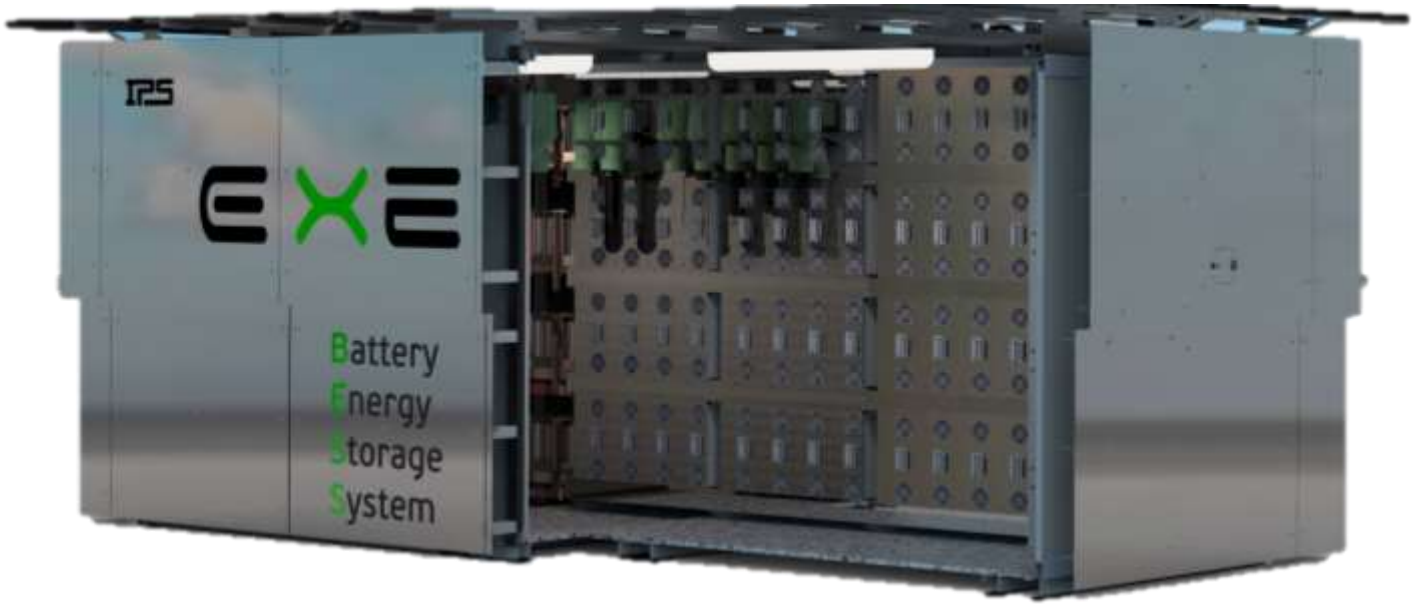

# IPS EXERON X-BESS technology

Incl. EXERON CheckMate battery inverter

LFP battery storage & EMS

# Presentation structure

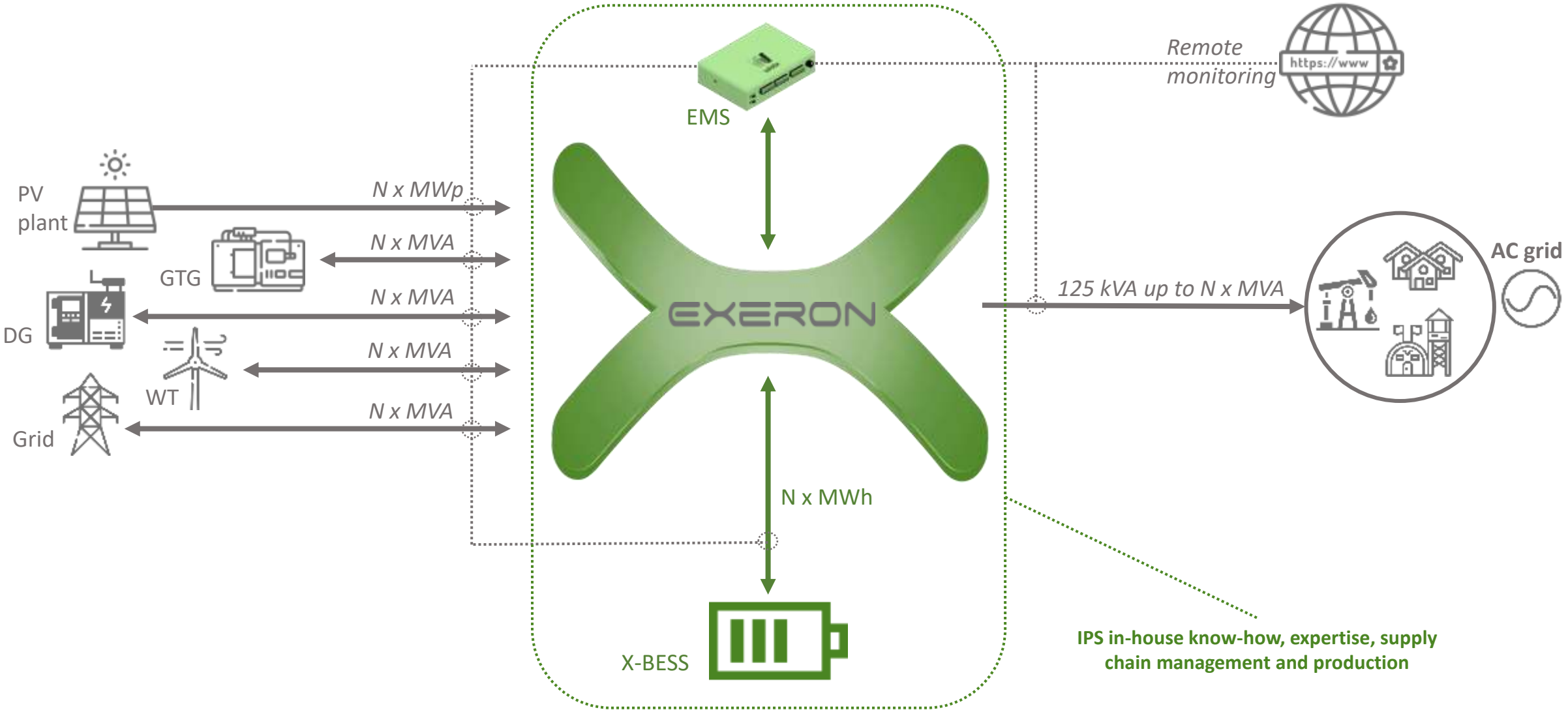
- IPS EXERON technology
- Technical parameters
- About IPS



