Shape the Future of Energy!

# Sept. 16-17th 2022

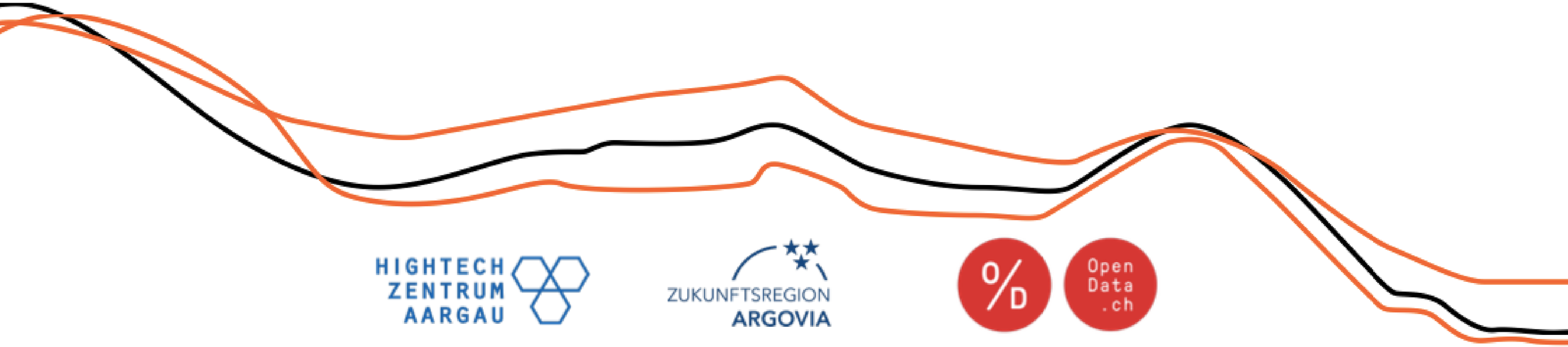
# Brugg

# Switzerland

www.energydatahackdays.ch

# ENERGY DATA HACKDAYS





HIGHTECH ZENTRUM AARGAU

ZUKUNFTSREGION ARGOVIA

%D Open Data .ch

# GROUP PHOTO

PARTNER


AEW
HIGHTECH ZENTRUM AARGAU
swissgrid
Mit Unterstützung von
energieschweiz
EKZ
VIA
axpo
sgsw
St.Galler Stadtwerke
all this future
KANTON AARGAU
TECHNOPARK® AARGAU
NCCR Automation
aliunid
PAUL SCHERRER INSTITUT
PSI
Lucerne University of Applied Sciences and Arts
HOCHSCHULE LUZERN
OST
Ostschweizer Fachhochschule
Kompetenzzentrum Energy Management (ior/cf-HSG)
Universität St.Gallen
UNIVERSITÉ DE GENÈVE
Energy Lab.
Innovation Booster
L//P
DIGITAL PROGRESS
EPFL
Empa
Materials Science and Technology
Energy Science Center
SD:>_
e-swissolar
KICKSTART
datacareer
geoimpact
Open Data .ch
ZUKUNFTSREGION ARGOVIA

# AGENDA SAT 17TH FINAL SESSION

## THANK YOU FOR BEING PART OF THE EDH22 !

THANK YOU PARTNERS

ENERGY DATA WORKING GROUP

who are they?

OPENDATA.CH

what's open anyways?

