
BUILD UP
The European portal for energy efficiency
and renewable energy in buildings
WEBINAR

BOOSTING THE DEPLOYMENT OF SMART ENERGY SERVICES IN BUILDINGS: CHALLENGES, OPPORTUNITIES AND BARRIERS

08.02.2024
13:30 – 14:30 CET

BUILD UP
The European portal for energy efficiency and renewable energy in buildings

Welcome!

domOS

Boosting the Deployment of Smart Energy Services in Buildings:

Challenges, Opportunities and Barriers

8 February,2024

Online

www.domos-project.eu

The domOS project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 894240.

BUILD UP
The European portal for energy efficiency and renewable energy in buildings

Hes·so
University of Applied Sciences and Arts Western Switzerland

FENIX.TNT
tvořivost nad technologií

Agenda

Introduction		
13:30	BUILD UP Introduction, Welcome and introduction to the workshop	BUILD UP, Zuzana Taťáková, FENIX TNT
13:40	Smart energy services in buildings: status, contribution to the energy transition, vision	Dominique Gabioud, domOS project coordinator, HES-SO

Session 1: Interoperability in smart buildings		
13:48	The domOS approach for making existing buildings smart	Frédéric Revaz, HES-SO
13:56	The SmartGrid ready association: making interoperability in buildings happen	Christoph Brönnimann, SmartGrid ready association
14:04	Industrialising the roll-out of smart services in small buildings: the approach of a PLC manufacturer	Stéphane Rey, WAGO GmbH & Co. KG
Podium discussion 10 min		

Agenda

Session 2: Buildings and the electricity grid		
14:22	Intelligent buildings' role in the energy system of the future	August Bech, Green Power Denmark
14:30	Data standards to support the integration of buildings into grids: status and perspective	Olivier Genest, Chair of Data management Working Group at BRIDGE initiative
14:38	Exploiting the flexibility of buildings for electricity grid services	Matija Arh, domOS Technical Manager, INEA d.o.o.
Podium discussion 10 min		

Session 3: Increasing energy efficiency through smart services		
14:56	Potential of smartness to improve the efficiency of heating and cooling	Felix Bünning, viboo
15:04	Energy services for district heating	Henrik Stærmose, NEOGRID Technologies APS, Christian Byrjalsen, Aalborg Forsyning
15:12	Smart service for efficient heat generation and distribution	Yves Stauffer, Centre Suisse d'Electronique et de Microtechnique (CSEM)
Podium discussion 10 min		

domOS

OPERATING SYSTEM FOR SMART SERVICES IN BUILDINGS

Smart energy services in buildings: status, contribution to the energy transition, vision

domOS – BUILD UP Webinar

Feb. 8th 2 024

Dominique Gabioud (dominique.gabioud@hevs.ch)

Project coordinator

HES-SO, Sion, Switzerland

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894240.

Building & Energy

42% **of energy consumed in the EU in 2021 was used in buildings**	**Over 1/3** **of the EU's energy-related GHG emissions come from buildings**	**+/- 80%** **of the energy used in EU households is for heating, cooling and hot water**

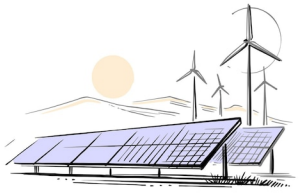
Source: https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/energy-performance-buildings-directive_en

- **Buildings must be involved in the energy transition**
- **Expectations**:

More efficiency

Especially for heating, cooling and hot water

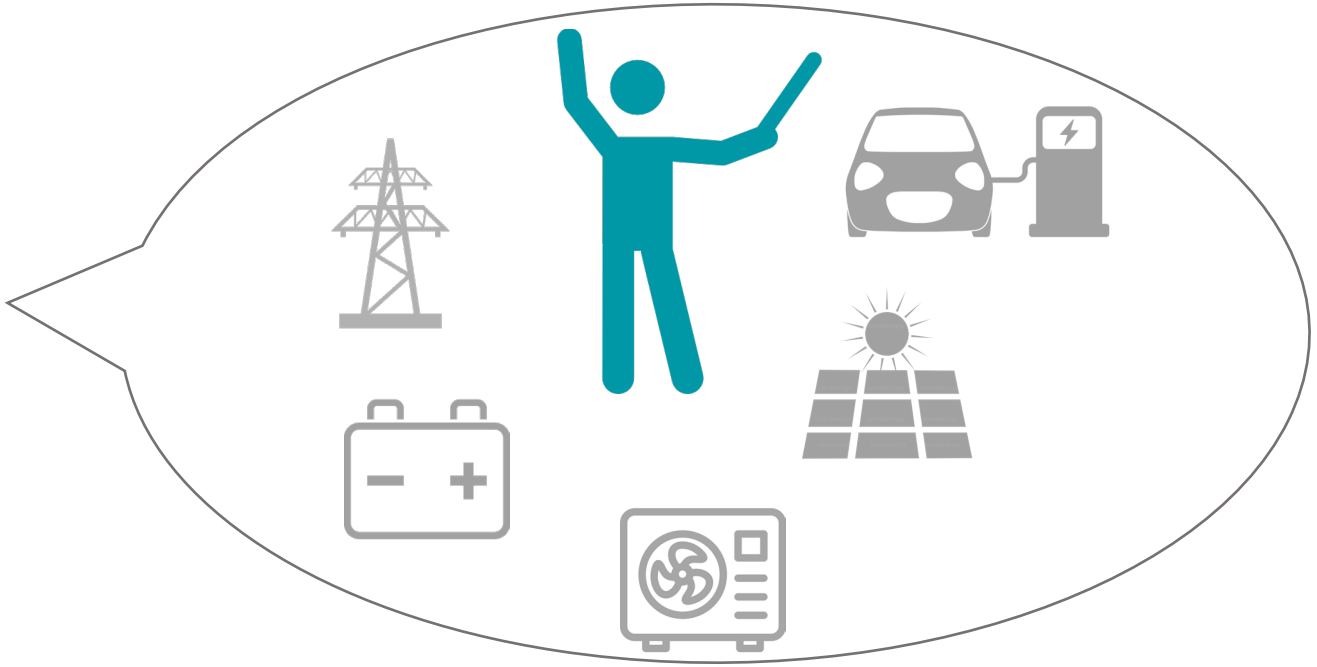
More flexibility



More local generation

Is smartness (part of) the solution?

- **More efficiency**
  - Deep renovation — Long term, heavy investment
  - **Smart services:** domOS — **Shorter term, less investment**
- **More flexibility** domOS
- **More local generation**



The two axes of domOS

1. Smart energy services for buildings

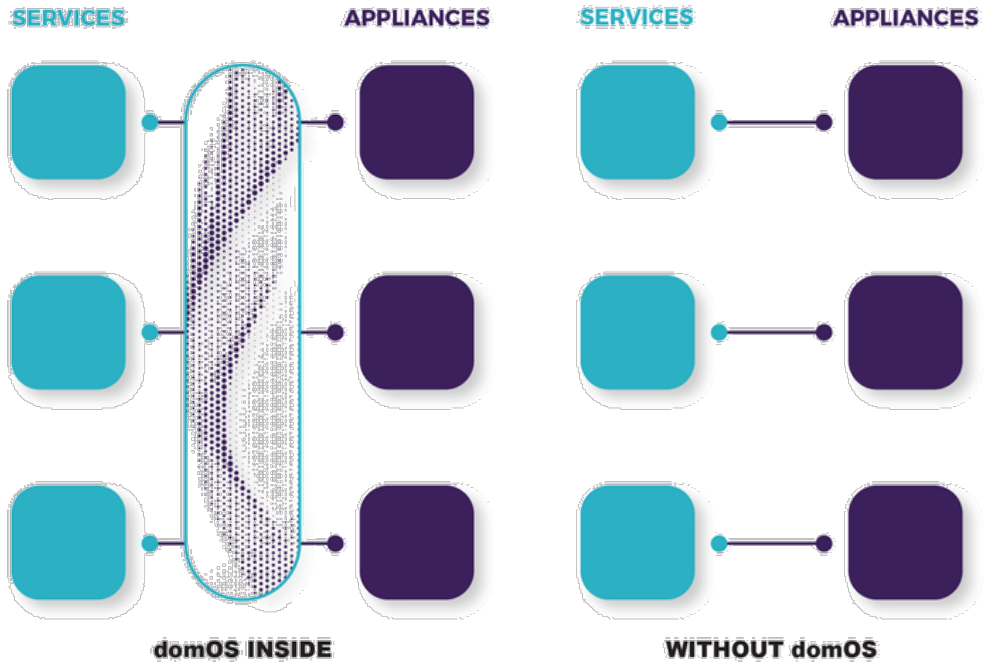
- **Energy efficiency services**
  - Session "**Increasing energy efficiency through smart services**"
- **Flexibility services**
  - Session "**Buildings and the electricity grid**"

2. Technology

- Objective:

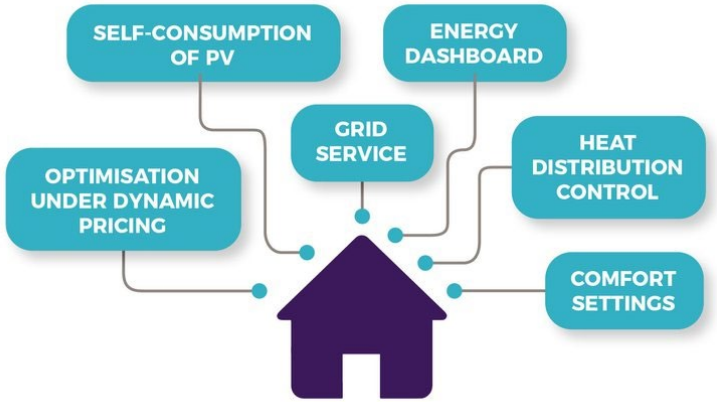
  To develop, prototype and experiment an **ecosystem** capable to boost the deployment of **smart energy services in existing buildings**
  - Session "**Interoperability in smart buildings**"

Technology: Where we are – and where we want to go



Operating System (-like) for buildings

Appliance model specific services, mostly provided by manufacturers



One building – one information system

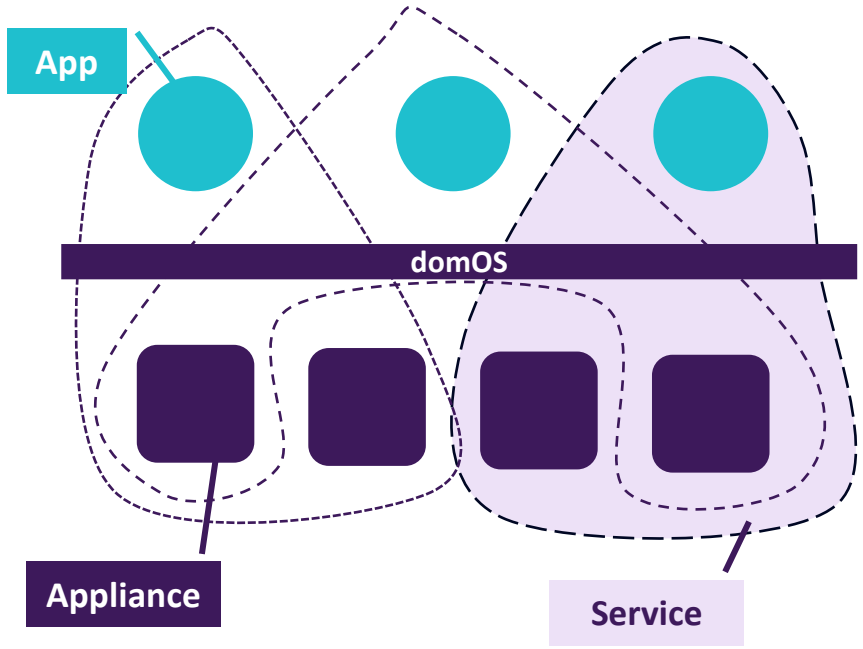
Limitations of the silo approach

- **Bad user experience**

- **Complexity to deploy energy management scenarios**
  - As they involve multiple appliances

Vision: an app store for smart energy services for buildings

- The **domOS ecosystem** decouples the **application plane** from the **infrastructure plane** in buildings
  - domOS developed an ecosystem, a specification that can be implemented on multiple platforms
    - Three platforms were upgraded in the frame of the project



- domOS paved the way for an **app store for buildings**
  - Energy management apps are independent of the building infrastructure

GET IT ON
domOS STORE

www.domos-project.eu

domosproject

domos_project

domos_project

Dominique Gabioud, Project Coordinator

HES-SO

dominique.gabioud@hevs.ch

Session 1:

Interoperability in smart buildings

domOS

OPERATING SYSTEM FOR SMART SERVICES IN BUILDINGS

domOS approach to make buildings smart

domOS Webinar

2024-02-08

Frédéric Revaz

HES-SO

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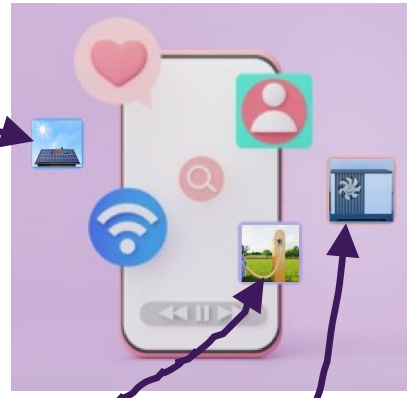
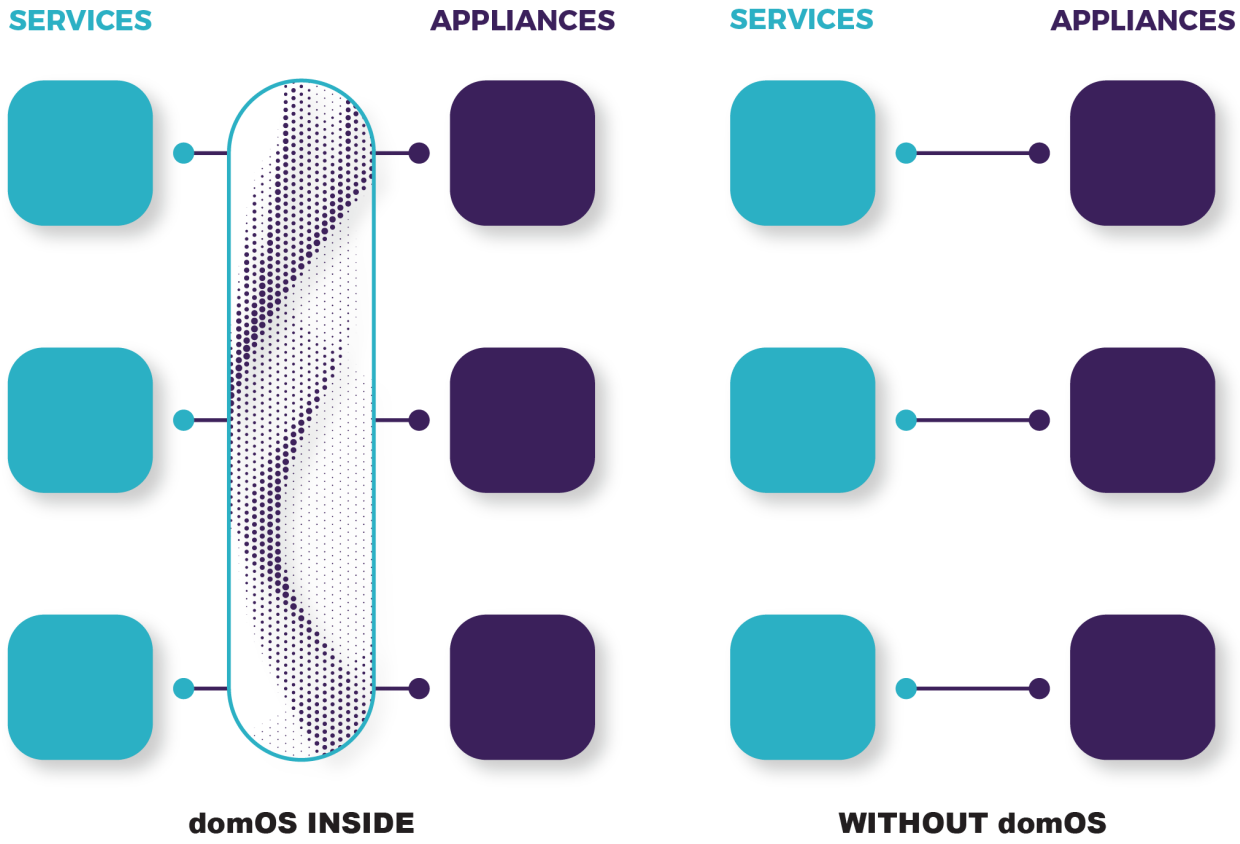
Customer: trapped in silos



What domOS brings

domOS is designed as an intermediary layer that basically offers the following capabilities:

- Discovery of the appliances present in a building and their capabilities
- Mediation layer allowing uniform access to these appliances



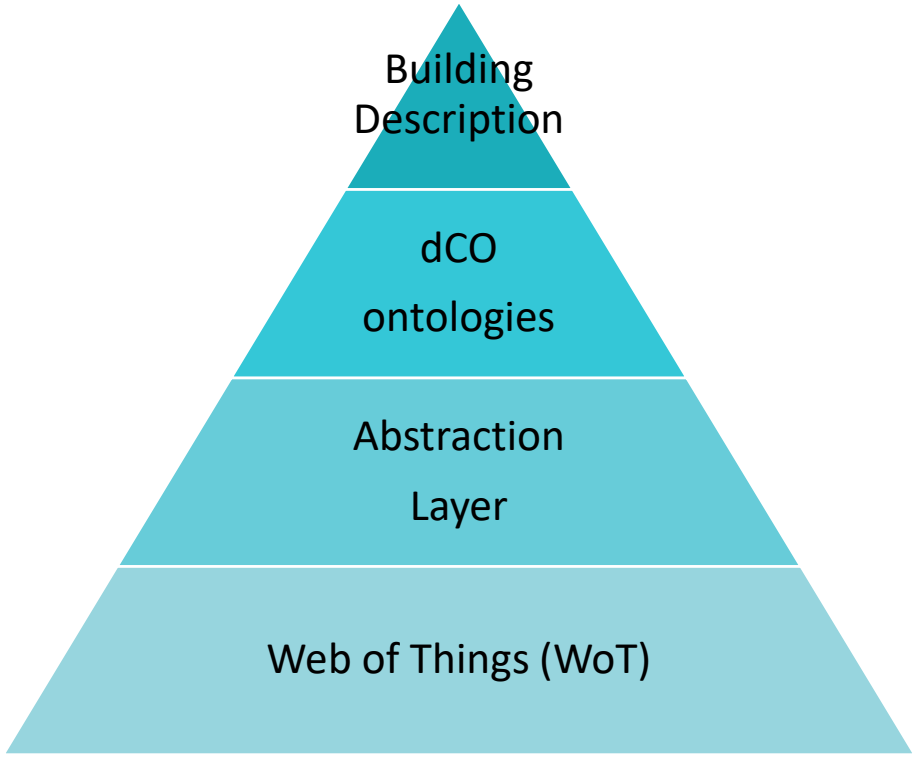
domOS components

Entry point (index.html) and description

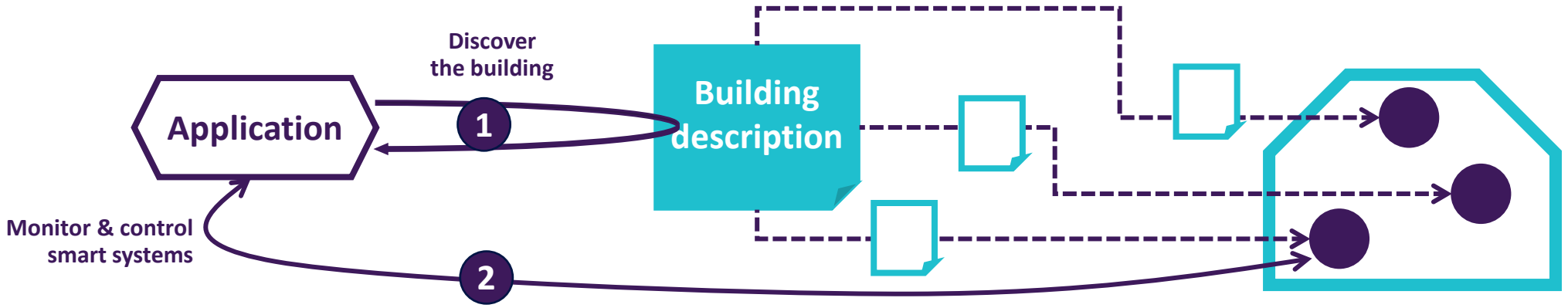
Common language

Models

Interaction



How does it work ?



