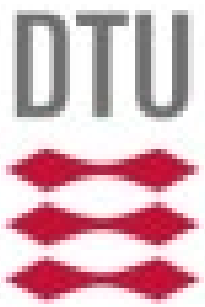
Research Infrastructure Automation Workshop 2024
DTU Risø Campus, Roskilde, Denmark

Agenda / Introduction

RESEARCH INFRASTRUCTURE AUTOMATION WORKSHOP


erigrid 2.0
Connecting European
Smart Grid Infrastructures


DTU


PowerLab DK


RISEnergy

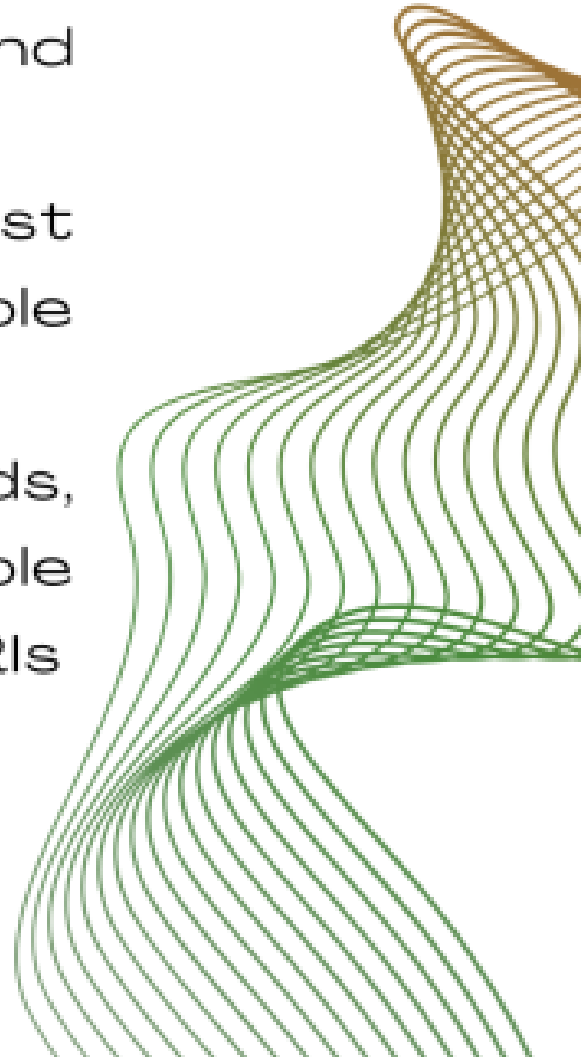

NEST


DERlab


ISGAN
INTERNATIONAL SMART GRID
ACTION NETWORK

Session outline:

- *Collaboration*: metadata and digital tools for facilitating research collaboration and data exchange
- *Automation*: how energy system test setups can be repeatable and reproducible (and less complex to handle)
- *Coupling of Test Facilities*: Methods, Techniques and Technologies to couple large scale test resources from multiple RIs
- Live Laboratory Demonstrations



Supported by the Horizon 2020 Programme

Research Infrastructure Automation Workshop

Day 1: 24.09.2024 — from 12:30 until 21:00 — Place: DTU-Risø - **B112**

Day 2: 25.09.2024 — from 09:00 until 14:00 — Place : DTU-Risø - **B319**

Day 1

13:00 - 13:20 **Workshop opening** Frida Frost, Head of PowerLabDK/Head of Innovation *DTU Wind and Energy Systems*

Session 1: Collaboration: metadata and digital tools for facilitating research collaboration and data exchange

Session Chair: Kai Heussen, DTU

13:20 - 13:40	Oliver Werth, *OFFIS*	Towards a National Research Data Infrastructure for Interdisciplinary Energy System Research (NFDI4Energy)
13:40 - 14:00	Jawad Kazmi, *AIT*	Dataspaces for Research – Technology, maturity, use cases
14:00 - 14:20	Artjoms Obuseys, *ZHAW*	Overview of IEEE working group on big data and analytics
14:20 - 14:40	Sebastian Dupraz, *BRGM*	Digital Twins Interoperability: challenge and perspectives
14:40 - 15:00	**Q&A**	
15:00 - 15:20	**Coffee Break**	

Session 2: Automation: how energy system test setups become can repeatable and reproducible (and less complex to handle)

Session Chair: Jirapa Kamsamrong, OFFIS

15:20 - 15:40	Kourosh Malek, *FZ Jülich*	The role of ontology and data management in cloud-connected automated labs
15:40 - 16:00	Ammar Malik and Terence O'Donnell, *University College Dublin*	Automated Testing of Distributed Energy Resources (DER) : Use of an open source testing platform (OpenSVP) for testing smart inverters against European network connection standards EN50549 and VDE 4105
16:00 - 16:20	Filip Prőstl, *AIT*	Automated Test Setup Generation for Validating Smart Grids Software Ecosystems
16:20 - 16:40	Santiago Sanchez, *SINTEF*	Cyber-physical metropolitan area digital substations test bench for evaluating intrusion detection systems
16:40 - 17:00	**Q&A**	

