Contents

March 2026 – Switch Lab Information for TKI PPS Innovation Call

Themes of the Innovation Call (TNO – TKI)

Integrating large-scale wind & solar with electrified off-takers and validated hybrid trading

Projects explore how large volumes of wind and solar can reliably power industrial loads, shore-power systems, or other high-demand users. They validate hybrid operation strategies — combining generation, storage and conversion — to improve market participation, reduce curtailment and stabilize operations.

Flexibility & energy storage (short / medium / long duration)

Concepts that strengthen system flexibility across all time scales: fast-response batteries, mid-duration storage, hydrogen production, thermal storage or hybrid solutions. The focus is on stabilizing renewable-heavy systems, mitigating intermittency, and proving cost-effective flexibility services.

Multi-commodity coupling and EMS resilience

Innovations combining electricity with hydrogen, heat or other vectors to optimize integrated energy flows. Projects should enhance EMS (Energy Management System) robustness under variable resources, market uncertainty, or operational disturbances — ensuring secure, coordinated control.

Digitalisation for coordination — EMS interoperability and multi-voltage digital twins

Digital solutions that improve communication and control across heterogeneous assets: interoperability protocols, controller-in-the-loop testing, and secure multi-voltage EMS architectures. Digital twins and emulators are used to accelerate design, validate algorithms and reduce on-site risks.

What is the Switch Field laboratory?

The SWITCH Field Lab is an open R&D facility jointly operated by TNO and Wageningen University & Research (WUR), located at the ACCRES site in Lelystad. It provides a unique environment to develop, test, validate, and de-risk innovations in renewable-energy-based hybrid systems.

The laboratory is a scaled hybrid power plant integrates several systems for power generation, storage and conversion:

- o Wind turbines (of 6x 10kW)
- o PV systems (2x 7.5kWp/6kW and 1x 30kWp/25kW)
- o Battery system (LiFePO4 batteries): 58 kWh/60kVA battery system
- o PEM stack electrolyzer (25kW/40kVA (5.3 Nm^3/hr., or 10.8 kg/day)
- o Transformer 0.4/10 kV (200 kVA) enabling both on-grid and off-grid operation
- o Advanced ICT utilities, SCADA, EMS, dashboards, and a digital shadow system

Together, these assets can be operated as a single hybrid power plant, enabling full-system coordination, flexibility testing, and market-oriented control strategies.

Digital infrastructure

The digital layer includes:

- Energy Management System (EMS) for real-time dispatch. The EMS is built up on:
  - A planning & scheduling layer (advisory), consisting of (multi-)objective optimization based on weather prediction and market data.
  - A control layer (execution), consisting of functionality such as unit commitment, curtailment or peak-shaving, based on the schedule from the advisory layer.
  - A base safety layer (protection), ensuring operational limits are not exceeded.
- Digital twin / emulated assets for rapid prototyping
- SCADA/measurement system logging data at high resolution
- Grafana dashboards for real-time and historical performance

This combination supports virtual de-risking, model-in-the-loop testing, and iterative development cycles before physical deployment.

A virtual representation (Digital Twin) of the SWITCH is available in the digital environment, to enable accelerated retesting and de-risking of new developments, before deploying them at the laboratory.
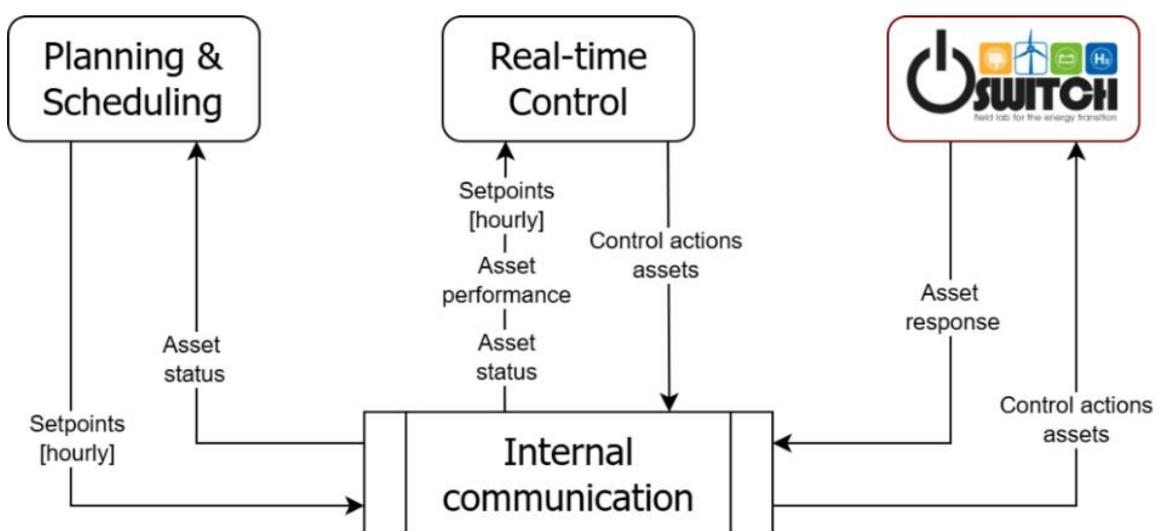
What kind of projects can the Switch Field Lab support?

- Asset characterisation of new storage or conversion technologies (e.g. testing new BESS or electrolyzers) RenewaFLEXNL
- Hybrid power plant integration, e.g., coordinated wind-PV-battery-electrolyzer systems SENSE Hub project
- Pilot configurations for industry (self-consumption, peak shaving, operational strategies) MAGPIE project
- Market-based operation validation (hybrid trading, curtailment reduction, flexibility arbitrage) OESTER project
- Digitalisation & EMS projects: interoperability, advanced dispatch, multi-voltage control
- Cyber-physical resilience & anomaly detection (IT/OT event response, cybersecurity validation) SWITCH2CREF project
- Model-in-the-loop / digital twin development

Evaluation Criteria

Project Feasibility

- Compatibility with SWITCH physical assets (capacity, voltage, size, footprint)
- Compatibility with SWITCH digital systems (EMS, SCADA, data formats)
- Safety, permitting, and operational constraint
- Capability to be executed within available infrastructure and timeframe (project completion within 2 years, including permitting, installation, execution and decommissioning).

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