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ENERGY

CETP Knowledge Sharing
Workshop
Flexibility in Industry

06.11.2024

Energy Flexibility from a Hypoxic Air Fire Prevention System

BKW

Swiss-based international energy & infrastructure services company

Operating in 10 countries (mostly Europe)

> 200 subsidiaries



1700 employees



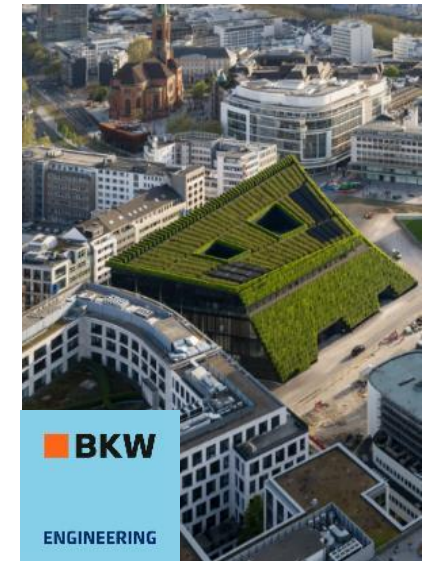
890 employees



4300 employees



1500 employees



3375 employees

CoPRESS - Overview

Objectives:

- Empower electricity consumers by enhancing interaction with the grid
- Create interoperable microservices for diverse energy resource collaboration
- Stack services benefitting energy cells and network operators
- Offer flexible microservices customizable for various use cases

Partners



BKW



csem



Institut de Recerca en Energia de Catalunya
Catalonia Institute for Energy Research