Laboratory tour & demo

17:00 - 18:20	Lab Tour	Refreshment and Initiation of laboratory tour — Risø Campus - Building 319
18:20 - 18:40	Oliver Gehrke, *DTU* Andres Acosta, *RWTH*	Global Configuration management for multi-site experiments

Day 2

Session 3: Coupling of Testing Facilities: Methods, Techniques and Technologies to couple large scale test resources from multiple RIs

Session Chair 1: Panos Kotsampopoulos, NTUA
Session Chair 2: Thomas Strasser, AIT

09:00 - 09:20	Vetrivel Subramaniam, *TU Delft* and Andres Acosta, *RWTH Aachen*	**Towards simplified and standardized experiments combining multiple research infrastructures: The ERIGrid 2.0 Universal API approach**
09:20 - 09:40	Giuseppe Silano, *RSE*	**Integrating Power-to-Heat Services in Geographically Distributed Multi-Energy Systems**
09:40 - 10:00	Tesfaye Amare Zerihun, *SINTEF* and Oliver Gehrke, *DTU*	Laboratory Validation of Event-driven Co-simulation
10:00 - 10:20	**Q&A**	
10:20 - 10:40	**Coffee break**	
10:40 - 11:00	Steffen Vogel, *OpalRT*	Simplifying real-time peer-to-peer data exchange between RIs using WebRTC protocols with VILLASnode
11:00 - 11:20	Alkistis Kontou, *ICCS-NTUA*	Advanced Techniques for Extended-Range, High-Fidelity PHIL and GDRTS Testing Alkistis
11:20 - 11:40	Luca Barbierato, *University of Torino*	Local Digital Real-Time Power System Co-simulation via Multi-phase Distributed Transmission Line Model
11:40 - 12:00	**Q&A**	
12:00- 13:00	**Networking lunch**	
13:00 - 13:30		Heat system demo final results
13:30 - 14:00	**Day 2 Wrap-up**	

Workshop Opening

Frida Frost

Head of PowerLabDK

Head of Innovation DTU at Wind and Energy System

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Lab tour

Laboratory tour & demo

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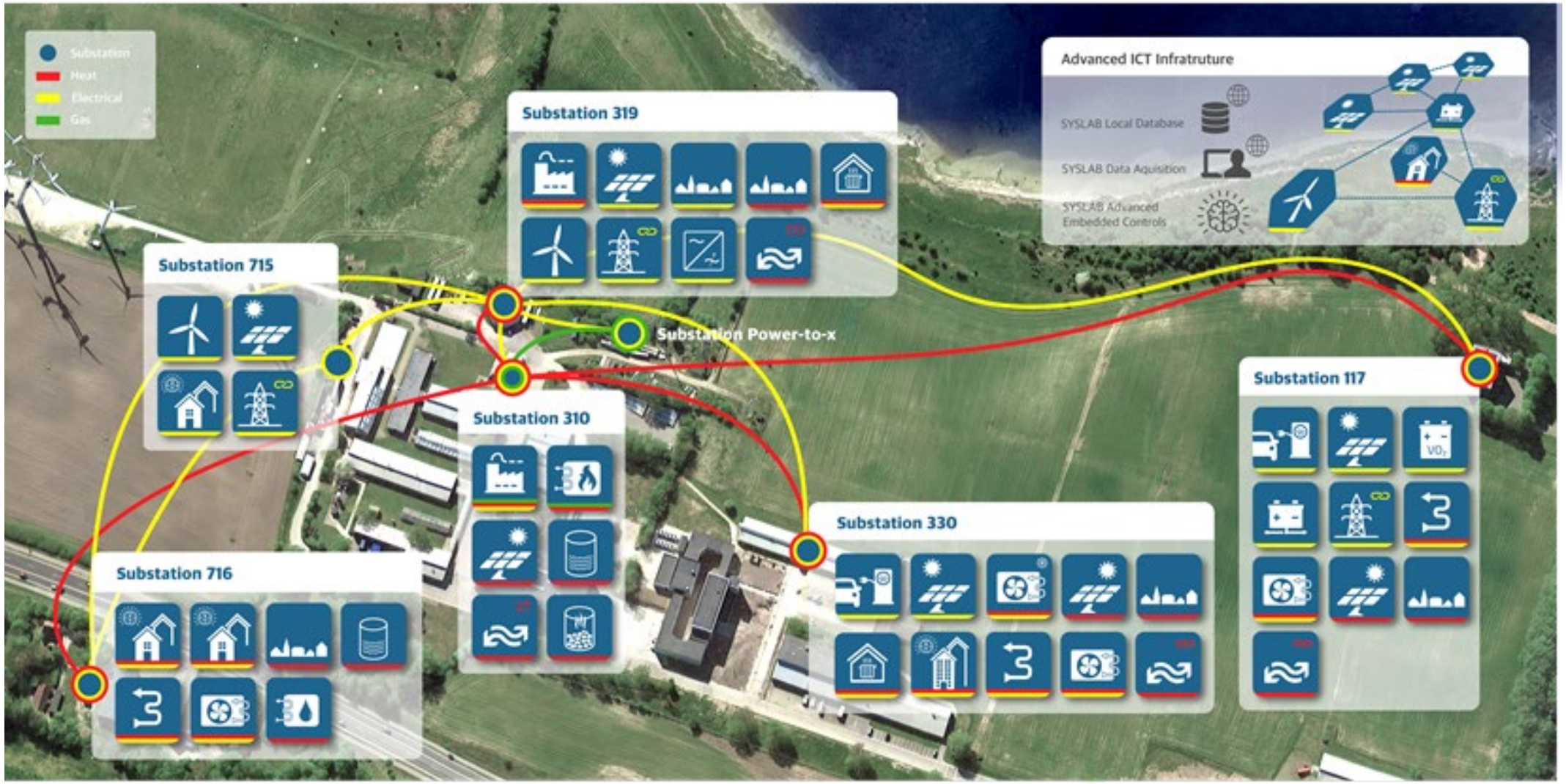
18:20 - 18:40	Oliver Gehrke, *DTU* Andres Acosta, *RWTH*	Global Configuration management for multi-site experiments	
18:40 - 19:00	**Day 1 wrap-up**	Configuration Management Demo	
19:00	**Dinner**	Dinner served in the laboratory facilities	Risø Campus - Building 310