# IPS'EXERON technology

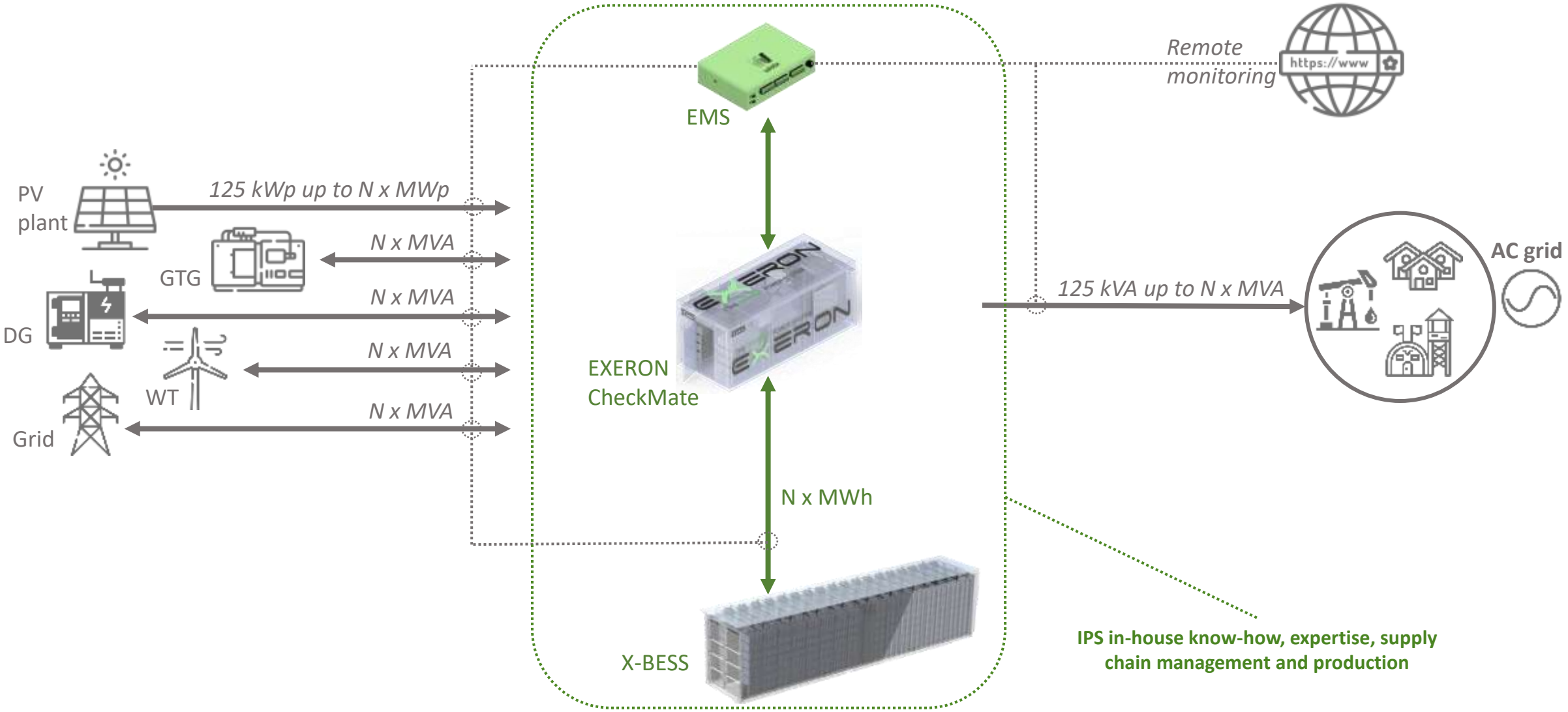
# IPS EXERON X-BESS technology

A unified platform for any grid-tie or grid-forming MW-scale applications

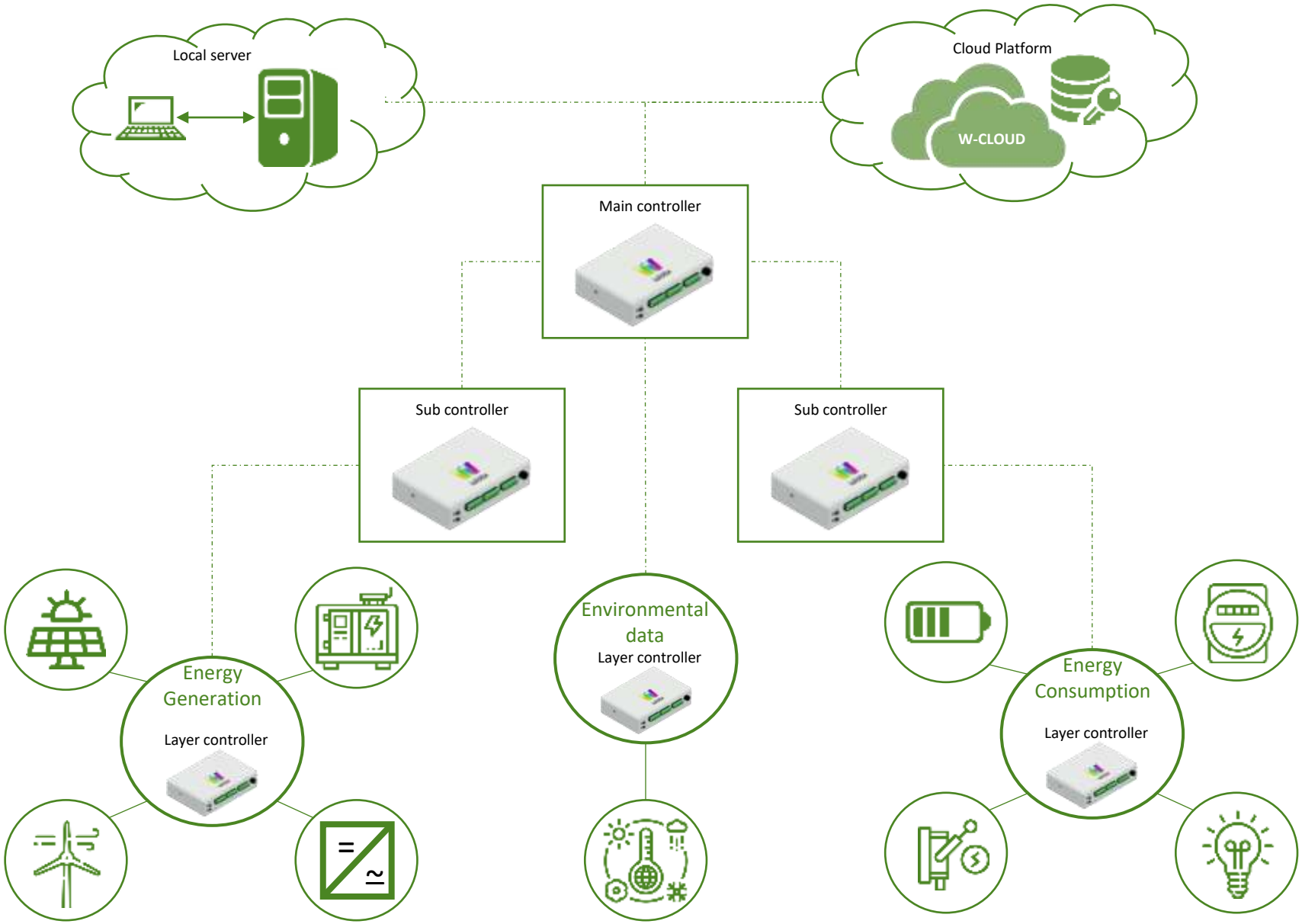


# IPS EXERON X-BESS technology

A unified platform for any grid-tie or grid-forming MW-scale applications



