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The future of C&I – from energy storage to BIPV

18 March 2025

2:00 pm – 3:30 pm | GMT, London
3:00 pm – 4:30 pm | CET, Berlin

Mark Hutchins
Magazine Director
pv magazine

Matthew Lynas
Editor
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Erik Wallnér
Head of Strategy and Communication
CheckWatt

Tadej Smogavec
Director of Operations
Enertec

Welcome!

pv magazine webinars

Do you have any questions? ❓ 🙋

Send them in via the Q&A tab. 👉 We aim to answer as many as we can today!

You can also let us know of any tech problems there.

We are recording this webinar today. 📹

We‘ll let you know by email where to find it and the slide deck, so you can re-watch it at your convenience. 👀 💡


GOODWE
DRIVING THE WORLD'S
SMART ENERGY FUTURE
GoodWe Company Introduction
Thanasis Sakkas, Sales Director Channels at GoodWe Europe GmbH

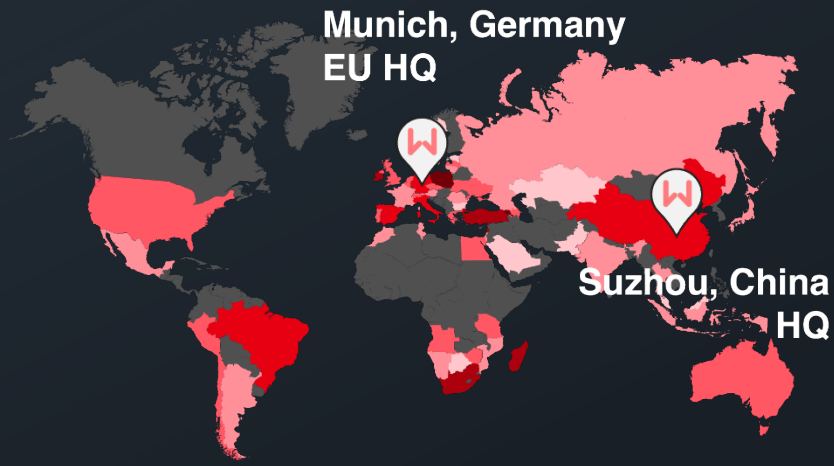
GOODWE

GOODWE GLOBAL TEAM

~5.000
Employees

1.000+
R&D Team

150+
International Staff



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We Are GoodWe

GLOBAL PRESENCE

11 Subsidiaries

Australia, Germany, Benelux, United Kingdom, Japan, United States, South Korea, Spain, Poland, Singapore, Vietnam

27 Sales & Service Centers

Australia, Netherlands, Germany, France, Mexico, Brazil, Poland, Spain, Italy, South Africa, Portugal, Greece, India, Turkey, Japan, United States, Vietnam, Thailand, Malaysia, UAE, Kenya, Sweden, Czech Republic, South Korea, Pakistan, Philippines, Egypt

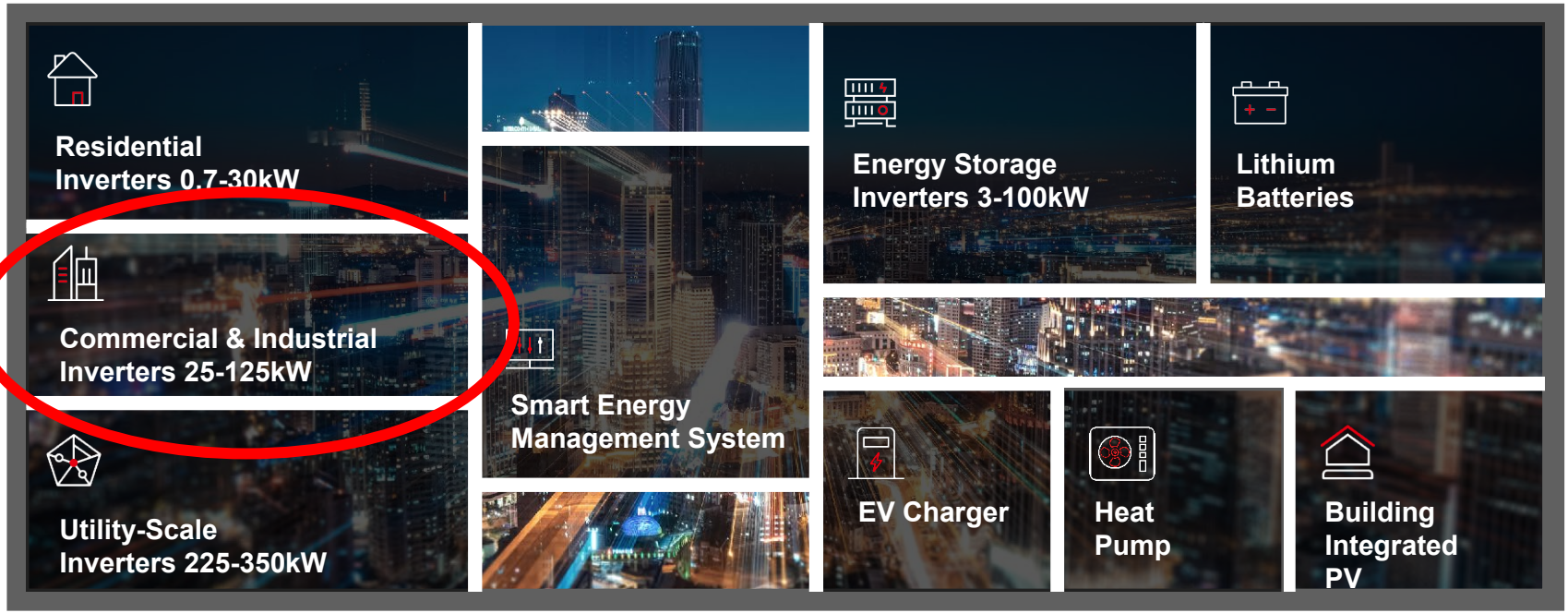
5 R&D Centers

Suzhou, Nanjing, Shenzhen, Wuhan, Shunde

4 Production Facilities

China: Suzhou, Guangde (three phases) , Shunde
Vietnam: Haiphong

GOODWE PRODUCT PORTFOLIO

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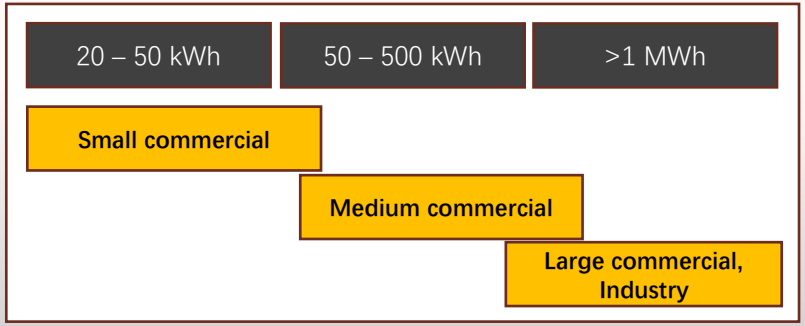
SMART ENERGY FUTURE
GoodWe C&I Storage potential Europe
Thanasis Sakkas, Sales Director Channels at GoodWe Europe GmbH

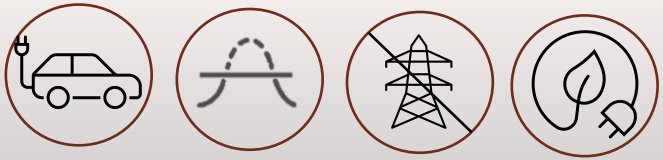
Introduction to C&I storage

The C&I storage segment covers a large variety of applications across a wide battery capacity range.



Benefits and challenges

Today, the C&I solar+storage market is largely driven by benefits related to PV energy self-consumption, peak-shaving and grid independence.



Lower energy cost

Improved energy security

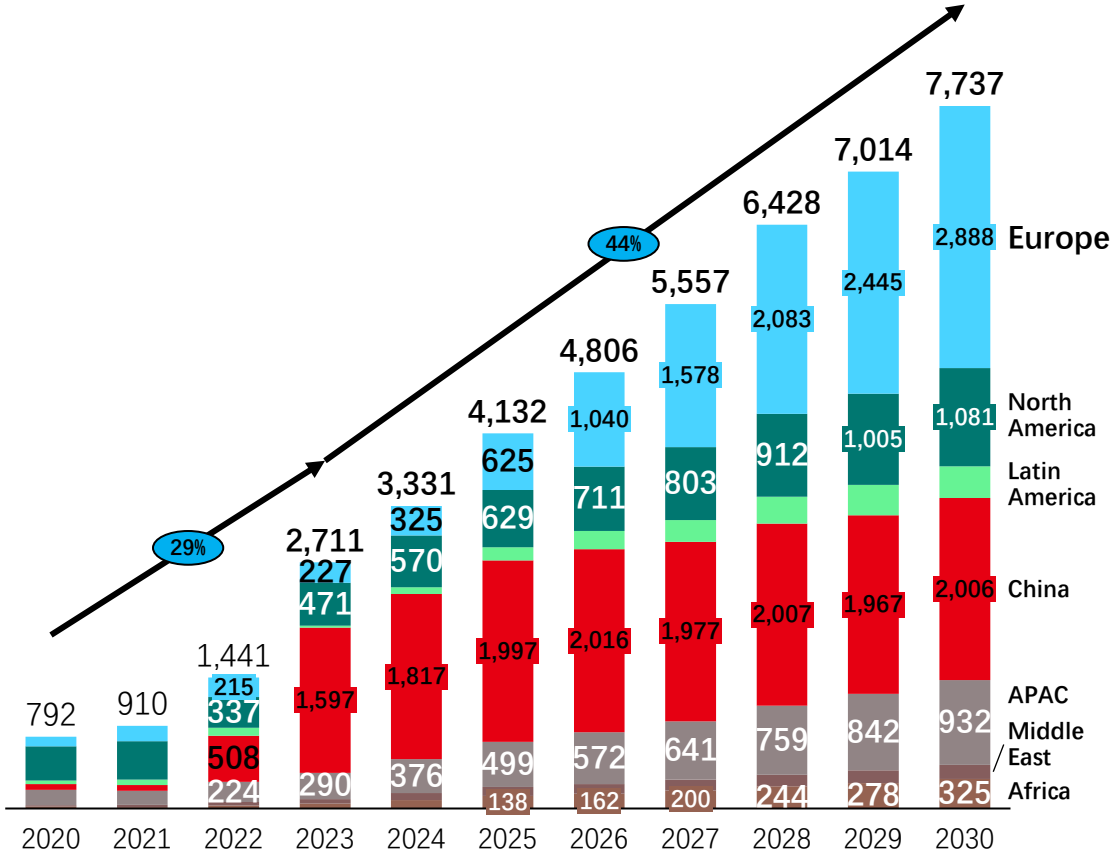
Reduced CO_2 footprint

High system cost

High complexity

Lack of incentives

Global C&I Storage Annual Additions (MW)



Source: S&P Global, team analysis

- Continuous Market C&I Growth
- 2023 – 2030: 44% CAGR
- **By 2030**, **Europe** will be the largest single market for C&I BESS globally.

The current market is still niche, but as costs decline stronger business cases are emerging

