# A cooperative initiative for innovative and intelligent energy management solutions

Research, development, and production, as well as optimization and trade, go hand in hand

Fraunhofer IPA

The Fraunhofer Gesellschaft is the largest organization for applied research in Europe.

Virtual Fort Knox

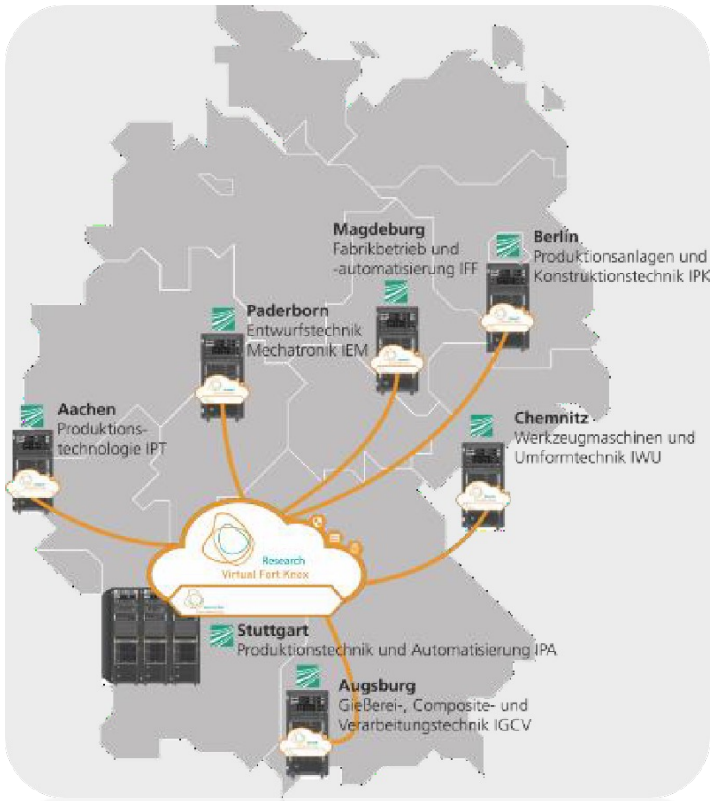
The VFK AG leverages Fraunhofer's innovative technologies and brings economic success to the industry.

NET CONSULT

The partner for international trade with solutions for renewable energies.

Fraunhofer IPA

# The Fraunhofer Gesellschaft is the largest organization for applied research in Europe


## The mission:

PRODUCING means application-oriented research, industrial implementation, systemic renewal of value creation, long-term partnerships, developing solutions with customers, entrepreneurial and results-oriented actions. FUTURE for people in Germany and Europe through sovereign industrial value creation systems, technology-based sustainability, continuous integration of new technologies, and innovation in automation.

## The benefit:

The Fraunhofer Gesellschaft can act as a general contractor in large projects and, if necessary, provide suitable project managers for the coordination and control of project implementation.

# VIRTUAL FORT KNOX

## The innovative tool for intelligent energy management solutions


Simple. Faster. Digital.

**The goal: Increase energy yield by up to 20%, despite fluctuations in energy supply**

Hydrogen storage and energy storage cannot optimally compensate the energy fluctuations on the producer side today to continuously maintain the production of H2 or electricity from H2. The systems must be shut down, interrupting the production of H2 or electricity. Battery storage has limitations in charging currents, and oversizing batteries is very costly.

**With VFK technology, the aggregates are optimally tuned and quickly started and stopped. This is done through AI forecasts at the optimal time.**

An example: According to an electrolyzer manufacturer, the electrolyzer requires > 45 min. for the startup process to reach 100% H2 production. The result after optimization: max. 2-3 min. to 100% H2 production.

# The partner for international trade with renewable energy solutions

**The goal: Promote the use and utilization of solutions for renewable energies and achieve the highest possible share of European value creation.**

Together with the partners of the cooperative initiative, new, innovative solutions in the renewable energy sector are sought, found, verified, and commercially optimized for customers.