# IPS' EMS architecture

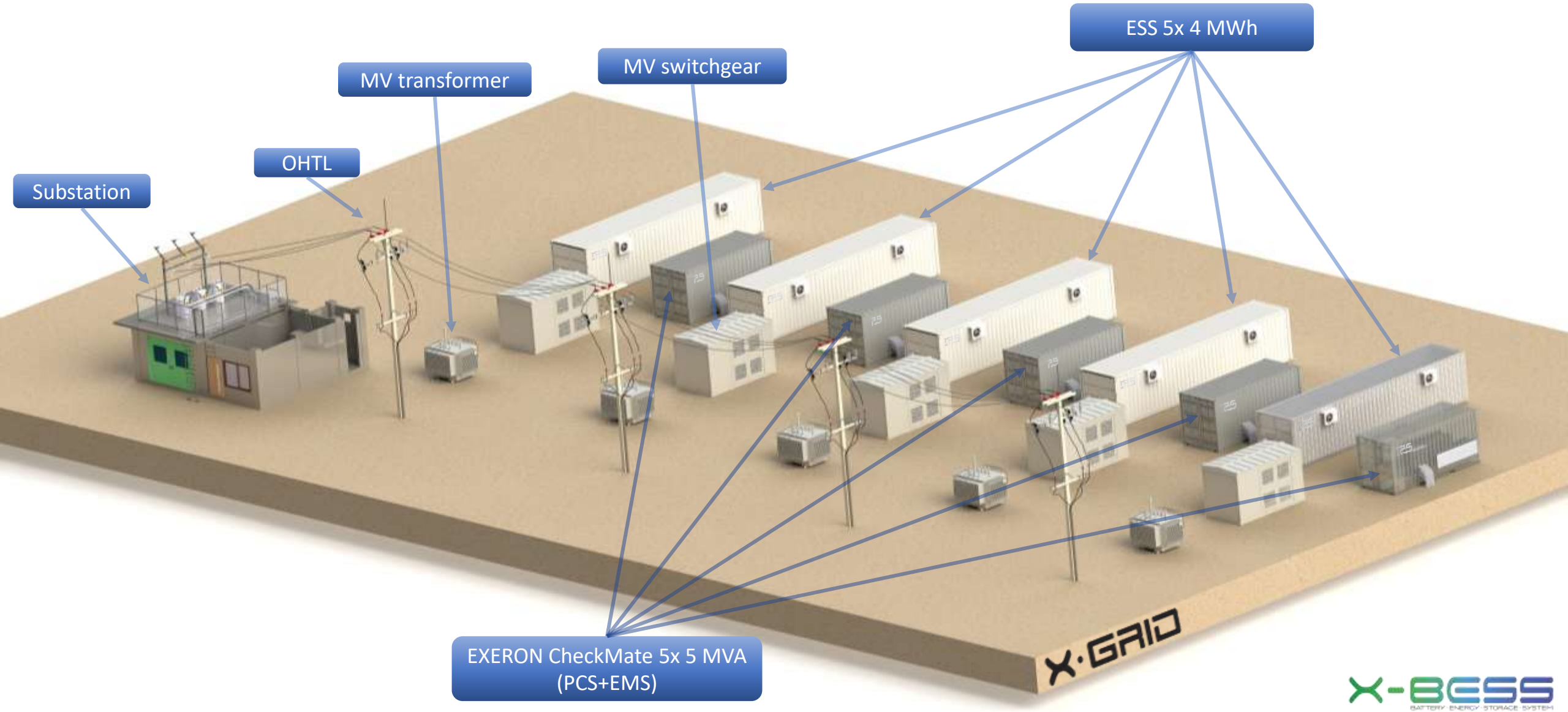


# IPS' EMS platform

- Remote monitoring
- Cybersecurity compliance (EU & US)
- Flexible and customizable
- Integration with trading platforms
- Integration with existing SCADA