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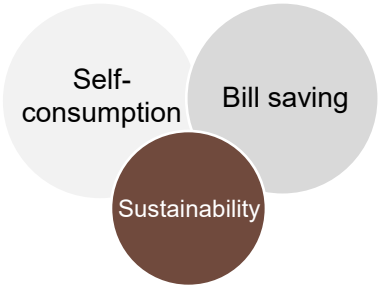
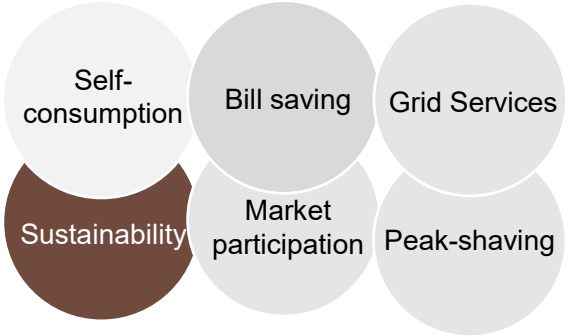
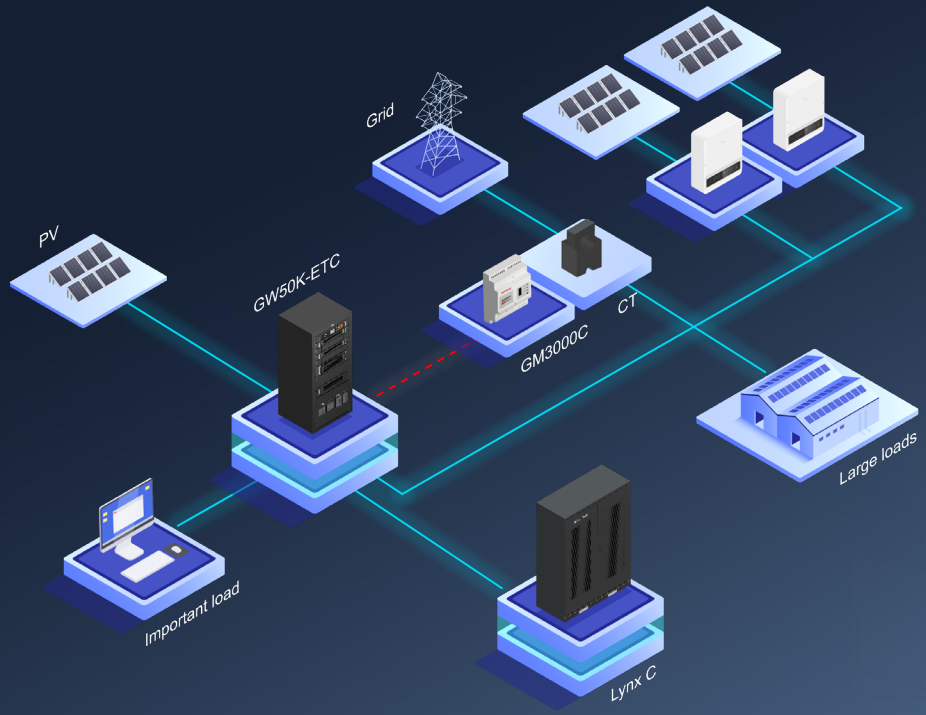
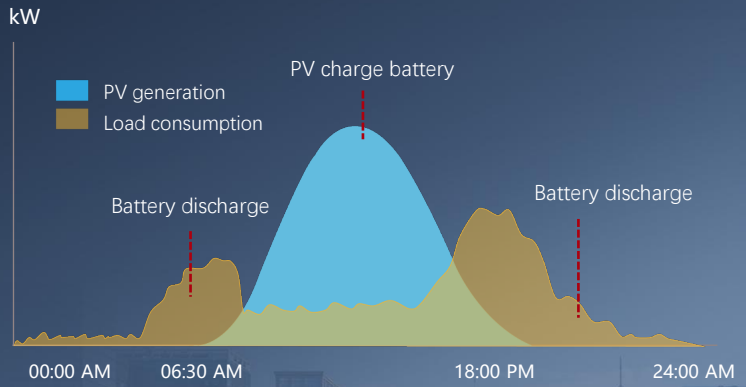
	Today	2025 and onwards
Reasons to add C&I storage	Niche applications, diverse customer landscape, case-by-case solutions 	Stronger business case, clear end-use products and applications 
Market drivers	▲ Energy independence/backup, bill savings ▼ Highly fragmented market, lack of reusable experience ▼ High system cost ▼ Most EU countries forbid feed-back electricity – cannot process arbitrage	▲ More mature and diversified market participation mechanism, e.g. arbitrage, VPP ▲ Strong C&I PV outlook up to 2030 ▲ Supportive policy and subsidies ▲ Easier and well-planned commercial structures along with dramatically cost cut-off

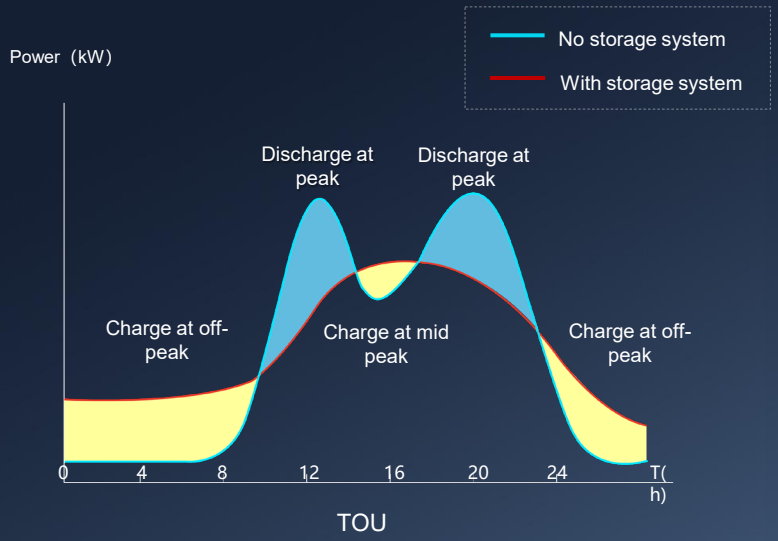
Self-use





In general mode, PV power will firstly support load operation and exceed power can be used to charge battery or sell to grid.

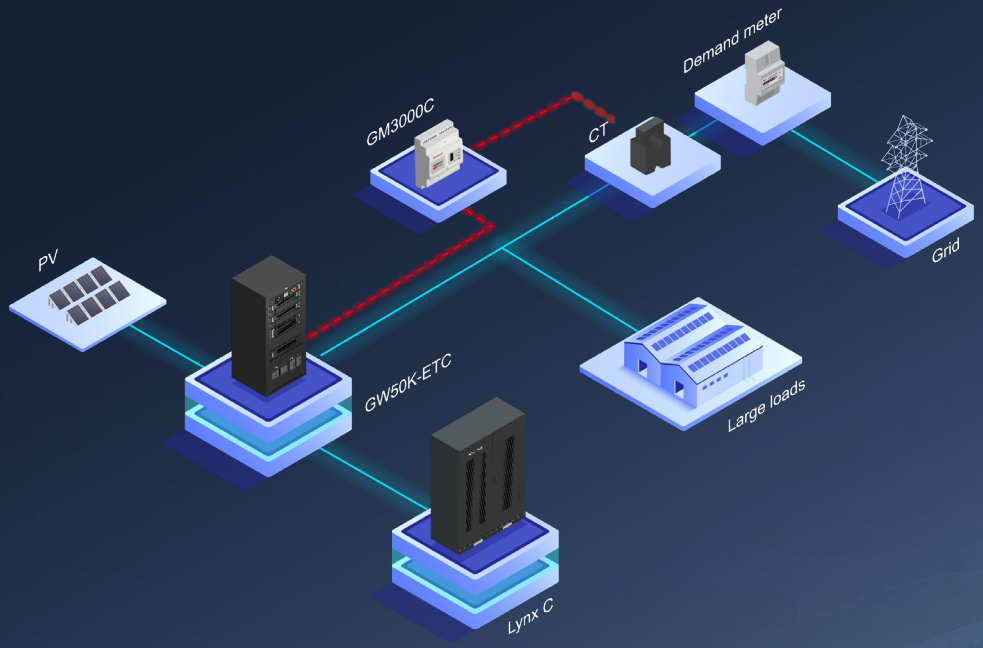
Time Of Use / Energy Arbitrage

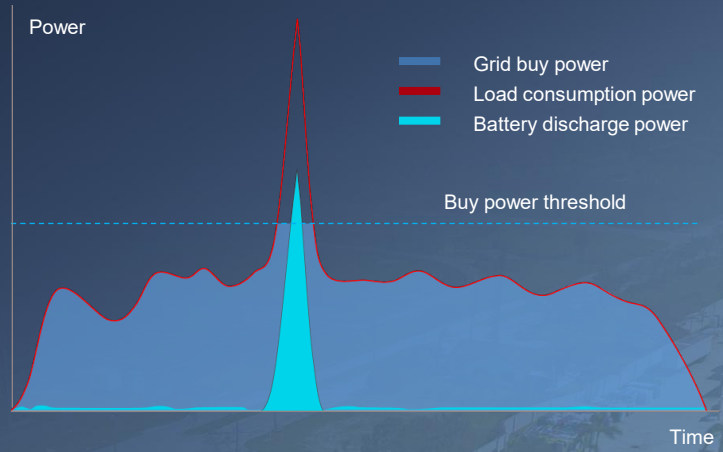


AL-TOU		Existing	New	% Change
Demand ($/kW/mo)	Summer Max	$24.51	$20.49	-16.4%
	Summer Peak	$21.13	$26.65	26.1%
	Winter Max	$24.51	$20.49	-16.4%
	Winter Peak	$7.57	$15.81	108.9%
Energy ($/kwh)	Summer Peak	$0.1276	$0.1374	7.7%
	Summer Part Peak	$0.1178	$0.1152	-2.2%
	Summer Off Peak	$0.0870	$0.0915	5.2%
	Winter Peak	$0.1157	$0.1204	4.0%
	Winter Part Peak	$0.1001	$0.1073	7.2%
	Winter Off Peak	$0.0787	$0.0928	17.9%
Fixed	Basic Service Fee	$116.44	$139.73	20.0%

In economic mode, time periods can be set to charge battery charge at off peak and discharge battery at peak hours.

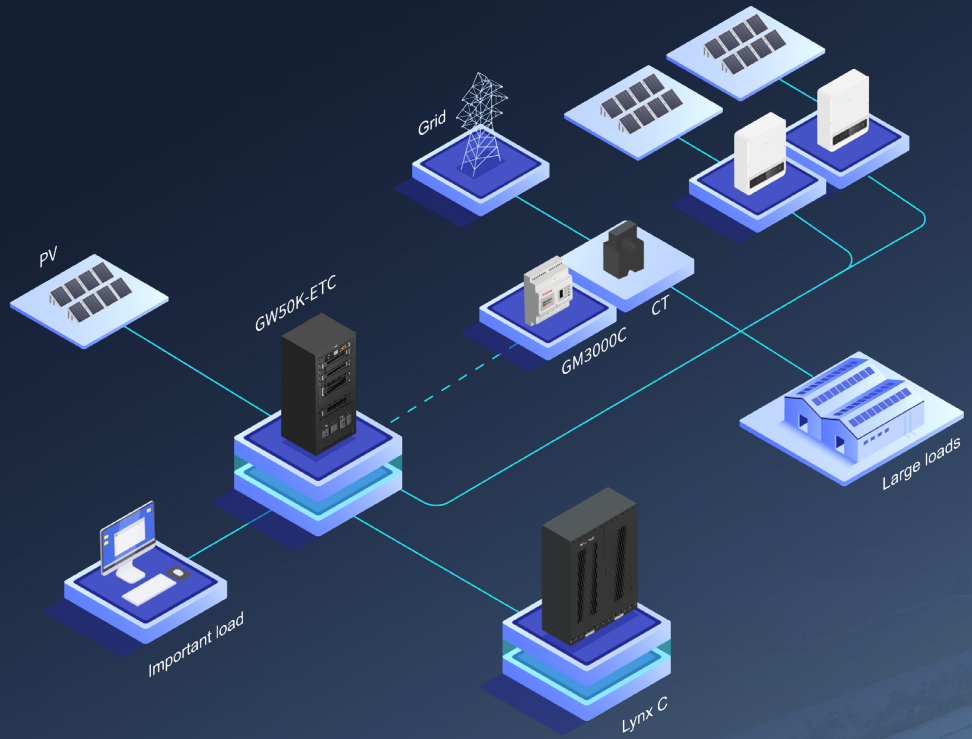
Peak-Shaving

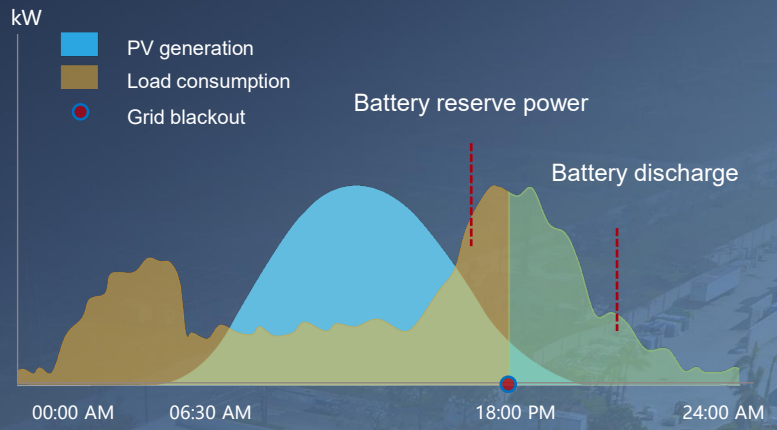




In peak-shaving mode, storage system detects power at grid connection point,once the power exceeds the limitation, storage system will discharge and reduce buy power from gird.