Results

- **4 domOS** participating platforms updated:
  - BD for each building
  - TDs (or TMs) for appliances
- Services updated
- Prototype service works across platforms
- Sound concept for interoperability

Future work

domOS can be adopted by the industrial world:

- All the bricks are in place
- Standardization ?
- Better to continue development with industrial actors

Create the first AppStore for Buildings

SmartGrid® ready

The SmartGrid ready association

making interoperability in flexibility happen

Focussing on IEC / CENELEC efforts for flexibility management in the grid
and the involvement of SmartGridready

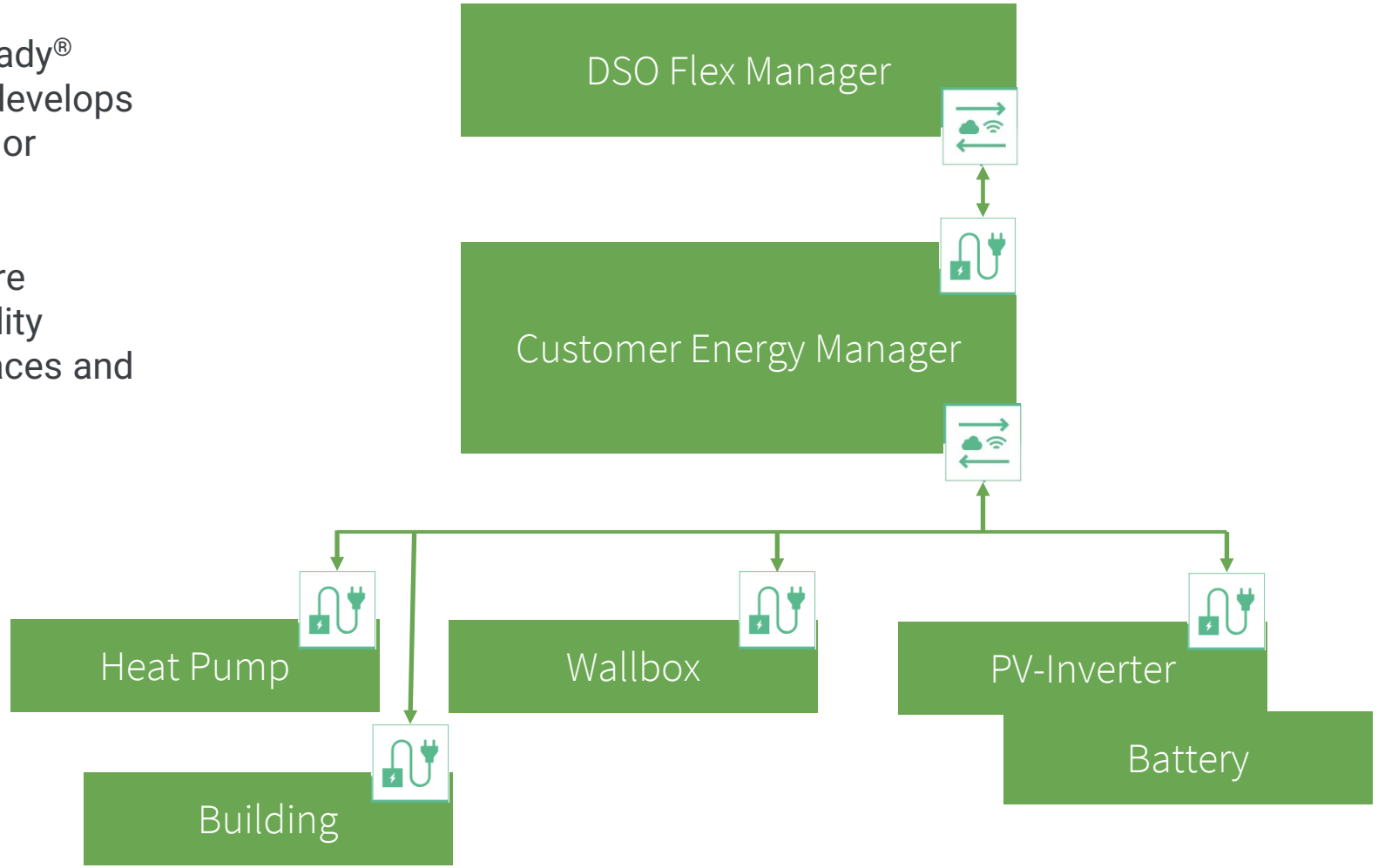
SmartGridready® , AN NPO IN SWITZERLAND

The purpose of the association is to develop, promote and distribute the label SmartGridready® and acts as a neutral body. The association develops a “bridge” between the network and facilities or systems (such as buildings, districts, etc.).

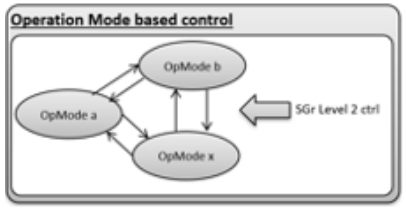
The label indicates that products and software (“communicator”) marked prove interoperability within a certain boundary of published interfaces and protocols.

communicator

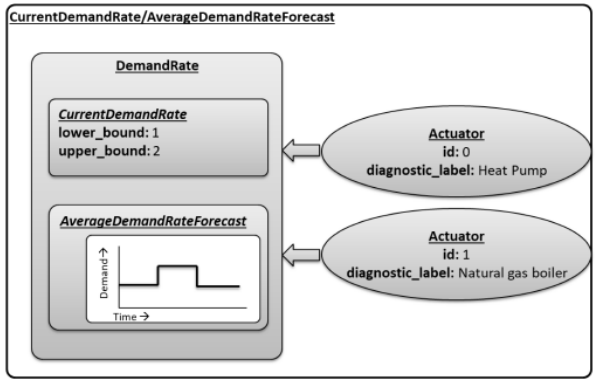
product



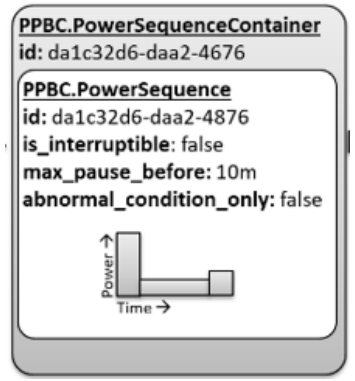
*INTEROPERABILITY NEEDS A **GENERIC FLEXIBILITY INDICATOR***



Operation mode control

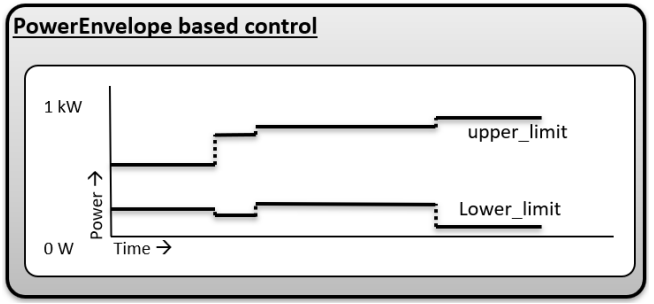


Direct control

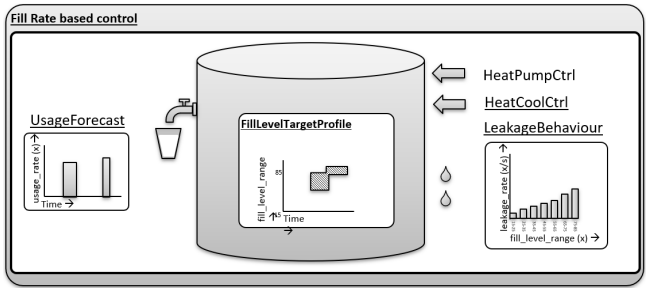


power Sequence Control

Power envelope control



Fill rate Control



☑ S2

Each of these control containers supports time setting, negotiation and demand side control

It was developed by CENELEC TC 205 WG 18 and brought to market as EN 50491-12-2 «S2» as a data model without protocols being assigned.

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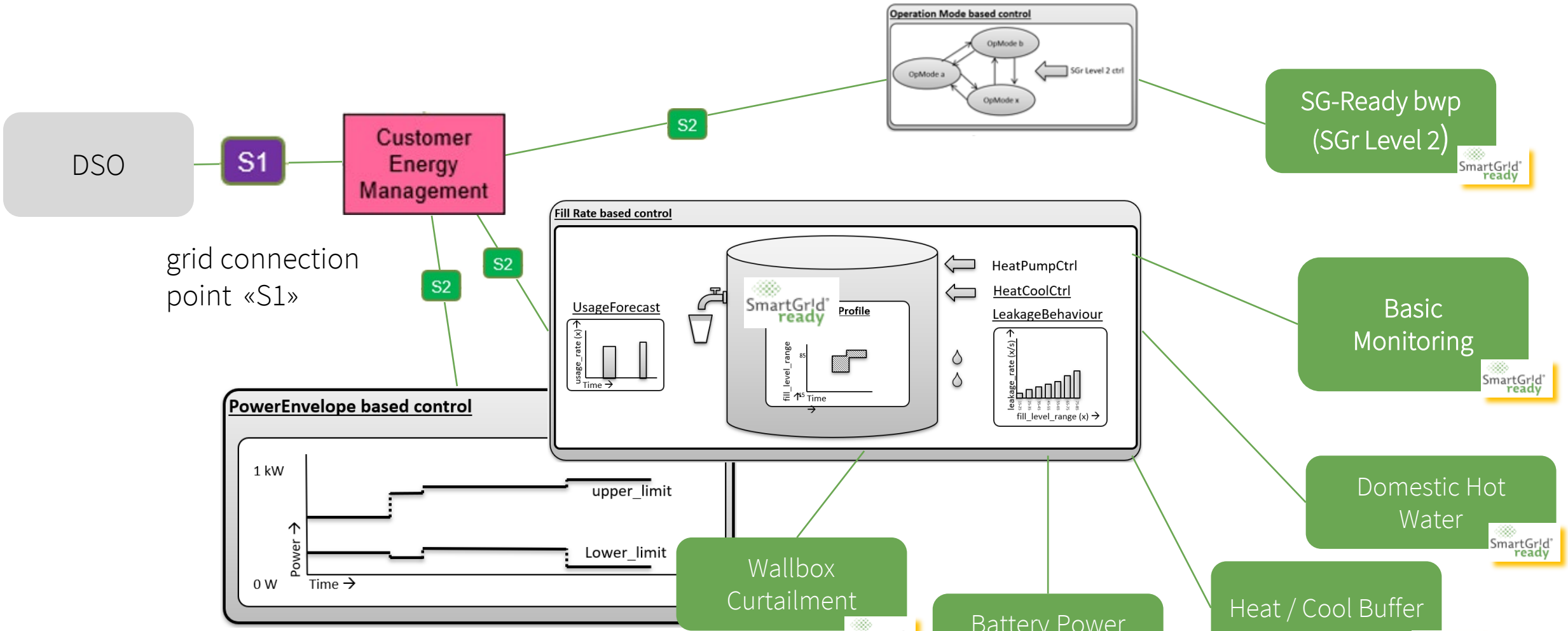
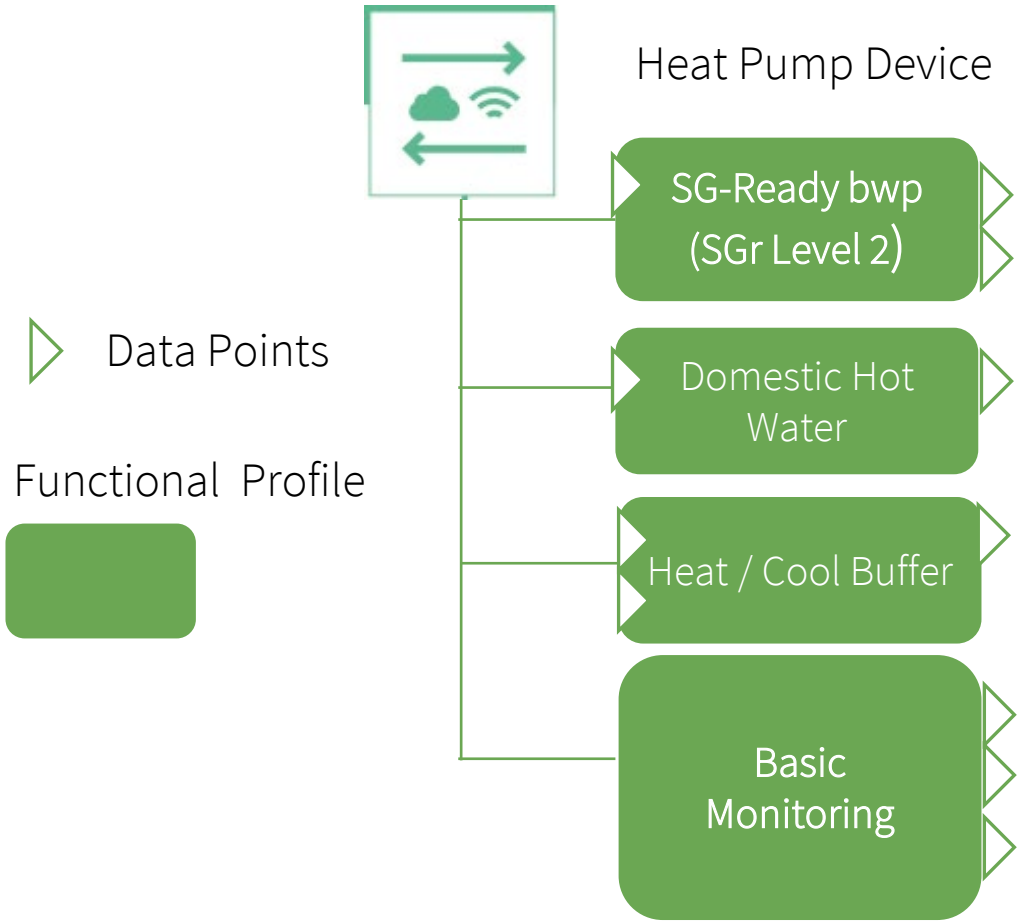
INTEGRATION USING FUNCTIONAL PROFILES AND CEM[1)]



[1)] Customer Energy Manager

WHAT IS A SMARTGRIDREADY FUNCTIONAL PROFILE



A Functional Profile is an Interface Class for a function block of a device.

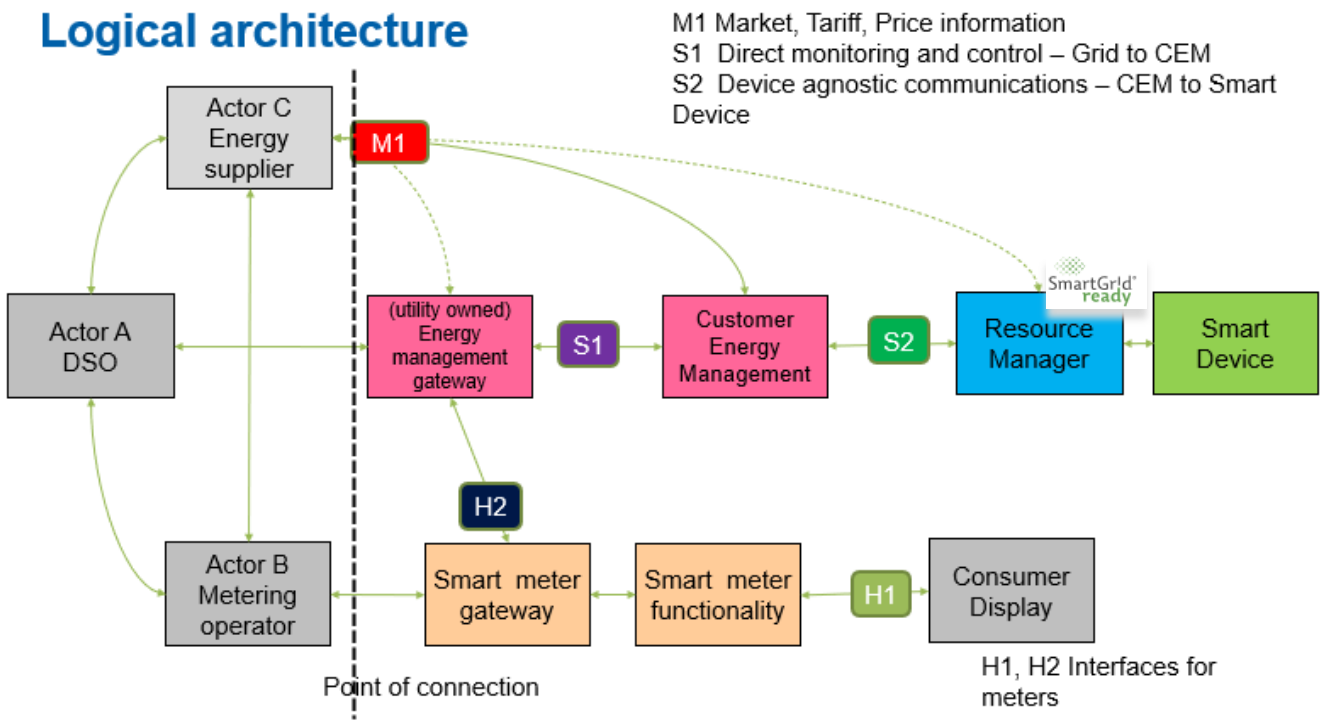
This example shows a heat pump with a Modbus Interface.

A SmartGridready Device owns a machine readable description in XML. Using our Open Source Software, it creates automatically an interface class with setters and getters for each data point.

Check Out the link below. Downloading the data sheet gives you the XML.

https://library.smartgridready.ch/SGr_04_0017_xxxx_HOVAL_HeatPumpV0.2.1.xml?viewDevice

THE EXTENDED REFERENCE ARCHITECTURE MODEL



S1 Grid Connection Point under joint development

H2 The SmartMeter H2 end customer interface .
SGr coor mit Smartgrids.at

SmartGridready offers Open Source Software Code ans EID's per device type

S2 *is currently as DIS **IEC 63402-2-2** under vote*

Architecture of Smart Energy IEC SC 23K WG 3 shared amongst different Stakeholders (e-Mobility, Smart Meter, Building Automation, SAREF4EENER etc.).

Corresponding committees and WGs: CENELEC TC205 WG19 / WG18 /IEC TC 57 / Sys Smart Energy / IEC TC 59 WG 7 / LOT33 / Lot38 / IEC TC69 / IEC TC 64 / K 716 / ACSEC / JTC1 SC25 /

HOW TO CREATE THE AI-INTERFACE WITH «SAREF4ENER» 28

SAREF: the Smart Applications REFerence ontology

Cenelec TC205 WG 19 SAREF: the Smart Applications REFerence ontology (etsi.org)

Ontology for Energy

interconnect the Horizon project «interconnect» creates the S2 mapping into SAREF

S2

Generic flex interface:
EN 50491-12-2 / IEC 63402-2-2 «S2»- Data model

Resource Manager	Resource Manager	SmartGridready Resource Manager(s)	KNX IoT Resource Manager	EEBUS Resource Manager

the SmartGridready bridge is one of the many potential Resource Managers

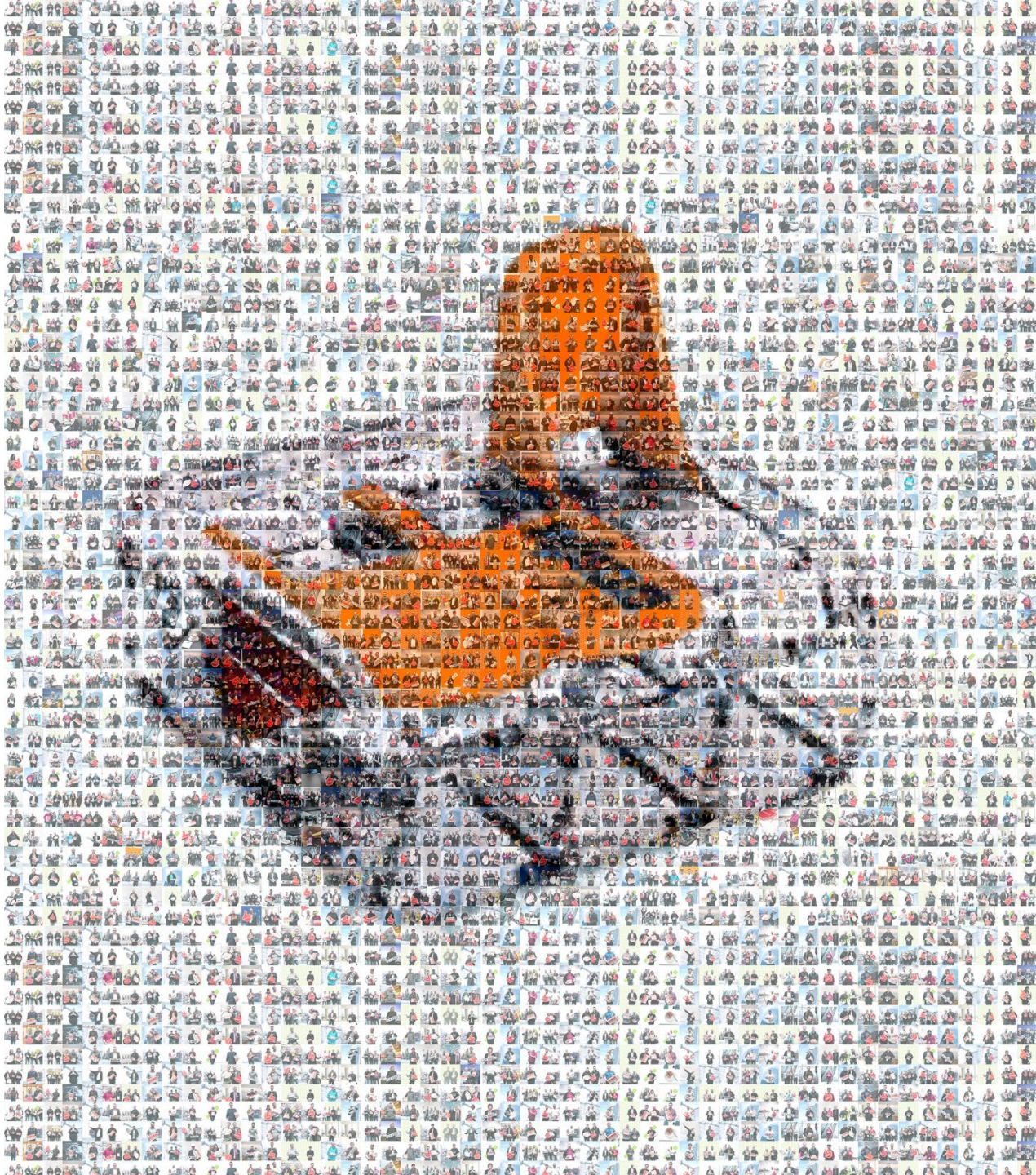
SmartGridready participates in Cenelec TC205 WG 19 for becoming part of the SAREF4ENER / SAREF4GRID Ontology.