**The mission: Medium-term participation in production facilities in Europe or their establishment.**

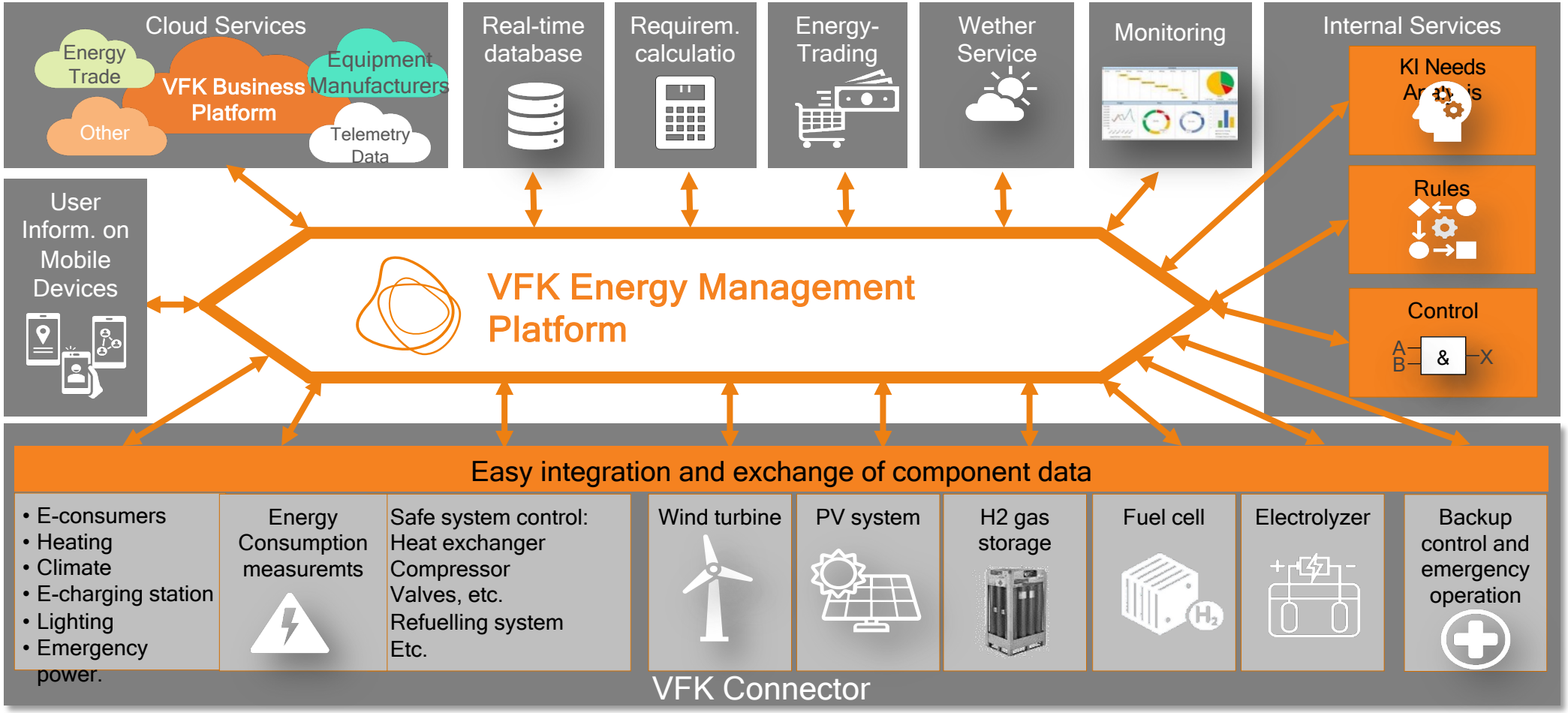
Whether these are productions for battery or hydrogen storage, the use of used car batteries in battery containers, the production of CO2-reducing plants, concepts for hydrogen distribution, etc., such as feeding heating networks or water treatment. Together with the partners of the cooperative initiative, innovative research, development, and production will be ensured while continuously increasing European value creation.

**The benefit: Net-Consult GmbH can act as a commercial general contractor and, if necessary, provide suitable project managers for the coordination and control of project implementation.**

Further options can be discussed and added at any time with all partners of the cooperative initiative.

# Intelligent Energy Management

Flexible Digital Twin concept with AI-optimized operation and energy trading innovative and scalable energy solutions.