LEARNINGS OF THE EDH22

everyone is a teacher

SURVEY

PRESENTATIONS

NEXT STEPS

THANK YOU

SHARING IS CARING



@HIGHTECHZENTRUM

@OPENDATACH

#ENERGYDATAHACKDAYS2022

#EDH22

# Energy Data Workin Group



https://www.linkedin.com/company/swiss-energy-data-working-group/



**Predictive Maintenance for Energy Systems (on-site event)**

Event by Swiss Energy Data Working Group

Thu, Oct 6, 2022, 4:30 PM - 7:00 PM (your local time) Add to calendar

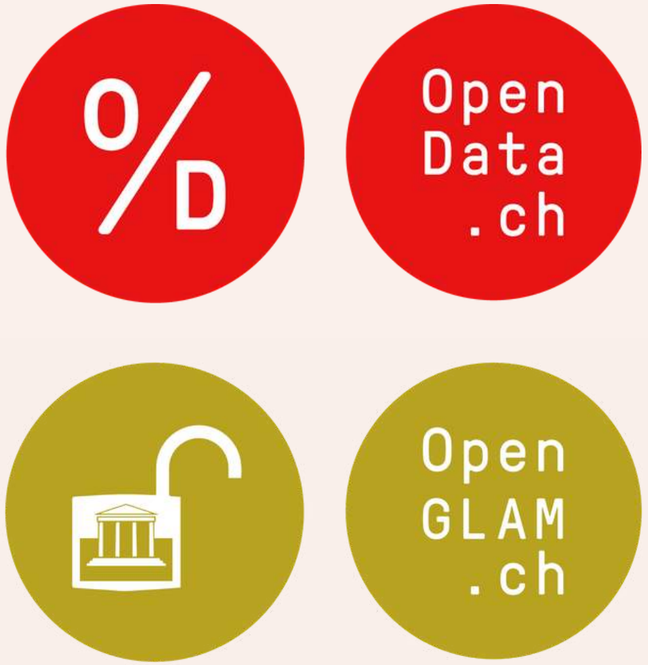
Ueberlandstrasse 129, Dübendorf, Zurich, CH, 8600
Empa NEST Gebäude

Wolfram Willuhn and 4 other attendees

Invite Boost Manage ···

https://www.linkedin.com/events/predictivemaintenanceforenergys6967447905041317888/comments/

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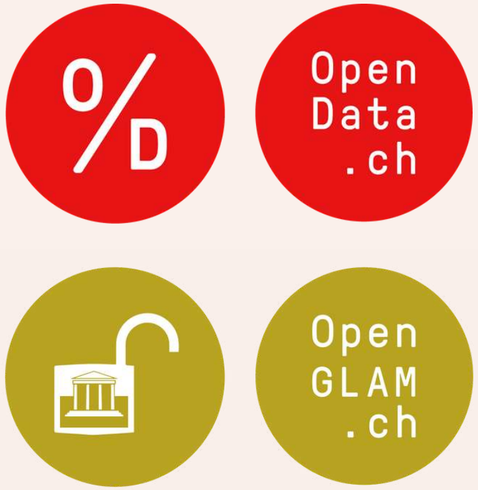