SAREF4ENER builds the hood of the EU «Code of Conduct» for Smart Appliances

We are WAGO

Industrialising the roll-out of smart services in small buildings:

the approach of a PLC manufacturer



WAGO Worldwide

29 WAGO subsidiaries

(of which) **9** are production sites

(total) **> 80** agencies

Electrical Interconnections

Electronic Interface

Automation Technology

Solutions

Solution

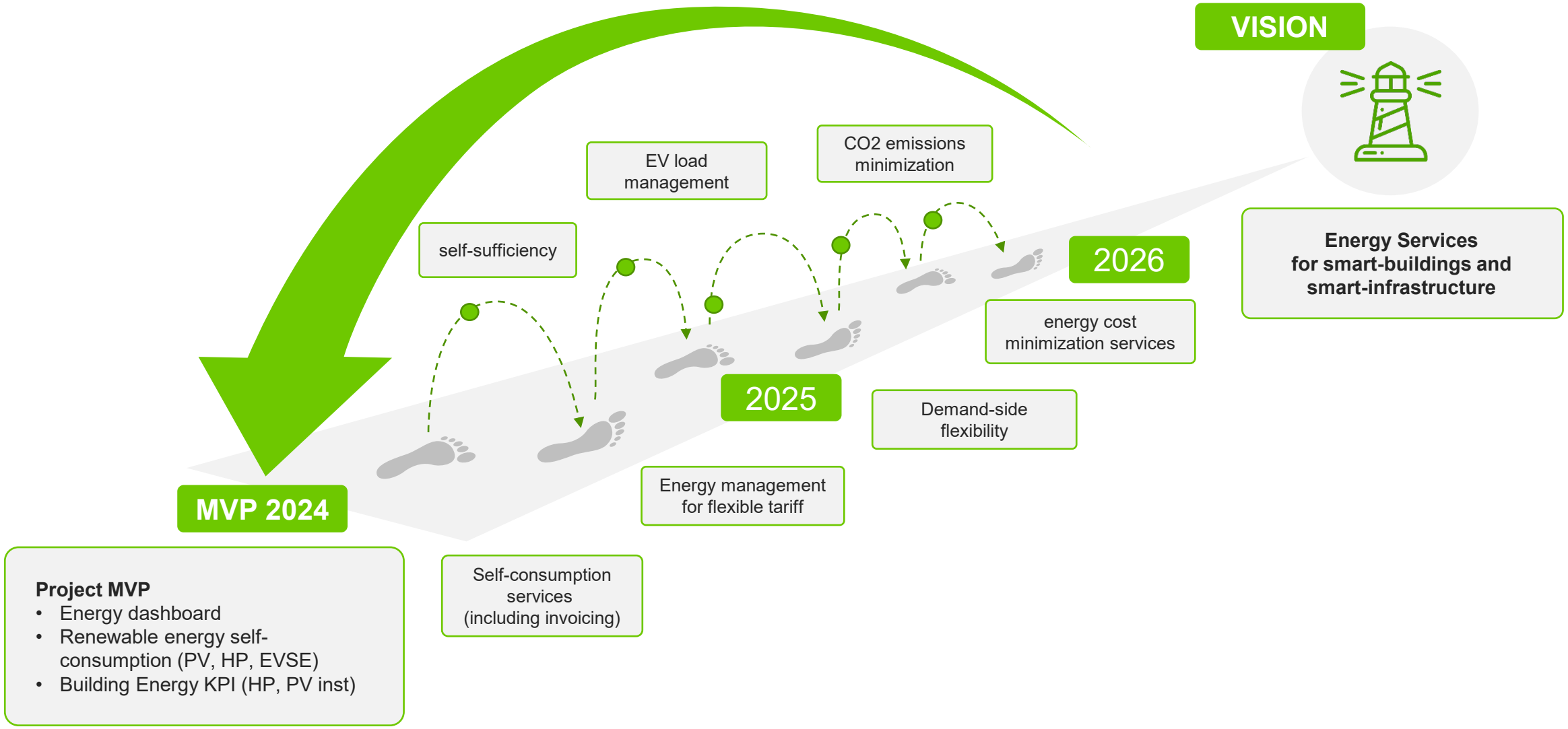
WAGO HEMS – Home Energy Management System
(Innosuisse project 101.827 IP-EE)

Home Automation

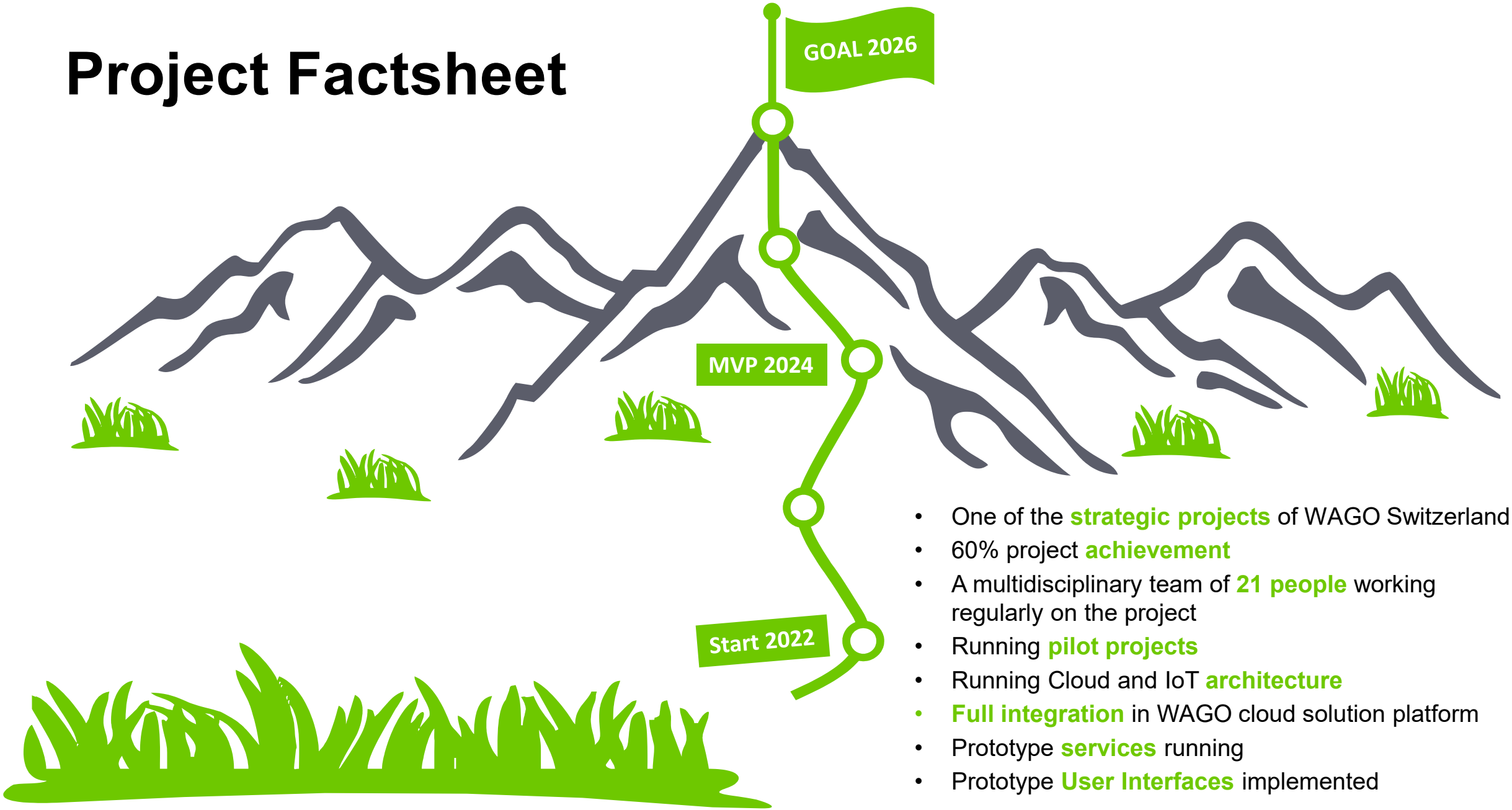
subscription

Products

PRODUCT VISION

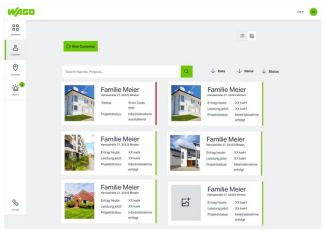


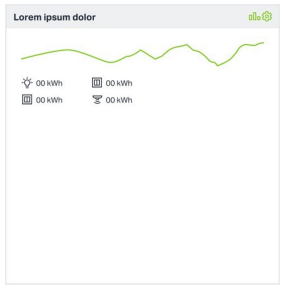
Project Factsheet

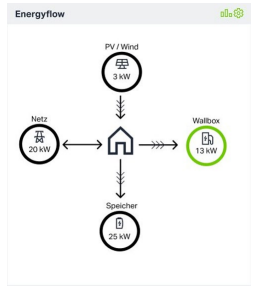


- One of the **strategic projects** of WAGO Switzerland
- 60% project **achievement**
- A multidisciplinary team of **21 people** working regularly on the project
- Running **pilot projects**
- Running Cloud and IoT **architecture**
- **Full integration** in WAGO cloud solution platform
- Prototype **services** running
- Prototype **User Interfaces** implemented

Topology



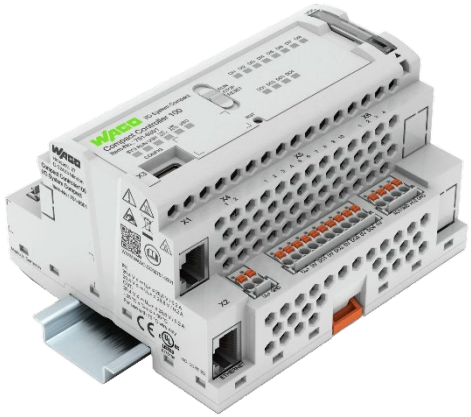


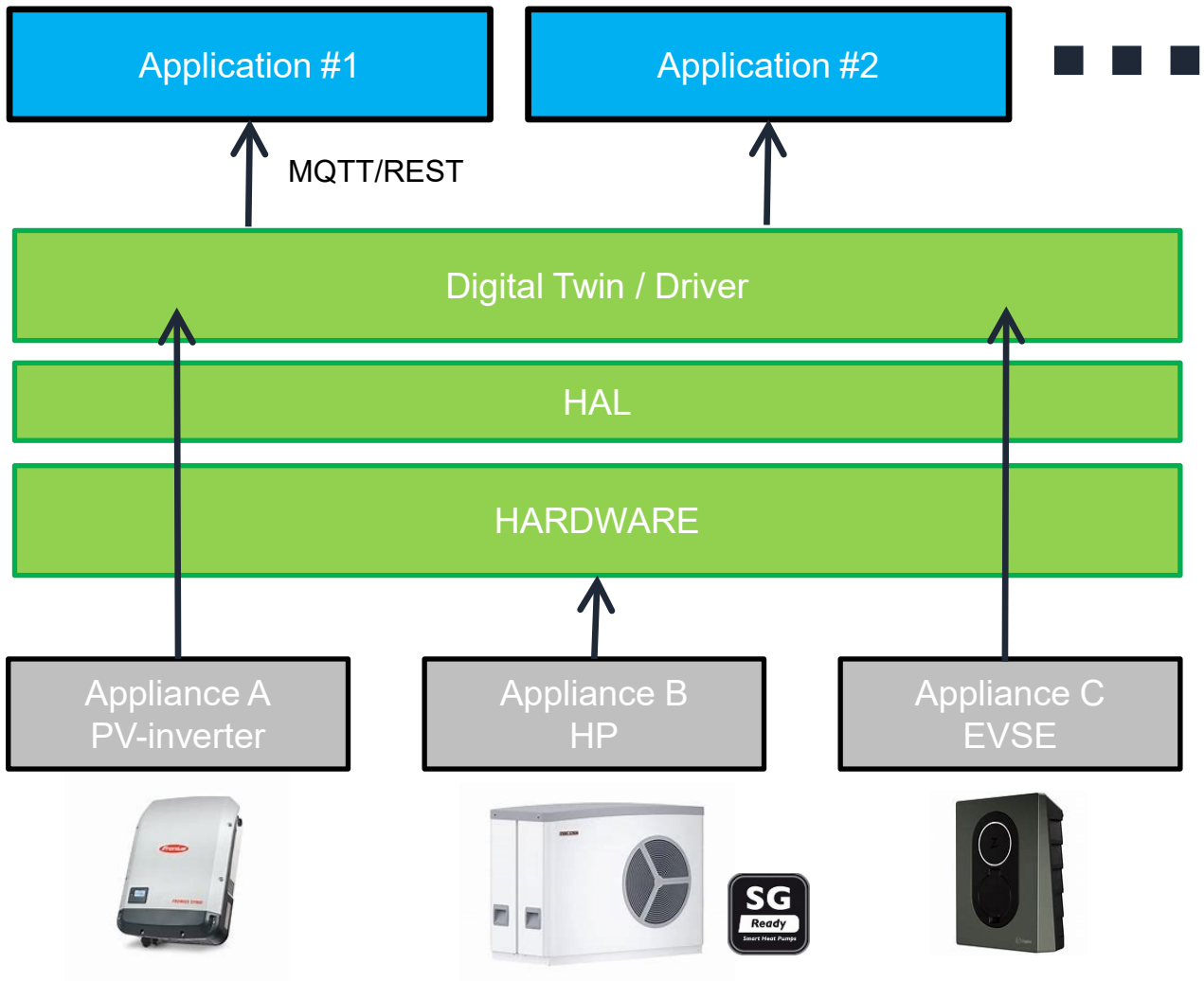


Applications

Edge Device

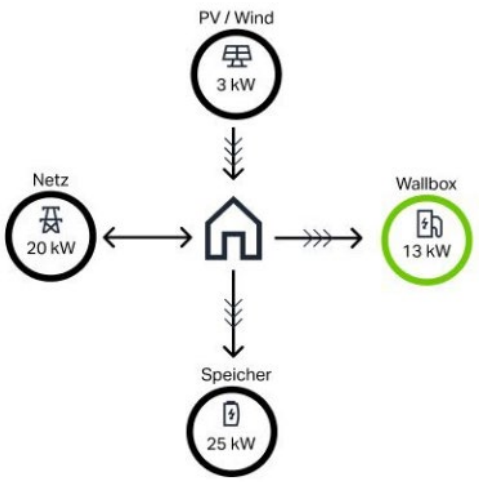
Appliances





Simplified eng. with the building description

- The building description is a single point of information **containing all necessary information** for a service
- It enables automatic **deployment** of the **appliance driver** with Docker
- It enables automatic **deployment** of the **application**
- ..



WAGO CLOUD

- Building metadata
  - Building location (GPS coordinates)
  - # of rooms
  - # of floors
  - Heating reference surface
  - Building insulation thickness
  - ..

➢ All information an application needs !

- Appliance driver parameter
  - Appliance type
  - Driver version
  - Port, slave-ID, bitrate
  - Reference of the docker container (registry)
  - Appliance configuration
  - ..

➢ All information the edge-device needs to communicate within the appliances

docker


WAGO

Podium discussion

Send us your questions!

Session 2:

Buildings and the electricity grid

DAG MÅNED ÅR

Needs for flexibility in a security of supply perspective

GREEN POWER DENMARK

2 trends in the european energy system

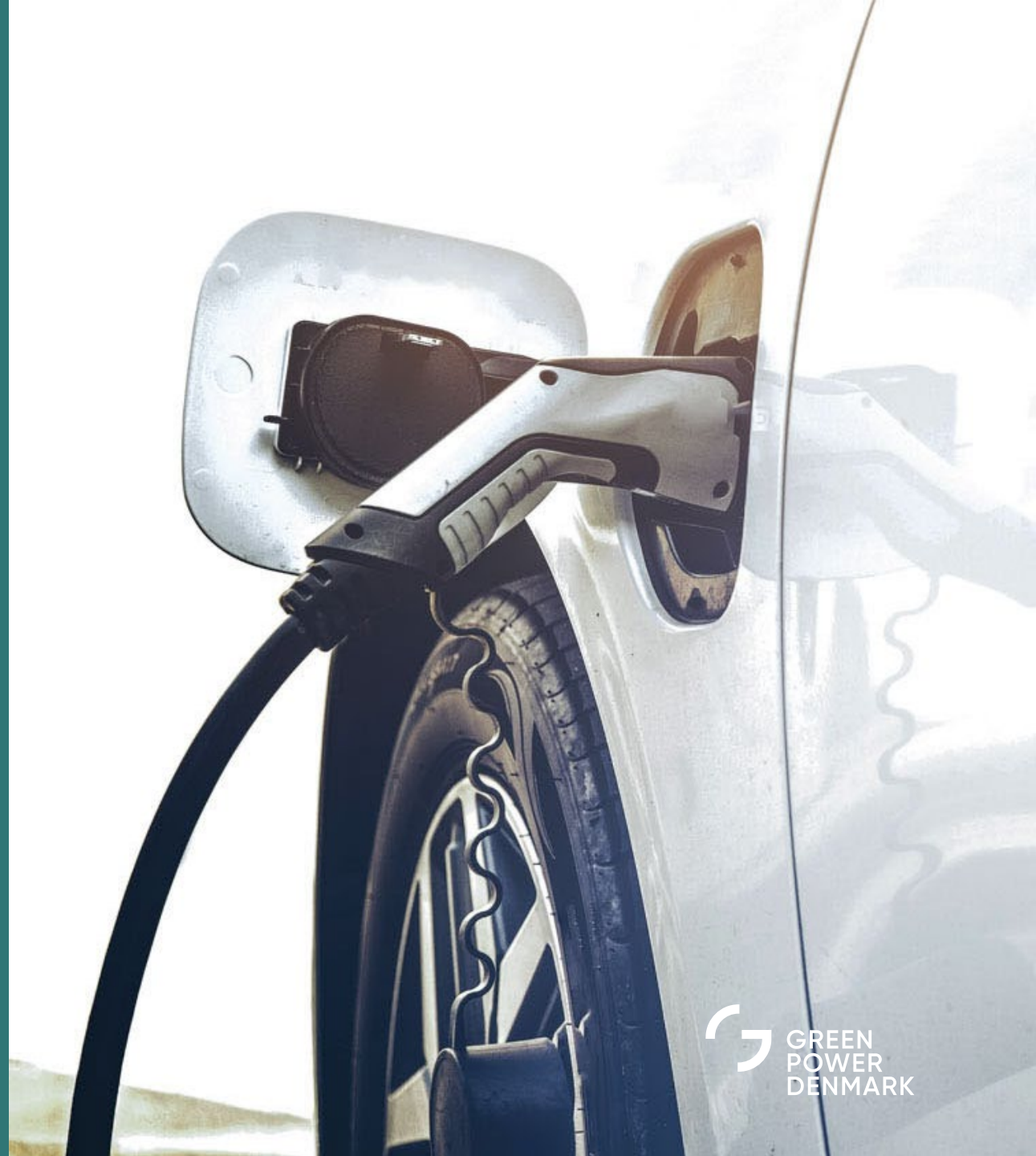
GREEN POWER DENMARK

Increase in fluctuating power production from wind and solar

- Political willingnes in member states and the EU for rapid expansion of the wind- and solar capacity.
- ERAA 2023 (ENTSO-E) calculate that roughly 50% of our power production capacity is from either wind or solar.
- Weatherbased power production means on a system level big variations in power production. Especially true in Denmark.