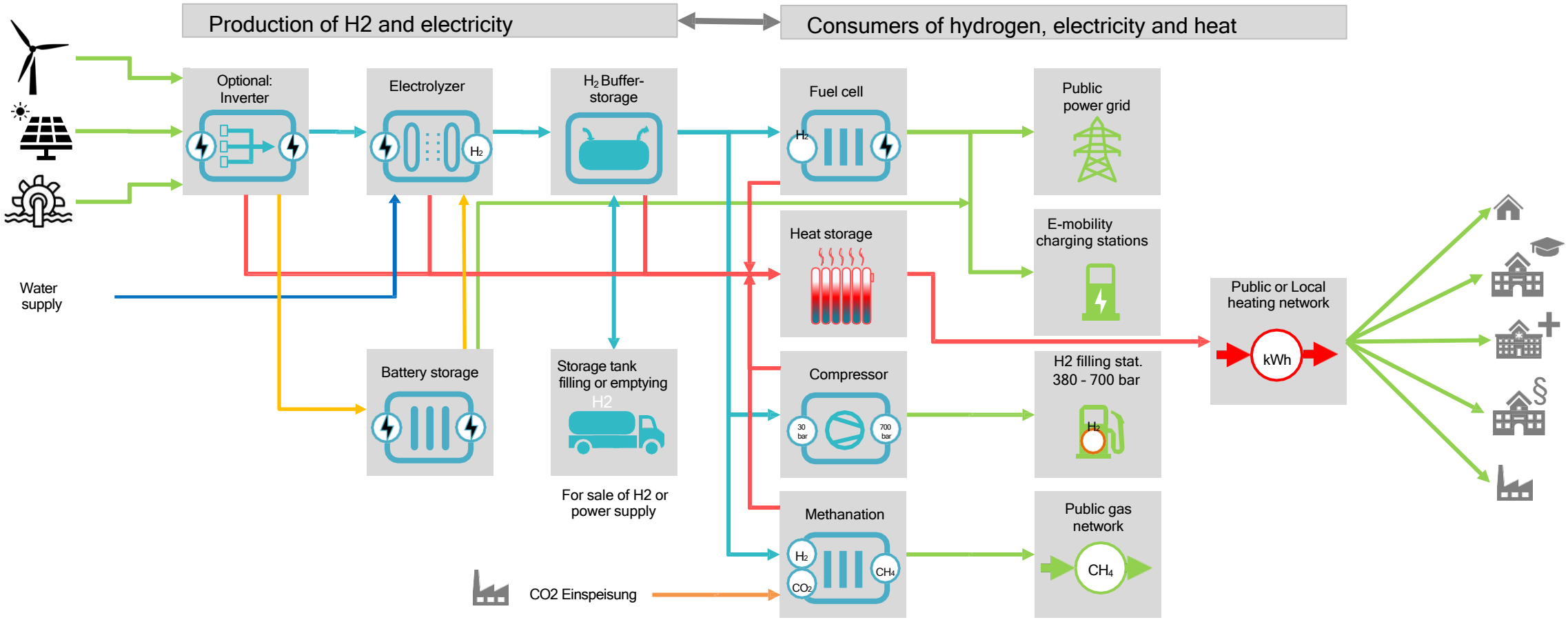



Offers can be made for all system modules, individually or in combination, and can be scaled up as needed.

# Innovative and scalable energy solutions

VIRTUAL FORT KNOX

## Virtual Fort Knox - Energy Management Platform




Offers can be made for all system modules, individually or in combination, and can be scaled up as needed.