Duration & Demo Sites

- 03.2024 – 02.2027
- 2 Demo Sites in FR, 1 Demo Site in CH

Agenda

- 1 Hypoxic Air Fire Prevention

- 2 Project Site & Setup

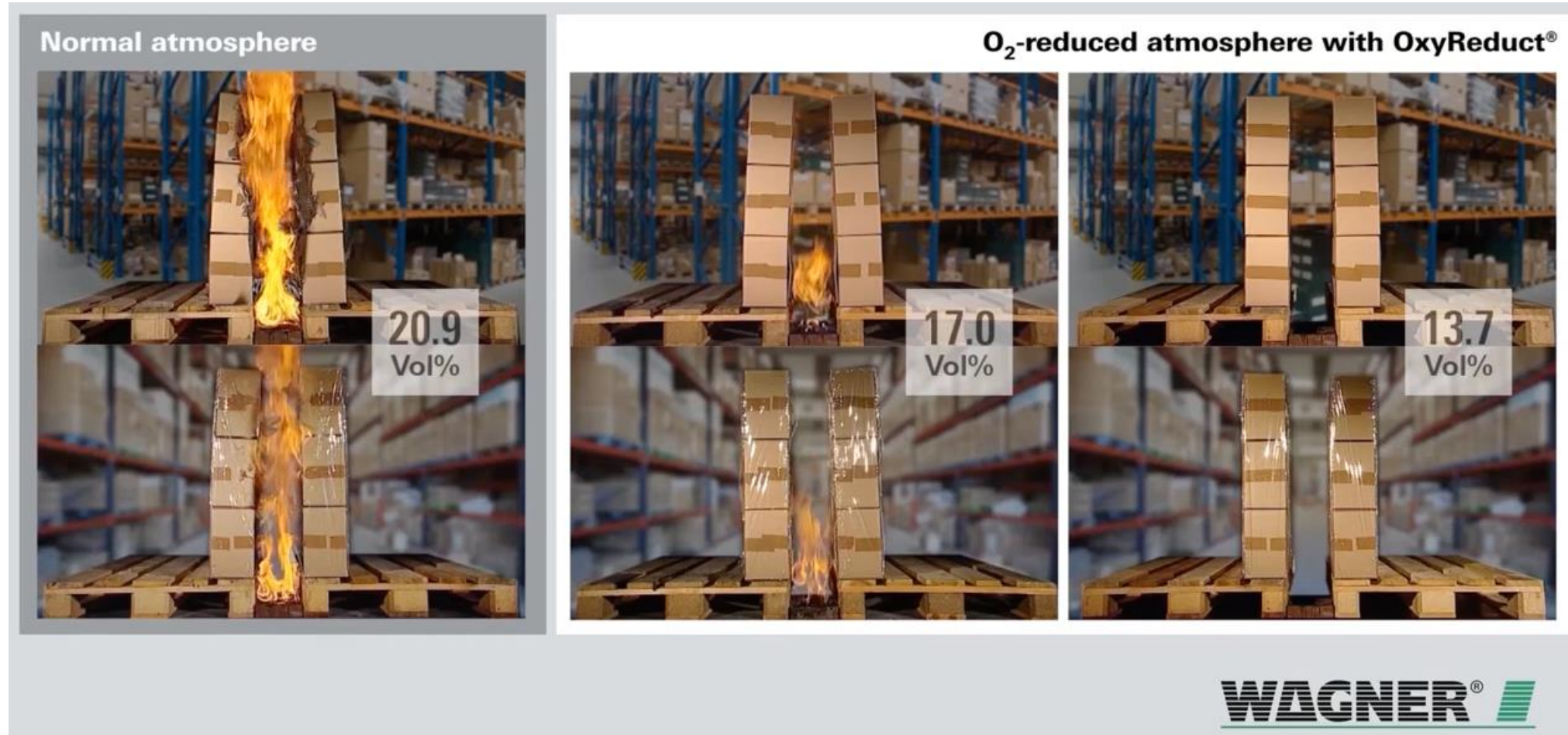
- 3 Ongoing Data Analysis & Modeling

- 4 Conclusion & Next Steps

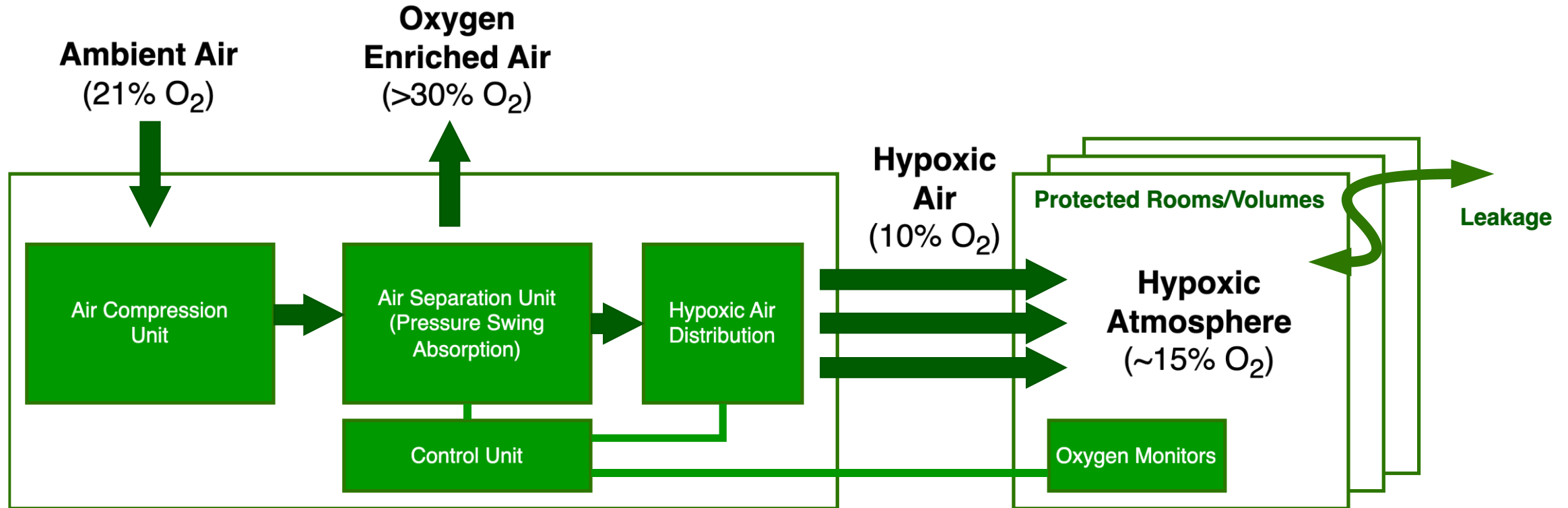


Hypoxic Air Fire Prevention

Hypoxic Air for Fire Prevention



Working Principle – Oxygen Reduction



Flexibility in Hypoxic Air

Hypoxic Atmosphere \simeq Thermal Storage

- O₂-concentration in a room evolves depending on