Increase in power demand

- Increase in power consumption for:
  - Transportation
  - Heat production (heat pumps in households or in district heating)
  - Datacenters
  - Power-to-X / Hydrogen production
- Green Power Denmark expects 3X electrical demand the next 10 years in Denmark.

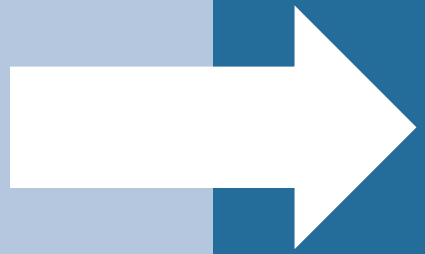


40%

- Energy consumption in buildings

GREEN POWER DENMARK

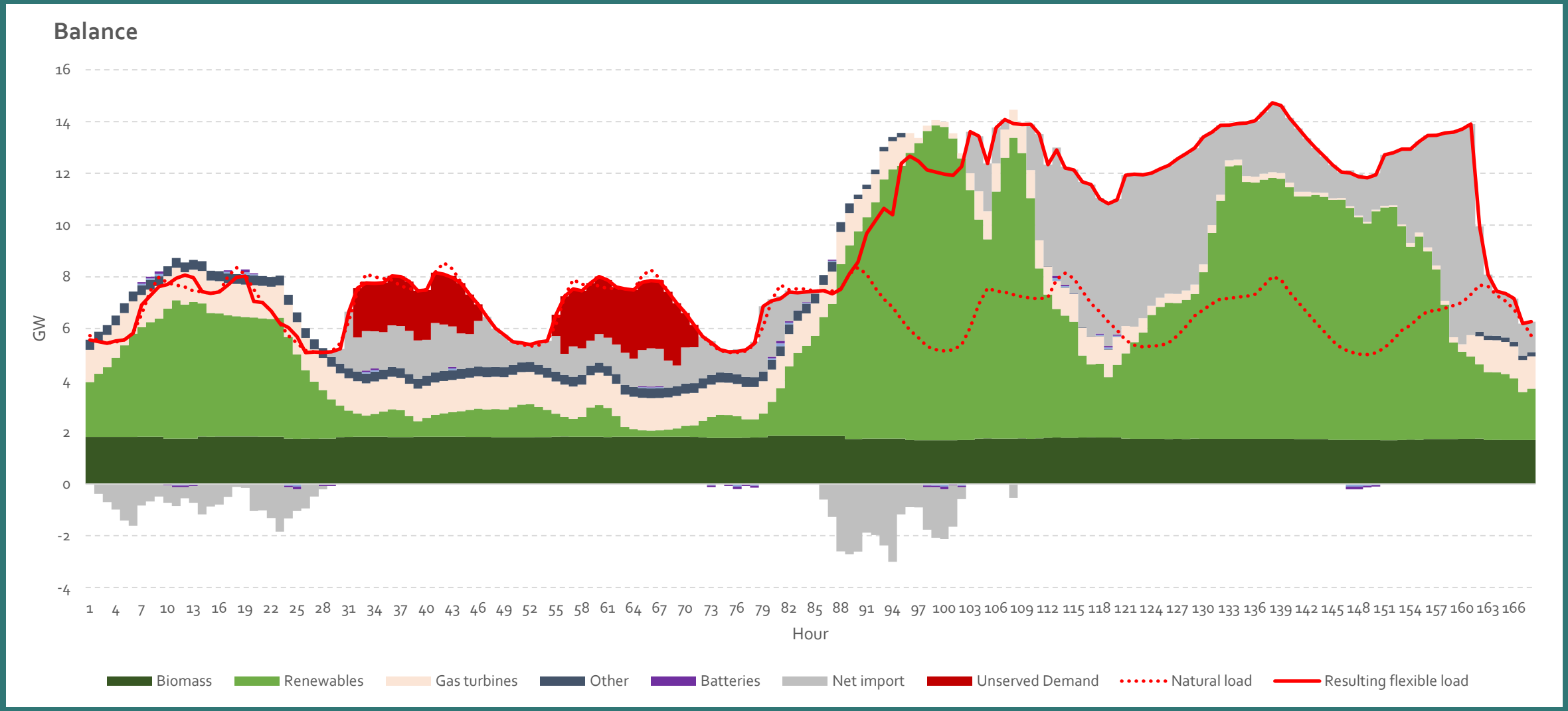
Managing energy production



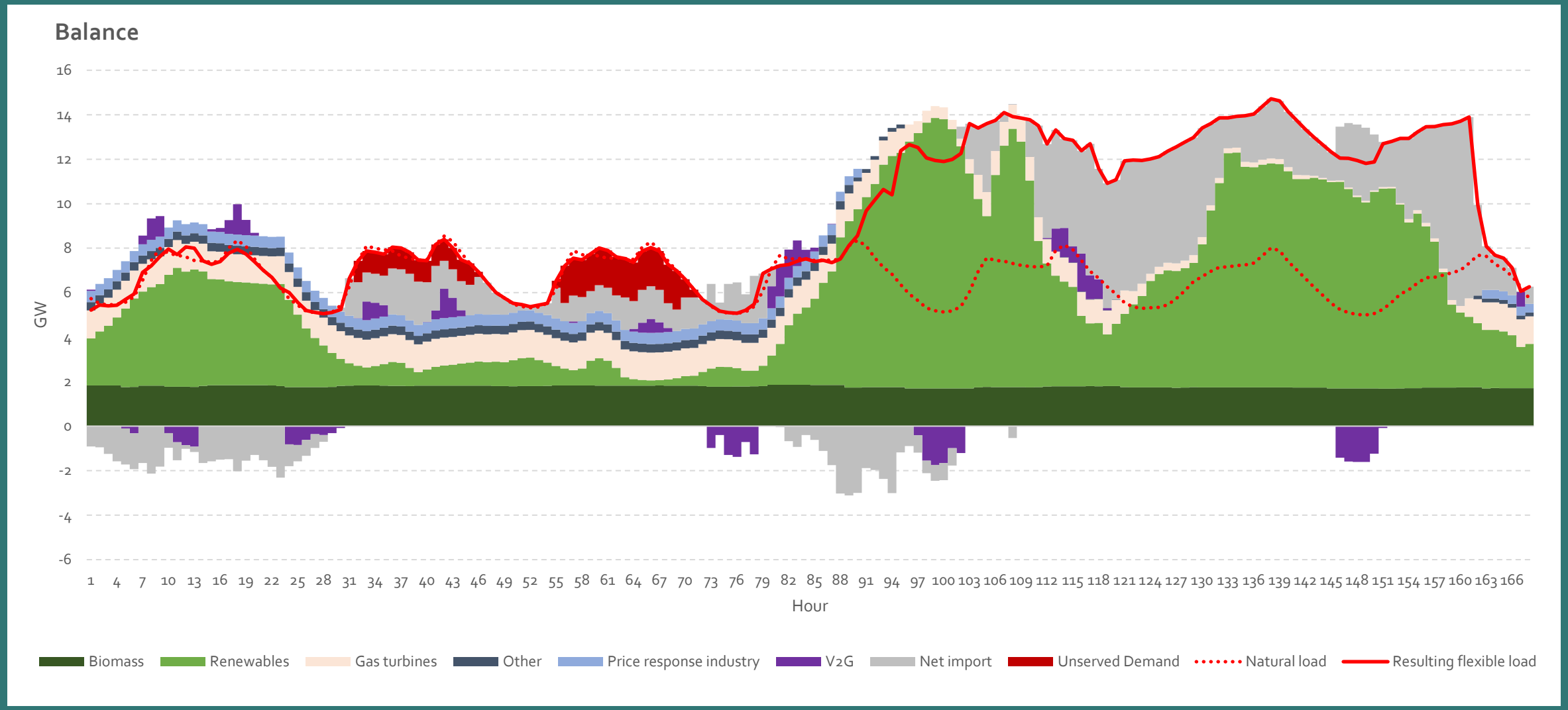
Managing energy consumption

GREEN POWER DENMARK

Chok scenario – Denmark 2030.
One cold winter week with low wind- solar production in Europe.



Chok scenario – Denmark 2030. Increasing the amount of flexibility 10% extra flexibility from companies, 25% extra flexibility datacenters and V2G capabilities

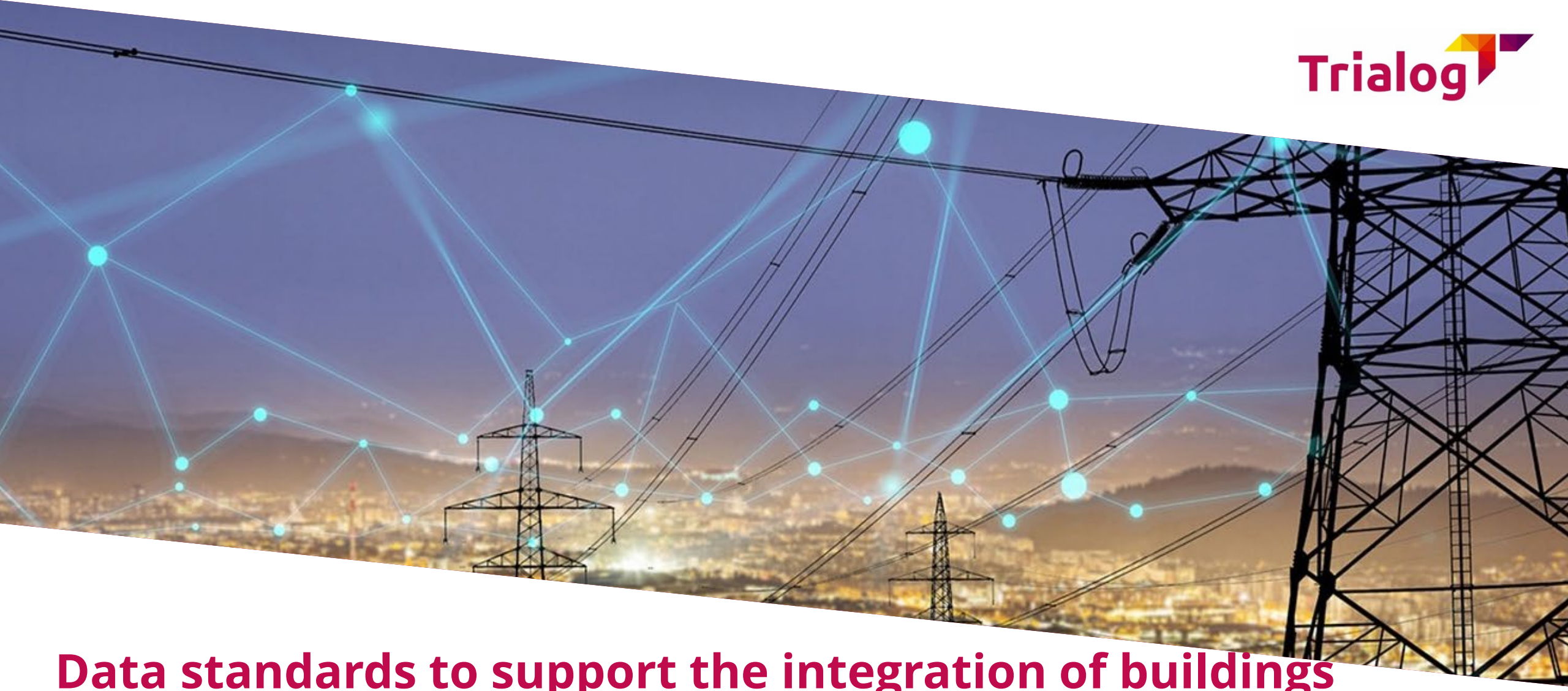


In a power system with increasing demand and fluctuating power production we need to switch from managing power production to managing power consumption.

Otherwise ends cant meet.

August Bech – Green Power Denmark

GREEN POWER DENMARK



Data standards to support the integration of buildings into grids: status and perspective

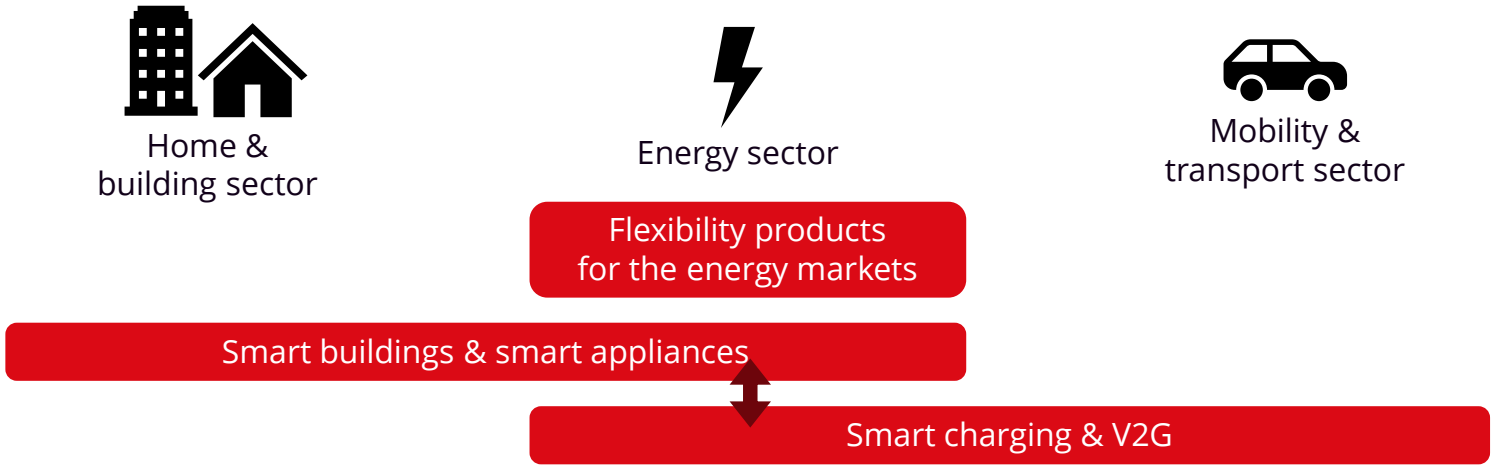
Olivier Genest – Director at Trialog

Chair of BRIDGE Data Management WG | Convenor of IEC SyC Smart Energy JWG3 | Moderator of FlexCommunity FG4

The need for cross-sector data exchange

Integration between three domains

→ enable novel use-cases and services



Requirements to support cross-sector data exchange

- Business level: roles, governance, regulation, …
- Function level: functional processes for data exchange
- Information level: data models, ontologies, …

Research Industry

Standards

EU R&I: from data sharing to data spaces

Data management | Customer engagement | Business models | Regulation

bridge HORIZON 2020

Launch date	N° of countries involved	N° of participating organisations
2016	39	1458

N° of projects	Accumulated EU funding	Time frame of the calls
98 / 155 SINCE 2016	€1.23bn	2014-2023

IoT LSPs cluster *led by* OPENDEI

Data-related projects
PLATOON
INTERCONNECT
OneNet
BD4OPEM
…

other domains

CEEDS cluster *led by* int:net Interoperability Network for the Energy Transition

DATACELLAR
EDDIE
ENERSHARE
OMEGA-X
SYNERGIES

DS other domains
…

DATA SPACES SUPPORT CENTRE

2016 2019 2022 2023 2026

Smart Grid Task Force

ETIP SNET PLAN. INNOVATE. ENGAGE.

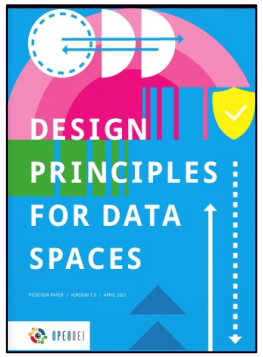
Alliance for Internet of Things Innovation

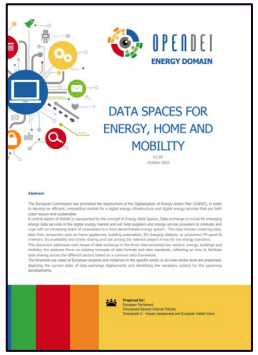
BDV BIG DATA VALUE ASSOCIATION

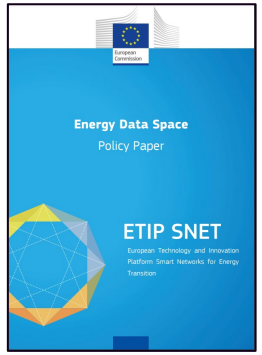
INTERNATIONAL DATA SPACES ASSOCIATION

gaia-x

Data4Energy WG



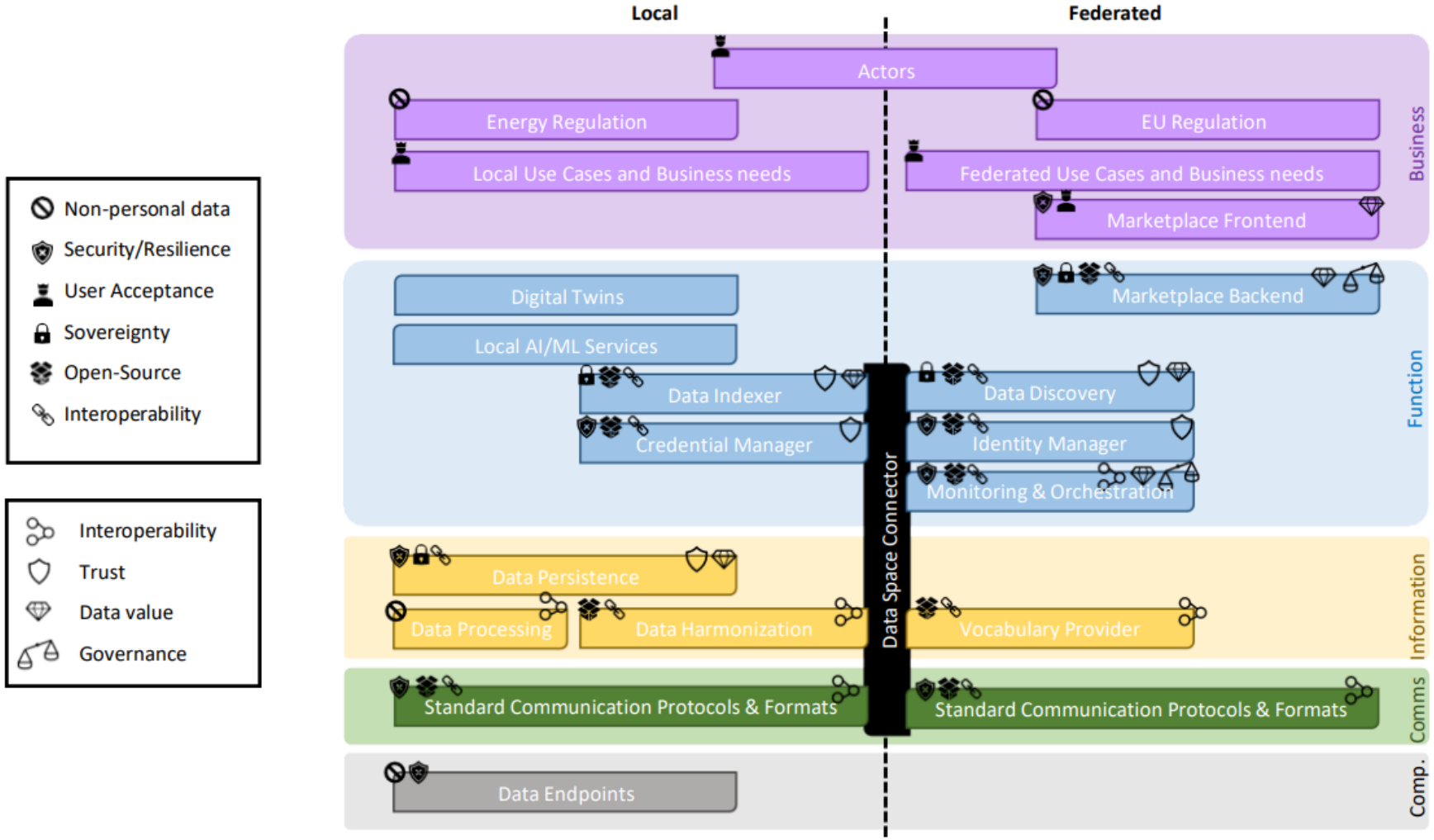




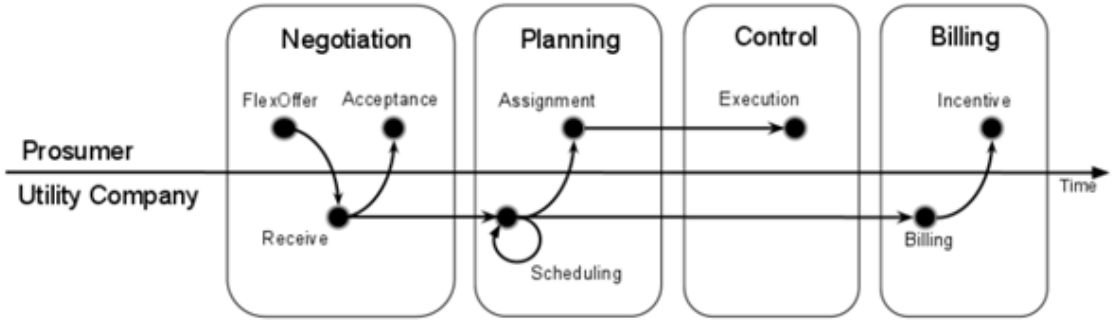
Trialog

BRIDGE Data Exchange Reference Architecture (DERA 3.0)