# Energy fluctuations vs. optimal yield

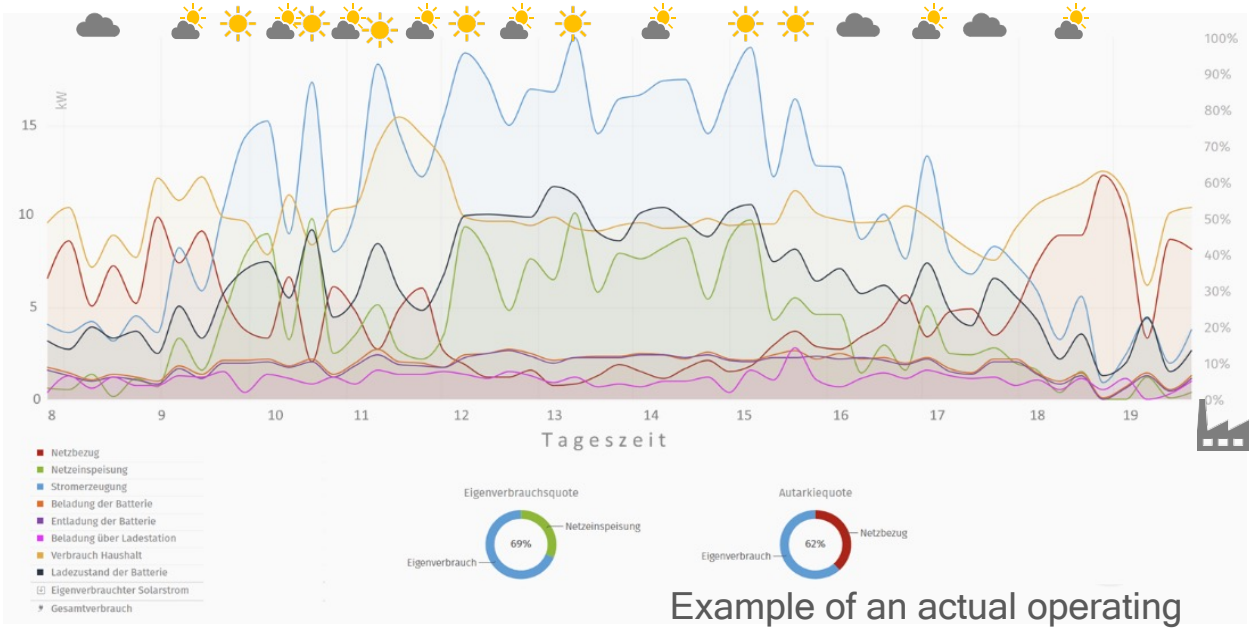
## Our goal: Increase energy yield by more than 20% despite fluctuations in energy supply.

Hydrogen storage and energy storage systems cannot optimally compensate for energy fluctuations on the producer side today, making it difficult to continuously maintain the production of H2 or electricity from H2. The systems need to be shut down, which interrupts the production of H2 or electricity.
Battery storage systems have limitations in charging currents, and oversizing the batteries is very costly.

**With our technology, the units are optimally tuned and quickly ramped up and down. This is achieved through AI forecasts at an optimal time.**

An example:
According to a manufacturer, their product requires more than 45 minutes to reach maximum H2 production during the startup process. The results after our optimization: Maximum 2-3 minutes to reach maximum H2 production, without affecting the durability of the product or H2 quality.

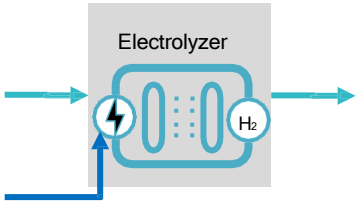
This is only possible if the AI-based VFK energy management can control all units in real-time.




Example of an actual operating plant

# Innovative Energy – a detailed solution example

## Electrolyser – conversion of the generated energy into green hydrogen





A technologically leading and scalable technology is used for electrolysis

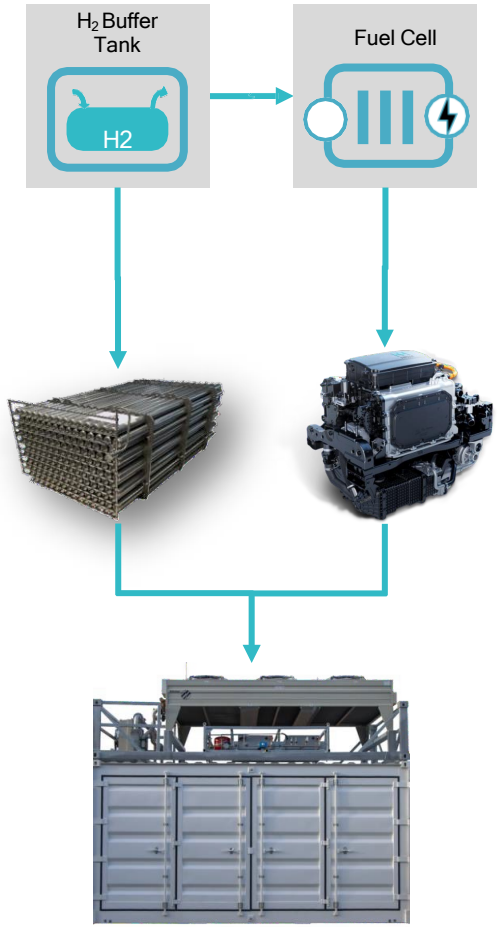
The AEM Nexus combines multiple AEM electrolysis stacks