# IPS' turn-key X-BESS example design

## Main solution components



EXERON CHECKMATE

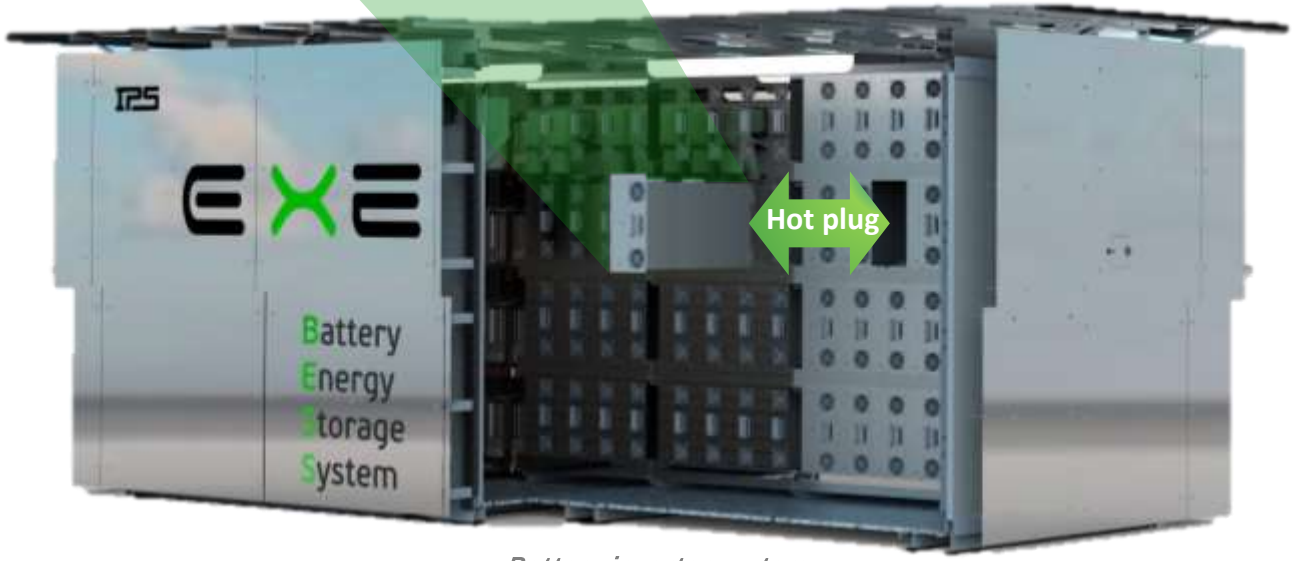
presents

# Unique advantages, patented

- **Unique MW-scale modular design**
  - multiple synchronized modules instead of one large and heavy unit
- **Hot plug battery inverter modules**
  - no wires, no screwdrivers, no special skills needed
- **48x inverter modules for 6 MW**
  - guaranteed high uptime, unmatched availability and O&M advantages
- **Inverter module exchange < 2 min**
  - lightweight, a single person can exchange
- **No system shut down for module exchange**
  - module exchange during system operation, zero downtime!
- **Forced ventilation ONLY**
  - negligible heat dissipation due to very high conversion efficiency ~ 99.7%
- **No A/C cooling**
  - eliminates additional 2-3% energy loss for cooling (for alternative products)
- **Protected servicing environment**
  - Service & maintenance at any time, independent from weather conditions