Main objective: support cross-sector data exchange



FlexOffer



FlexOffer technology

- FlexOffer is made of a common generic core and possible application-specific profiles.
  - Common representation of flexibility
  - Application protocol and data format
  - Trading and settlement, depending on the market
  - Flexibility activation (direct or via EMS)
- FlexOffer has been or is being used by more than 15 projects

MIRABEL energy
Balancing energy supply and demand
TotalFlex
DCyPS
FEVER
GOFLEX
GIFT
domOS

→ FlexOffer User Group

- Objective: maintain FlexOffer specification and promote its use
- 54 registered participants
- Part of the FlexCommunity (as FG4)
- Open source specifications

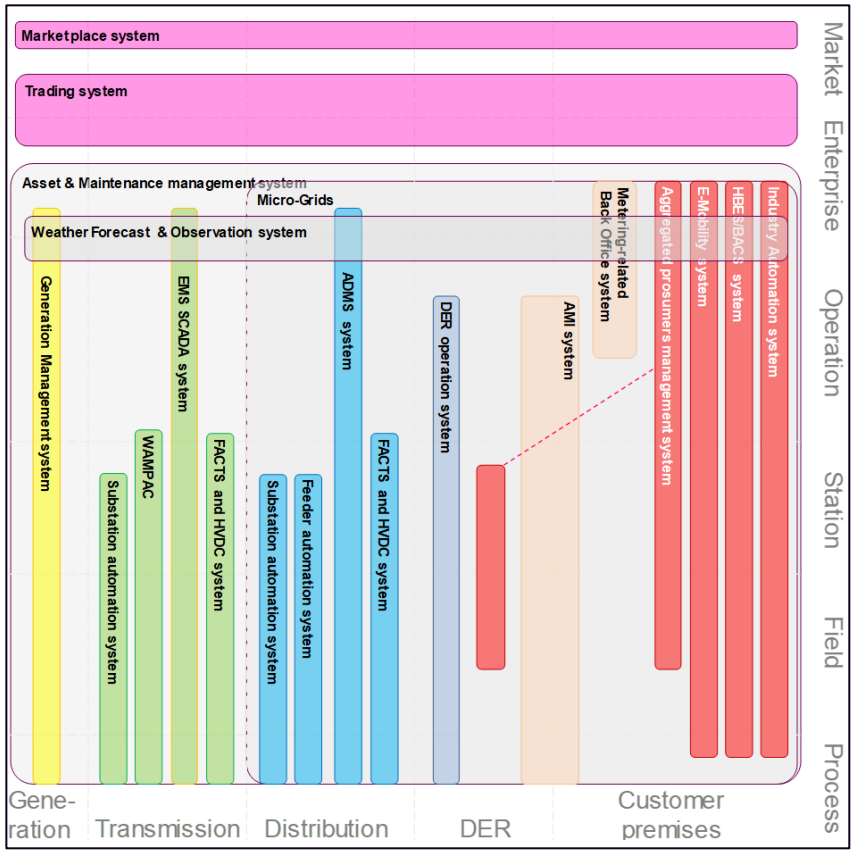
flexcommunity

https://flex-community.eu/

Standardisation

Navigating through standards: Smart Energy Roadmap

IEC SyC Smart Energy



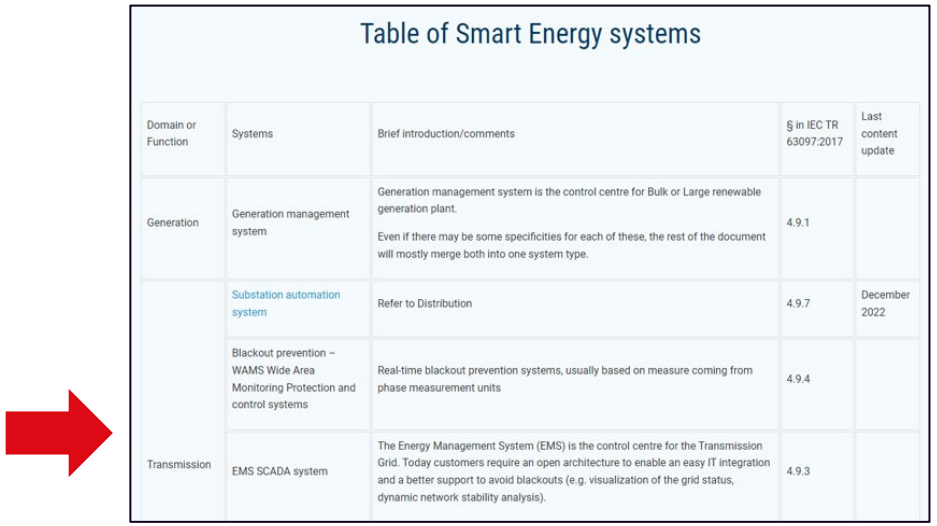


Table of Smart Energy systems

Domain or Function	Systems	Brief introduction/comments	§ in IEC TR 63097:2017	Last content update
Generation	Generation management system	Generation management system is the control centre for Bulk or Large renewable generation plant. Even if there may be some specificities for each of these, the rest of the document will mostly merge both into one system type.	4.9.1	
	Substation automation system	Refer to Distribution	4.9.7	December 2022
	Blackout prevention – WAMS Wide Area Monitoring Protection and control systems	Real-time blackout prevention systems, usually based on measure coming from phase measurement units	4.9.4	
Transmission	EMS SCADA system	The Energy Management System (EMS) is the control centre for the Transmission Grid. Today customers require an open architecture to enable an easy IT integration and a better support to avoid blackouts (e.g. visualization of the grid status, dynamic network stability analysis).	4.9.3	

https://syc-se.iec.ch/iec-63097-smart-energy-roadmap

Available standards

Coming standards

Trialog

Towards standards-based interoperable data exchanges

Complementary initiatives targeting the same final objective

- EU R&I
- Industry alliances
- Standardisation

PoC & pilots

Industry adoption

Main achievements and future perspectives

- Cross-sector use-cases → cross-sector integrated systems
- Dta models and ontologies → standards enabling semantic interoperability
- DERA and data spaces → harmonized data exchange architecture and procedures
- Leverage existing and future standards → smart energy roadmap
- Support industry adoption → user groups and feedback loops

Merci !

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OPERATING SYSTEM FOR SMART SERVICES IN BUILDINGS

Exploiting the flexibility of buildings for electricity grid services

Name of the event

8.2.2024

Matija Arh
domOS Technical Manager

INEA d.o.o.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894240.

INEA d.o.o.

domOS

INTELLIGENCE

Manufacturing intelligence & decision support, control, visualization and forecasting

ENERGY

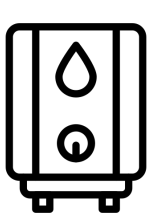
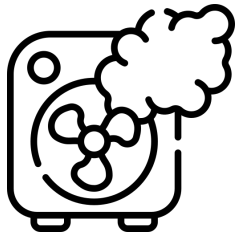
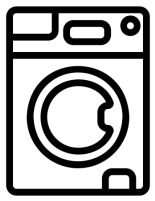
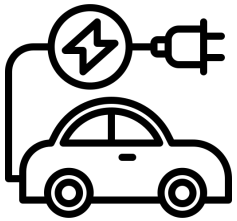
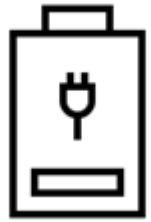
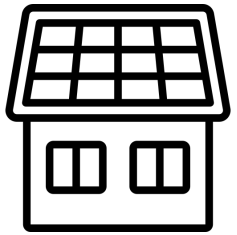
Increasing energy efficiency and managing your energy costs

AUTOMATION

Increasing productivity performance, increasing and maintaining reliability

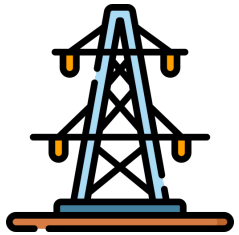
Flexibility of buildings

What are flexibility providing loads?

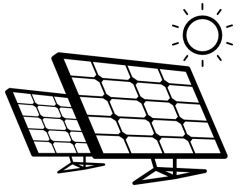







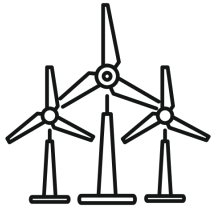
Use of flexibility

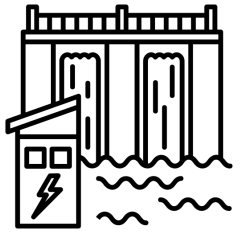
What would you use flexibility for?



- Optimization of consumption according to energy price
- frequency control
- voltage control
- congestion management







Connectivity

- The energy contribution of each device is relatively low in aspect of the grid
- Cost of IoT devices
- domOS solution:
  - Connecting existing IoT devices
  - Simple connection of any IoT device
  - Allows monitoring and controlling

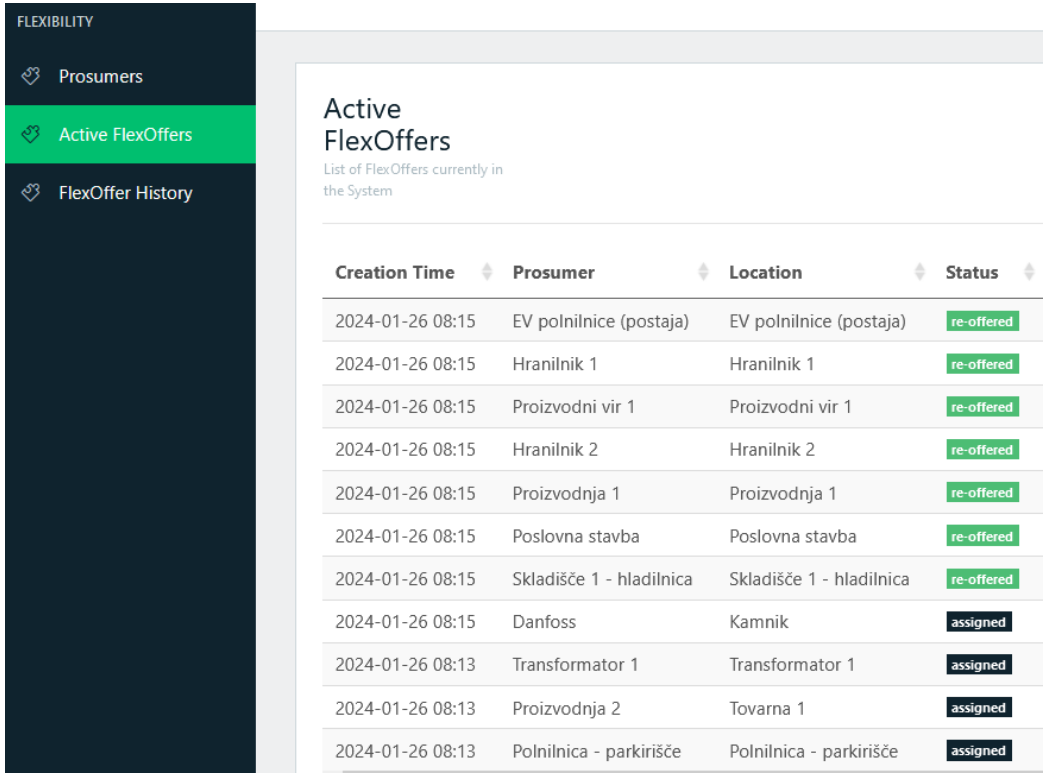
Aggregation

Monitoring + user settings = FlexOffer

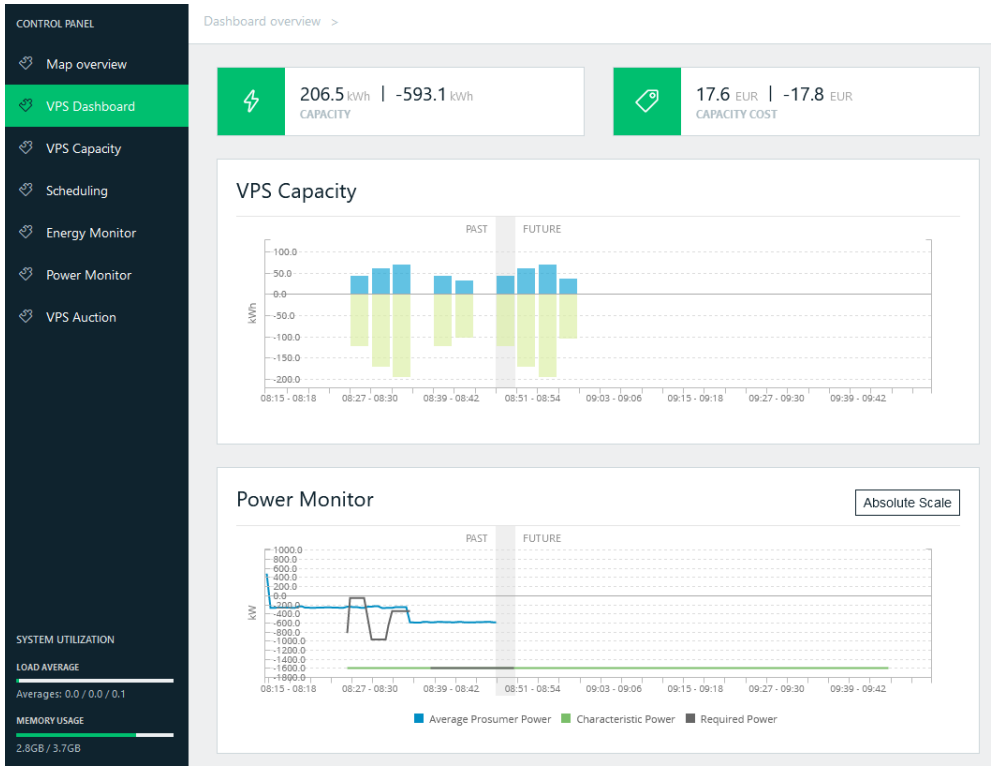
“The grid” generates its own FlexOffer

Optimization algorithm to match compatible FlexOffer-s

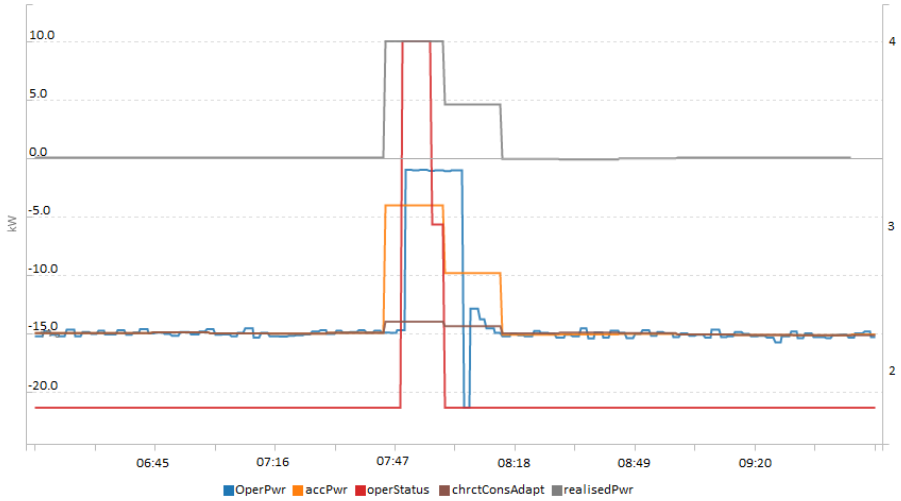
Controlling devices based on optimization results (activation of flexibility)



Orchestrated control



During activation, the devices are monitored
And after, the effects of flexibility are estimated



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Thank You!

Matija Arh

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08.02.2024

Presentation has been designed using images from Flaticon.com

Podium discussion

Send us your questions!

Session 3:

Increasing energy efficiency through smart services

viboo

Building intelligence,
empowering efficiency

Self-Learning Predictive control for light commercial buildings

Felix Bünning, CEO
felix.buenning@viboo.io
https://viboo.io

Building intelligence, empowering efficiency

We've developed a software **platform to empower building efficiency**

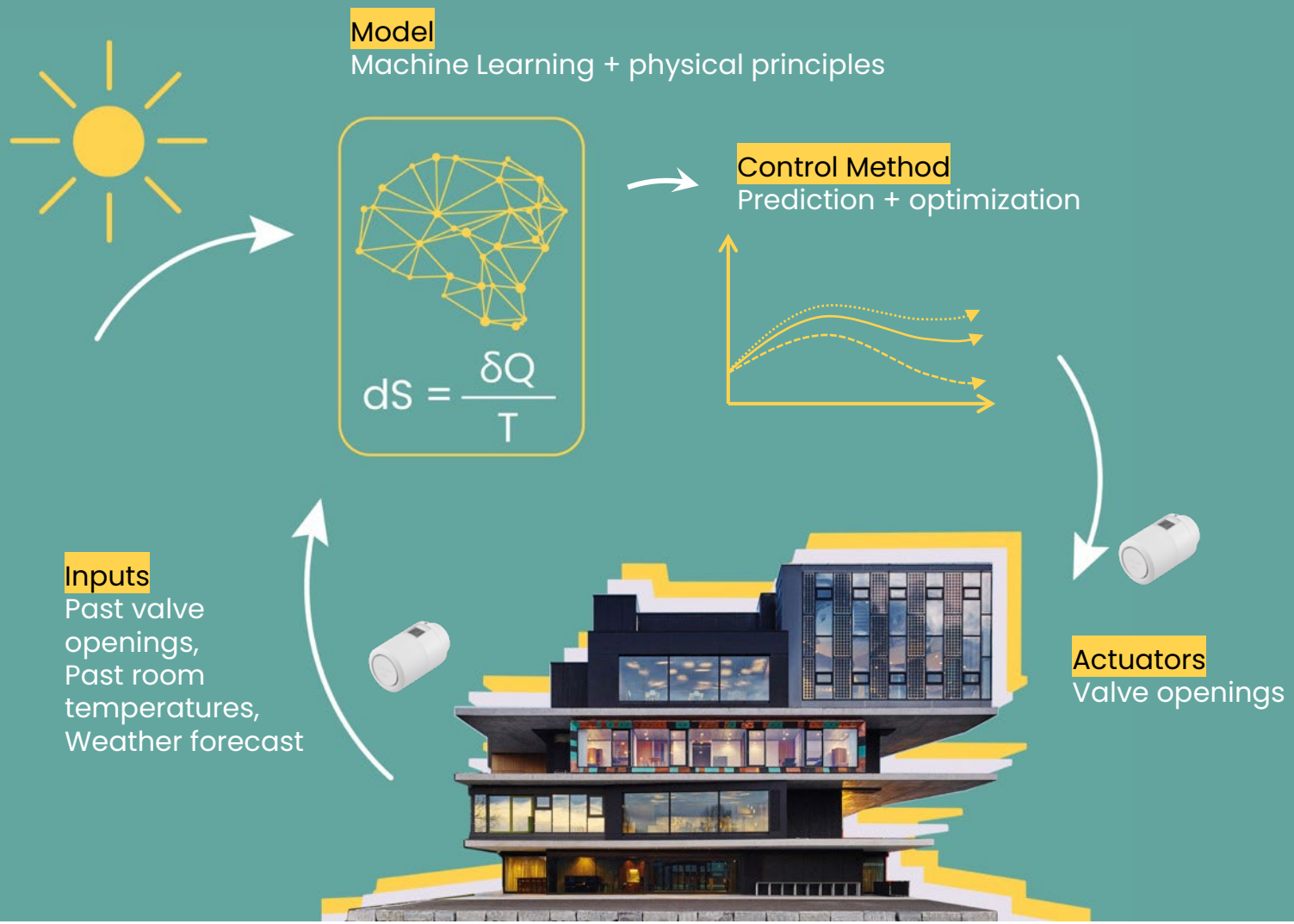
Self-Learning Predictive Control is the first feature of our platform

Reduce a building's energy demand by **20 – 40%, increase comfort**

Based on **5 years of research** at ETHZ and Empa, undergoing certification by **South Pole, Collaborations with market leaders**

viboo

Offering Predictive Control as a service



The first product based on our technology is **already available: Self-Learning Predictive Control**

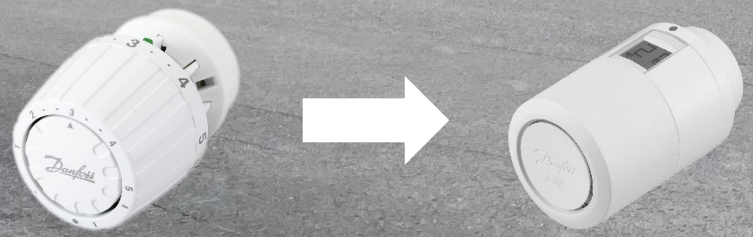
We connect smart thermostat hardware to our cloud platform, read measurements, **predict the future and send back optimized actuator inputs.**

Equipment manufacturers profit from **seamless integration**, empowering them to upgrade their product portfolios and generate additional revenues.

viboo

Example Verwaltungsgebäude

Built 1960, facade renovated in 2008
Already low energy consumption: 65 kWh/m²a
Connected to district heating



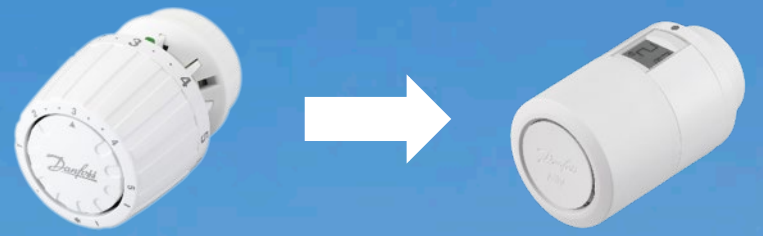
Ally™ empowered by viboo!