 - Hypoxic air production
 - Leakage (open doors, imperfect sealing)
 - Noise (people breathing)
- O₂-concentration needs to stay in an admissible band:

Human Health & Safety

13.7%

Flexibility

15.2%

Effective Fire Prevention



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Project Site & Setup

CoPress Use Case 1 (CH): Intelligent Building Automation



Use Case Objective:

Increasing the profitability of the overall energy system by means of intelligent building automation

Logistic warehouse (retail) in Switzerland

Aim to fully automate logistics operations

Continuous investments in energy infrastructure

CoPress Use Case 1: Pilot Site

Opportunities:

- Peak-shaving
- Optimized self-consumption of PV production
- Provisioning of power grid ancillary services

Energy Assets:

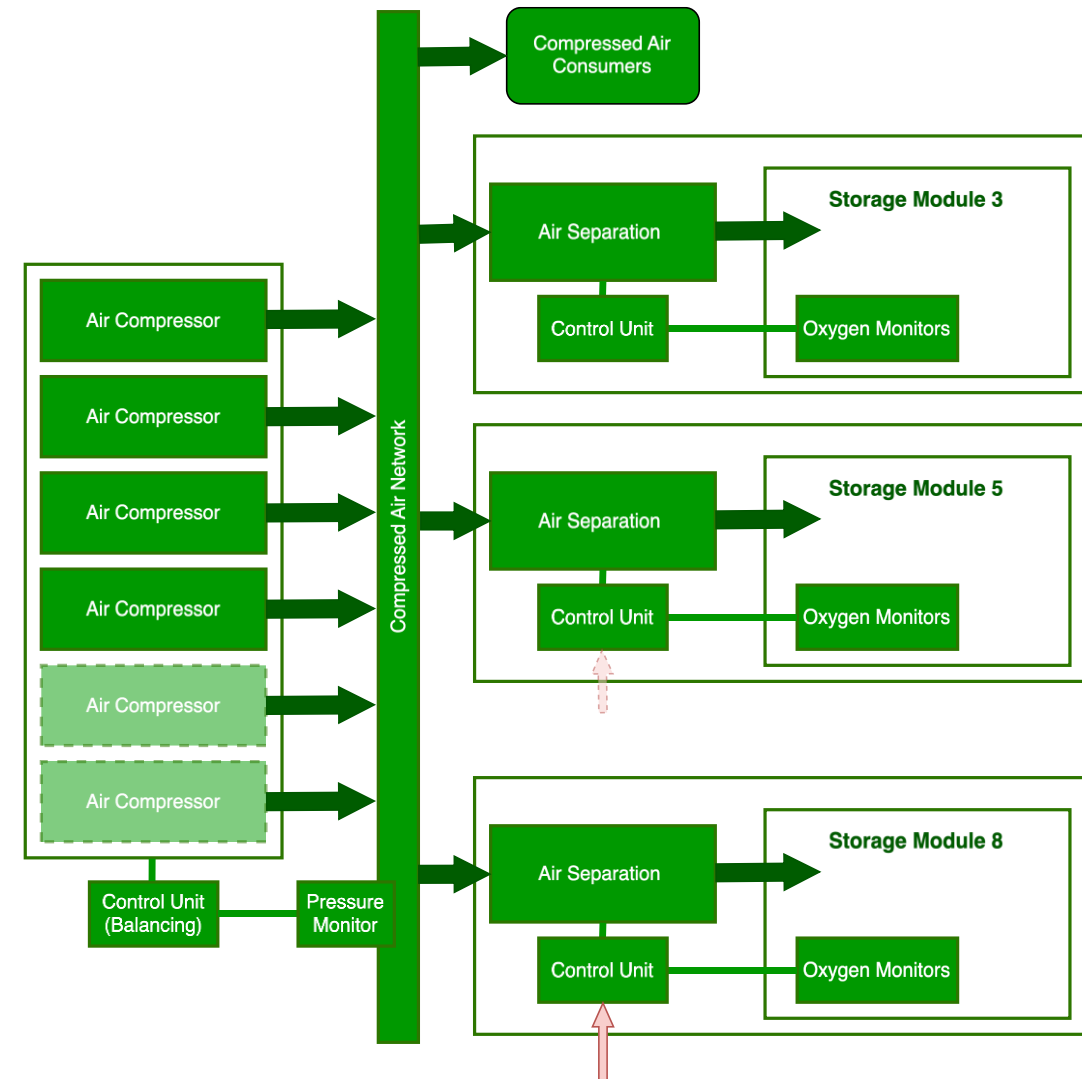
- Fire prevention system (330kW)
- PV system (1340kWp)
- Heating & cooling system:
 - 5 heatpumps (total 550kW)
 - 4 recoolers (total 120kW)
 - 3 thermal tanks (low, medium, cold)