*Battery inverter module*
*EXERON Mate G*
*125 kW, 1500 VDC*

EXERON CHECKMATE




*Battery inverter system*
*EXERON CheckMate G6000*
*6 MW, 1500 VDC*

X-BESS BATTERY ENERGY STORAGE SYSTEM

# IPS' EXERON CheckMate Battery Inverter

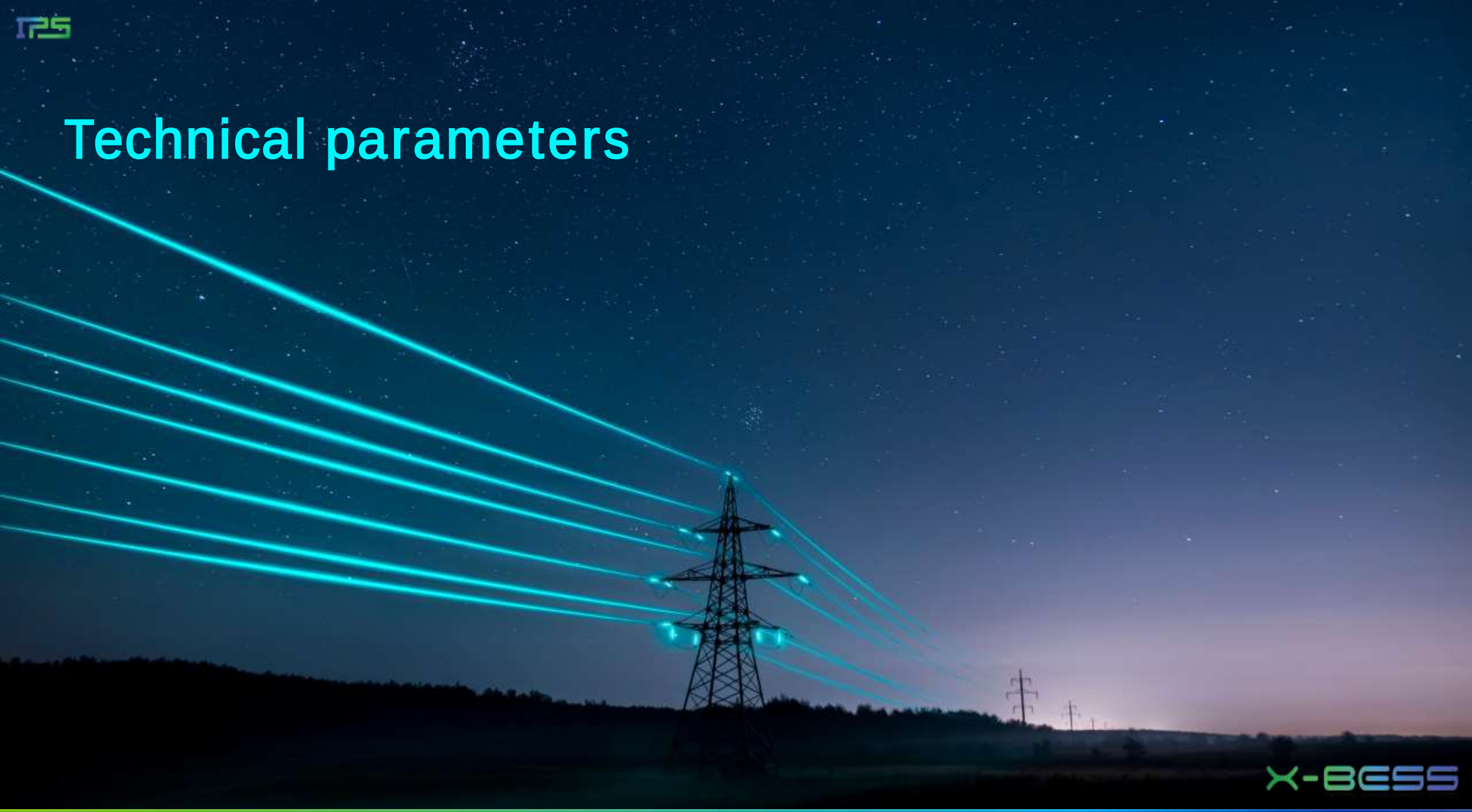
## Competitive advantages

EXERON CHECKMATE

- PCB topology
- Modular structure
- Plug & Play, Hot-plug modules
- No de-rating up to 60°C
- Very high overall system efficiency >99%
- Close to zero maintenance
- Lower costs for engineering, installation, maintenance
- Higher overall savings and system efficiency
- No special engineering skills and tools required
- Unmatched spare parts management
- Applicable in harshest environmental conditions
- Safety first! Environmental protection for equipment and personnel