- Scalable as required
- High efficiency in H2 generation
- Optimal reliability
- Flexible responsiveness even with fluctuating load
- User-friendly maintenance without interruption of operation
- Higher reliability compared to other solutions
- Easy to maintain due to the modular design
- Hydrogen with a purity of 99.999%

- 1 MW AEM Elektrolyseur: bis 210 Nm3/h H2 (ca. 450 kg per day)
- 500 kW AEM Elektrolyseur: bis 105 Nm3/h H2 (ca. 225 kg per day)

# Innovative Energy – a detailed solution example

## DASH Power Systems – Store electrical energy wherever it is needed!

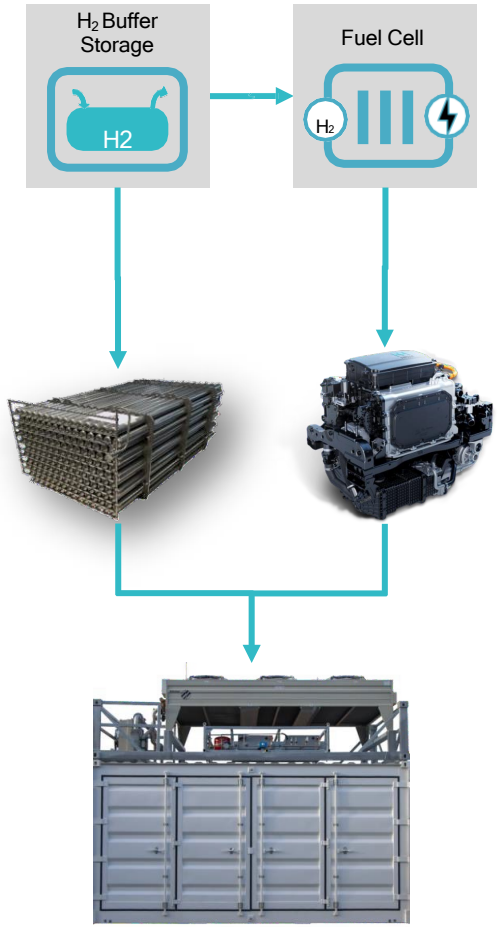



- DASH Power Systems are containerized systems that combine solid-state hydrogen storage, fuel cell systems, and auxiliary components.
- They can be charged with hydrogen from any source
- They supply H2 or electrical energy for every application as needed
- Durability and cycle stability. The technology is extremely cycle-resistant, as the storage technology is based on a completely reversible process. The entire specified capacity can be used indefinitely.
- Electrical energy storage up to 4.5 MWh of usable electrical energy on the very small footprint of a 20-foot ISO container (14.9 m²)
- They deliver up to 500 kW of electrical power
- Security without compromise – by design. The integrated safety system results in excellent safety features that allow installation in almost any environment.
- DASH Power opens up many possibilities:
  - More efficient and cost-effective power generation
  - Improved network management
  - Decentralized storage of large amounts of electrical energy at any location
  - DASH Power enables the lowest average storage costs of any distributed technology