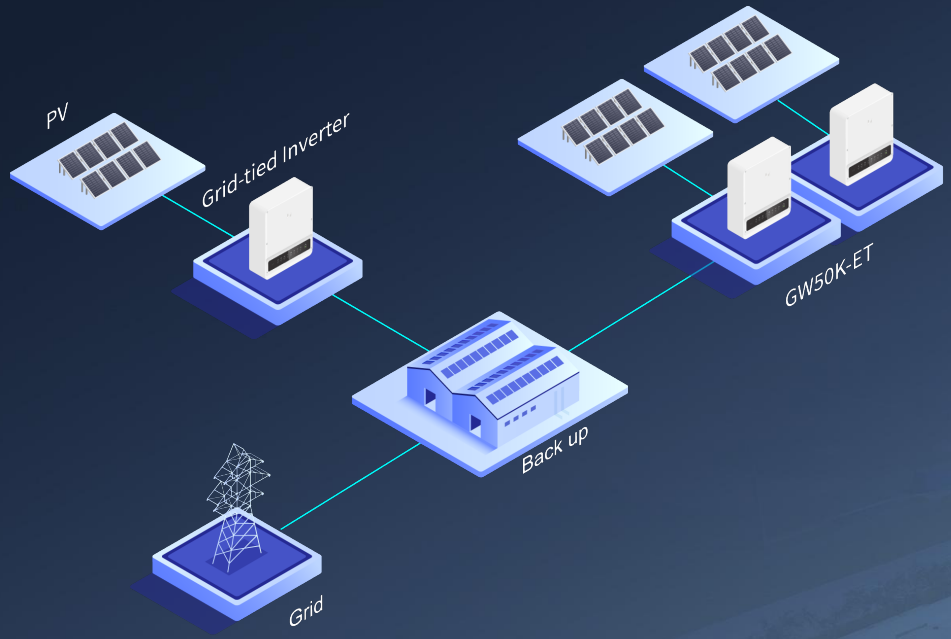
Backup Solution





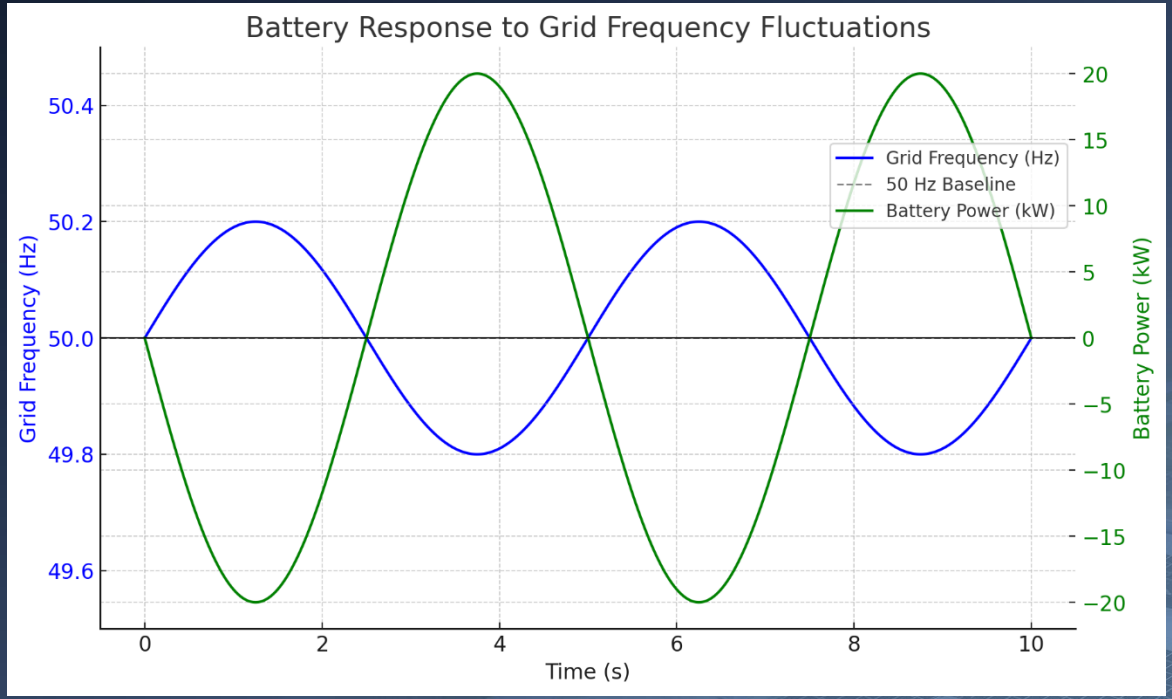
In backup mode, battery will reserve power for emergency use.

Micro-grid Solution



Connect the grid-tied inverter to the backup output of storage system to realize the system working when grid outage.

Frequency Regulation



From Residential to C&I: Benefits and Challenges

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RESIDENTIAL

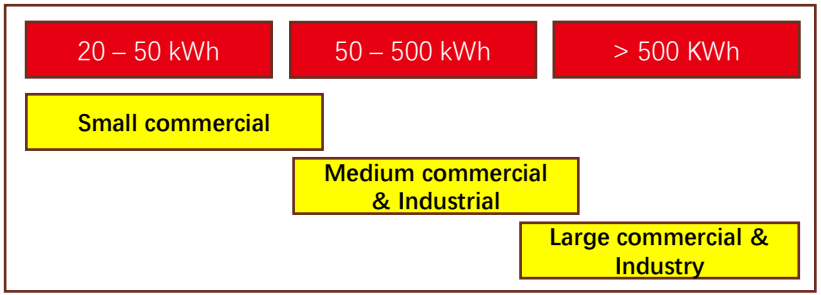
Customer's Focus:

- ✓ Cost-saving --> Self-consumption

C&I

Customer's Focus:

- ✓ Cost saving --> Self-consumption
- ✓ System Reliability
- ✓ Seamless scalability
- ✓ Mid-long term ROI



C&I covers a large variety of applications across a wide battery capacity range

NEW TECHNICAL CHALLENGES & USE CASES: EMS

Self-Consumption

Peak-shaving

ToU

Microgrids

Grid Support

Backup Power Supply

Demand Response

Dynamic Tariff

Energy Arbitrage

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THANK YOU

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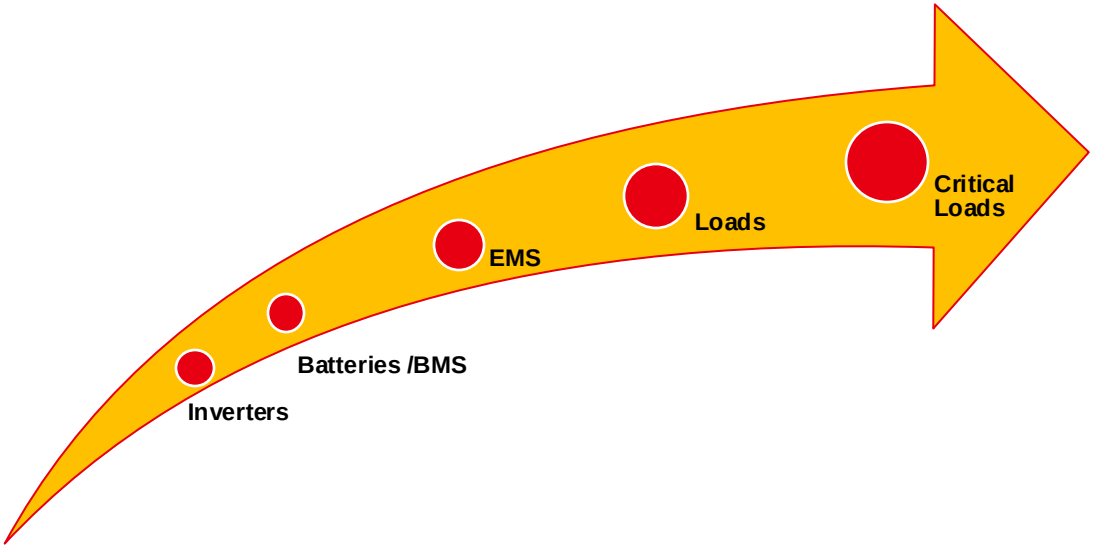
C&I STORAGE - TRENDS

GoodWe Company Introduction

Faisal Bouchotrouch, C&I Product Manager, GoodWe Europe

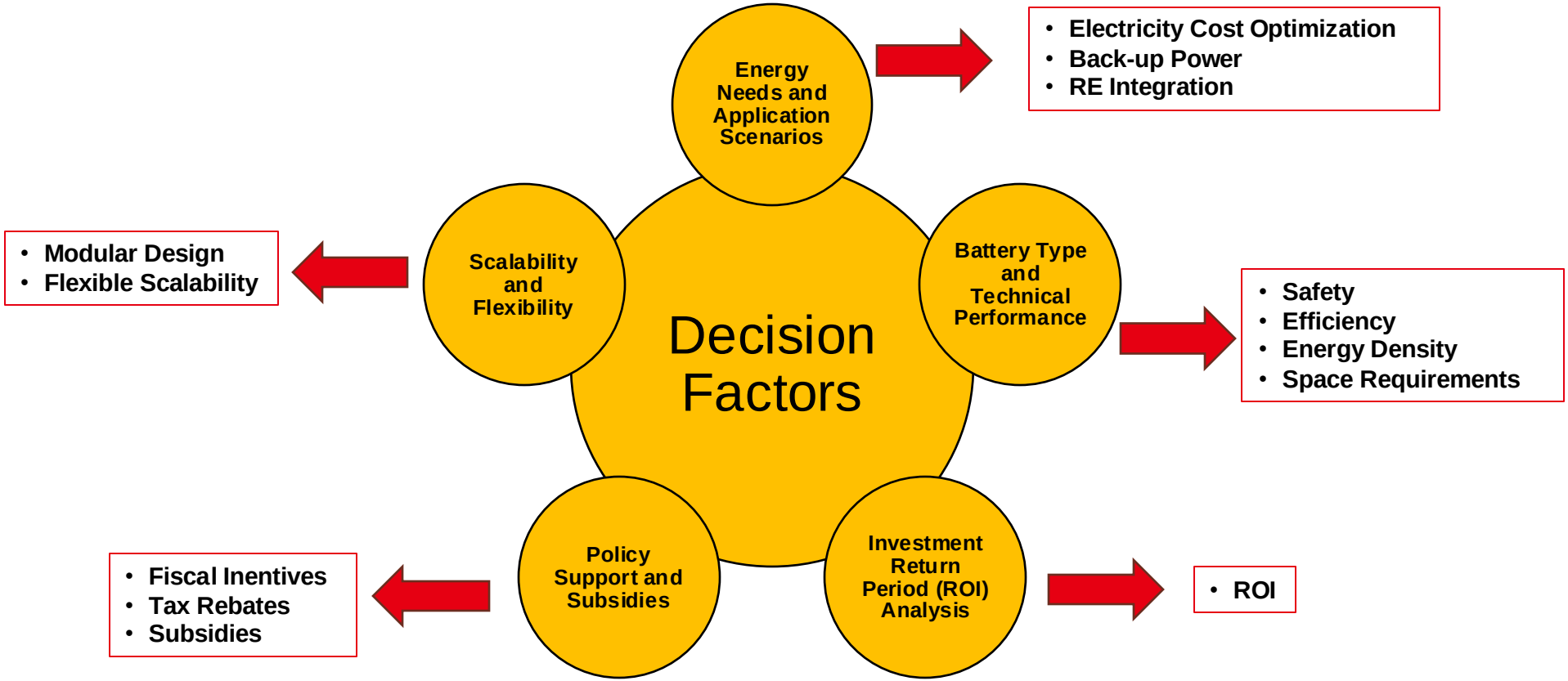
What are C&I ESS?



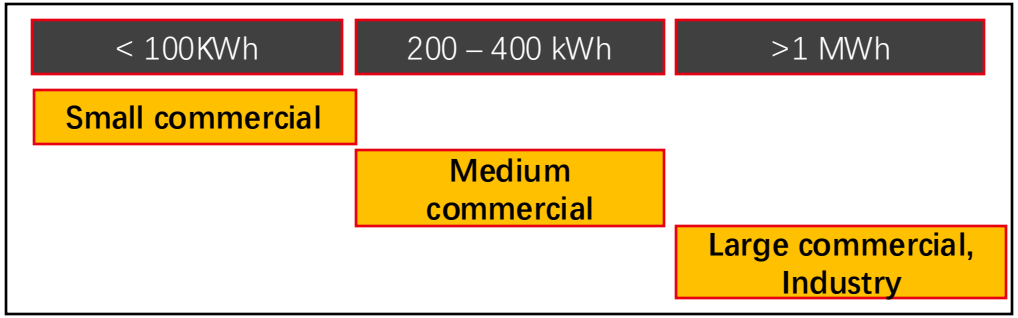
Key Functions and Benefits

- Energy use Optimization
- Energy Bill Reduction
- Energy Security
- Revenue Stacking
- ESG and Environmental Protection