X-BESS BATTERY ENERGY STORAGE SYSTEM

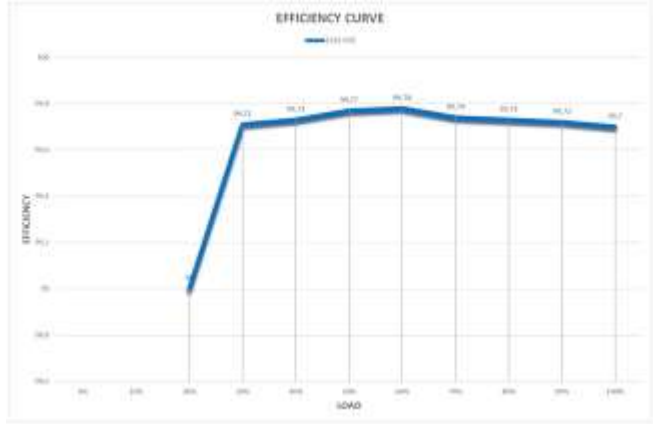
# Technical parameters

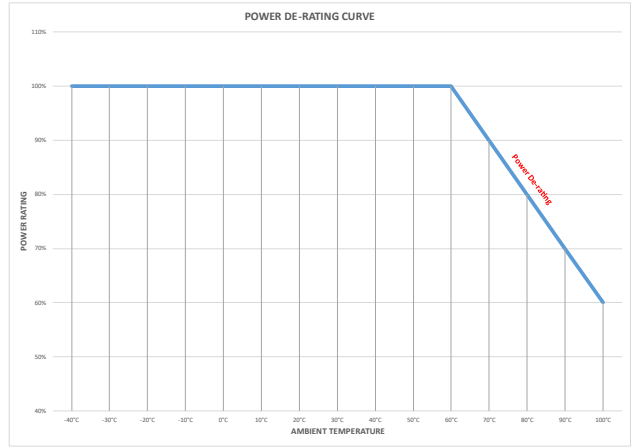


# IPS EXERON CheckMate – technical details


EXERON CHECKMATE

| DC CHARACTERISTICS | CHECKMATE G 1000 | CHECKMATE G 2000 | CHECKMATE G 6000 |
|---|---|---|---|
| Input voltage range | | 1000-1500 VDC | |
| Max. charging current | 800A | 1600 A | 4800 A |
| Charging static voltage stability | | +/- 0.5% | |
| Charging dynamic voltage regulation (10-90%) | | +/- 5% | |
| Response time | | <2 ms | |
| **AC CHARACTERISTICS** | | | |
| Output voltage | | 690 VAC | |
| Frequency | | 50 / 60 Hz | |
| Frequency accuracy | | +/- 0.1 Hz | |
| Maximum output current | 1450 A | 2900 A | 8700 A |
| Maximum output power | 1 MVA | 2 MVA | 6 MVA |
| Power Factor | | 0-1.00 Leading or Lagging | |
| Peak Efficiency | | > 99% | |
| Operation mode | | Bi-directional | |
| THDI | | < 3% | |
| **OTHER** | | | |
| Operating temperature | | -40 - +70 °C | |
| Operating altitude | | < 6000 m a.s.l. | |
| MTTR | | < 120 sec. | |
| Hot Swap technology | | Yes | |
| Load Sharing capability | | Yes | |
| Smart Grid capability | | Yes | |
| Communication | | Modbus RTU/Modbus TCP-IP/CAN/SNMP/RS-232/RS-485 | |
| Local Data storage device | | > 2 000 000 samples/year | |

