in normal mode.

EHM

Solar → EHM → distribution board. Hydrogen in metal hydride as energy reserve.

Diesel generator

Grid → distribution board. Generator and diesel tank connected during outages.

	EHM	Diesel generator
Readiness	Running every day, always ready	Idle until an outage
Power outage	Automatic start within 10 seconds	Connected manually at the outage
Value in normal mode	Solar management, peak shaving, energy communities, ancillary services	None
Fuel	Hydrogen produced on site, primarily from renewable solar power	Diesel that must be bought, stored and replaced
Local emissions	Water vapour only	CO_2, NO_x and particulates
Safety	Installed indoors, out of sight	Installed outdoors, fully visible
Heat	Fuel cell heat can always be used	Rarely used
Back-up test run	Automatic, every week	Scheduled test runs
Endurance	Set by hydrogen storage size and solar output	Set by tank size and refuelling

Where diesel still holds its ground

Low upfront cost and high power per volume. EHM's advantage is that the investment creates value every day, and that the fuel is produced on site rather than having to be delivered during a crisis – if it is available at all.

THE DECISIVE LINK

Storage determines how long resilience lasts

A battery provides power for hours. Hydrogen in metal hydride provides energy for days, weeks, months – and it is the size of the hydrogen store that sets the limit.

Battery: hours

Fast response for daily swings and peaks. But every extra kWh needs more battery – covering two winter weeks with batteries alone quickly becomes large and expensive.

Hydrogen in metal hydride: days, weeks, months

Power (kW) is set by the fuel cell, energy (kWh) by the store. Endurance can easily be extended by enlarging the store – without changing the existing storage system.

33.3 kWh

chemical energy per kg of hydrogen (lower heating value)

In a fuel cell this typically becomes about 15–18 kWh of electricity. The rest is released as heat, which EHM can supply to the building as warm air or hot water.

WORKED EXAMPLE (SIMPLIFIED)

A resilience centre for 14 winter days

Average electrical load	**2 kW**
Period	**14 days = 336 hours**
Electricity demand	**672 kWh**
Electricity from hydrogen at approx. 50% efficiency	**≈ 17 kWh/kg H_2**
Equivalent to	**≈ 40 kg H_2**

Solar energy during the period also reduces the H_2 requirement. Actual sizing depends on load, solar irradiation, battery and endurance requirements.

GRZ METAL HYDRIDE

Why hydrogen belongs in a solid

GRZ alloys absorb hydrogen like a sponge. The molecules split into atoms that settle into the metal lattice. The process is fully reversible: hydrogen is absorbed at low temperature and released when the store is heated.

Low pressure

No 350–700 bar high-pressure tanks in or near the building.

Inherently safe

Release requires heat. In the event of a leak, the store cools itself down and the outflow slows.

Compact

High volumetric density – a lot of hydrogen in a small volume.

Long lifetime

GRZ's latest tests show over 99% capacity after 20,000 cycles.

Virtually maintenance-free

The store is designed not to limit the project's lifetime.

Losses over time

No leakage – suited to keeping hydrogen ready regardless of time.

	Metal hydride (GRZ)	Compressed hydrogen	Liquid hydrogen
Storage form	Bound in a solid	Gas, 350–700 bar	Liquid at –253 °C
Energy for storage	Heat management, no high-pressure compression	Compression	Liquefaction, high consumption
Losses over time	Negligible	Low	Boil-off
Weight	Heavy	Light	Light
Best suited for	Stationary, very safe long-duration storage	Mobility	Large volumes, transport

Metal hydride is heavy. In a stationary installation that is irrelevant – what counts is safety, volume and lifetime.

HEAT INTEGRATION

Heat is part of the solution

Metal hydride exchanges heat with its surroundings. In EHM this fits naturally with the other components, turning waste heat into a resource rather than a loss.



Thermal image of the GRZ store at the inauguration.

CHARGING

Surplus power → hydrogen → storage

As hydrogen is absorbed, the store releases heat that must be removed – and can be used.

DISCHARGING

Storage → fuel cell → power and heat

Waste heat from the fuel cell provides the heat the store needs to release hydrogen.

ABOUT GRZ TECHNOLOGIES

Swiss metal hydride – from material to system

2017
Spin-off from EPFL, Lausanne

30+ years
of fundamental research behind the technology

300+
alloys developed

12
global patents in materials science

GRZ builds its DASH stores (Dense And Safe Hydrogen) on its own production lines in Switzerland to a patented, modular design. Its materials scientists select and quality-control the alloy for each application using in-house measurement equipment. The material is filled into stainless steel tubes (e.g. AISI 304L), and each stack is pressure-tested and quantitatively leak-tested before being charged with hydrogen and assembled to the capacity the project requires.

The same metal hydride platform is also used in GRZ's thermal compressors (HyCo), in industrial operation at Messer Schweiz among others.

APPLICATIONS

For those who cannot be without power

Critical community functions

Elderly care homes, health centres, childcare, communications and resilience centres.

Buildings and energy communities

Optimised self-consumption, sharing of local power and revenue from ancillary services.

Off-grid sites

Autonomous supply where the grid doesn't reach or is too costly to connect.

How to get started

1. **Needs assessment**
   Load, important and critical consumers, solar energy needs and required endurance.
2. **Sizing**
   Generation and hydrogen storage are matched to meet the endurance requirement.
3. **Quotation and installation**
   Complete solution with commissioning and automatic weekly testing of the backup power.



The inauguration in Sweden, 21 September 2026.

EHM ENERGY HYBRID MODULE

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grz TECHNOLOGIES

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