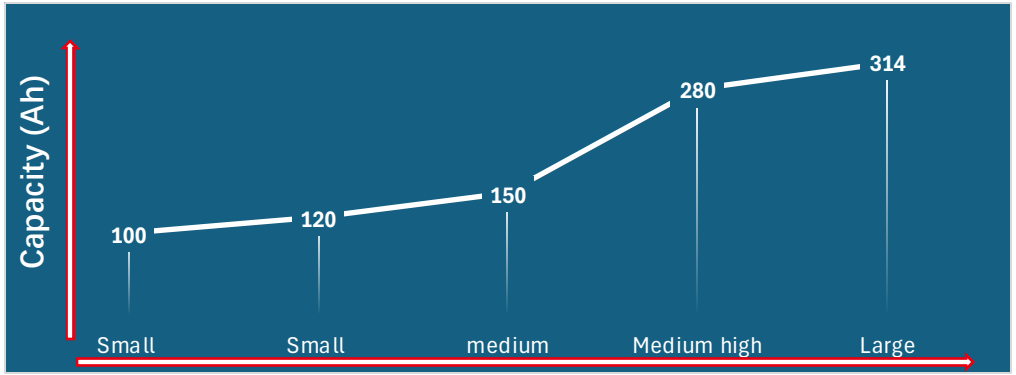
Key Decision Factors for C&I ESS



Typical C&I Capacity Ranges Applications

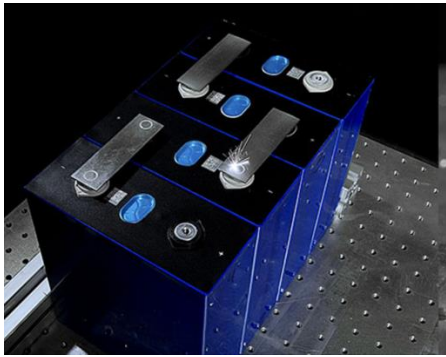


Diffrent Applications requires different Cell Type and Capacity

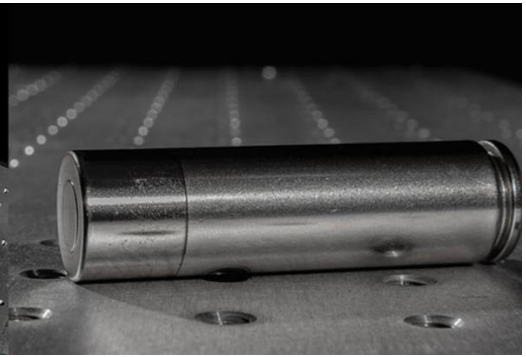


Cells Type for C&I Applications

PRISMATIC CELLS



CYLINDRICAL CELLS



PRISMATIC CELLS

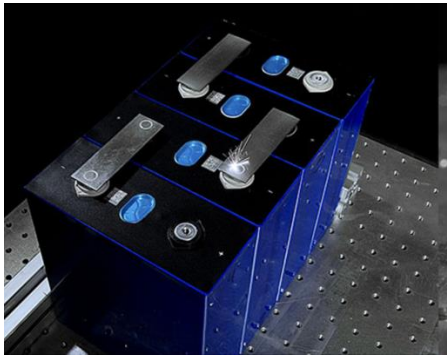
- Chemistry into a rigid casing
- Rectangular
- More energy density due to size
- Energy intensive applications

CYLINDRICAL CELLS

- Chemistry into a cylinder can
- Small and round
- Stackable on devices of all sizes
- Store less energy
- Can discharge power much faster

Cells Type for C&I Applications

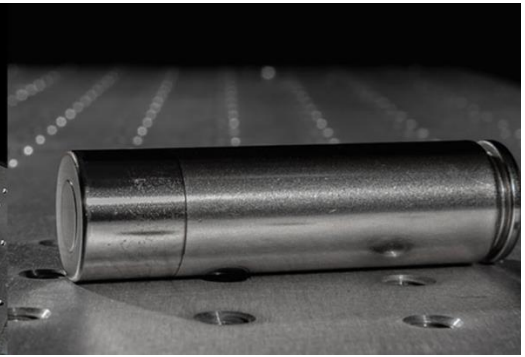
PRISMATIC CELLS



✅ **Advantages:**
- Higher energy density per pack
- Better integration for space-constrained applications.
- Fewer interconnections needed, reducing complexity

❌ **Disadvantages:**
- **More prone to thermal runaway if not properly managed**
- More expensive to manufacture compared to cylindrical cells

CYLYNDRICAL CELLS

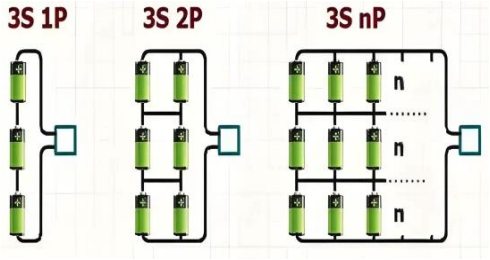


✅ **Advantages:**
- Lower manufacturing cost due to standardized production
- **Better cooling performance and heat dissipation**
- High mechanical durability

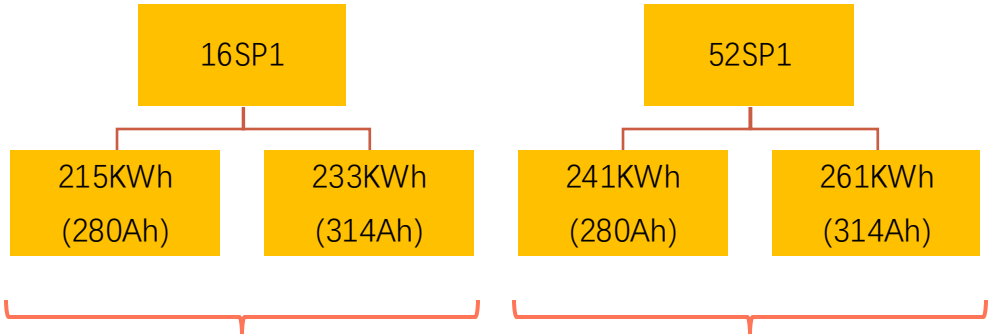
❌ **Disadvantages:**
- Wasted space in battery packs due to cylindrical shape
- Requires more interconnections, adding complexity and failure points

Security: Battery Thermal Management System

S-P Configurations:



CYLINDRICAL CELLS CONFIGURATIONS for C&I ESS

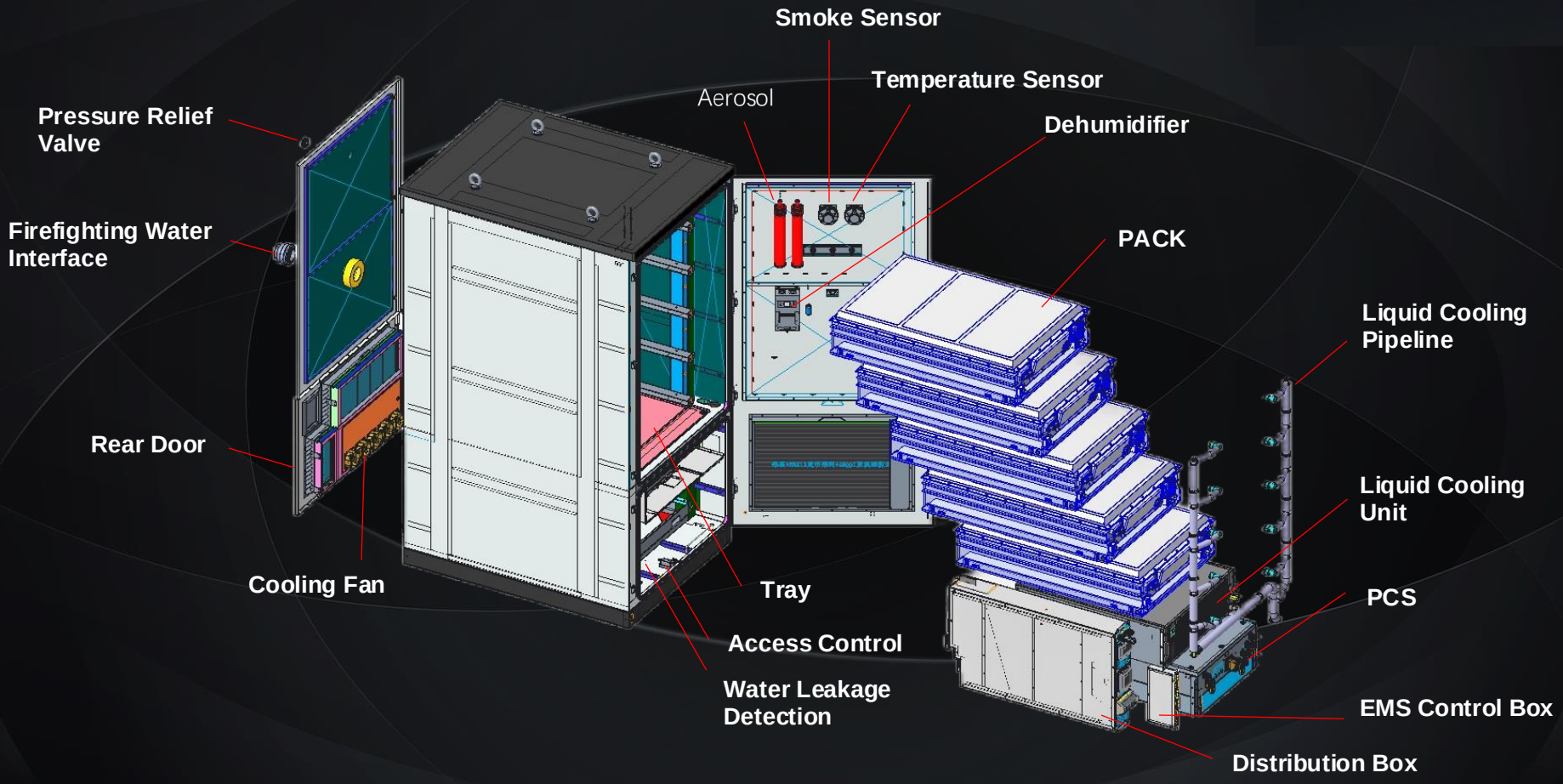


ESA 125kW/261kWh Outdoor Storage – AC COUPLED

Launch Date: H2 -2025

ESA 125kW/261kWh	
Cell technology	LiFePO4 3.2V/**314Ah**
Usable energy capacity	**261kWh**
System battery voltage range	754V~910V
Battery cooling type Liquid cooling	**Liquid cooling**
Rated AC power	**125kW**
Rated AC voltage	400Vac
PCS cooling type	**Intelligent force air cooling**
System dimension	1050(W)*2250(H)*1400(D)
Communication interface	Ethernet, Bluetooth, WIFI
Life Cycle	8000

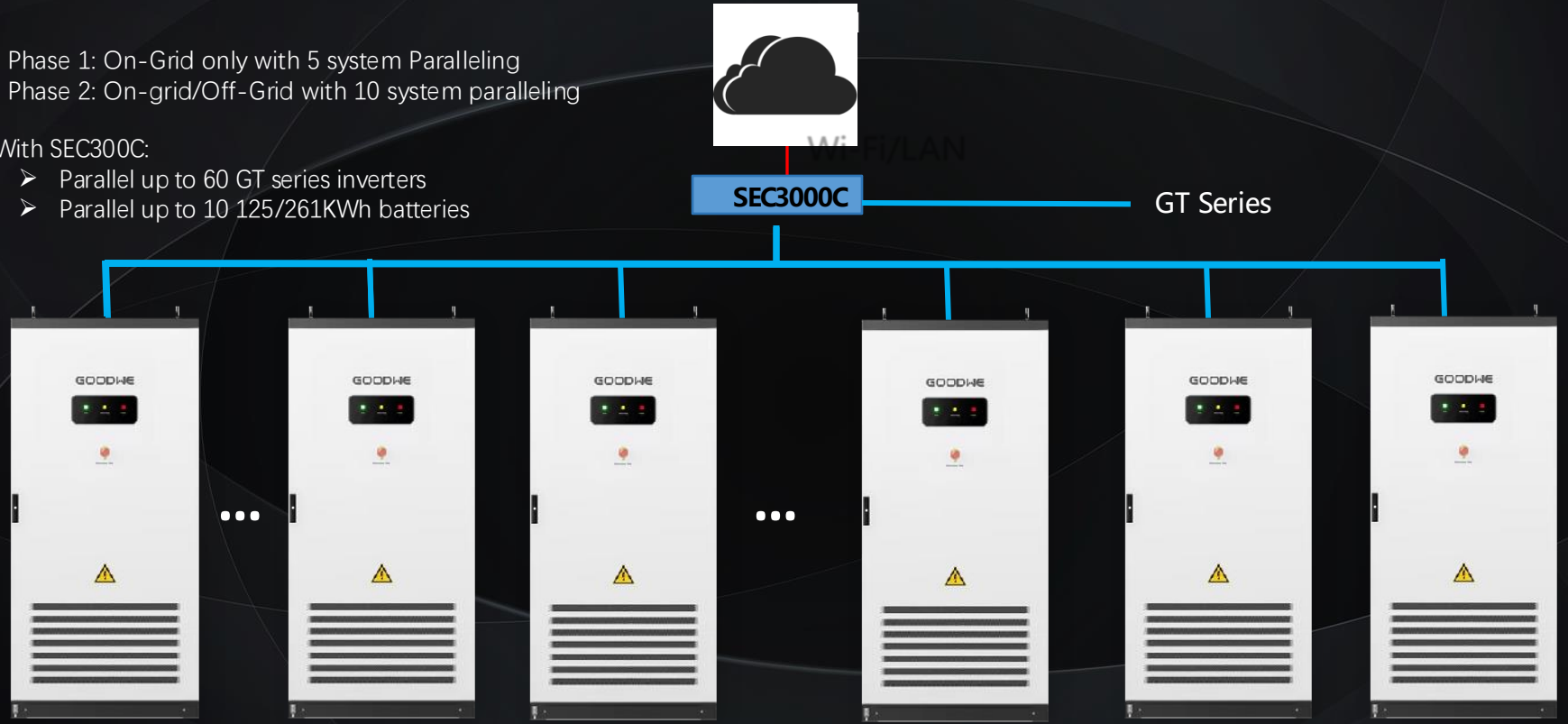
ESA 125kW/261kWh - Detailed Product Overview



ESA 125kW/261kWh

- Phase 1: On-Grid only with 5 system Paralleling
- Phase 2: On-grid/Off-Grid with 10 system paralleling