30% savings compared to analogue valves

84% of occupants claim that their **comfort improved**, or stayed the same

CHF 5’625 energy cost savings per year, at subscription costs of CHF 1800

Example School Männedorf



27% savings in energy use

Installation and commission were done in one day **without downtime**

Männedorf

viboo supports you in all project phases.

A **free portfolio analysis.** We help you plan your renovations and together we identify suitable buildings.

Selection, installation and commissioning of the suitable **hardware** is handled through partners and internal experts.

If needed

Connection of smart thermostats to the viboo-cloud. The system learns the behaviour of each room within 1-2 weeks.

Existing thermostats can be connected directly.

The software and support packages make sure **everything runs smoothly.** You watch **your energy use goes down.**

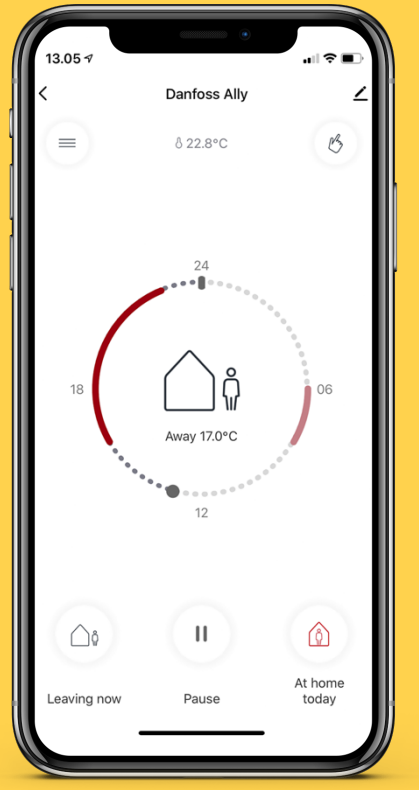
Your advantages

20-40% savings compared to analogue valves, +10-15% additional savings to Smart Thermostats

Improved comfort, especially when room sensors are used

Extended reporting, e.g. reports of achieved and future savings, and maintenance suggestions

Ready for the future: New features such as time-varying energy prices, and automatic definition of heating schedules via occupancy detection



Easy installation and operation:

1. Install smart thermostats as usual
2. Add **onboarding@viboo.io as a user** to the app
3. Set heating schedules and set point temperatures via the thermostat app

Costs: CHF 12 per thermostat and year

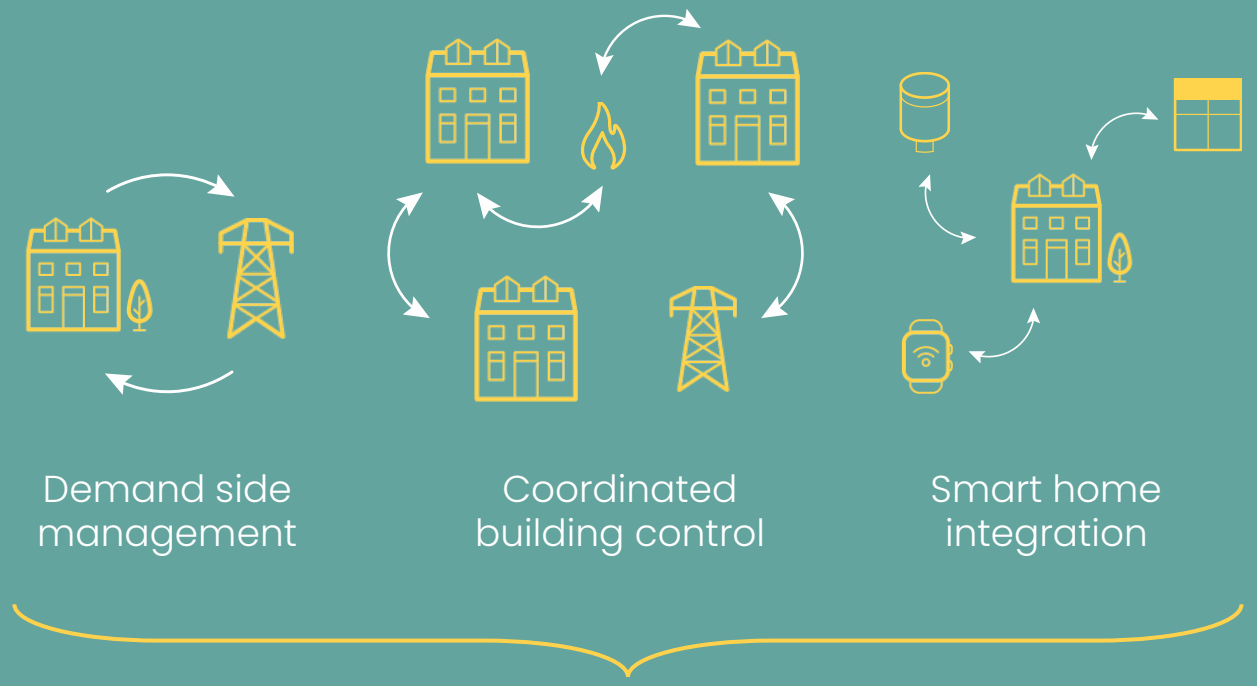
viboo

The platform boosting building efficiency

We've only just started.

Our Predictive Control as a Service platform (PCaaS) futureproofs the industry as it integrates buildings into the energy market.

Based on our research, we have a pipeline of additional features coming to market.



Future features of our PCaaS platform

viboo

viboo

Building intelligence,
empowering efficiency

WISSENSCHAFT BEWEGEN
GEBERT RÜF STIFTUNG

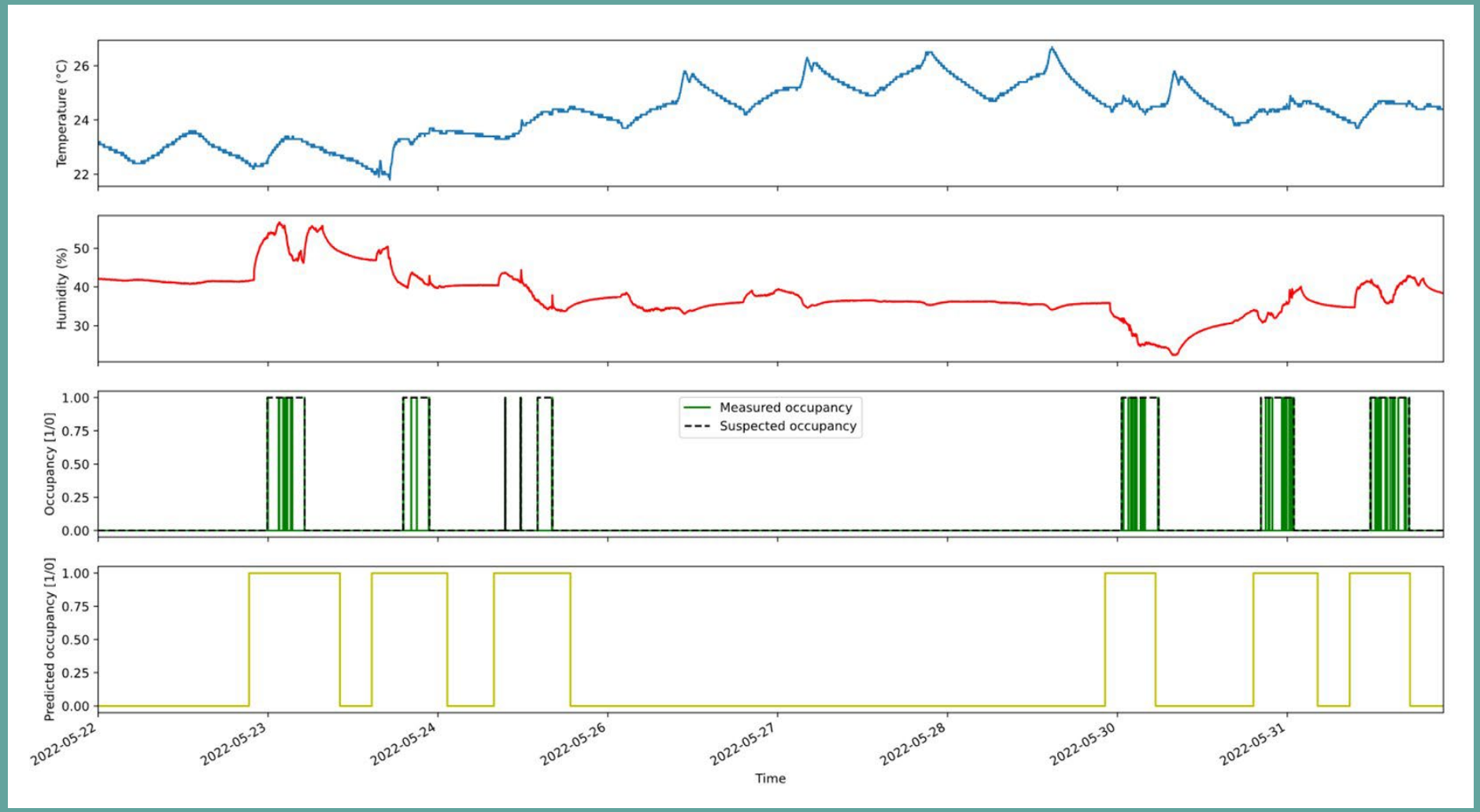
BRIDGE

VENTURE KICK

spin-off | Empa

digitalswitzerland
Swiss Digital Day

Occupancy detection



viboo detects and predicts occupancy from humidity and temperature.

viboo

The platform boosting building efficiency

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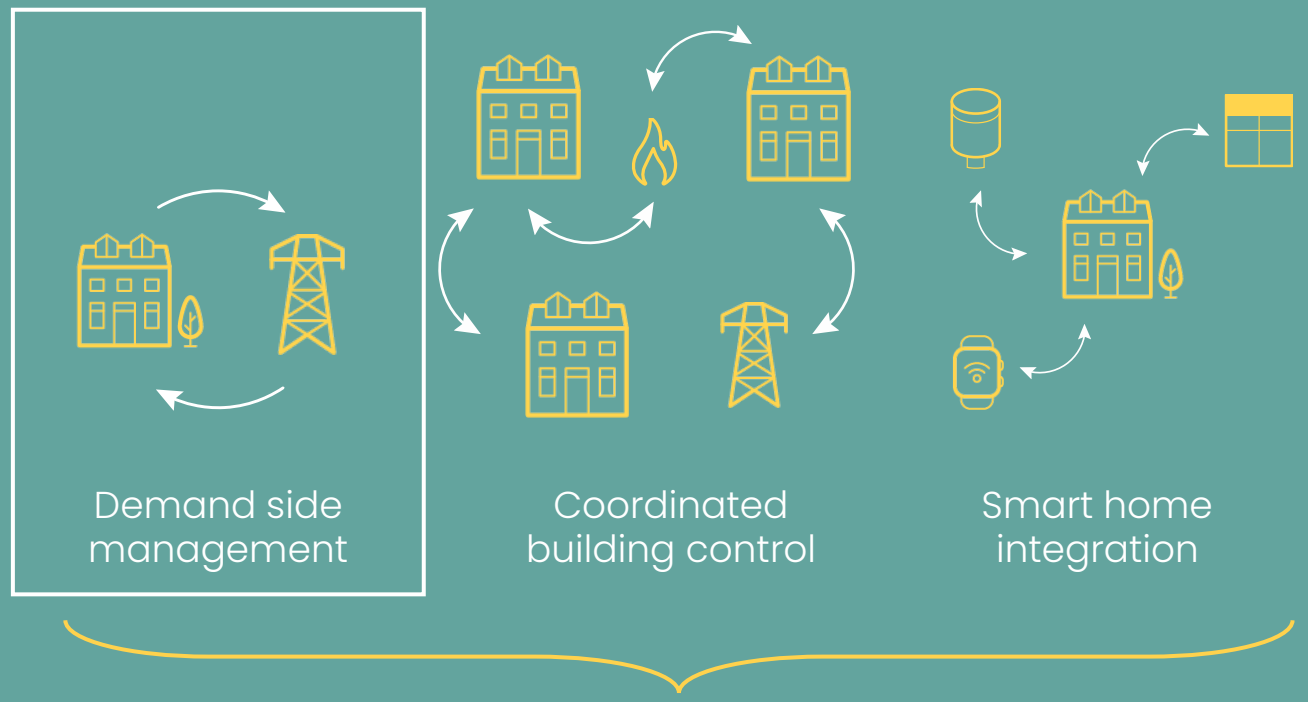
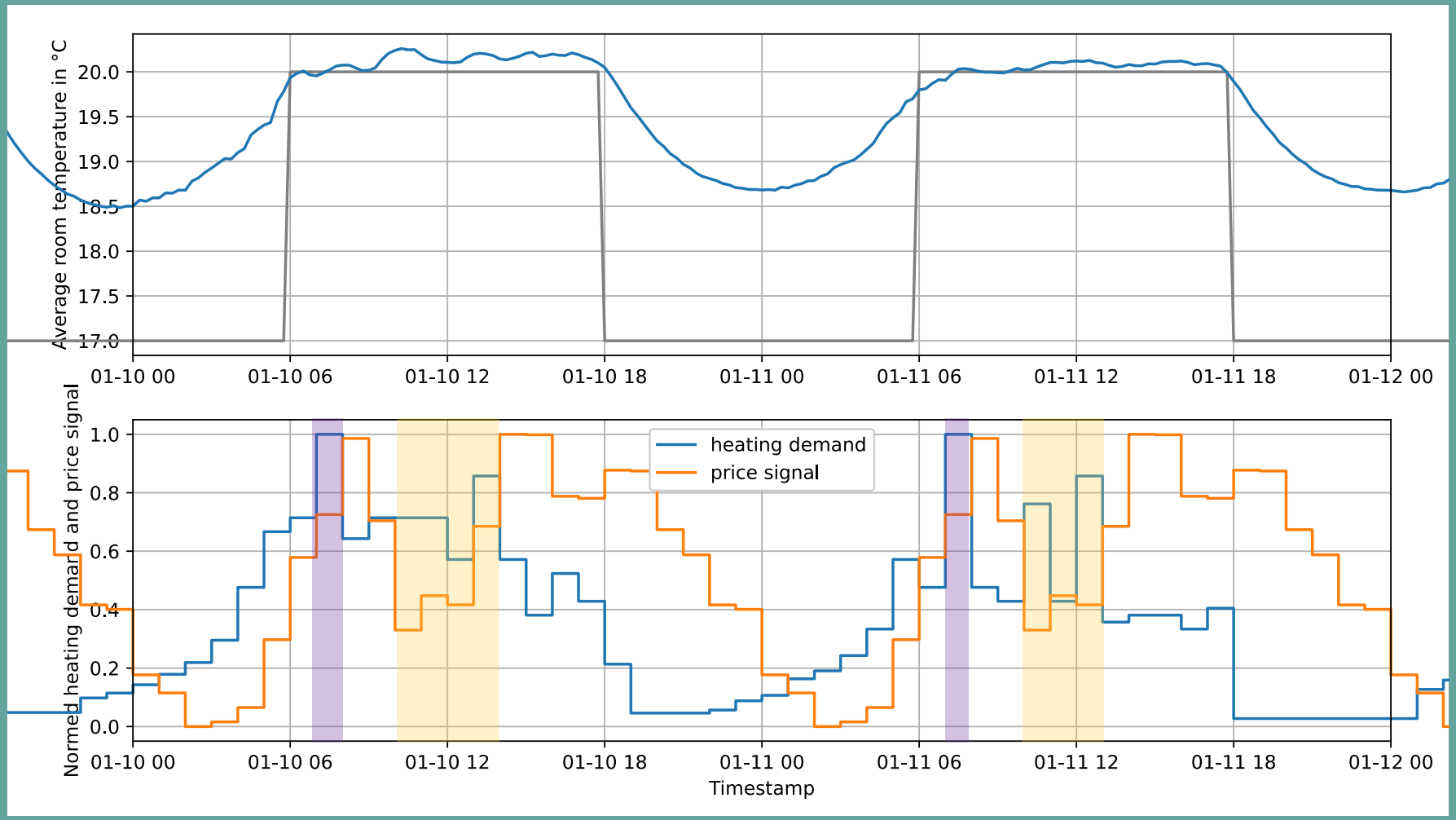


Future features of our PCaaS platform

viboo

Variable energy prices



Preheating before price peaks

Preheating at low prices

viboo optimimizes predictively with dynamic energy prices.

viboo

Save energy, CO_2 and costs:

viboo

domOS

OPERATING SYSTEM FOR SMART SERVICES IN BUILDINGS

Energy services for district heating

Boosting the Deployment of Smart Energy Services in Buildings

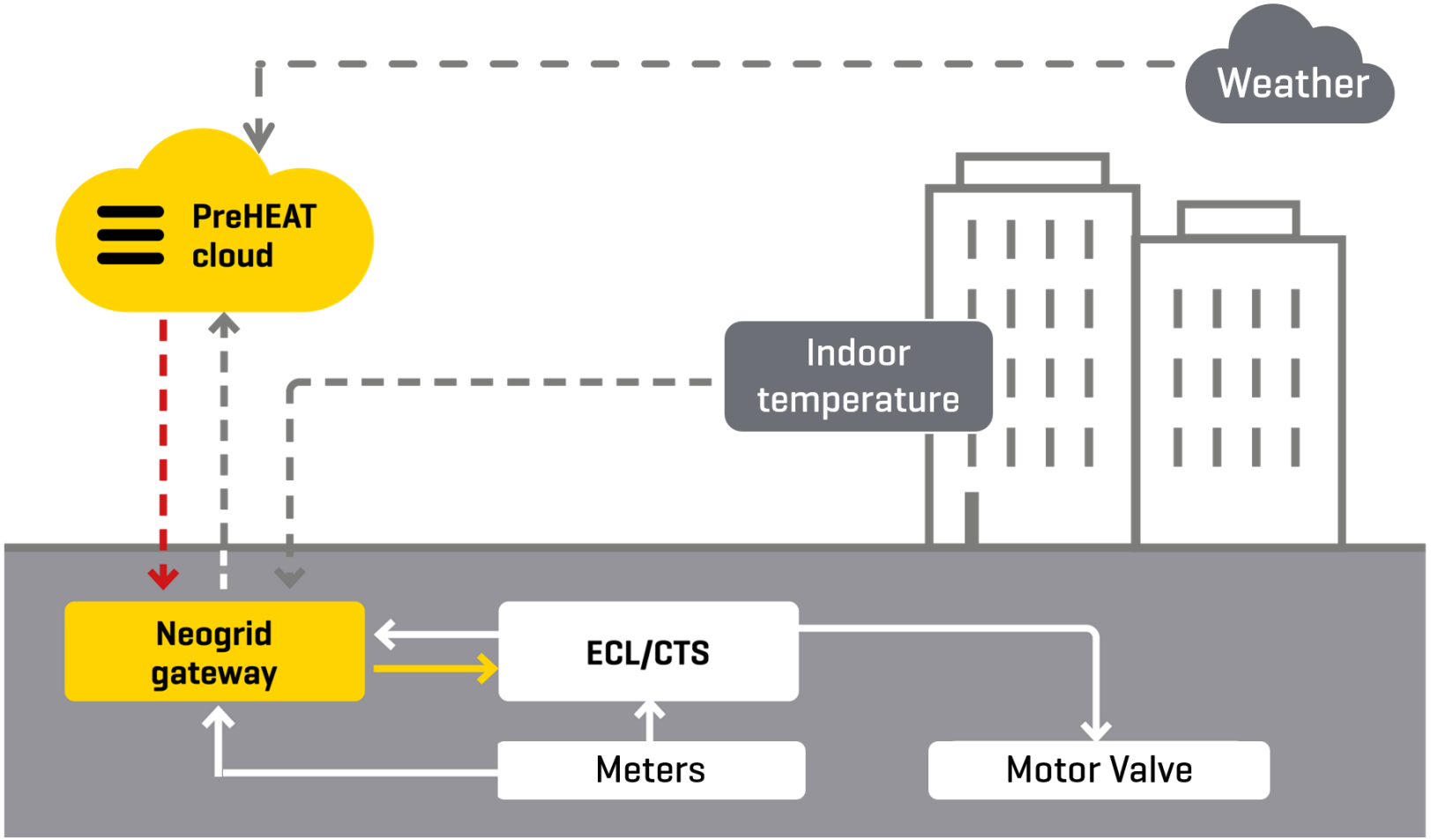
February 8th 2024

Henrik Lund Stærmose & Christian Mølgaard Byrjalsen

Neogrid Technologies & Aalborg Forsyning

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 894240.