Challenges:

- Building energy system is continuously evolving
- Control possibilities are limited, many systems are black-boxes
- Interference with business processes is not possible

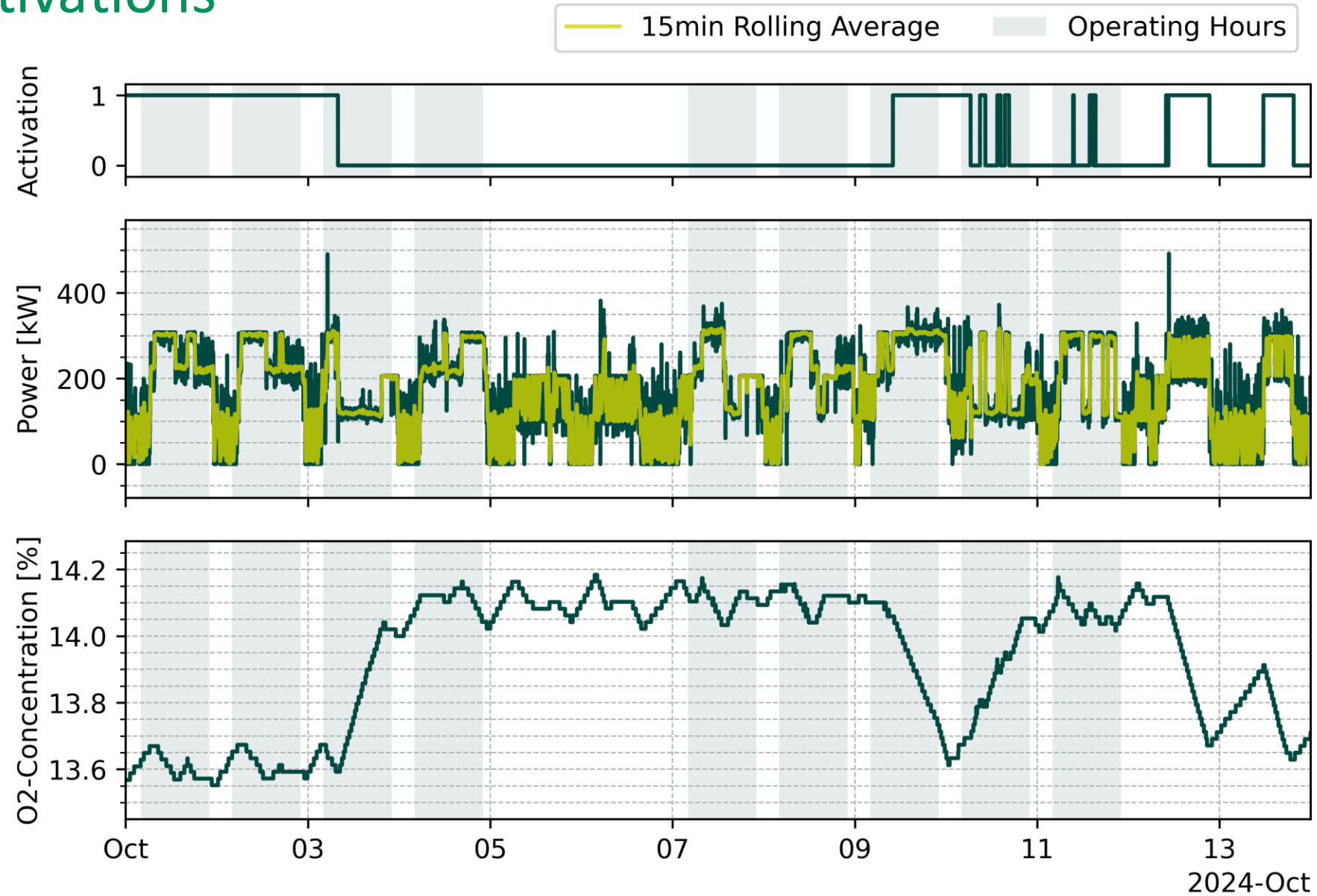
Hypoxic Air System

- 4 air compressors in operation: 4 x 90kW, 2x75kW
- 10% of pressurized air is used for pneumatic machinery & doors
- Available **measurements**:
 - O₂-concentrations (averaged) in all modules
 - Aggregated electricity consumption of air compressors
- Binary **control signal** for O₂-concentration in only one storage module:
 - «0»: setpoint at 15.2% O₂
 - «1»: setpoint at 14.7% O₂