- With SEC300C:
  - Parallel up to 60 GT series inverters
  - Parallel up to 10 125/261KWh batteries



EMS: From Self-consumption to Revenue Stacking

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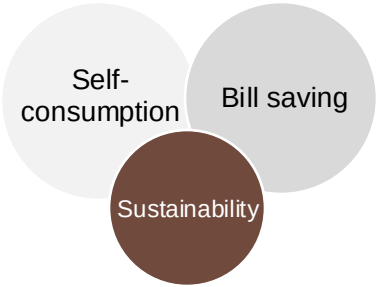
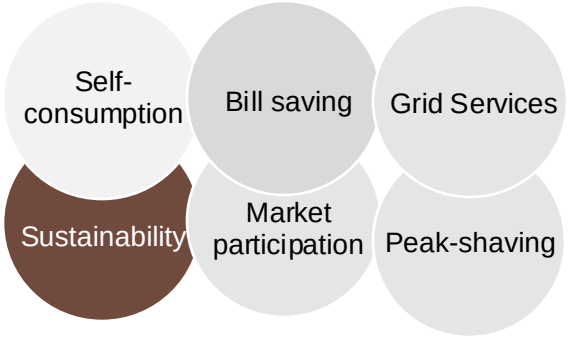
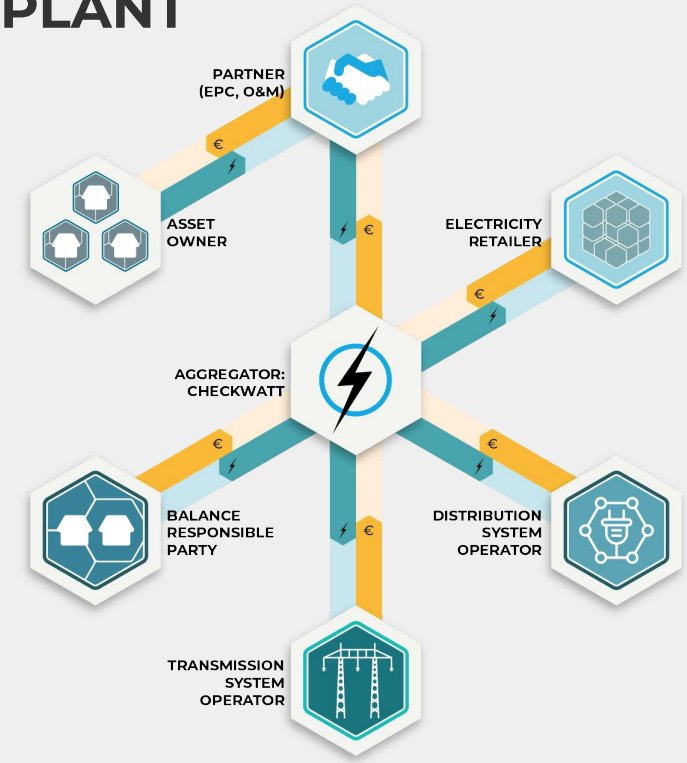
Smart Energy Innovator

	Today	2025 and onwards
Reasons to add C&I storage	Niche applications, diverse customer landscape, case-by-case solutions 	Stronger business case, clear end-use products and applications 
Market drivers	▲ Energy independence/backup, bill savings ▼ Highly fragmented market, lack of reusable experience ▼ High system cost ▼ Most EU countries forbid feed-back electricity – cannot process arbitrage	▲ More mature and diversified market participation mechanism, e.g. arbitrage, VPP ▲ Strong C&I PV outlook up to 2030 ▲ Supportive policy and subsidies ▲ Easier and well-planned commercial structures along with dramatically cost cut-off

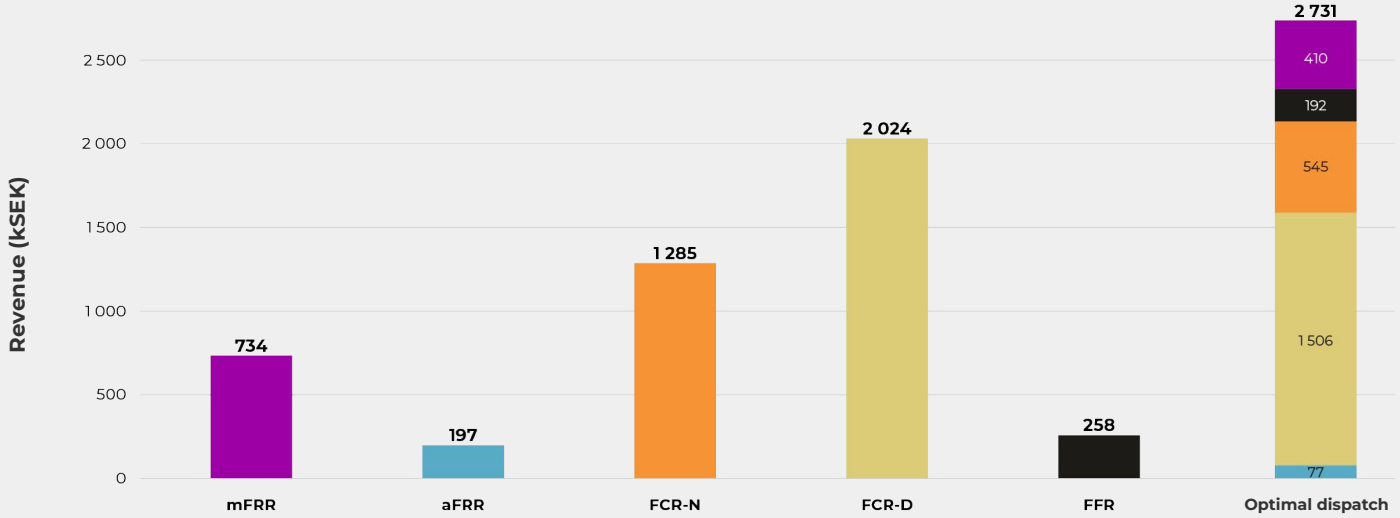

CheckWatt
PV Magazine & GoodWe TECHNOLOGIES

CHECKWATT'S VIRTUAL POWER PLANT

- Integrating inverters and batteries on the one side, integrating with buyers of flexibility on the other.
- Aggregating over 10,000 battery systems, ranging from a couple of kilowatts to tens of megawatts.
- Optimizing the usage of batteries depending on different price signals. The asset owner expects that we maximize their revenue.



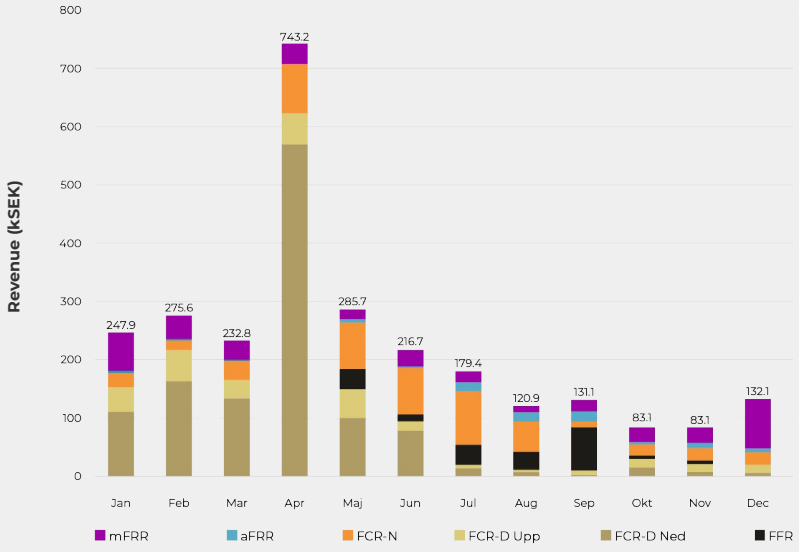
A BOOMING BESS-MARKET IN SWEDEN IN 2024



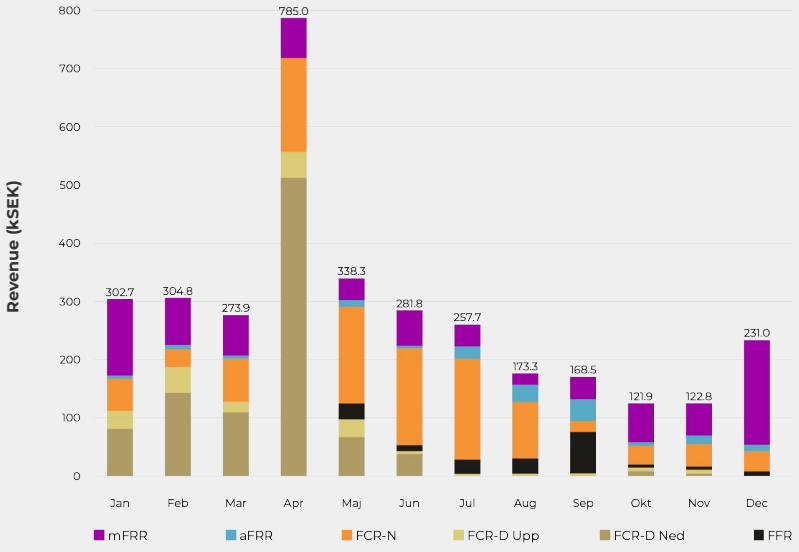
Revenue for specific ancillary services and optimal dispatch for a 1 MW / 1 MWh BESS in Sweden in 2024. 10 SEK ≈ 1 Euro

CheckWatt

OPTIMIZATION IS BECOMING MORE COMPLEX



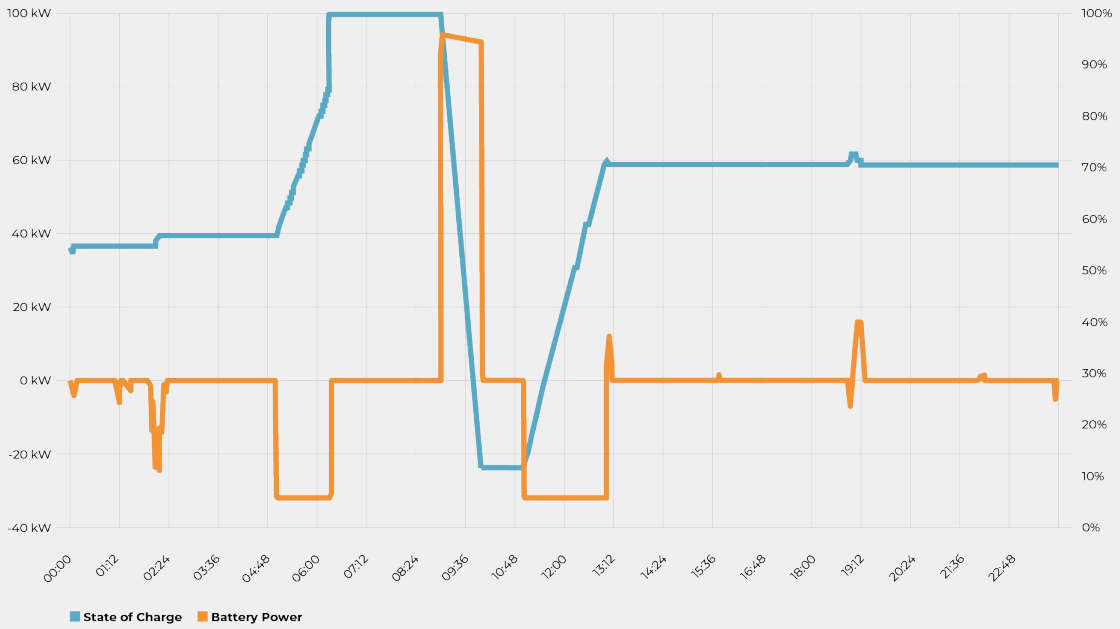
Revenue for an optimal dispatch for a 1 MW / 1 MWh BESS in Sweden in 2024