>DATA LITERACY & COMPETENCY

>DATA ACCESS & ACCESSIBILITY

>CIVIC ENGAGEMENT

OPENDATA.CH

# >HACKATHONS
# >PROTOTYPE FUND
# >WORKING GROUPS
# >NEWSLETTER

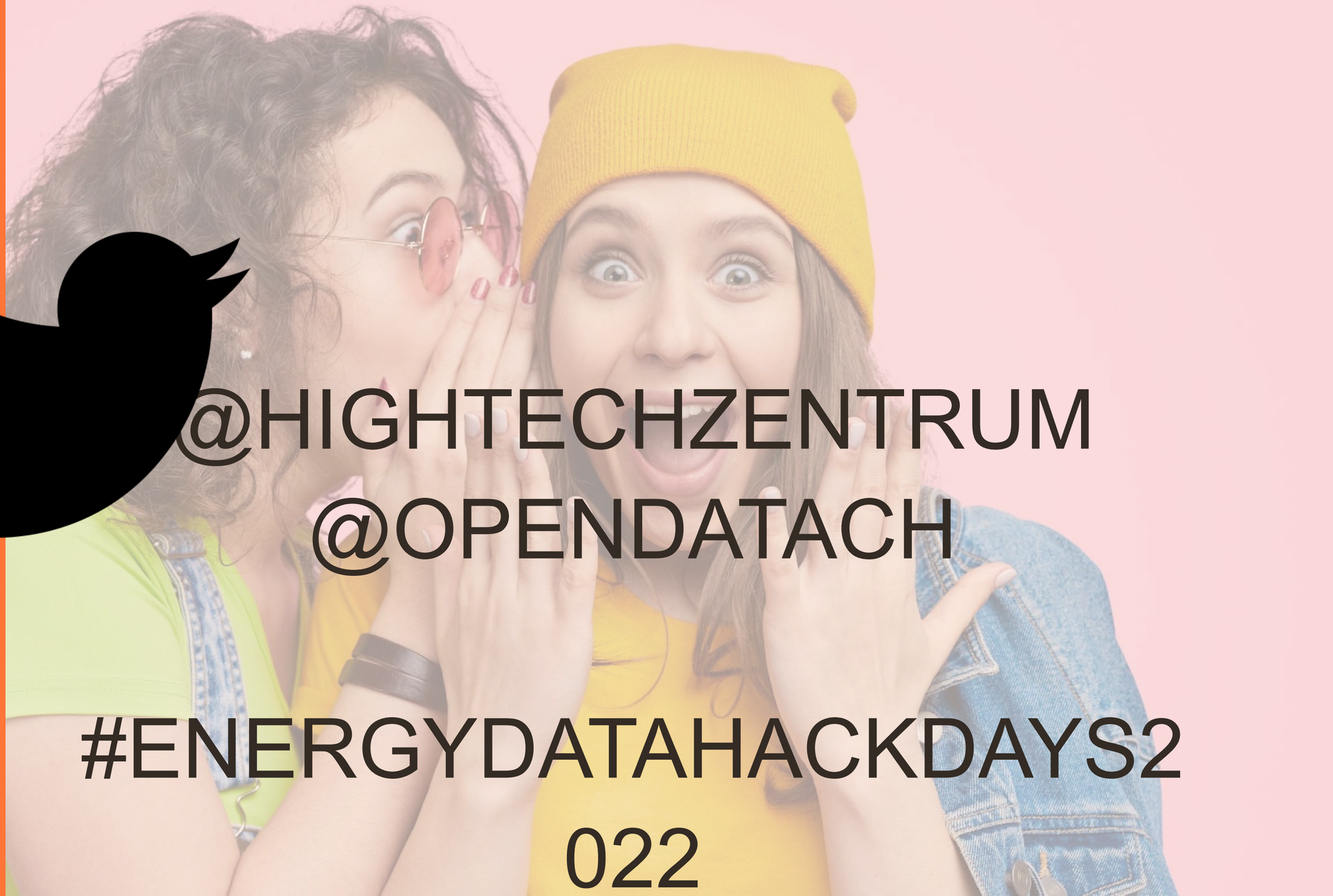




LET'S

# PRESENT

SHARING IS CARING



@HIGHTECHZENTRUM

@OPENDATACH

#ENERGYDATAHACKDAYS2022

# Presentation

## RULES



3 Minutes on stage! sound

at 2:30 Min



Enjoy!!

ENERGY DATA HACKDAYS

# Energy Data Hackdays 2022

**Hightech Zentrum Aargau**

September 16 - 17, 2022 Brugg

15 Regional Energy Information..



09 Graph Neural Network of a W..



11 Gamification of building en..



10 New interface to estimate h..



3 01 E- Mobility Analytics



4 12 Mapping of Swiss PV power p..



1 04 eco-friendliness score



3 05 Optimizing short-term activ..



07-08 Alternative pathways to ..



5 16 SolarDAO - The Digital Ener..



4 17 Smart-Meter CII Interoperab..



3 02 Energy (Heat Demand) modell..



03 Enriching Point Clouds (LiD..



1 06 Optimizing PV usage in a tu..



1 08 Can we visualize sector cou..