13:00 - 13:30	Heat system demo final results
13:30 - 14:00	**Day 2 Wrap-up**

Lab Testing of distributed and integrated energy systems

Kai Heussen, Oliver Gehrke,
DTU Wind and Energy Systems

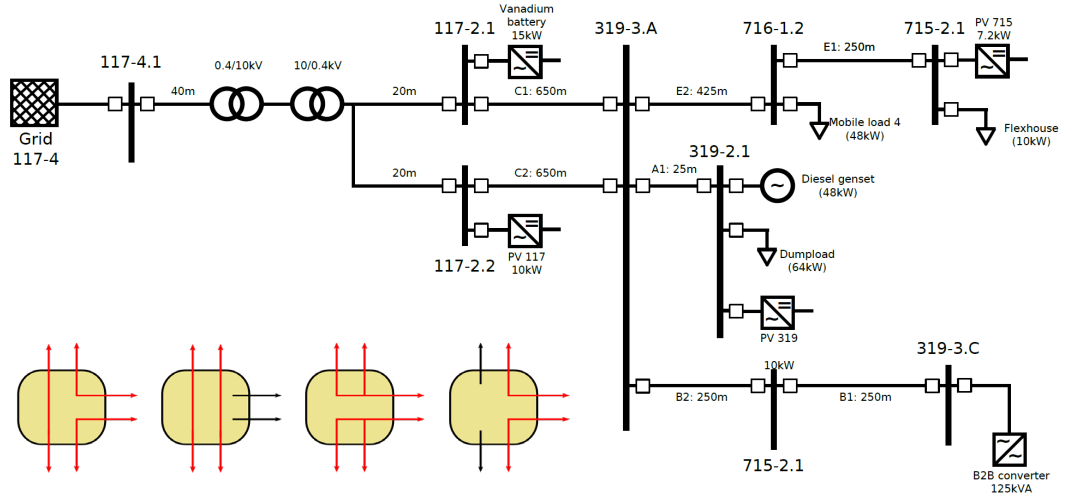
SYSLAB - multi-domain energy system integration facility