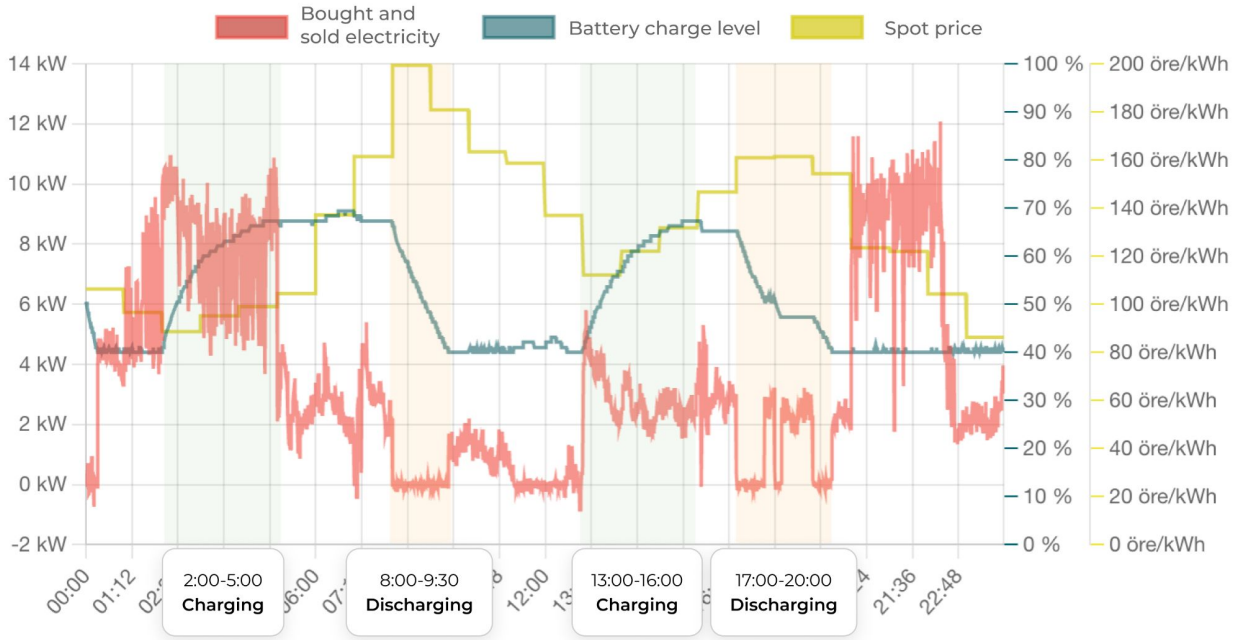
Revenue for an optimal dispatch for a 1 MW / 2 MWh BESS in Sweden in 2024

LOCAL FLEX WITH DSO'S AS PART OF THE OPTIMIZATION

Wednesday	Thursday	Friday
FCR-D	FCR-D	FCR-D
FCR-D	FCR-D	FCR-D
FCR-D	FCR-D	FCR-D
FCR-D	FCR-D	FCR-D
FCR-D	FCR-D	FCR-D
FCR-D	Charge (0.5 LFP)	FCR-D
FCR-D	Charge (0.5 LFP)	FCR-D
FCR-D	Idle	FCR-D
FCR-D	Idle	FCR-D
FCR-D	Discharge (LFP)	FCR-D
FCR-D	Idle	FCR-D
FCR-D	Charge (0.5 LFP)	FCR-D
FCR-D	Charge (0.5 LFP)	FCR-D
FCR-D	FCR-D	FCR-D
FCR-D	FCR-D	FCR-D



CHECKWATT AI & BEHIND-THE-METER SERVICES



THANK YOU FOR THE ATTENTION!

CONTACT ME AT ERIK.WALLNER@CHECKWATT.SE

CheckWatt

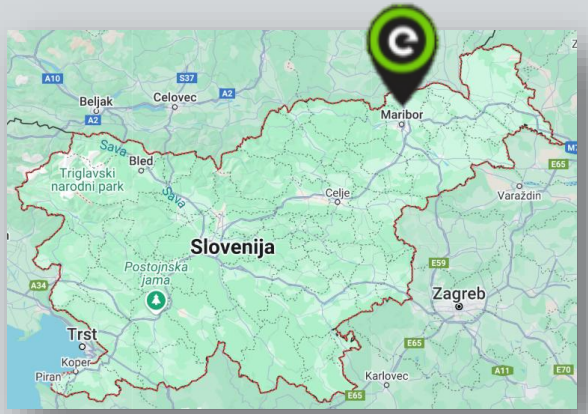
Goodwe Solutions & Energy Management

Tadej Smogavec, PhD
COO & partner

Enertec
think energy

We have been building a sunny future since 2009…

…and inspiring people to use solar energy.



25MW

TOTAL INSTALLED CAPACITYOF OUR SOLAR POWER PLANTS

- Enertec, one of the **leading companies in the renewable energy sector**.
- With our dedicated team of **experts**, we are delivering top-tier solar energy solutions, including PVs, BESS, EV chargers, EMS,…

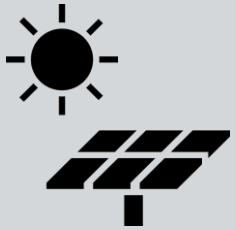
Collaboration with GoodWe

- Over **2 years** of successful partnership
- Chose GoodWe for its **technically advanced and reliable solutions**
- The **largest implementer** of GoodWe systems in Slovenia
- More than **200 battery storage systems** sold and installed
- Successful integration of GoodWe systems with **EMS**

Process

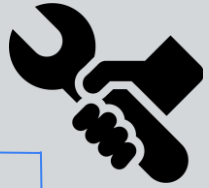
Market demand

Use our in-house simulator to calculate **savings and ROI**



Install **PV systems, BESS, EV chargers, and EMS** (in collaboration with partners)

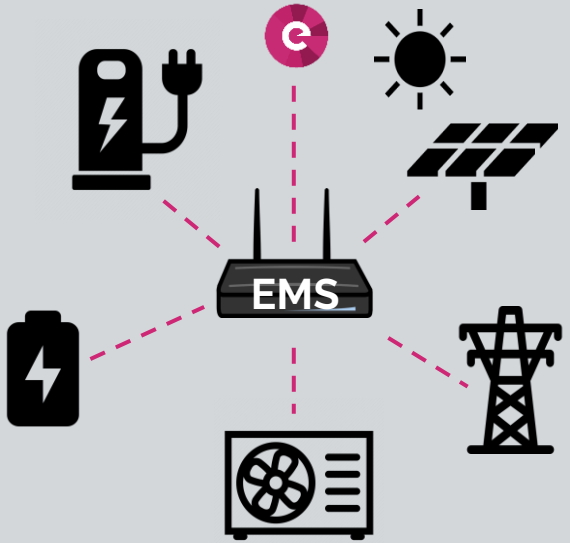
Manage the system via EMS to achieve **optimal performance**



Provide proper **maintenance and long-term reliability**

What does EMS include?

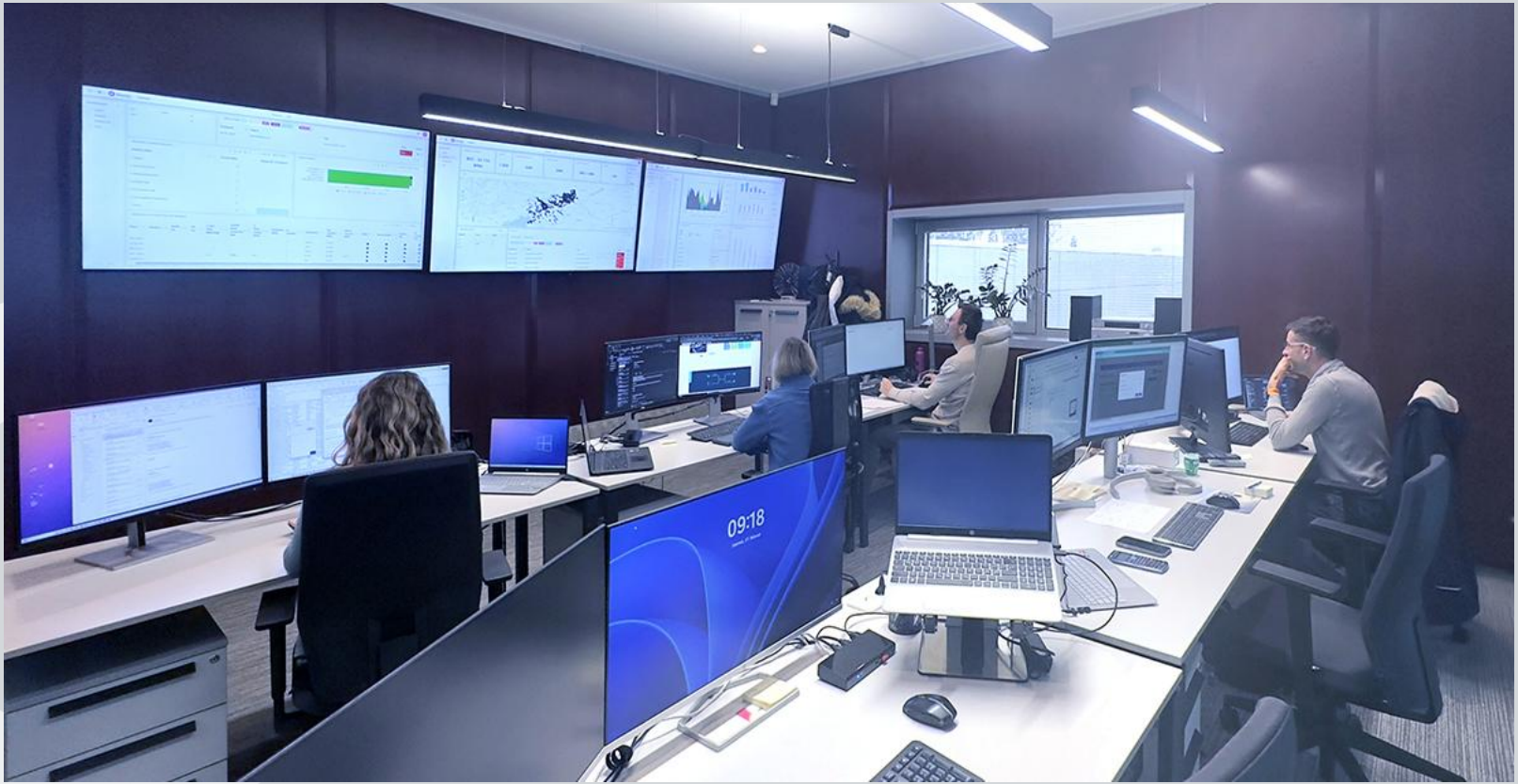
- **Smart Energy Management** – Optimization of electricity production, storage, and consumption
- **Connection of Various Energy Devices** – Integration with photovoltaic systems, batteries, EV chargers, heat pumps, and air conditioning units
- **Real-Time Analytics and Monitoring** – Tracking energy consumption and production
- **Automation for Maximum Savings** – Dynamic adjustment of consumption based on electricity prices and building needs



Effects of EMS on Energy Consumption and Electricity Bill

- **Reduction of Electricity Costs** – Optimization of self-consumption and use of lower tariffs
- **Lower Dependence on the Grid** – Increased self-sufficiency with own energy
- **Avoidance of Peak Loads** – Reduction of demand charges and grid fees
- **Higher Consumption Efficiency** – Smart device management based on real needs
- **Environmental Impact** – Reduced carbon footprint through better use of renewable energy sources

Control room



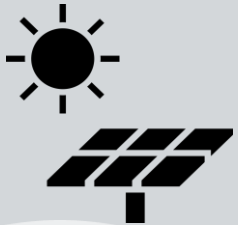
Example 1 – Manufacturing Company

Challenges

- **High Peak Power in the Morning** – A significant surge in consumption at the start of production increases grid fees
- **High Energy Consumption During Expensive Tariff Periods** – The company consumes a large amount of energy during peak tariff times, leading to high costs
- **Low Direct Compensation from the Existing Solar Power Plant** – The produced energy is not utilized optimally.

Example 1 – Manufacturing Company

System Implementation



Existing Solar Power Plant: 481,16 kWp

Battery Storage System >300 kWh (150 kW)

Energy Management System (EMS) for smart control

Example 1 – Manufacturing Company

Sistem optimisation

LOAD - SHIFTING

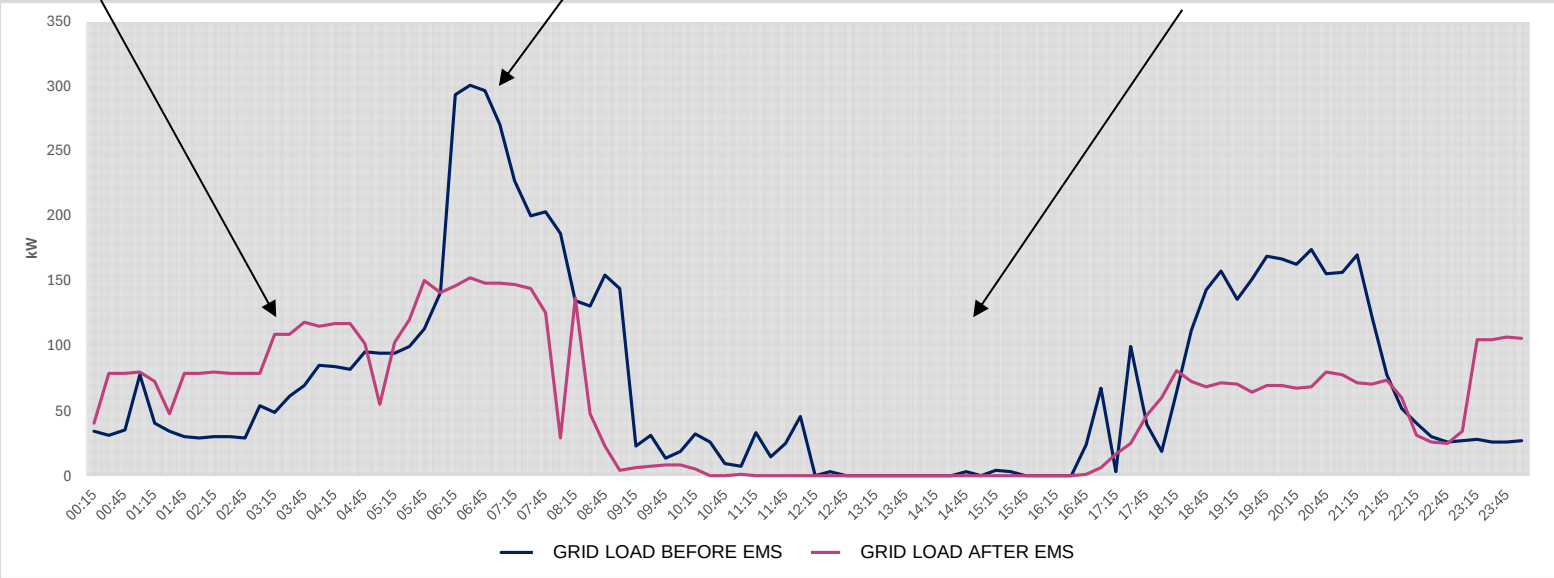
- Shift in Consumption from Peak Tariff to Off-Peak Tariff
- Annual Savings: **3.500 EUR**

