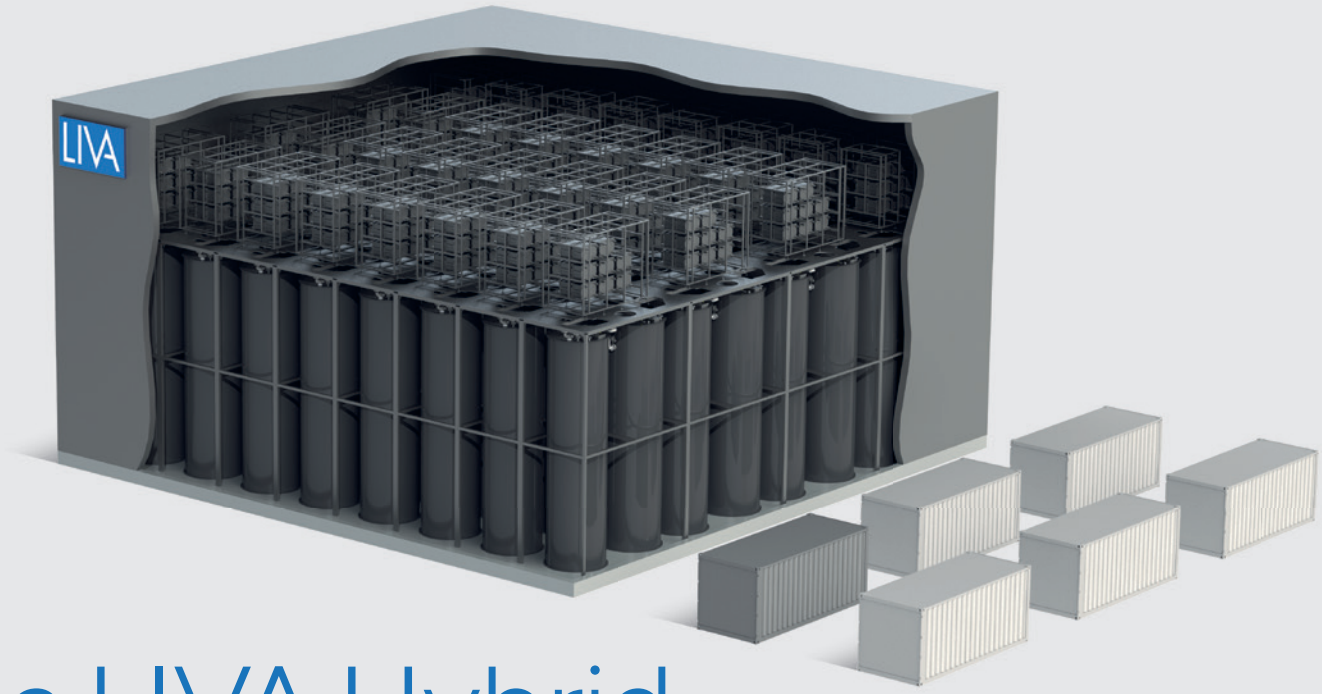


The LIVA Hybrid Energy Storage System

The LIVA Hybrid ESS optimizes industrial use of energy: Whether peak shaving, frequency containment reserve, load & energy shifting, renewable energy integration, charging station optimization or power-to-X solutions. We make the electricity and energy supply for companies secure, sustainable and efficient. The storage capacity of the Hybrid ESS can be scaled as required.

Three components effectively combined

Software solution with artificial intelligence (AI) for analysis and control

Lithium-ion battery as a high-performance storage unit

Vanadium redox flow battery as a mass energy storage unit

The system enables the economic integration of sector coupling strategies with renewable energies through to the production and utilization of green hydrogen.

Designed to meet industrial requirements

- Integration of all energy assets on site
- 20–40 % less energy costs
- Individual and scalable design
- Combination of multiple use cases
- Intelligent control by p7 software
- Increased reliability and 25+ years lifetime
- Closed life cycle for vanadium redox flow batteries

More about our products and services

LIVA POWER MANAGEMENT SYSTEMS

LIVA Hybrid ESS Specification

Vanadium Redox Flow Battery (VRFB)

Components
16 Flow Battery Modules, Central Battery Management System

Performance [1]	Flow Battery Module	String [2]
Discharge Duration	4–10 hours	
Rated Power, AC	128 kW	2 MW
Energy Capacity	Up to 1.28 MWh	Up to 20.2 MWh
Cycle Life	unlimited	
Communication	Controlled by LIVA's p7 software	

Lithium-Ion Battery (LIB)

Components
10 Containerized Lithium Iron Phosphate Battery Modules, Battery Management System

Performance	LIB Module
Discharge Duration	2 hours
Rated Power, AC	2,037 kW
Energy Capacity	4,074 kWh
Cycle Life	10,000
Communication	Controlled by LIVA's p7 software

LIVA Hybrid Energy Storage System operational at Hauzenberg, Germany

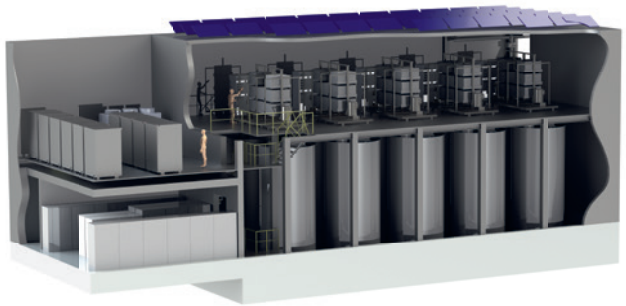
Hybrid ESS

Components
A Hybrid ESS consists of at least one Flow Battery Module and one LIB Module.

Operating Capabilities	
RTE AC [3]	76%–90%
Design Lifetime	25+ years
Communication	Controlled by LIVA's p7 software
Auxiliary Supply	3 Phase, 400 V
Grid Connection [4]	Medium voltage via transformer

Certifications and Standards [5]	
Certifications	CE, UL 1973, UL 9540A, Sub Assembly under UL 9540
Standards	NFPA 855, IEC 62619, IEC 62933-5-2 EN 62321, IEC 62932

Footprint	
Standardized Flow Module	3 m x 6.7 m
Exemplary Hybrid ESS Layout	29.7 m x 10.3 m
Energy specific Footprint	29.1 m²/MWh



Example of LIVA Hybrid Energy Storage System: 10.5 MWh, 2.7 MW, combining five Flow Battery Modules and one LIB Module

Environmental
LIVA's building concept is adjustable to environmental impacts, e.g. high ambient temperatures.

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1 Performance values are for operation with electrolyte at 35° C. Contact LIVA for more information.

2 Exemplary Full String specifications. String design can be adjusted to customer needs based on one Flow Battery Module as smallest unit, and due to modular hard- and software components.

3 RTE AC is valid for a Hybrid ESS containing at least one VRFB String and depends on the operating mode.

4 Project specific, different voltage levels possible. Contact LIVA for more information.

5 Only the core list of codes and compliance for HESS sub-components is provided. Contact LIVA for the compliance status of codes not referenced.

Contact

LIVA POWER MANAGEMENT SYSTEMS