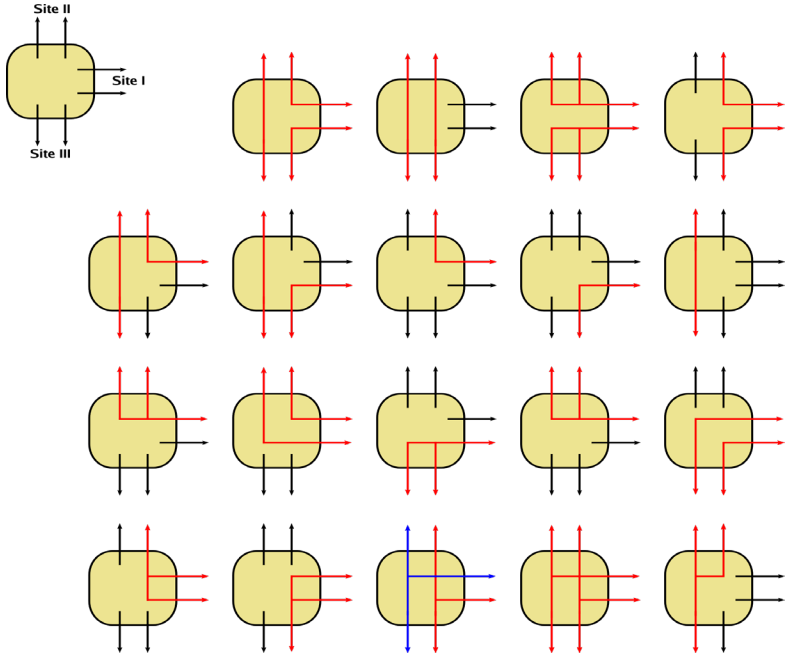


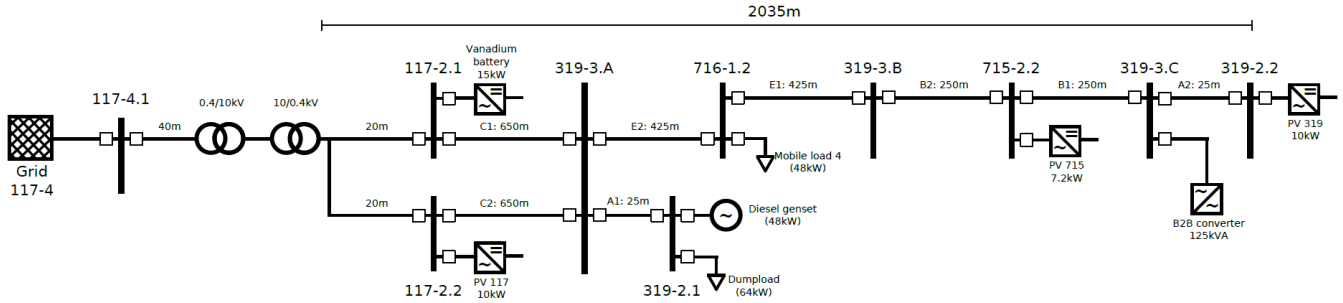
SYSLAB design concepts I

- In order to adapt to many different testing scenarios, a **flexible grid topology** is important.

- Configurations
  - Rural grids vs. urban grids
  - Weak grids vs. strong grids
  - Generation surplus vs. load surplus
  - Complex tests vs. simple tests
  - Component tests vs. system tests
  - […]

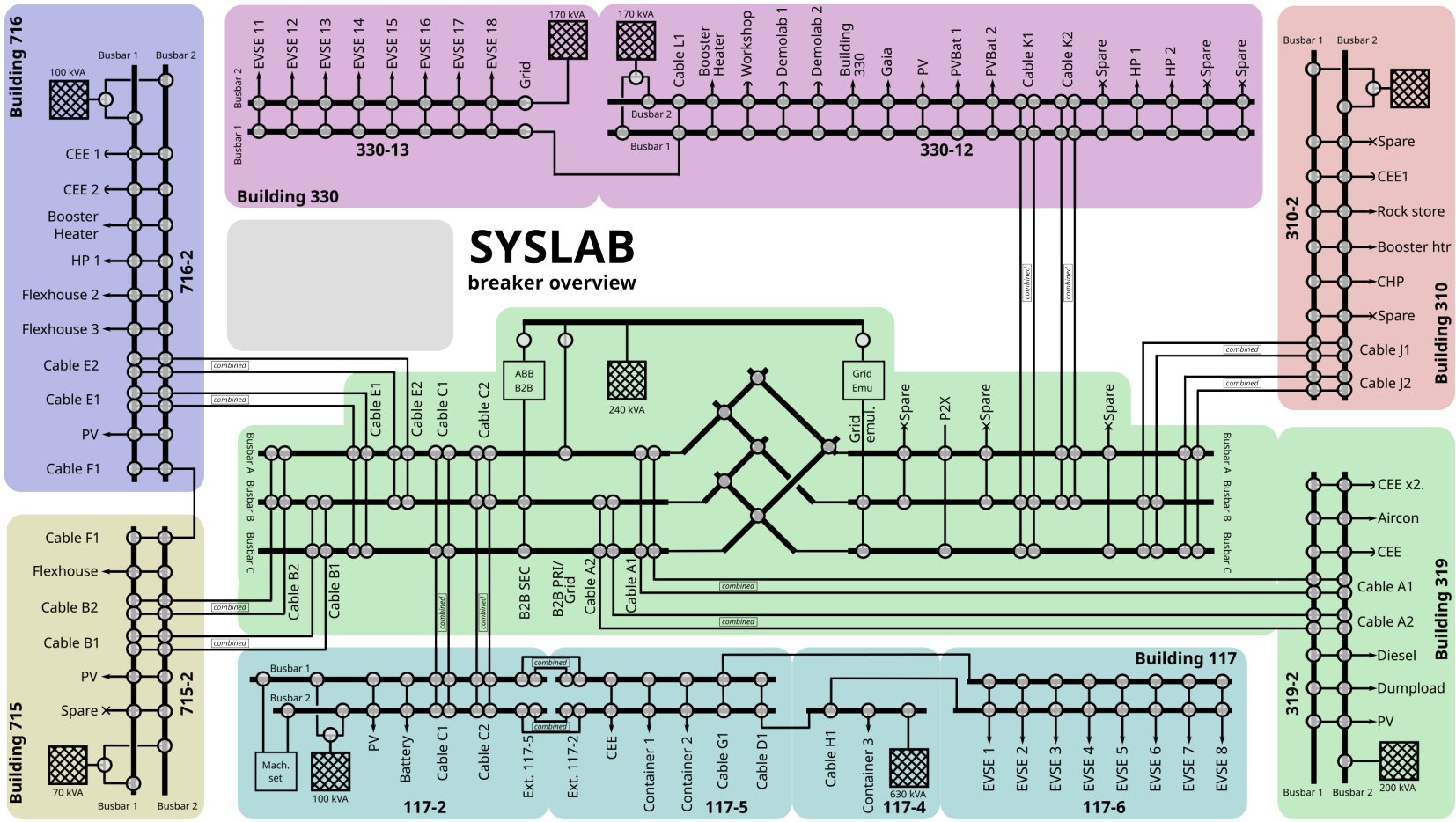






SYSLAB configuration I

- Electrical power grid with **twelve substations** connecting **six physical sites** on Risø campus
- 8km of distribution cables
- ~ 40 different energy resources
  - PV, wind and fossil generation
  - Battery energy storage (Lithium-Ion, Vanadium redox-flow, Supercapacitor)
  - Consumers (buildings, EVs, heat pumps, ...)

