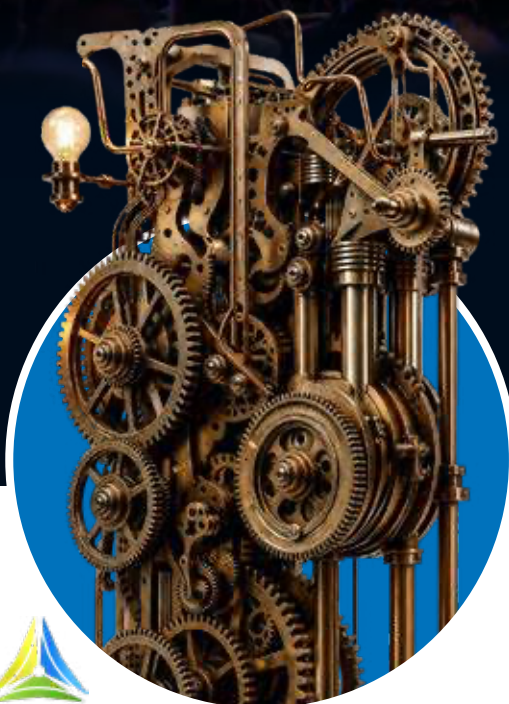




SECTOR COUPLING

The Key to a Successful Energy Transition in Switzerland



In collaboration with:



Kanton Bern
Canton de Berne



Triewald DMES – Decentralised Multi-Energy Systems as Infrastructure for Sector Coupling and Long-Term Storage

Marc Meyer, Gregor Zust

eRevo AG



THE PROJECT

The energy transition has an unresolved core problem. In summer, photovoltaic systems produce more electricity than can be used locally. Surpluses are curtailed, given away, or sold at negative prices. In winter – when heat demand, electric mobility, and industrial loads peak simultaneously – capacity falls short, while grid connection capacity in urban areas is already under strain. What is missing is not primarily more generation, but infrastructure that stores energy across days, weeks, and entire seasons and returns it precisely when needed.

This is the problem eRevo AG addresses with the decentralised multi-energy system (DMES) called Triewald. Buildings, industrial sites, and districts are no longer treated as passive consumers, but as active energy infrastructure that generates, stores, and thermally uses electricity while interacting intelligently with the wider grid. Triewald integrates photovoltaics, short-term storage, electrolysis, metal hydride-based hydrogen storage, a fuel cell, heat recovery, and digital control into a local energy hub. Hydrogen is produced on-site from renewable electricity, stored, and converted back into electricity and heat on demand – without any external supply chain.



The technological core is a solid-state metal hydride storage system. Hydrogen is not stored as high-pressure gas but chemically bound within a metal lattice. This fundamentally changes the