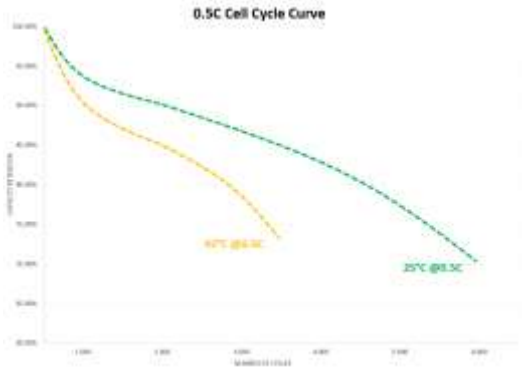


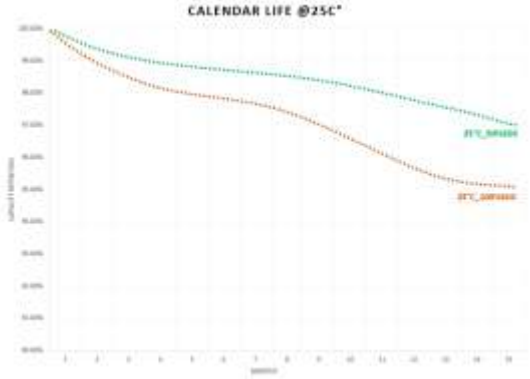



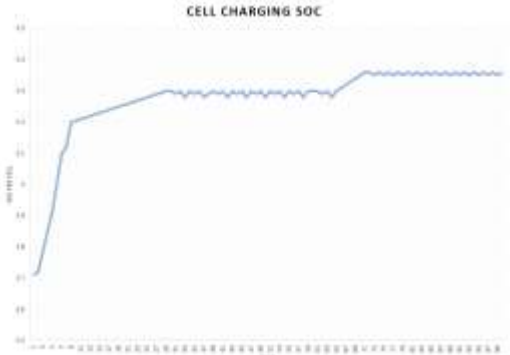

X-BESS BATTERY ENERGY STORAGE SYSTEM

# IPS X-BESS – technical details


| Parameters / Items @ cell level | Value |
|---|---|
| **V voltage @ cell level** | 3.2VDC \| 0.5C, 2.5-3.65VDC |
| **Minimum capacity @ cell level** | 280Ah \| 0.5C, 25± 2°C , 2.5-3.65VDC |
| **Minimum energy @ cell level** | 896Wh \| 0.5C, 25± 2°C , 2.5-3.65VDC |
| **Charging Cut-off Voltage (Umax) @ cell level** | 3.65VDC |
| **Discharging Cut-off Voltage (Umin) @ cell level** | 2.5VDC (>0°C )<br>2.0V (≤ 0°C) |
| **Charging Current @ cell level** | 140A \| 0.5C |
| **Discharging Current @ cell level** | 140A \| 0.5C |
| **Fundamental Parameters** | **Value** |
| **Nominal voltage range** | 3.2VDC/ 48VDC/ 153.6VDC / 720VDC / 1228VDC |
| **Maximum voltage range** | 3.6VDC / 54VDC/ 172.8VDC/ 810VDC/ 1500VDC |
| **25°C ± 2°C @0.5C/0.5C Standard Cell Cycle** | 8000 cycles |
| **Rate Discharge Performance at 25°C** | 0.5C (A) : ≥ 100%<br>1C (A) : ≥ 98% |
| **Charge Retention and Capacity Recovery @ 25°C , 28 days** | Capacity Retention ≥95% / Capacity Recovery ≥97% |
| **Storage @ 25°C, 28 days, 50% SOC** | Capacity Retention ≥ 96% / Capacity Recovery ≥ 98% |
| **Operation Temperature** | Charging Temperature 0-60°C<br>Discharging Temperature –30-60°C |
| **BESS self-consumption >40°C** | 380W per 1MW |
| **Storage Temperature 6 months** | 0°C - 35°C |
| **Storage Temperature 1 months** | -20°C - 45°C |
| **Battery Management System** | |
| **Three-level BMS architecture** | Stack, rack, and pack level |
| **Stack Level** | Collecting cell voltage, temperature and provide balancing management as well as thermal management. |
| **Rack Level** | Collecting rack voltage, current and temperature, calculating SOC/SOH and other states, execute balancing strategy, diagnose battery faults, and local protection. |
| **Pack Level** | Summarizing and displaying all data and fault diagnosis information, performing alarm and protection functions to ensure system safety, along with local storage. |
| **Operating voltage** | Up to 1500VDC |