PEAK – SHAVING

- Reduction of Billing Power 300 kW -> 250 kW
- Annual Savings: **4.380 EUR**

DIRECT COMPENSATION

- Direct Consumption of Produced Electricity
- Annual Savings: **32.000 EUR**



Example 1 – Manufacturing Company

Business Case

Total Investment: **277,000 EUR**

- Battery Storage System
- EMS

Subsidies Received: **€67,500.00**

- Battery Storage: €225/kWh → €67,500.00

Annual Savings: **€39,880**

- EMS Effect Savings: €7,880
- Electricity Cost Savings: €32,000

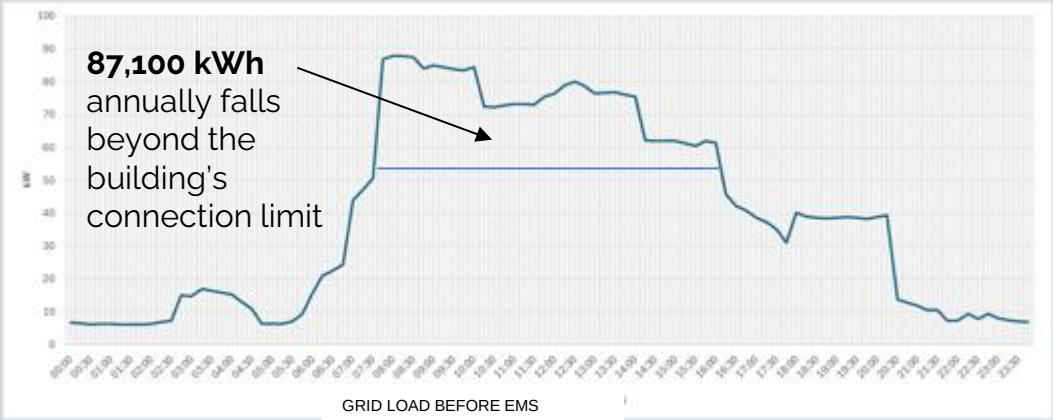
Return on Investment (ROI): ~5.3 years

Example 2 – Commercial Building

Challenges

Required Power of the Building (110 kW) – Due to electricity consumption for heating, cooling, and charging stations for 10 company vehicles

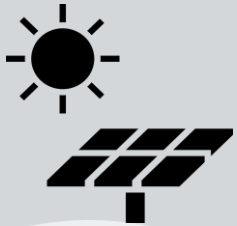
Limited Connection Capacity of the Building (53 kW) – Insufficient to cover all consumers in the building



GRID LOAD BEFORE EMS

Example 2 – Commercial Building

System Implementation



Solar PV Plant: 160.4 kWp

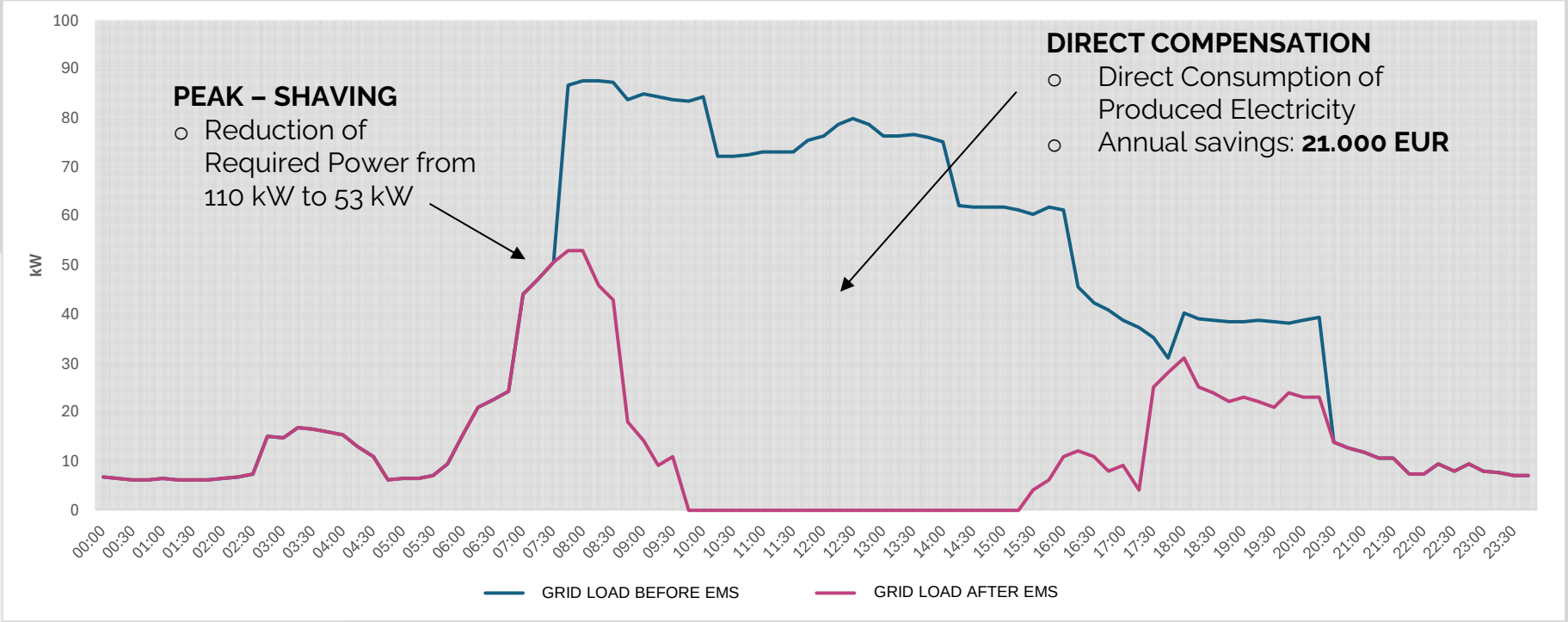
Battery Storage System: 156.67 kWh

Energy Management System (EMS) for smart control

10 EV Chargers (Power: 11 kW each)

Example 2 – Commercial Building

Sistem optimisation



Example 2 – Commercial Building

Business Case

Total Investment: **€230,000**

- Solar Power Plant
- Battery Storage System
- EMS
- EV Chargers

Subsidies Received: **€64,122.75**

- Battery Storage: €225/kWh → €35,250.75
- Solar PV: €180/kWp → €28,872.00

Annual Savings: **€45,000**

- EV Charging Savings: €20,000
- Electricity Cost Savings: €25,000

Return on Investment (ROI): ~3.7 years

Summary

- **Enertec – 16 Years of Renewable Energy Expertise**
  - Providing energy solutions from renewable sources since 2009.
- **Over 2 Years of Intensive Work with BESS & Energy Management**
  - Faced various challenges and successfully solved most of them.
- **Primary Partner: GoodWe**
  - Strong collaboration in battery storage and energy management solutions.
- **In-House Simulation Tool**
  - Developed proprietary software to simulate the effects of batteries with EMS.
- **Own Energy Management System (EMS)**
  - Designed for smart optimization of energy consumption, storage, and distribution.
- **Open to Cooperation**
  - Willing to collaborate with other partners working with GoodWe to enhance energy solutions.

Contact

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COO & partner
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+386 31 779 739

GOODWE

Safely unlocking solar potential on low-load-bearing roofs.

Barbara Terreni

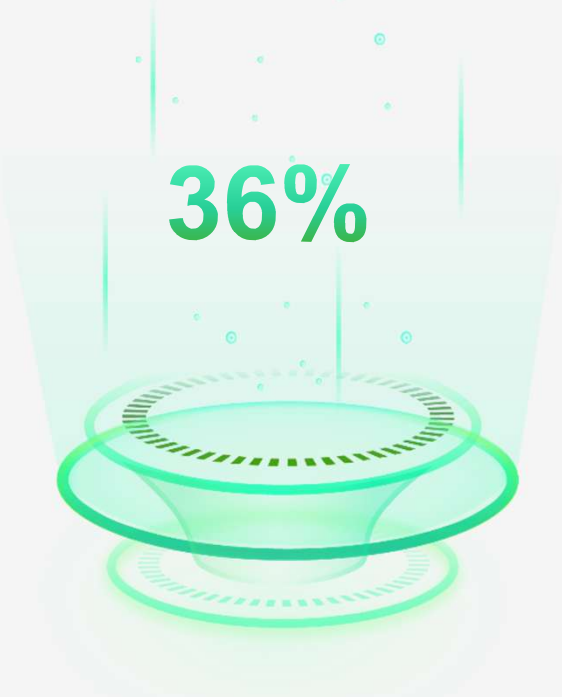
GoodWe Technologies Co., Ltd

BUILDINGS ARE THE SINGLE LARGEST ENERGY CONSUMER IN EUROPE & ARE THE TOP EU PRIORITY

GOODWE
Smart Energy Innovator

131M building stock

40% of EU energy consumption



36% of GEG emissions

Source : European Commission & RICS

LOW-LOAD BEARING FLAT ROOFS ARE AN UNTAPPED OPPORTUNITY

GOODWE
Smart Energy Innovator

50% of EU buildings built since 1970 have flat roofs, often prone to low load-bearing issues, limiting standard PV module installation

Source : EURAC

GALAXY
A MODULE DESIGNED FOR LOW-LOAD BEARING ROOFS

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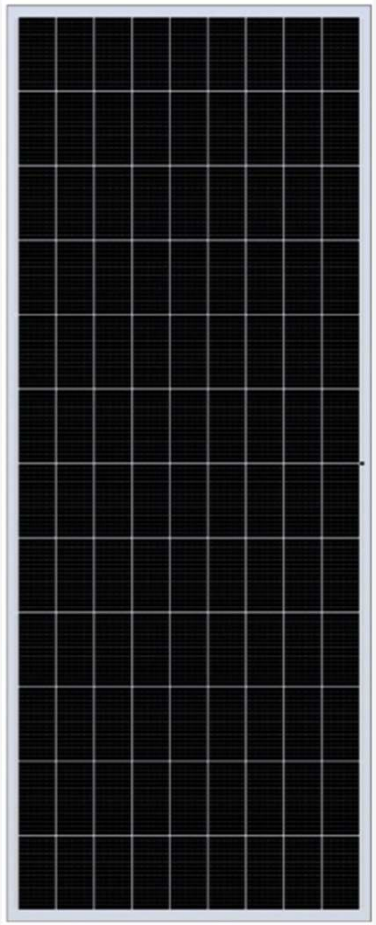

- 5,6 kg/m²
- 1,6 mm front glass

GLASS MAKES A DIFFERENCE: HAIL RESISTANCE

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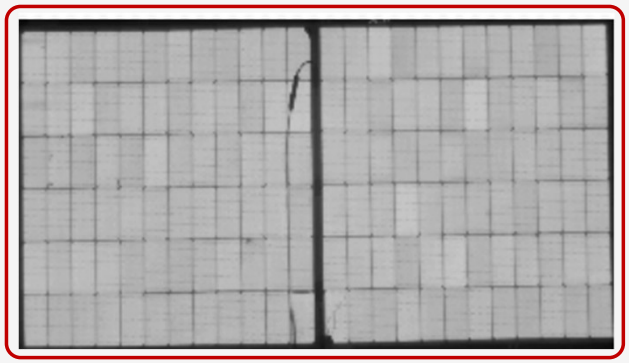
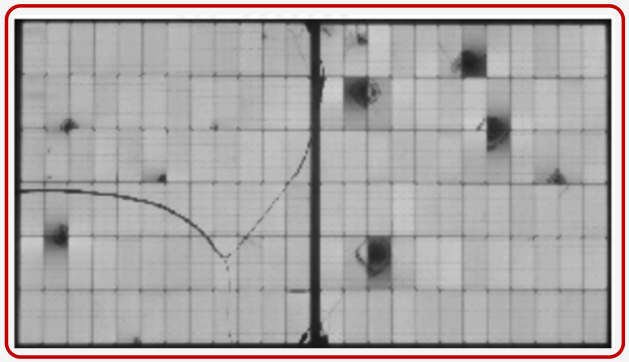
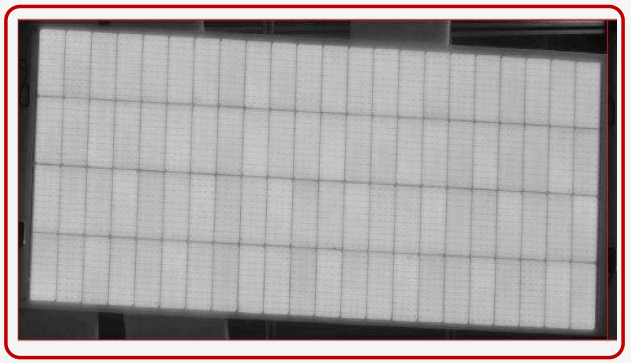
Polymer Front Sheets- Before and After Hailstorm