District Heating cloud setup



Data brings so much more…

… than the legacy controller

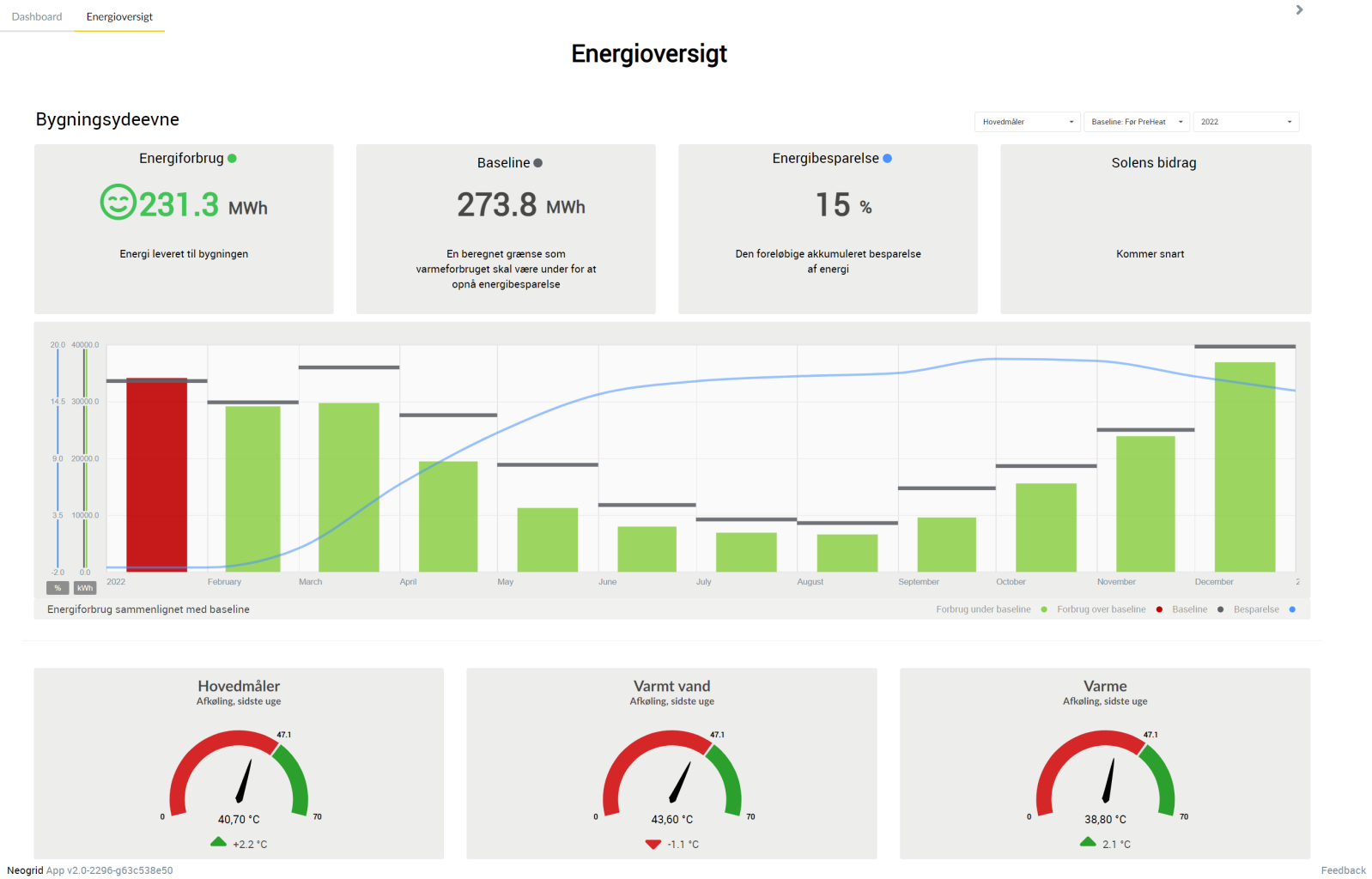
domOS

PRE HEAT

- Advanced model-based alarms
- Model-based adaptive control, using weather forecasts
- Remote diagnostic and management
- Detailed analysis of performance
- Integrated operation of building systems, also with local energy production in building and/or community

- Maintenance and fault identification based upon instantaneous values of parameters
- Basic static weather compensation

Documented savings – One building view



District Heating Solutions

With lowest possible flow temperatures

- PreHEAT is a cloud based add-on for existing BMS- and ECL-controllers
- PreHEAT cloud based control of heating based on building module and weather forecast.
  - Exploiting the building inertia, wind and solar exposure to plan the correct flow temperature.
  - Controlled in relation to indoor temperature sensors, to ensure comfort.
  - Self-learning – sets and adjust itself after installation and adapts to the seasons and time of the year.
- PreHEAT – Domestic Hot water control.
  - Individuel legionella fuse.
  - Adaptive demand-based control
- PreHEAT's energy savings comes from:
  - Lesser wasted heat from transmission in Cellars, heat shafts etc.
  - Making better use of future solar exposure.
  - Less consumption in apartments with inappropriate use of radiators.
  - Correct amount of heat at the correct time
- PreHEAT – Obtained results on installations.
  - Typical, 10-20% energy savings on the main energy meter.
  - Approx. 5 degrees lower temperature on the district heating return.

Services for District heating Setup

Control of mixing loop

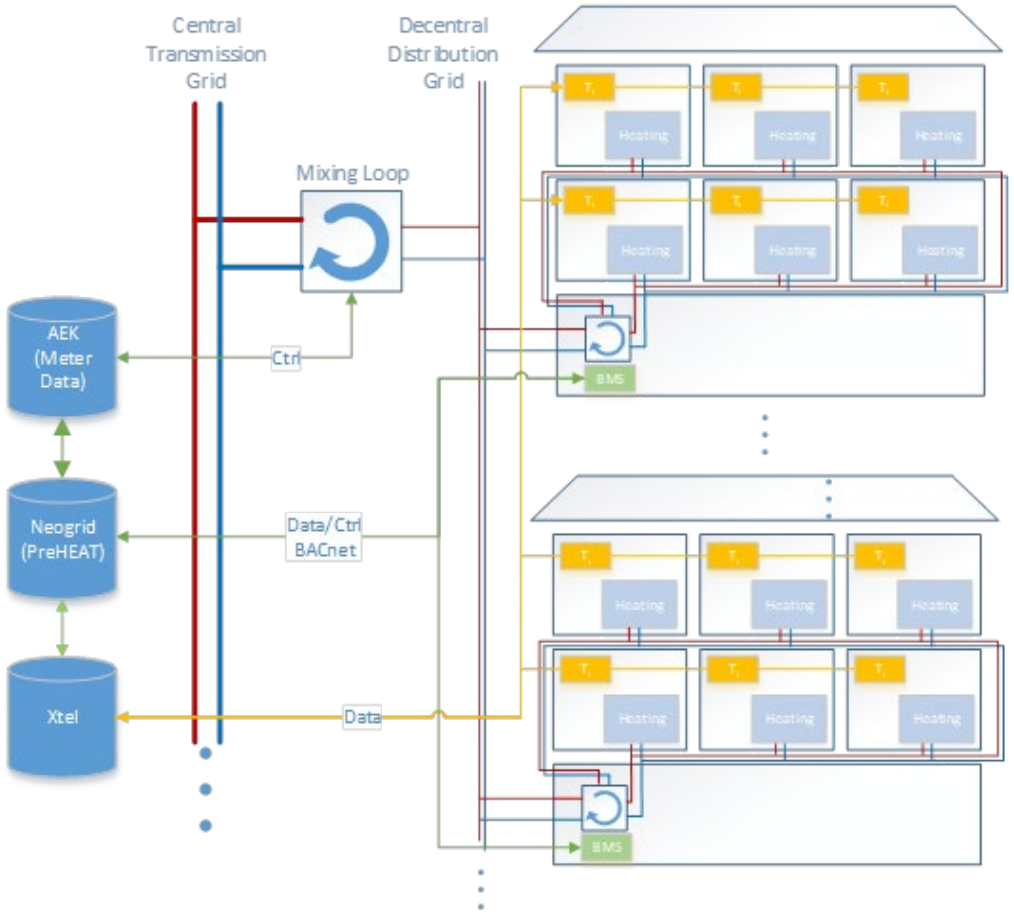
- Hot water requires higher supply temp. (min. 55°C) than the building itself.
  - Hot water is the only determinant.
- Historical data to predict consumption of hot water.
- Decide on the lowest adequate supply temp.

Control of buildings

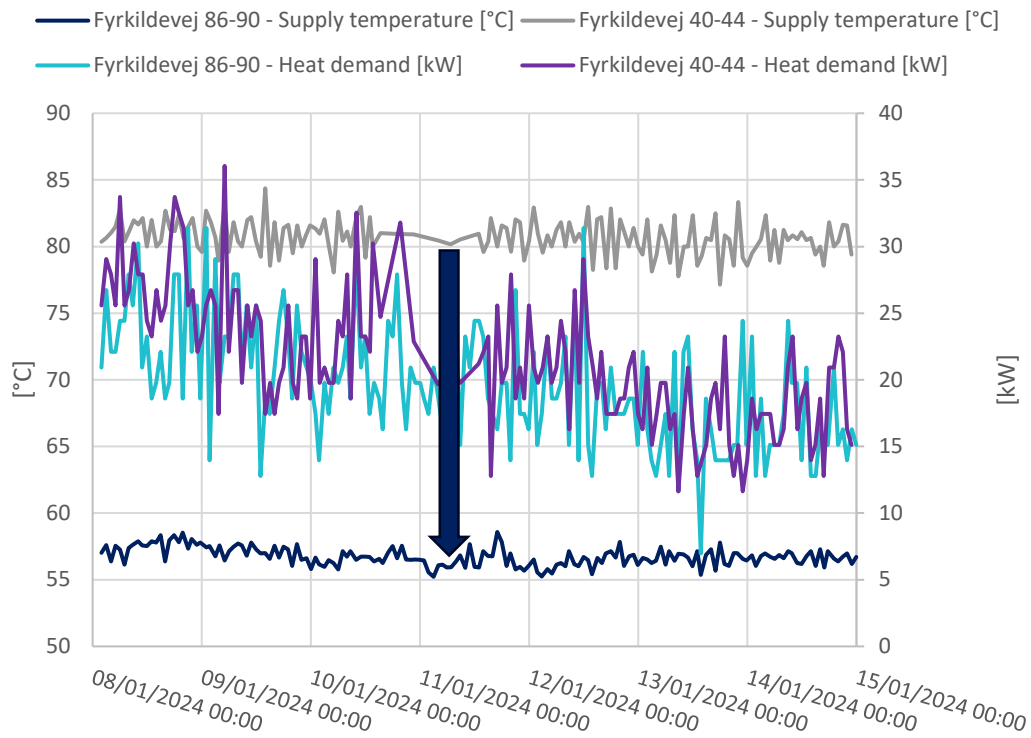
- Historical consumption predicts min. necessary supply temperature.
- PID layer on top to ensure comfort.

Control of hot water

- Dishes requires 52°C in the tap.
- Increase every 14 days to 60°C to disinfect the pipes.



Results from pilotstudies



For the consumer

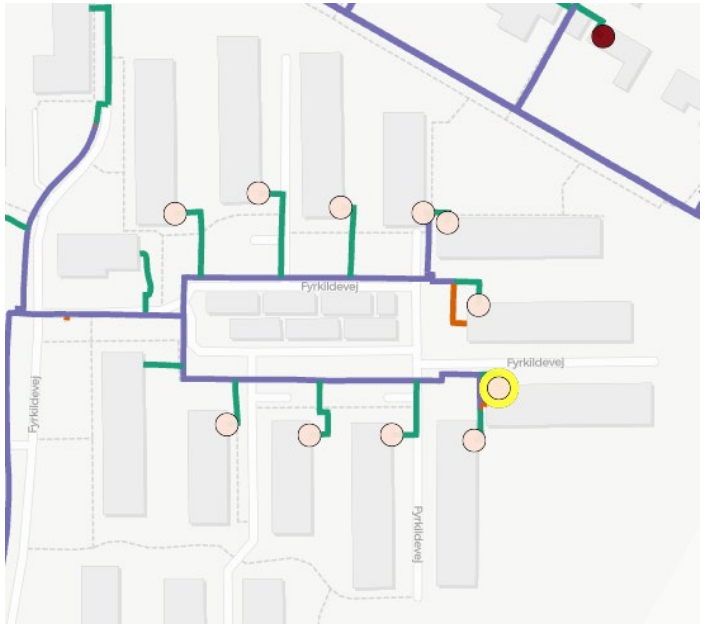
- Decrease in energy consumption
- Lower tariff for DH

For the DH

- Lowering the supply temperature
- Decrease in energy demand
- Increase liftetime for service pipes
- Optimal for green transition

Potential in decreasing net-loss

Reducing the net-loss in the demonstration site with 20% - when reducing the supply temperature from 80°C to 60°C



For each degree it is possible to reduce the supply temperature, the heat loss in the DH-grid is reduced by 1,1%.

Extrapolating the results to the entire grid:

Temperature set	72/37 (current)	71/37	70/37
Energysaving	0 MWh	3.237 MWh	6.475 MWh
CO2 emission	-	356 ton	713 ton

Smart production, smart grid and smart buildings

NOW

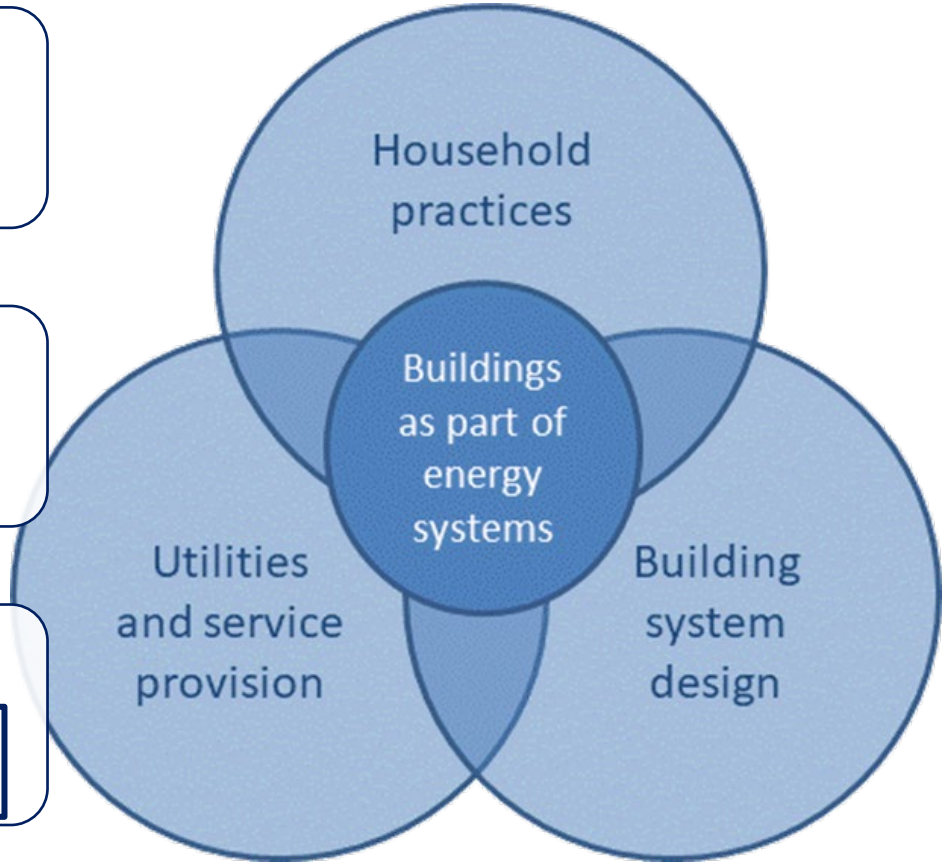
- Energy savings
- Remote meters
- Rental of DH units

Tomorrow

- Remote controlled units
- Big data and AI
- Integrate consumers into the distribution system
- Deliver comfort instead of "Hot water"

In a few years

- District heating is 100 % renewable and electrified -> lower temperature
- Established seasonal storage tanks
- Time shifted consumption → Differentiated prices by the hour



Varme+ (rental of DH units) - posibilities

- The consumer and the utility company is integrated. Aalborg Forsyning offers to own, operate and maintain the district heating unit
- The consumer is offered a maintenance scheme for the buildings heating system (50% of the heating systems has errors today)
- The benefit for the consumer is, that the utility company takes the investment, maintenance and operation. The consumer avoids risks and trouble regarding to the unit
- The benefit for the utility company is a competetive product, benefits in including the consumers heating installation in the district heating system as well as access to energy optimizations
- Including or allowing e.g Neogrid in Varme+,
  - For the consumer this will result in energysavings and the possibilities to time shift the consumption (might be extremely relevant i the energy price is hourly based).
  - The DH utilities can subsidy/support the expenses based on reduction in net loss.

www.domos-project.eu

Yves STAUFFER, joined CSEM over 10 years ago. After a phd in microengineering (from EPFL) he started working in the field of energy efficiency at building and district level. In domOS he was in charge of the Energy efficient heat generation and distribution.