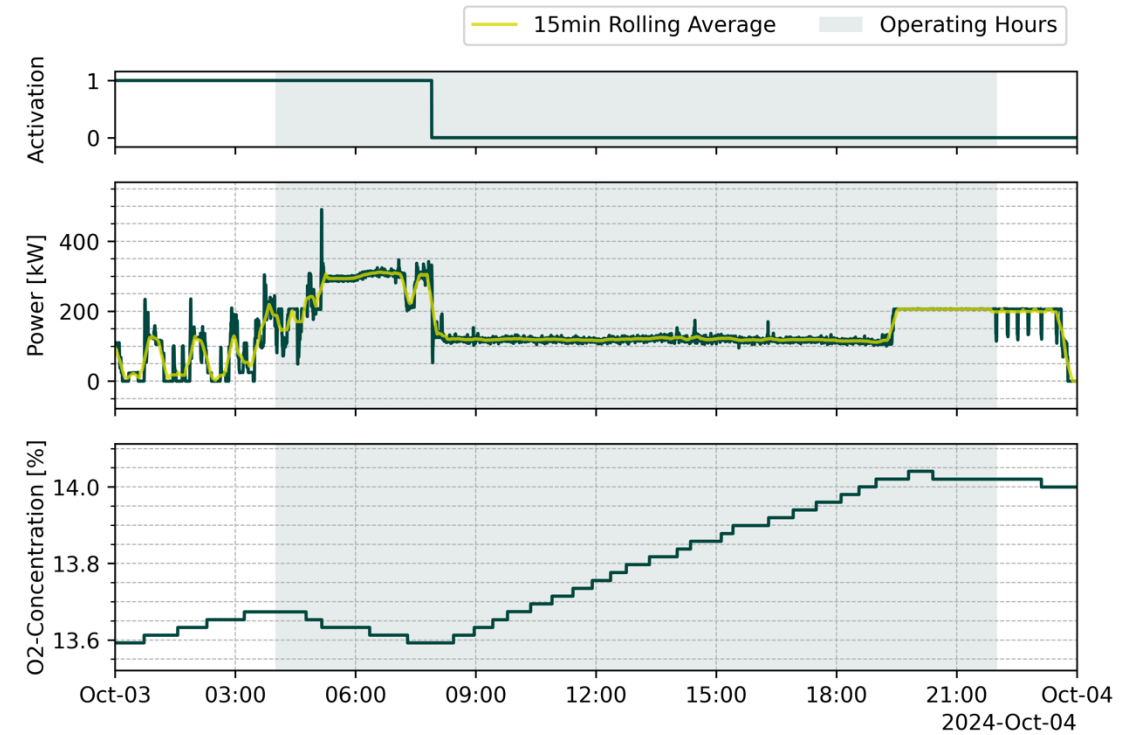
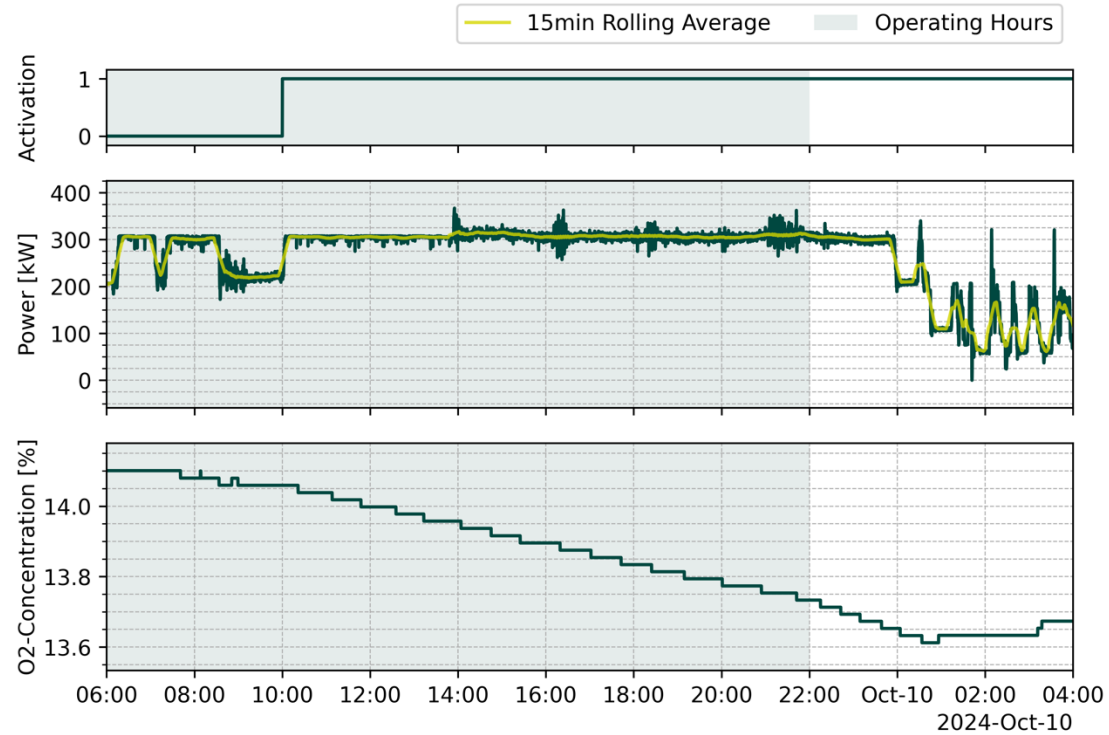


On-going Data Analysis

Trial Activations



Trial Activations



Flexibility Estimation

Operating Range (Concentration): 13.7% - 14.0% O₂

- outside of this range, low-level hysteresis-controllers are active

	During Operating Hours	Outside of Operating Hours
Base consumption air compressors (pneumatic doors & machines)	160 kW	50kW
Avg. consumption hypoxic air generation	100 kW	55kW
Leakage	+0.040 %O ₂ /hour	+0.015 %O ₂ /hour
Reduction	-0.026 %O ₂ /hour	-0.040 %O ₂ /hour
Flexibility (compared to avg. consumption):	+40kW for 11.5 hours -100kW for 7.5 hours	+150kW for 7.5 hours -55kW for 20 hours

Conclusion & Next Steps



Current Status

- Established viability and technical feasibility of using fire prevention system on the pilot site for energy flexibility
- Improved quantification of flexibility potential

Next Steps

- Fit a dynamical model for control, forecasting and analysis purposes
- Stakeholder management:
 - Agree with aggregator on specific requirements for flex-provisioning
 - Agree with plant operator on operational strategy



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Thank you for your attention

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