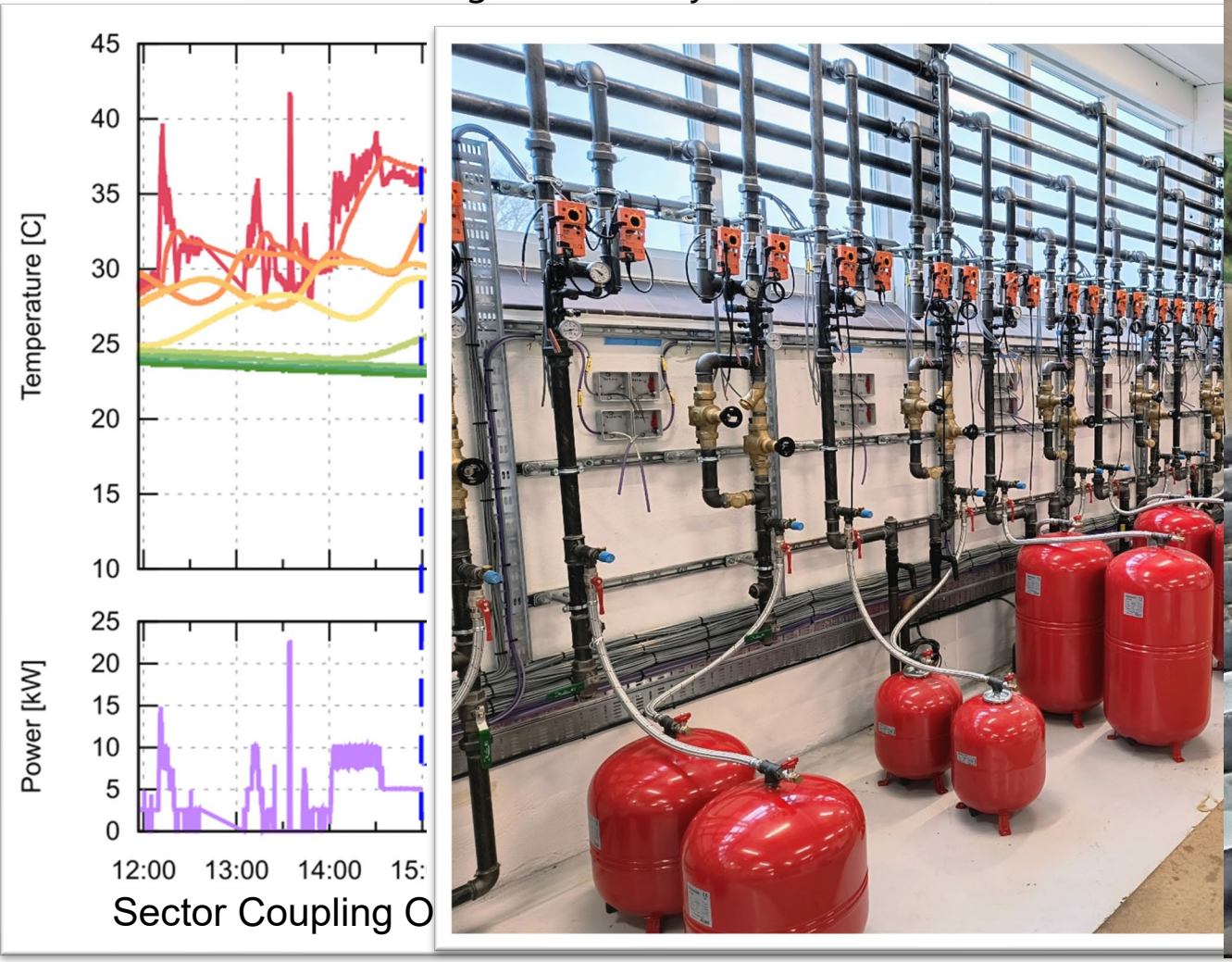


District heating extension I - 2015

What happened since 2022 …

Spring 2024: installation of transmission “heat switchboards”