domOS

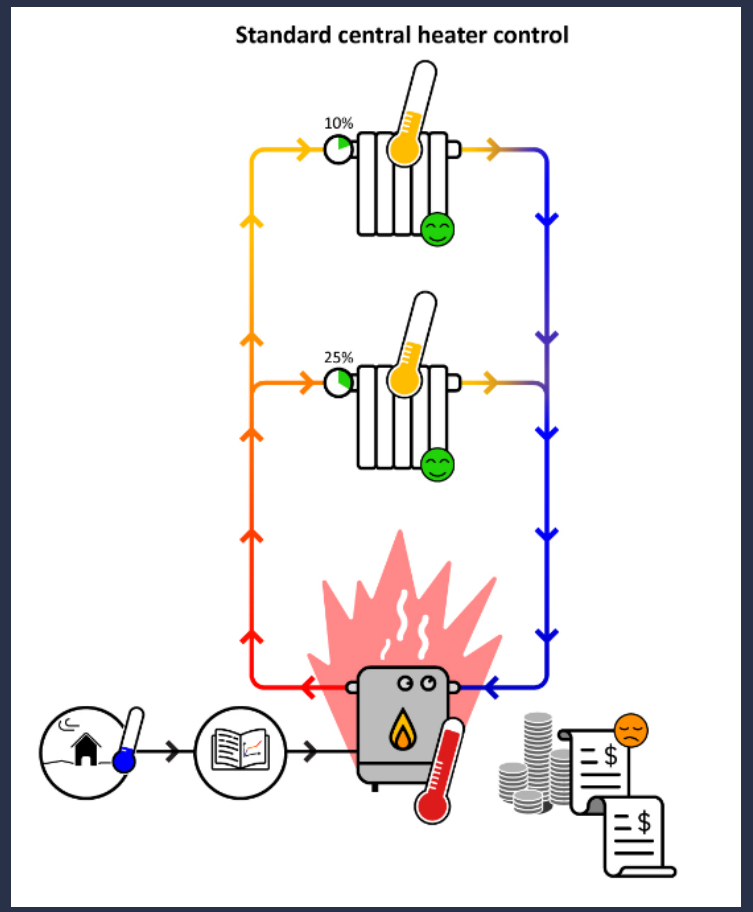
Energy efficient heat generation and distribution

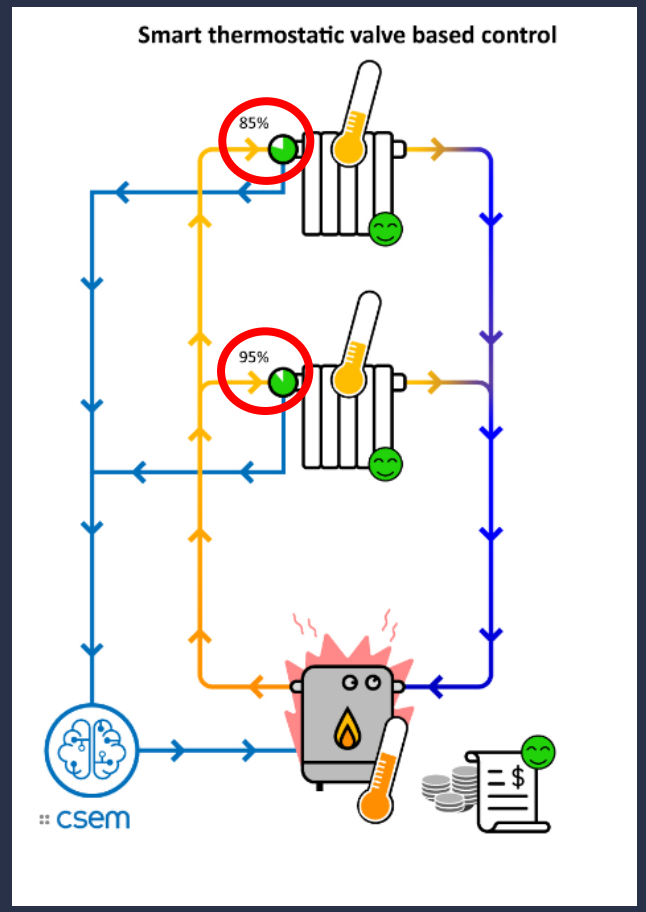
Y. Stauffer, M. Boegli,
T. Gorecki, N. Koch

Closed loop energy efficiency service: what is that?

- Objective:
  - Reduce heating costs
  - Ensure comfort

Smart Thermostatic Valve (STV)
Measure: temperatures & opening





csem

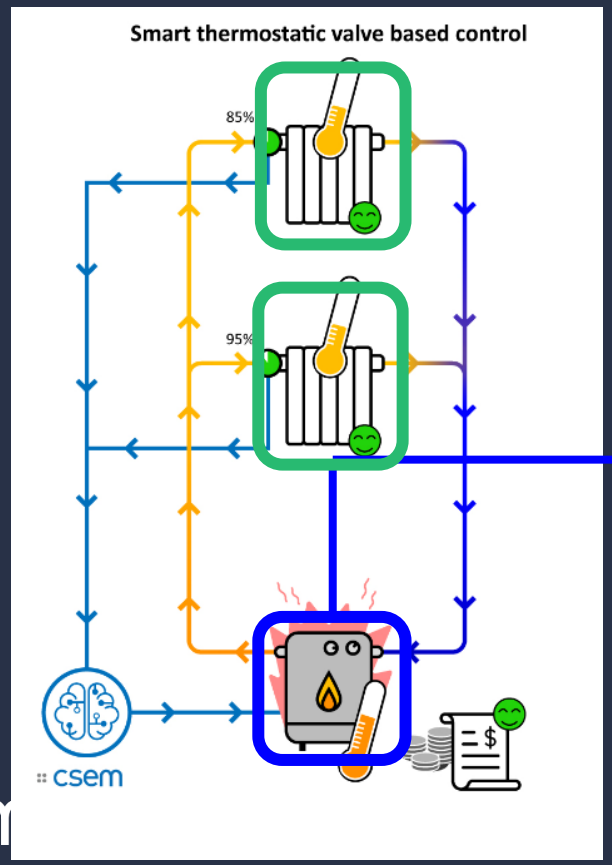
Neuchâtel demonstrator: what does it look like?

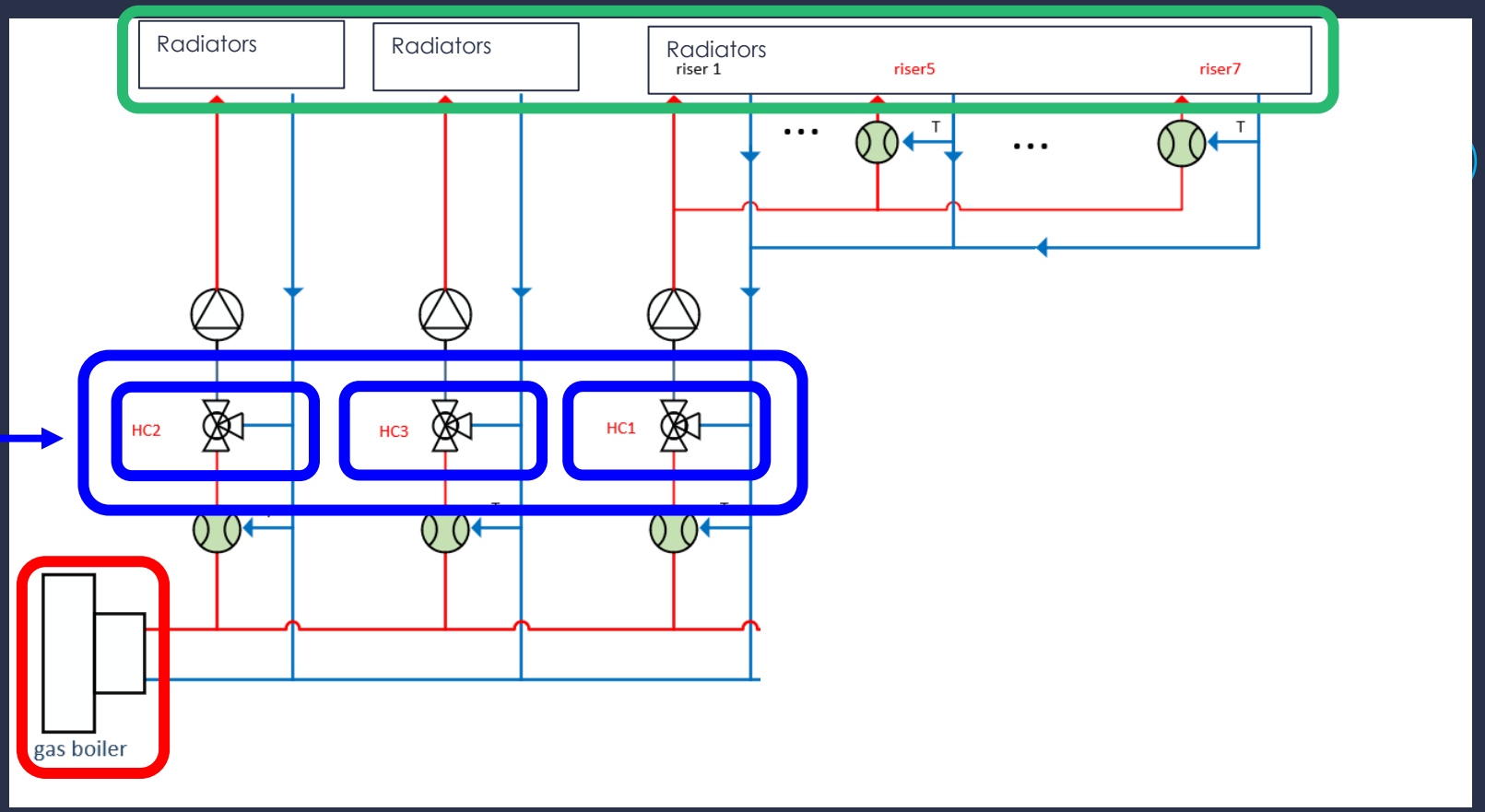
- Building with 4 floors
- 7 flats & 3 commercial areas

- Central gas boiler
- 3 heating circuits
- ~70 radiators

Compute 1 set-point per heating circuit

The gas boiler adapts its production





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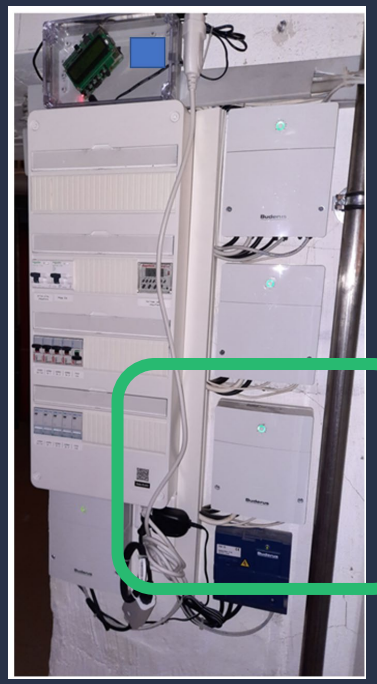
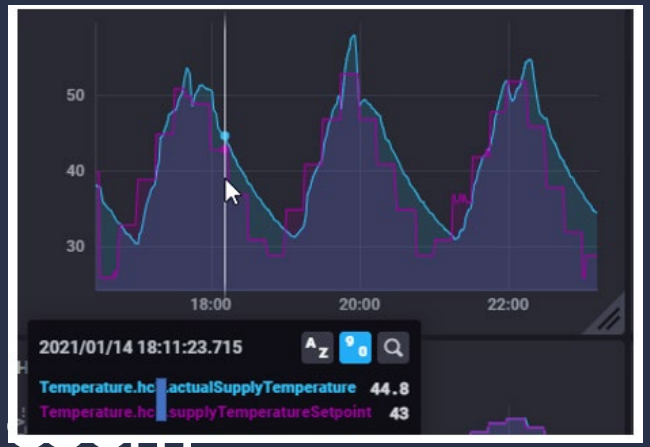
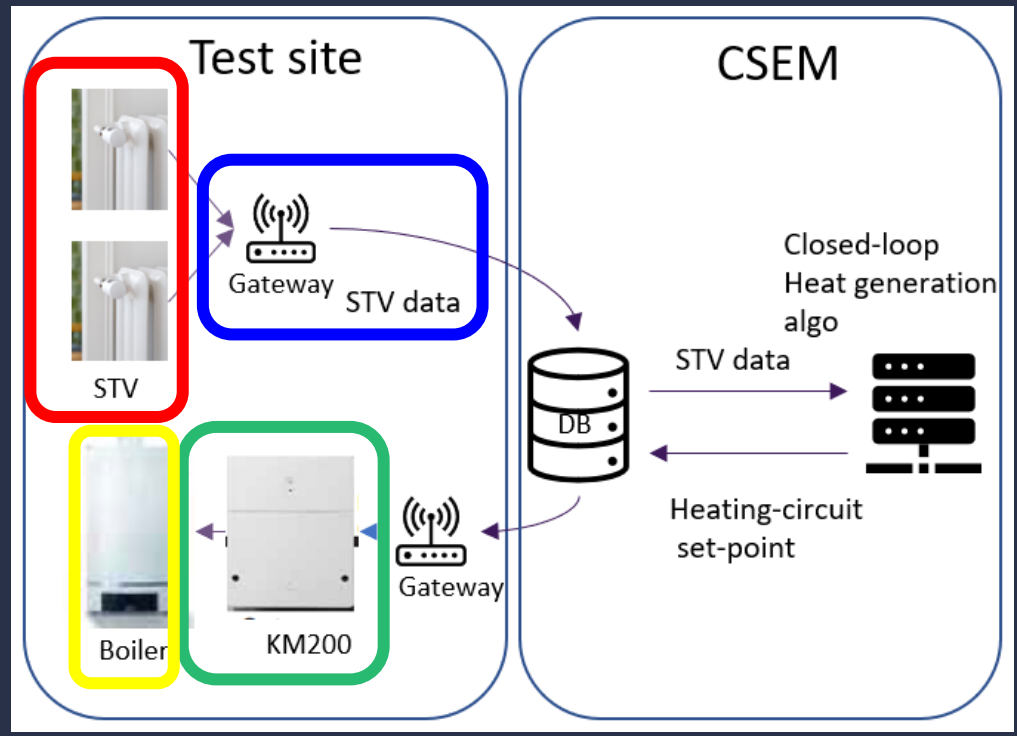
Neuchâtel demonstrator: key elements







2021-2022: Analysis overview

- domOS versus standard heating curve (HC) for 2021-2022 heating season

Temperature @ riser

Lower: -2°C (HC1) to -5°C (HC3)

➔ **Desired**

Valve opening

Higher: +5% (HC1) to +20% (HC3)

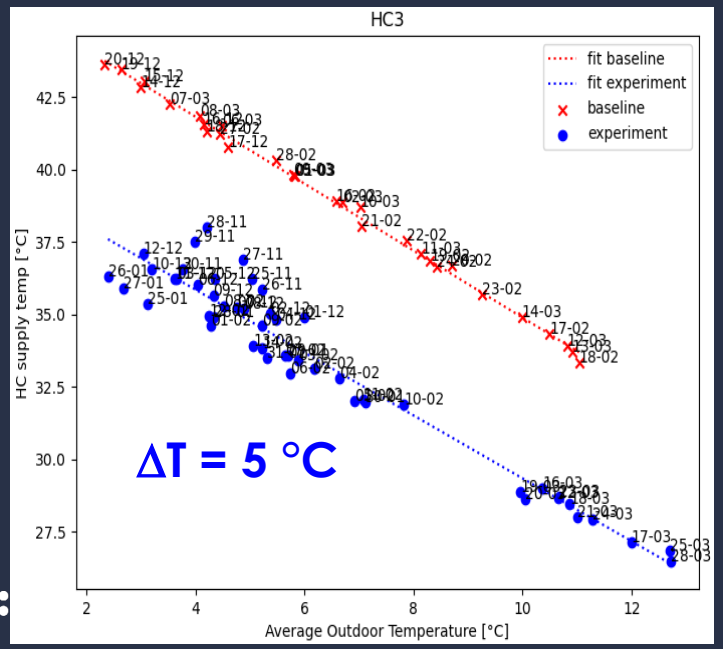
➔ **Expected**

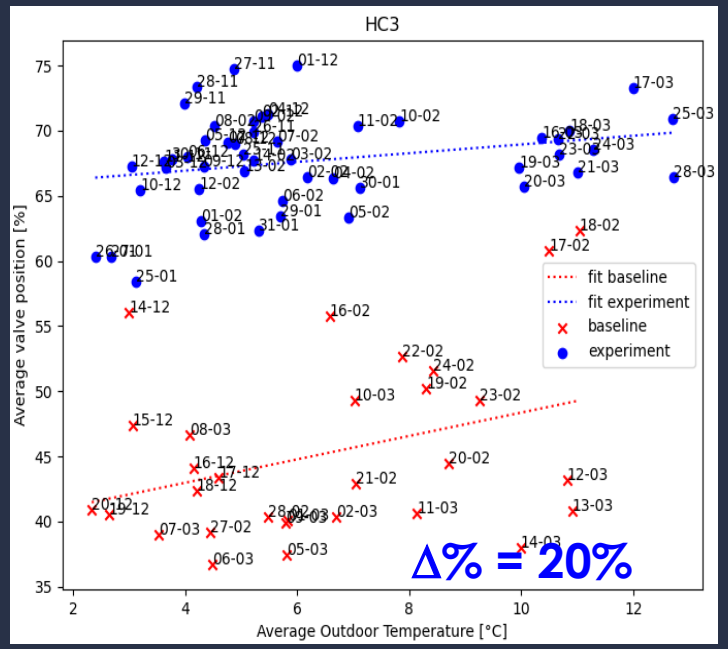
Energy @ riser

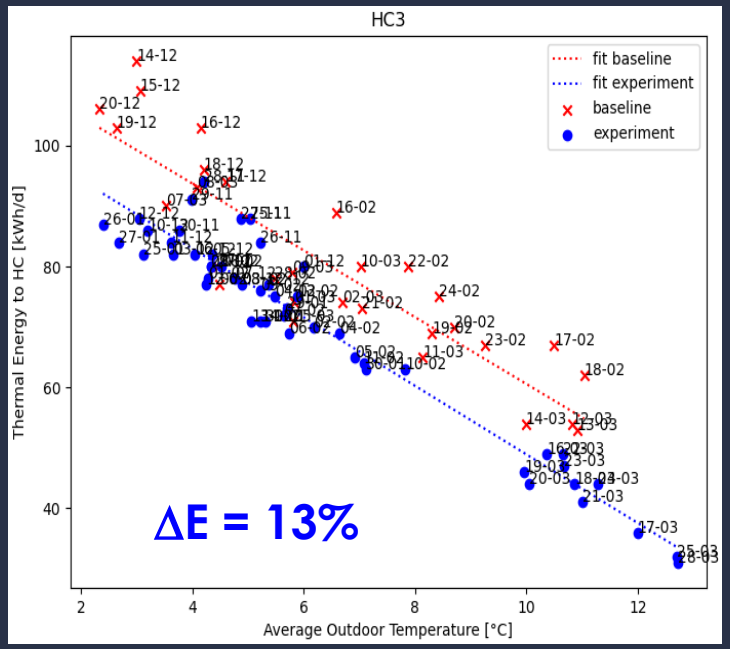
Equal for HC1/2

Lower: 13% (HC3)

➔ «not expected» as energy should be the same







Conclusion

- The service is functional:
  - Deployment is fast, valve change takes ~1 minute
  - The computed set-points per heating circuit (riser) are coherent ➔ lower
  - The comfort is not impacted

  ➔ **Patent pending**
- The lower temperature obtained at riser level did not trace back to the gas boiler, that was identified as highly over dimensioned thus not operating as it should.

Thank you for your attention

Podium discussion

Send us your questions!

Thank you!

domOS

Watch the Final Video of the project
on the domOS website!

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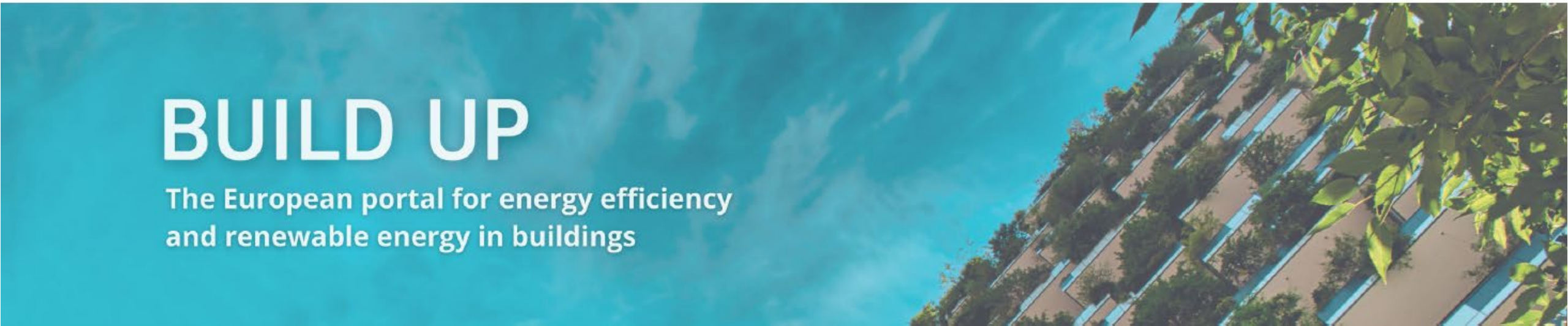
Thank you!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