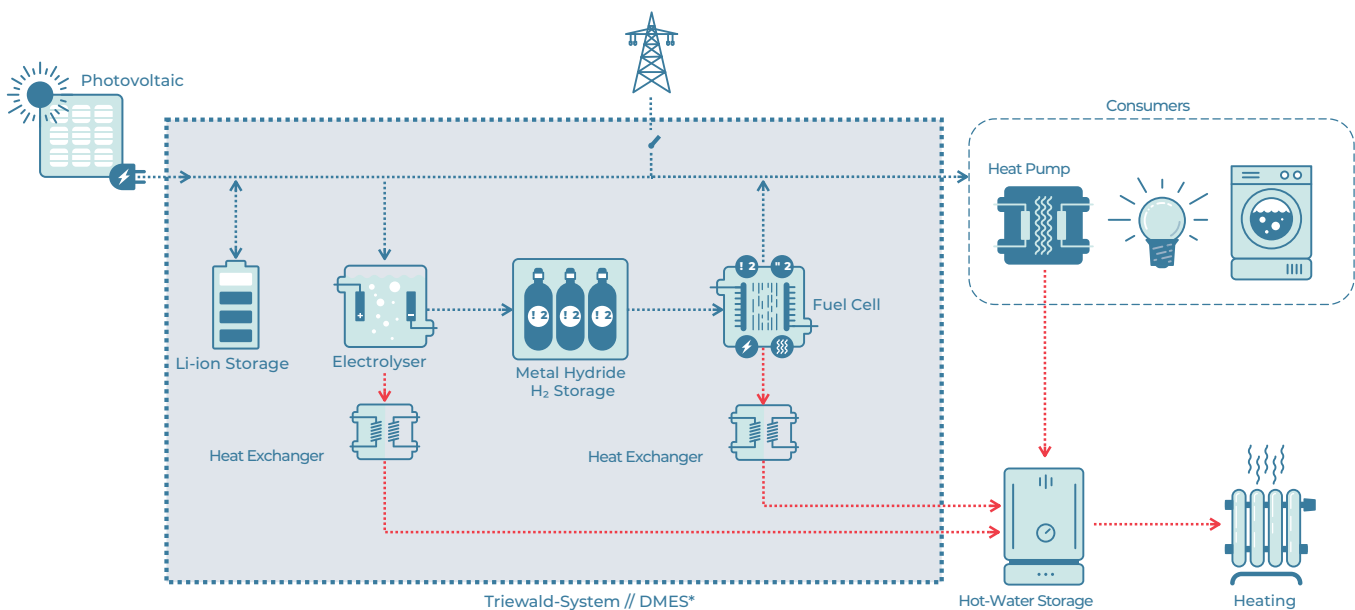
safety profile and allows high storage volumes directly within occupied buildings — where battery storage and high-pressure solutions reach their limits. Triewald complements battery storage rather than replacing it: batteries handle short-term flexibility, peak loads, and day-to-night shifting, while the metal hydride storage covers multi-day and seasonal shifting. The heat generated during electrolysis and power reconversion is systematically channelled into hot water, heating, district heating networks, or industrial processes. Sector coupling is not an added benefit here — it is the core logic of the system.

PARTNERS

eRevo AG, Eich (canton of Lucerne), www.erevo.ch acts as system architect and integrator. Industrially established, series-manufactured components are combined with a proprietary system architecture, reducing both technological and supply chain risk.

TRIEWALD DMES

Electricity, Heat, Storage and Consumers in One System — Building-Integrated



*DMES = Decentralised Multi-Energy Systems

POWERED BY eRevo

Implementation draws on a specialised partner network: GRZ Technologies (metal hydride storage, Switzerland), electrolyser manufacturers from Germany and Italy, Qynn Energy (data-driven energy economics and ROI modelling), enerpeak (energy engineering), RISAM (safety and fire protection), saprom (compliance with Swiss regulations), Hälz Group (HVAC), and SyEnergy and Maréchaux (electrical, battery, hybrid inverters). Market development partnerships include Integral Design Build and the Halter Group, as well as a strategic exchange with GETEC for industrial and contracting structures.

OBJECTIVES

- Enable seasonal and multi-day energy shifting, building-integrated, safe, and permissible.
- Achieve sector coupling of electricity and heat at a combined efficiency of over 75 percent.
- Absorb local grid overcapacities and return them on a time-shifted basis, reducing grid expansion and curtailment.
- Demonstrate economic viability without subsidies and without speculative price spreads.



- Establish an AI-supported control layer across all energy flows through Energy Intelligence.

STATUS AND KEY FIGURES

Since April 2024, the world's first fully building-integrated DMES installation based on metal hydride with thermal recovery has been running at full load in Eich, canton of Lucerne. The demonstrator serves as a reference for technology, operation, safety, and permissibility, and reduces key risks in system integration and regulatory approval.

- **Demonstrator Eich:** 508 kWh electrical (480 kWh H₂ storage and 28 kWh short-term storage), 250 kWh thermal, 7.2 kW electrolysis, 8 kW fuel cell.
- **Triewald INDUSTRY:** Modular 0.5 to 16 MWh per room; reference configuration 3,200 kWh electrical and 2,000 kWh thermal; service life over 30 years, warranty up to 20 years.
- **Triewald AREAL:** Energy hubs from around 100 MWh; reference design 12 MW / 92 MWh electrical plus 20 MWh short-term storage and 25 MWh thermal, integrated within just 440 m² of floor space.