# Innovative Energy – a detailed solution example

VIRTUAL FORT KNOX

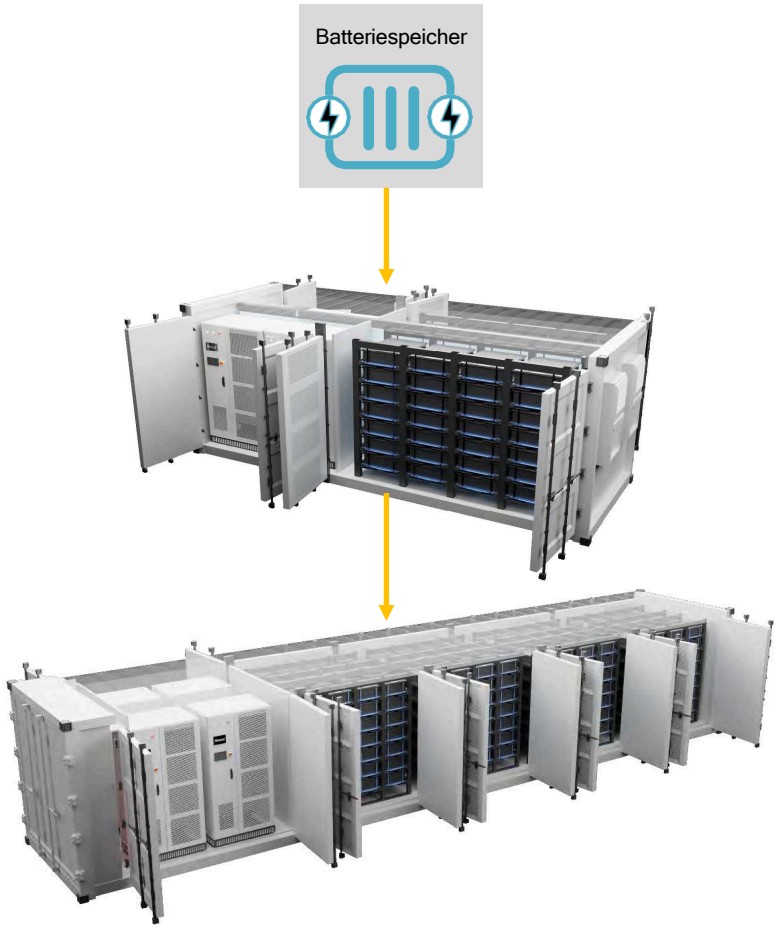
## DASH Power Systems – Optimal combination of hydrogen storage and fuel cells




| Specification | |
|---|---|
| Storage capacity | 0,9 bis 4,5 MWh |
| Rated power | 175 - 500 kW |
| Electrical interface | 3-phasig 400 V 50/60 Hz |
| Hydrogen supply pressure | 30 - 45 bar(g) |
| Purity of hydrogen supply | 4,5 (> 99,995 %) |
| Communication Interface | TCP/IP OPC UA and hardwired |
| External cooling requirements | None |
| Container | 20ft-ISO Hi-Cube, C5-Color, equipped with doors, fans, Ventilation, light, gas sensors, dry coolers, etc. |
| Place | 14,8 m² (20 Foot ISO-Container) |
| Weight | < 29,25 t |
| Ambient temperature | -5 - +38 °C |
| Expected Lifetime | > 20 Years |

# Innovative Energy – a detailed solution example

## Battery storage containers – cheap storage of electrical energy!




- Battery storage systems are containerized systems that combine different battery systems (LFP/NCM/NAM, etc.) and auxiliary components.
- They can be charged with electricity from any source
- They supply electrical energy for every application according to demand
- Durability and cycle stability
- Electrical energy storage from 0.5 MWh to 2 MWh and more, scalable and usable electrical energy on the footprint of a 20-foot or 40-foot ISO container
- They deliver up to 500 kW of electrical power
- Integrated safety systems lead to excellent safety properties
- Battery storage systems open up many possibilities:
  - Efficient and cost-effective electricity storage
  - Improved network management
  - Decentralized storage of large amounts of electrical energy at any location

## Virtual Fort Knox – Energy Management Platform


- All system modules shown are scalable as required and can be expanded with additional functionalities at any time.
- All offers or solutions depend on the specifications, regulations, energy network operators and/or requirements of the customer's energy consumers.
- The desired solution will be worked out after clarifying the circumstances.

# Contact

Benefit from the enormous innovative strength of the Fraunhofer Gesellschaft, the Virtual Fort Knox AG and the Net-Consult GmbH.

A UNIQUE COMBINATION!

Net-Consult GmbH

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