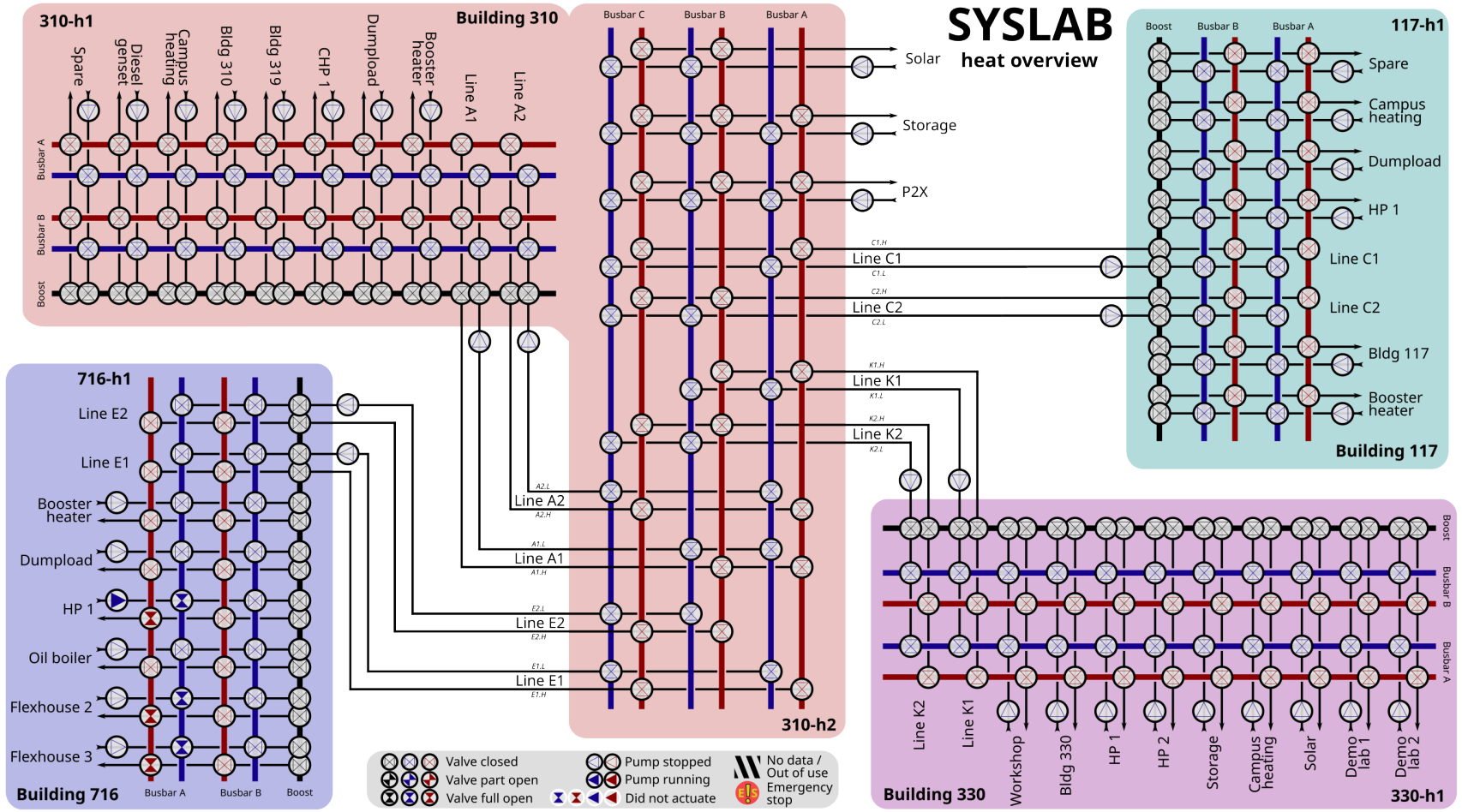
Installation inside buildings, device bays, instrumentation



District heating extension III

- Currently under construction: District heating grid with five substations connecting five sites.

- Connection points for about 40 different energy resources
  - Heat sources (solar thermal, heat pumps, electric heaters, gas boiler, CHP, high temperature storage)
  - Heat storage
  - Consumers (buildings, simulated demand)