14 Energy Data Access Control ..



01

E- Mobility

Analytics

Ekz

Angelos Selviaridis

André Eggli

Nicola Ruch

Marina Gonzalez

Jeremy Buchmann

Abdullah Shakil

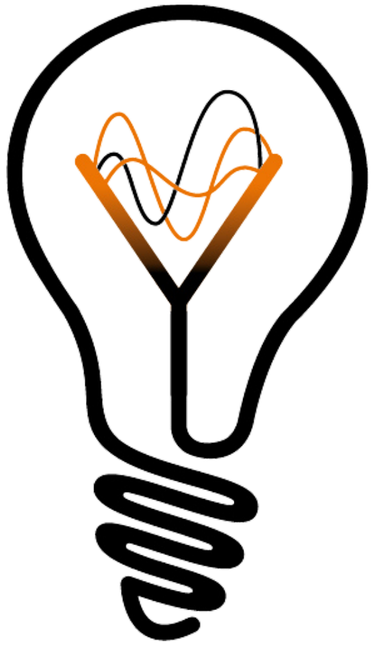
Adrian Swiridoff

Lucas Jamanr

Christian Köhler

Braulio Barahona

Julian Gander



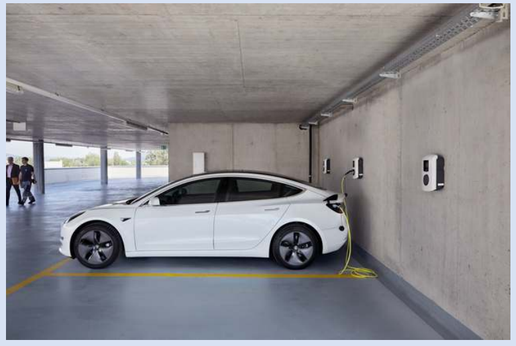
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# 01 E-Mobility Analytics

## What do we want to do?

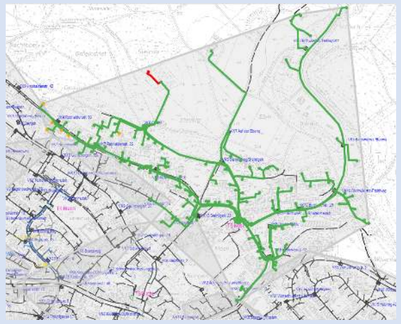
**Investigate and understand the behavior of electric cars**. How do they use different types of charge points?

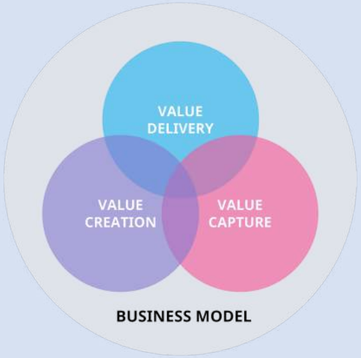
- at home
- at work
- at points of interest



## Why is it important?

- **Model future grid loads**
- **Unlock new business models**






## What do we bring?

**LOTS OF REAL DATA!!!!!!!!!!!!!!!**
Timeseries of **45'000 charging sessions** & more than **500 charging stations** over **two years**

**For whom is it interesting?**

Data enthusiasts with some programming knowhow and energy enthusiasts willing to learn

**Example**
People charge their car at home only during low tariff hours (8 pm to 7 am). Behavior might still have a huge impact!

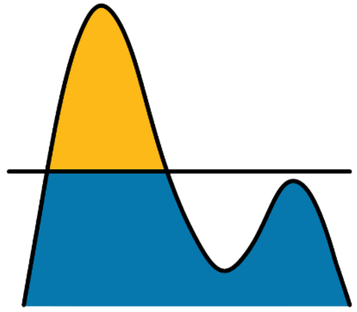
A) Everyone drives until the battery is empty before plugging in the car
-> 1 charging process / week

B) Everyone plugs in his/her car whenever at home
-> 1 charging process / day

In case B all cars will start to charge at 8 pm each day! Resulting in a **peak potentially 7 times** the peak in case A

EKZ

# Key Take Aways



**8 PM (20:00)**
Highest Charging load (Weekday)
Bad… many other consumers at that time



**18 %**
Plug in and don’t charge right away

- 2/3 of those shift to low tariff (Start time)
- 1/3 Shift with “End time”