- **Combined efficiency:** over 75 percent for combined electrical and thermal use.
- **EWL site study, Lucerne:** configurations of 774 to 3,200 kWh assessed. Economic optimum at around 1,700 kWh, self-consumption above 90 percent.
- **Circularity:** metal hydride materials consist largely of recycled metals and are recyclable at end of life.
- **Supply chain:** the majority of key components sourced from Europe — specifically Switzerland, Italy, and Germany.
- **Pipeline:** SFP site Root (with Integral Design Build), high-rise project in the Basel-Landschaft region, logistics blueprints with GETEC, initial AREAL approaches with the canton of Lucerne.

BENEFITS AND CHALLENGES

Triewald makes renewable energy plannable, storable, and thermally usable. The system raises self-consumption, reduces grid purchase and grid expansion costs, strengthens local security of supply, and absorbs grid overcapacities where

they arise. Since only a minimal proportion of the hydrogen exists as free gas, integration into existing buildings and urban sites is possible — where large-scale battery storage increasingly runs into fire safety, space, and permitting constraints. At area level, the energy hubs act as active buffer nodes between local generation, consumption, and the grid.

The challenges lie less in the technology than in project cycles and regulatory conditions. Twelve to eighteen months from project initiation to commissioning require capital discipline and a robust pipeline. eRevo addresses regulatory uncertainties surrounding hydrogen installations in buildings through its active participation in the SVGW working group on the recently published guideline H10001, helping to shape future regulatory frameworks rather than merely applying them. Investment decisions in practice often proceed in stages: short-term storage first, long-term storage as a pre-planned expansion — as the SFP site in Root illustrates.

ECONOMIC OVERVIEW

A typical Triewald INDUSTRY project involves around CHF 2 million in investment, with larger installations reaching CHF 3–4 million. ROI modelling for the EWL site in Lucerne shows payback of ten to fourteen years over a 30-year operating period — calculated without subsidies and without speculative revenues. Value drivers are increased self-consumption, heat extraction, avoided grid costs, and storage flexibility. Dynamic electricity prices and grid tariffs offer additional upside. The addressable Swiss market comprises 50 to 80 DMES-relevant site and industrial projects annually.

Energy Intelligence underpins economic performance across the full lifecycle: forecast-based dispatch over 24 to 72 hours, multi-asset optimisation across electricity, heat, hydrogen, and grid purchase, grid services such as peak shaving and balancing within collective self-consumption (vZEV) and local energy community (LEG) structures, and a self-learning operational layer that continuously analyses operating data and adapts control parameters.



KEY TAKEAWAYS

- System logic cannot be reduced to electricity prices alone. Economic viability comes from the coupling of electricity, heat, and storage flexibility.
- Metal hydride storage fundamentally shifts the permitting and safety logic, opening urban space to hydrogen.
- Short-term and long-term storage are complementary. Effective DMES installations combine both time horizons.
- Software is decisive. Without data-driven orchestration, the potential of coupled systems goes unrealised.
- Early regulatory engagement reduces project risk more effectively than case-by-case approval after the fact.

REPLICATION POTENTIAL IN SWITZERLAND

The Swissgrid white paper of March 2026 notes that integrating up to 40 GW of photovoltaics under current conditions is barely conceivable. The answer lies in distributed storage and system integration. Triewald DMES offers a proven, replicable infrastructure approach — building-integrated for commercial, industrial, and multi-family residential use, and at area scale as an energy hub for districts, industrial clusters, and collective self-consumption or local energy community structures. With the new legal framework for local electricity communities and growing pressure on the grid, a structural market segment is emerging in which buildings and sites become active nodes in the energy supply system. ■