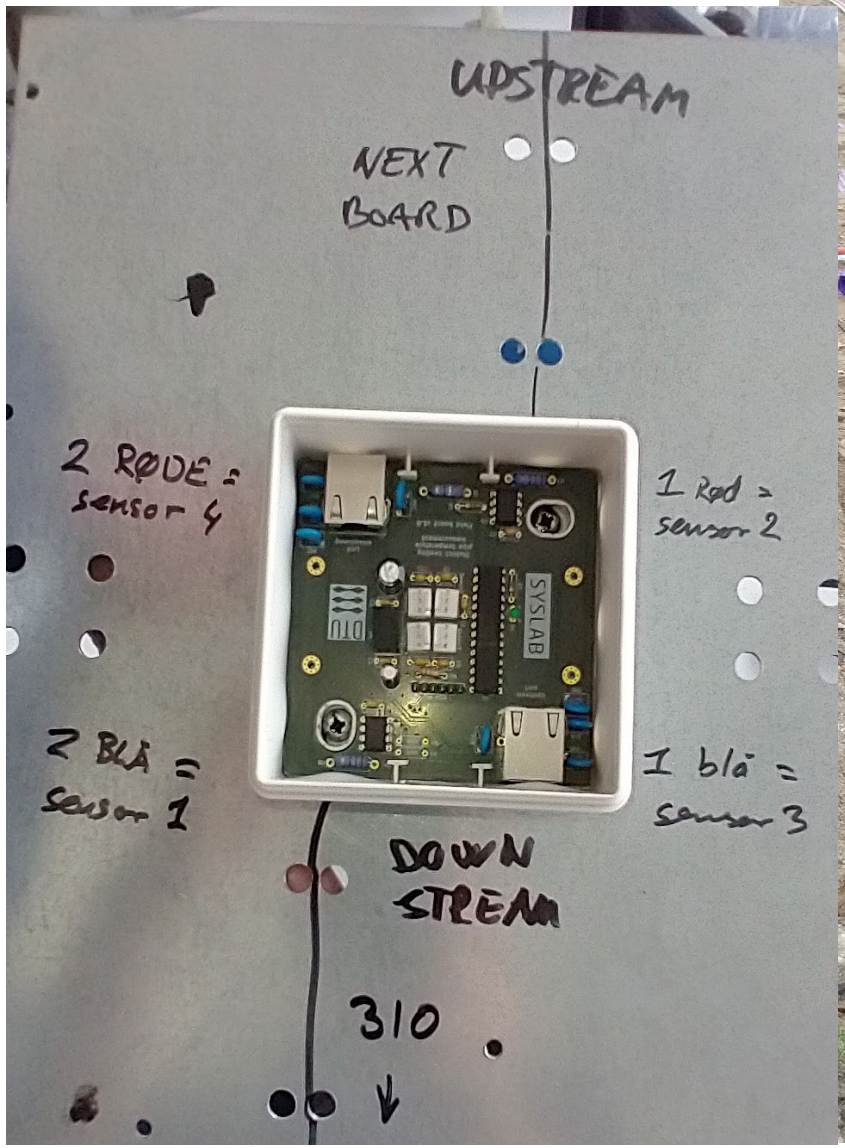


District heating extension III

- Winter 2022/23: Pipe laying (~4.5km of insulated twin pipe
- Spring 2023: Intermediate connection of a single 2x350m double-circuit
- Summer 2023: Detailed engineering and dimensioning of “heat switchboards” finalized, tendering process
- Winter 2023/24: Installation inside buildings, device bays, instrumentation

District heating extension III

- Temperature measurements along the pipes (~every 100m)
- Digital sensors clamped to the outside of the pipe (inside the insulation) and sealed at installation time
- Robust, bus powered, daisy chained data acquisition system (in-house development)
- 1 reading/second (Fwd+Ret)
- Use cases: model calibration, state estimation, closed-loop control



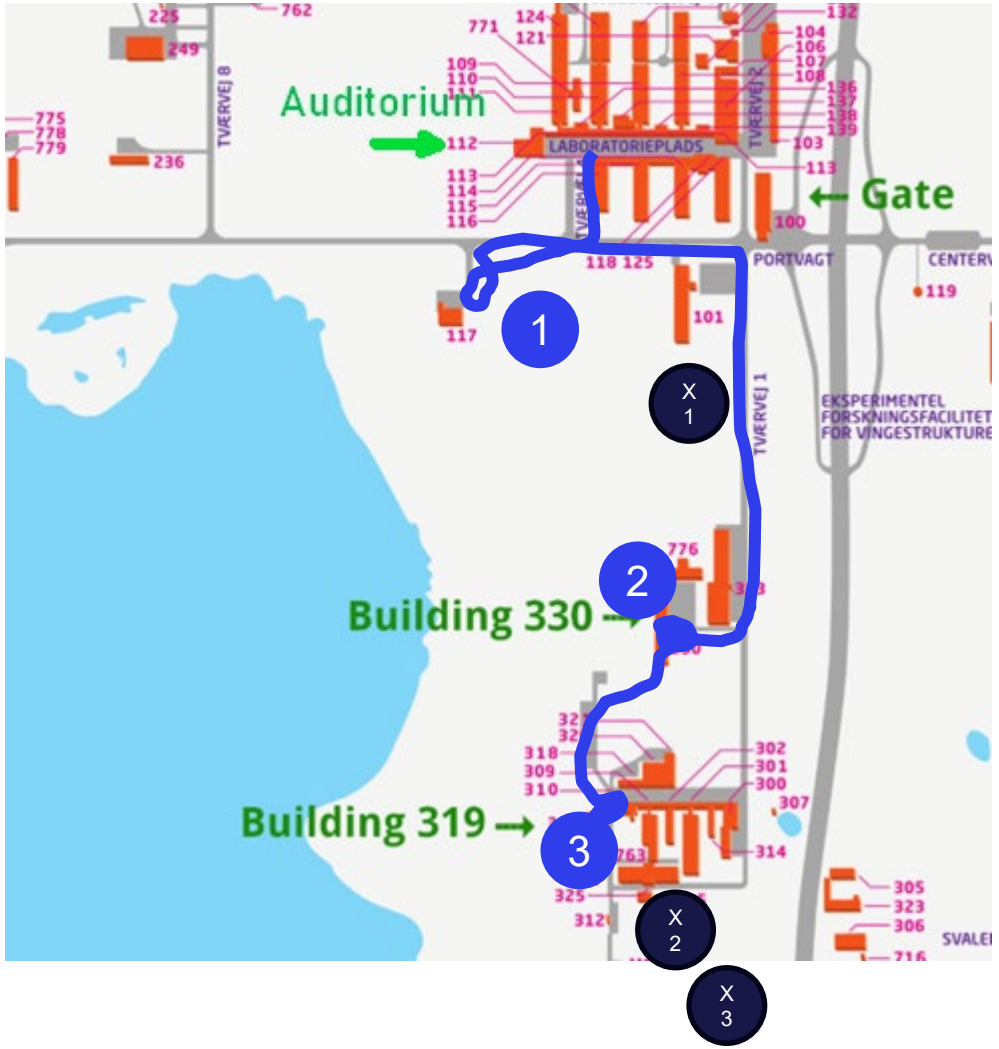
Lab tour logistics

- 3 Locations – *two parallel tracks*
  1. ~~Building 117~~
  2. Building 330
     - EV charging facility - *Kristian*
     - “Intelligent” Office building & Heat Substation - *Oliver*
  3. Building 319 + 310
     1. B310 – District Heating - *Oliver*
     2. B319 – Grid switchboards – *Kristian*