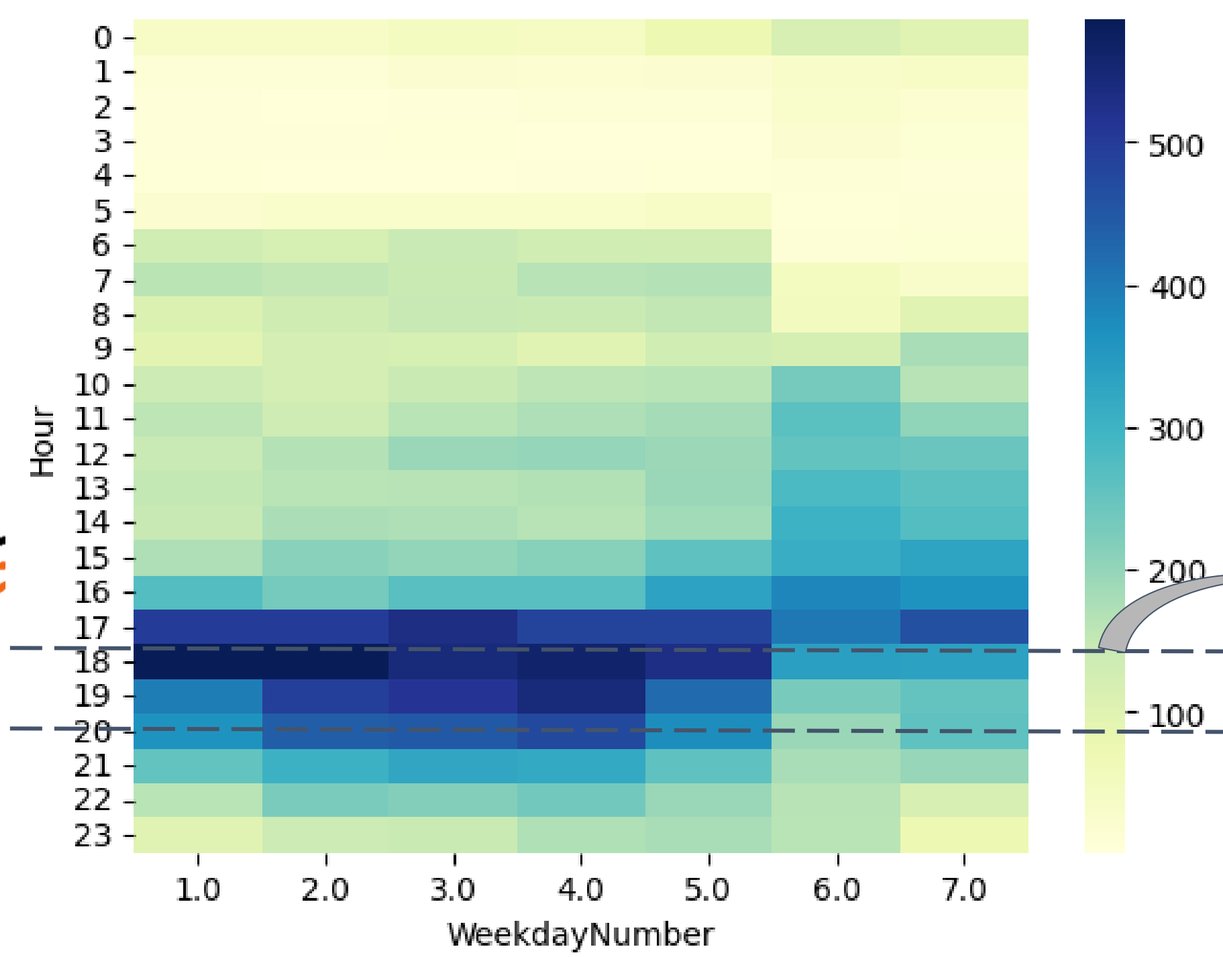


**> 60 %**
of the Time plugged in, the cars are not charging
(available for flexibility)

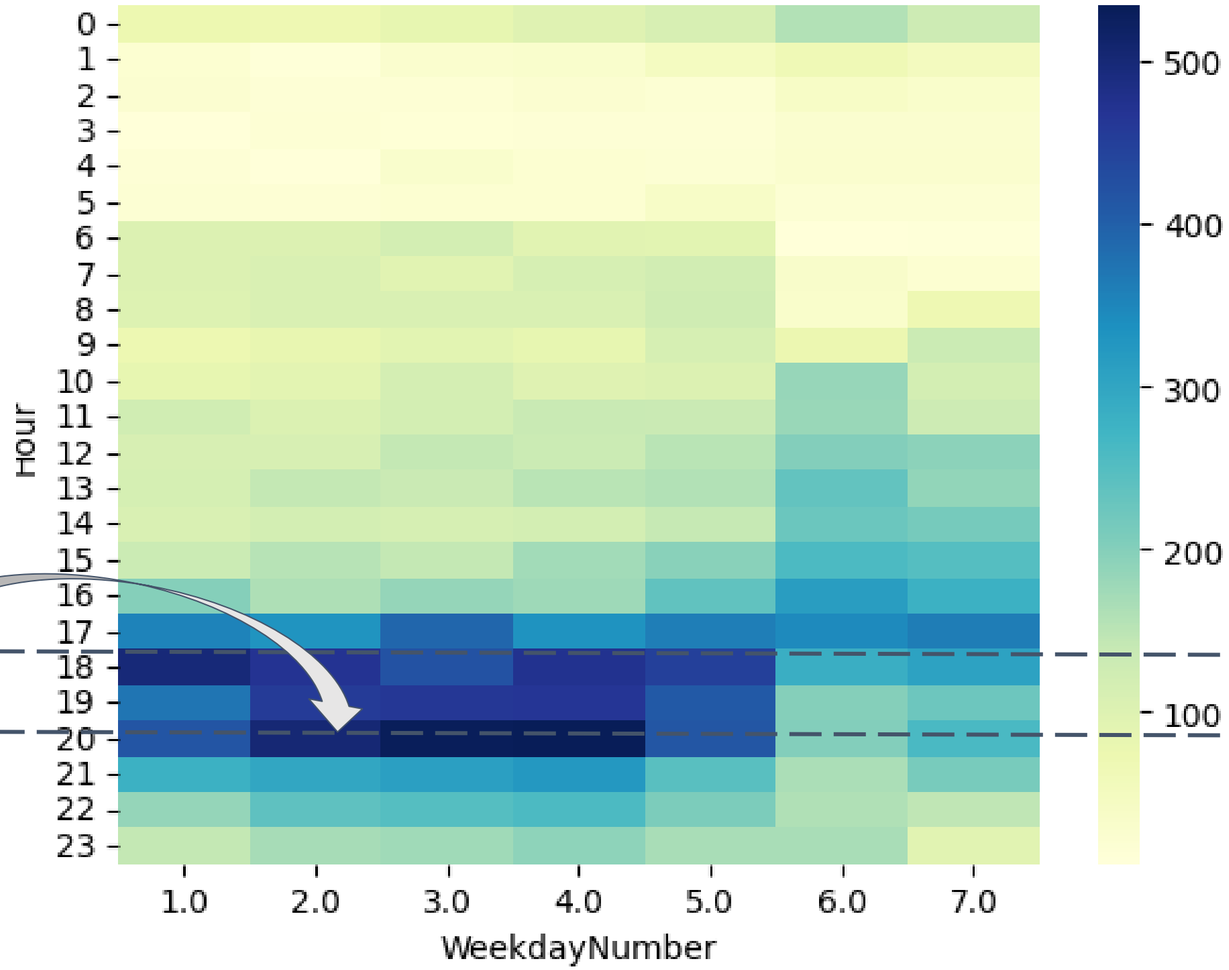
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# Most people plug in between 5-6PM and start charge between 6-8 PM (8PM: Start low Tariff)