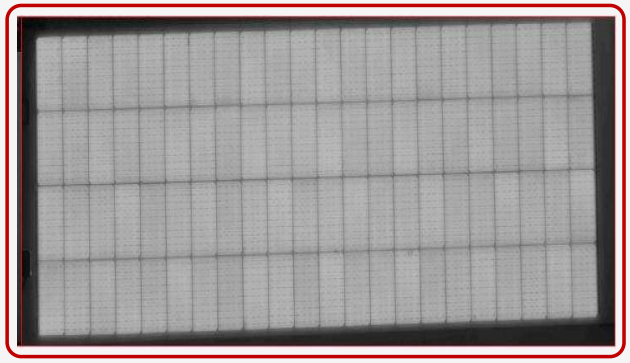




Degradation rate: -1.83%

Galaxy Glass Front Sheets - Before and After Hailstorm





Degradation rate: -0.237%

GLASS MAKES A DIFFERENCE: RIGIDITY & SELF-CLEANING

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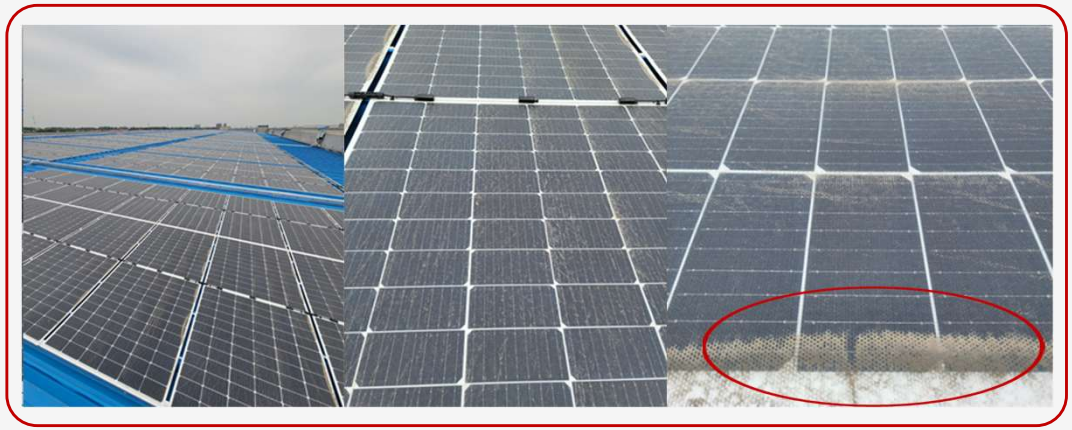
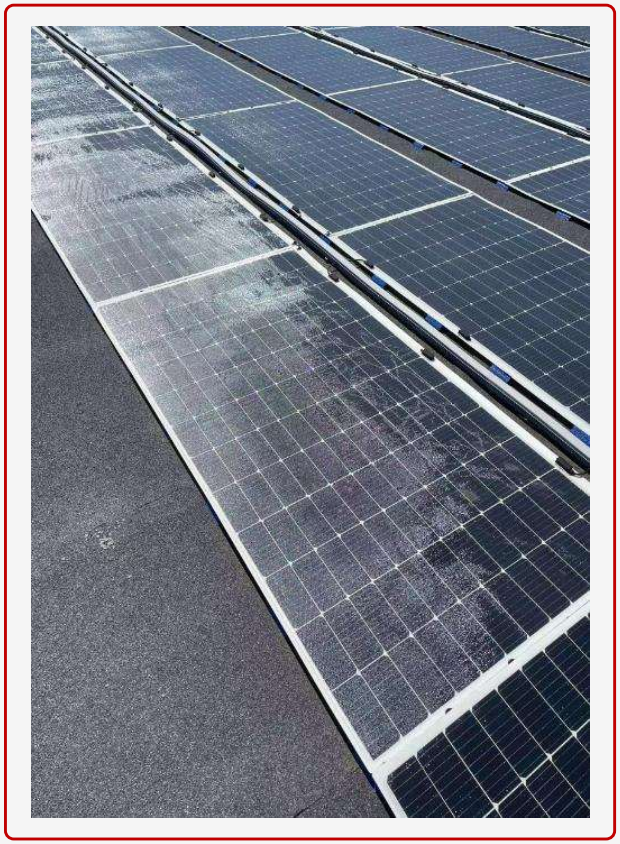


GLASS MAKES A DIFFERENCE: JUNCTION BOX POSITION



- The junction box positioned on top will gradually age under sunlight.
- Additional metal components are needed to cover the junction box, increasing costs.

VERSATILE INSTALLATION POSSIBILITIES THAT ENSURE VENTILATION

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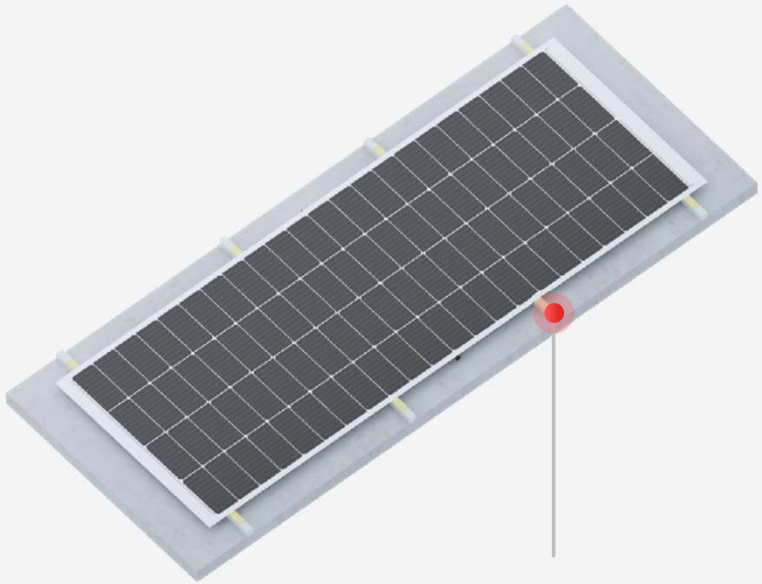
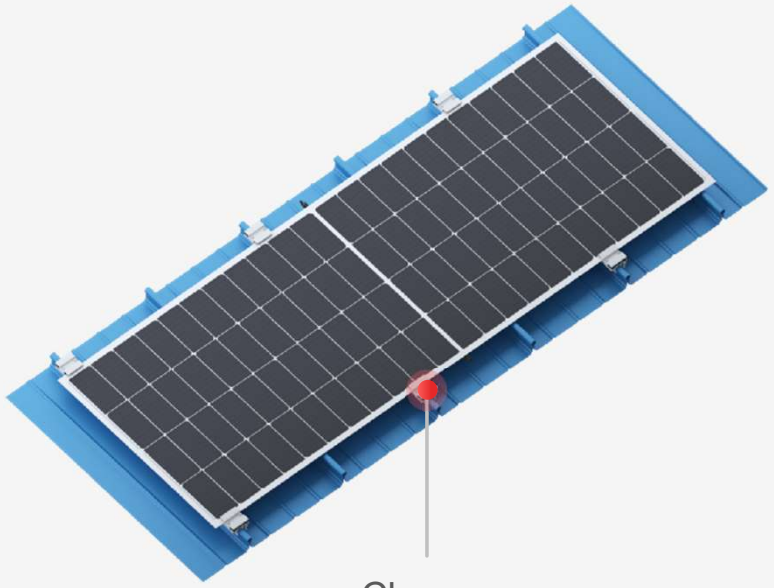
Adhesive Gluing



Heat dissipation pad

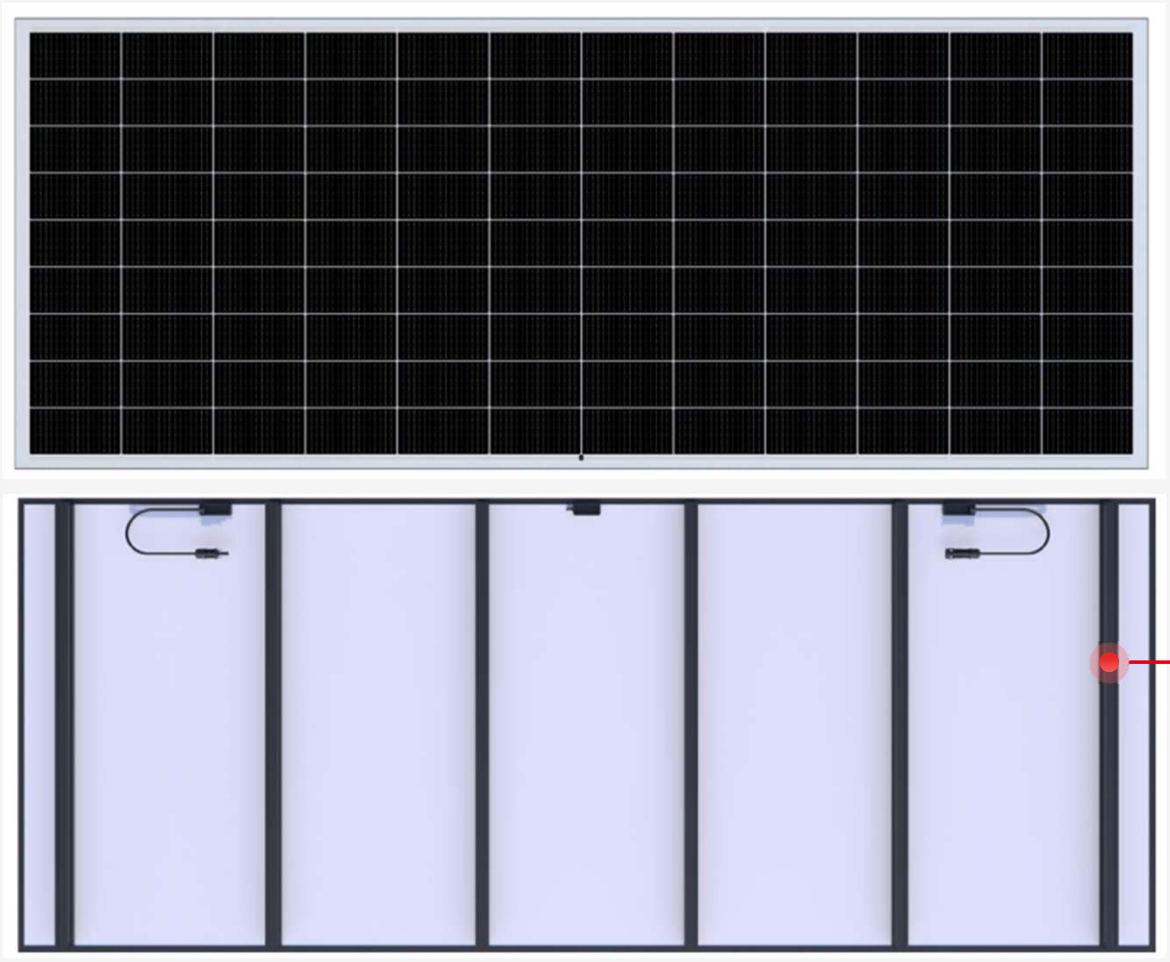
Up to 20°C difference vs gluing directly on the roof

Clamps Fixing



Clamps

GLUING WITH INTEGRATED DISSIPATION PADS



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ALSPEC Case (AUSTRALIA)

ALSPEC CASE (AUSTRALIA) – HOW GALAXY MADE A PREVIOUSLY IMPOSSIBLE 50 KW PV + STORAGE SYSTEM A REALITY

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- An aluminum extruder with rising electricty costs could not go solar due to the factory roof's low load-bearing capacity.

ALSPEC CASE (AUSTRALIA) – HOW GALAXY MADE A PREVIOUSLY IMPOSSIBLE 50 KW PV + STORAGE SYSTEM A REALITY

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- GoodWe provided a reliable answer combining the safety features of their three product lines

Lightweight solar panel
Galaxy Serie – 315 W

x 154

Inverter
ET Plus+ Serie

x 2

Storage
Lynx F Serie

x 2

GOODWE
Smart Energy Innovator

Q&A

Thank You

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18 March 2025

2:00 pm – 3:30 pm | GMT, London

3:00 pm – 4:30 pm | CET, Berlin

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Thursday, 20 March 2025
12:00 pm – 1:00 pm EDT, New York City
5:00 pm – 6:00 pm CET, Berlin

Navigating quality risks for U.S. module buyers: From warehoused modules to new factories

Thursday, 3 April 2025
4:00 pm - 5:00 pm CET, Rome

L’agrivoltaico a portata di schermo

(Webinar in Italian)

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Thank you for joining today!

Mark Hutchins

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Matthew Lynas

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