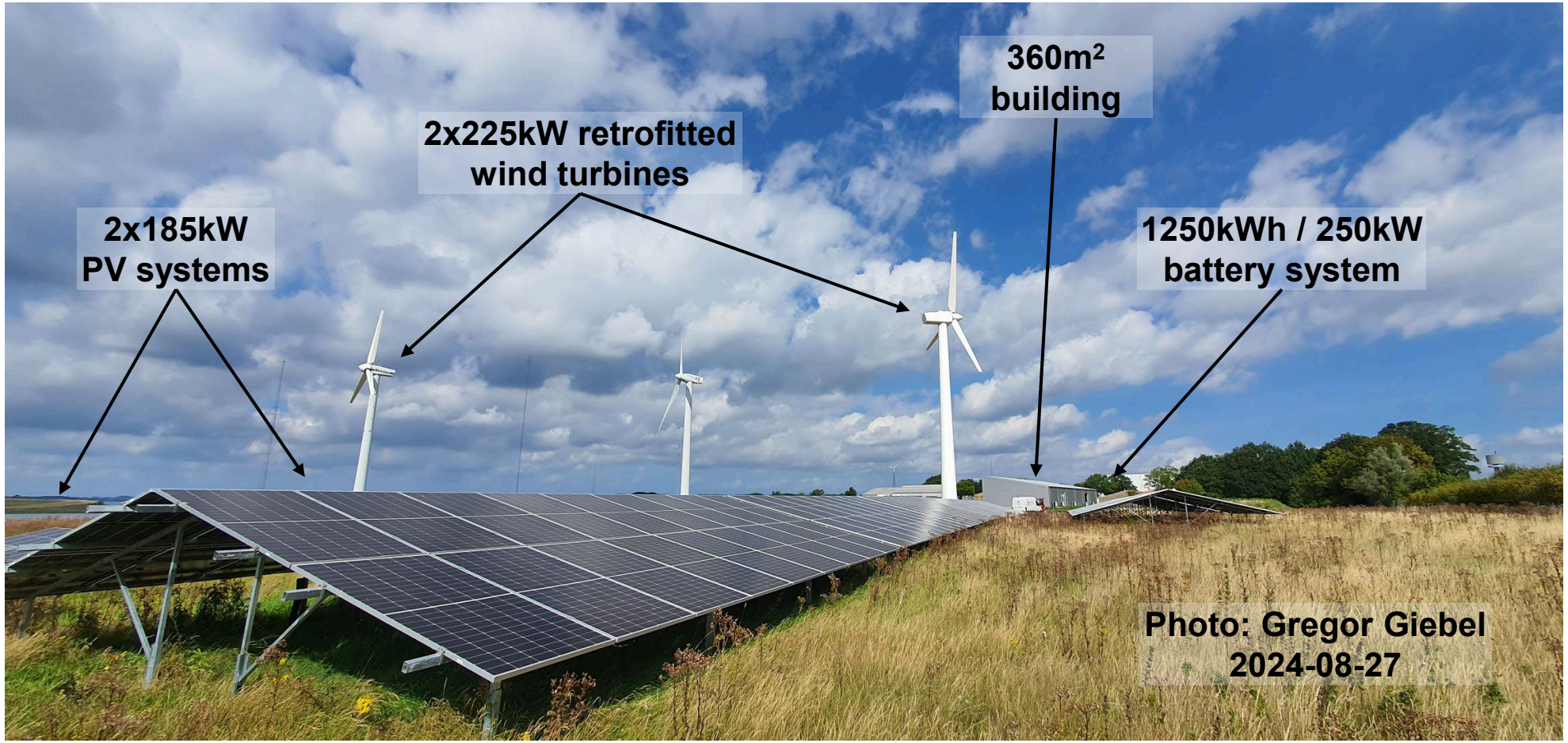
  - X – *optional & on-demand (alternatives)*
    1. Materials Lab
    2. Building 715
    3. RisøHybrid PowerPlant

- Talk & DEMO @ 18:20

  “Global Configuration management for multi-site experiments”



Risø HPP – currently on site



Opportunities to *visit* and *use* SYSLAB

➢ ERIGrid 2.0 Training School on Sector coupling for Electricity and District Energy Systems

Winter 2024/25

Date TBD

(until Spring 2025)

➢ Lab Access

i.e. free access and travel

https://erigrid2.eu/lab-access/

ERIGrid Lab Access Last Call closing: 30th Sept

RISEnergy Lab Access First Call opening: 30th Sept

➢ Workshop on Lab Automation & Coupling

24-25th Sept. '24

***free* Lab Access also via StoRIES (until Fall 202w4)**

https://www.storiesproject.eu/tna

RISEnergy (2024-2028)

Homepage - (risenergy-project.eu)

Session 3, Demos, Wrap-up

Day 2

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