| **Communication** | CAN, RS-485, Ethernet, MODBUS and other protocols |




X-BESS
BATTERY ENERGY STORAGE SYSTEM

# About IPS

# ABOUT IPS

## Background: 35+ years R&D, Engineering and Manufacturing

- R&D and manufacturing of power technologies since 1989
- Unique and patented technology (US, EU, GCC)
- Highest reliability in extreme conditions, NATO approved

## Track record

- System deployments in 59 countries
- 162+ MW power system capacity installed
- 324 MWh total battery capacity deployed

## IPS capabilities

### R&D & Manufacturing

PCS + BESS
and energy management software

### Turn-key power solutions

Engineering, design, integration
and O&M for specific applications

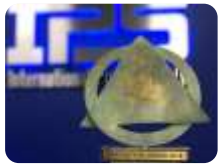
## Recognition

**SpaceX innovation Award**
California, USA

*"Modular power system EXERON for the pod of the Hyperloop competition"*

**ees Award**
Munich, Germany

*"Best innovative off-grid power system EXERON with electrical energy storage"*



**Innovation Award 2019**
Sofia, Bulgaria

*"Most Innovative company in Bulgaria for 2019 – state honorary award given by the President of Bulgaria"*

# IPS' MARKET FOCUS

## Turn-key electrification solutions for 6 key industries

Micro and Smart Grids: decentralized power generation and supply

Oil & Gas: oil, gas and water wells RTU, TETRA, CP, Decarbonization

Utility substations: Balance of System, battery charging, power to critical loads

Defense & Security: radar systems, special equipment, TETRA, camps

Agriculture: water pumps, remote processing plants and facilities

Telecommunications: remote towers, OPEX reduction of DG

# IPS' REFERENCES

## ENERGY

KOZLODUY NPP

أرامكو السعودية
saudi aramco

SIEMENS

ABB

enel

ديوا
dewa

kostt

EVN

LUKOIL

Eskom

BULGARGAZ

THALES

ЈАВНО ПРЕДУЗЕЋЕ
ЕЛЕКТРОМРЕЖА СРБИЈЕ

AES

## TELECOM

TELEKOM AUSTRIA GROUP

Deutsche Telekom

ERICSSON

telelink

Safaricom

Nokia Siemens Networks

VIVACOM

Telekom Srbija

telenor

e.co

bynet

Indra

NATO OTAN

EADS
European Aeronautic Defence and Space Company

## DEFENSE & SECURITY

NATO OTAN

NIGERIAN AIR FORCE


EXERON
EXERON – a US patented technology by IPS
www.exeron.com