**People plug in**



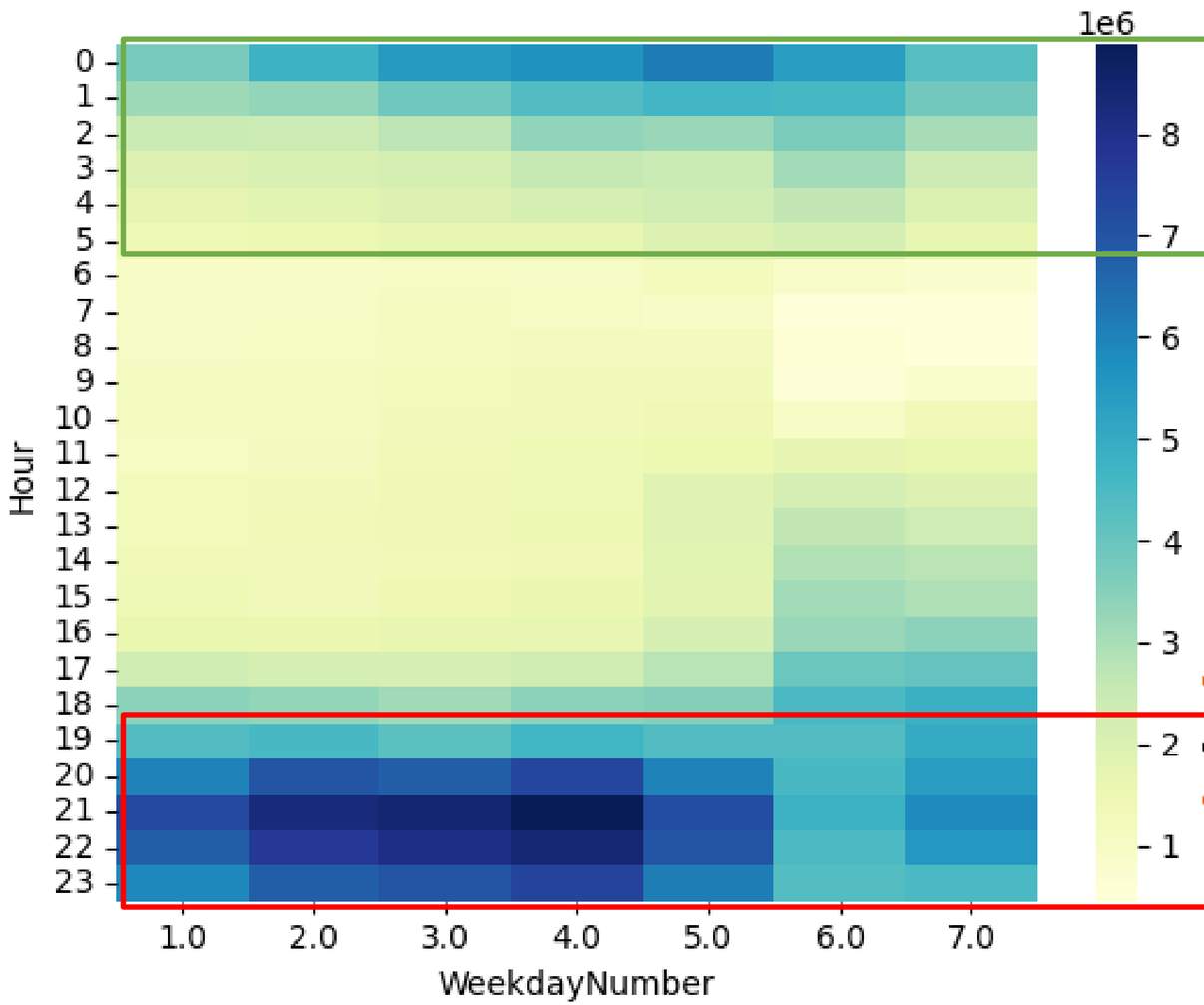

**People start charge**



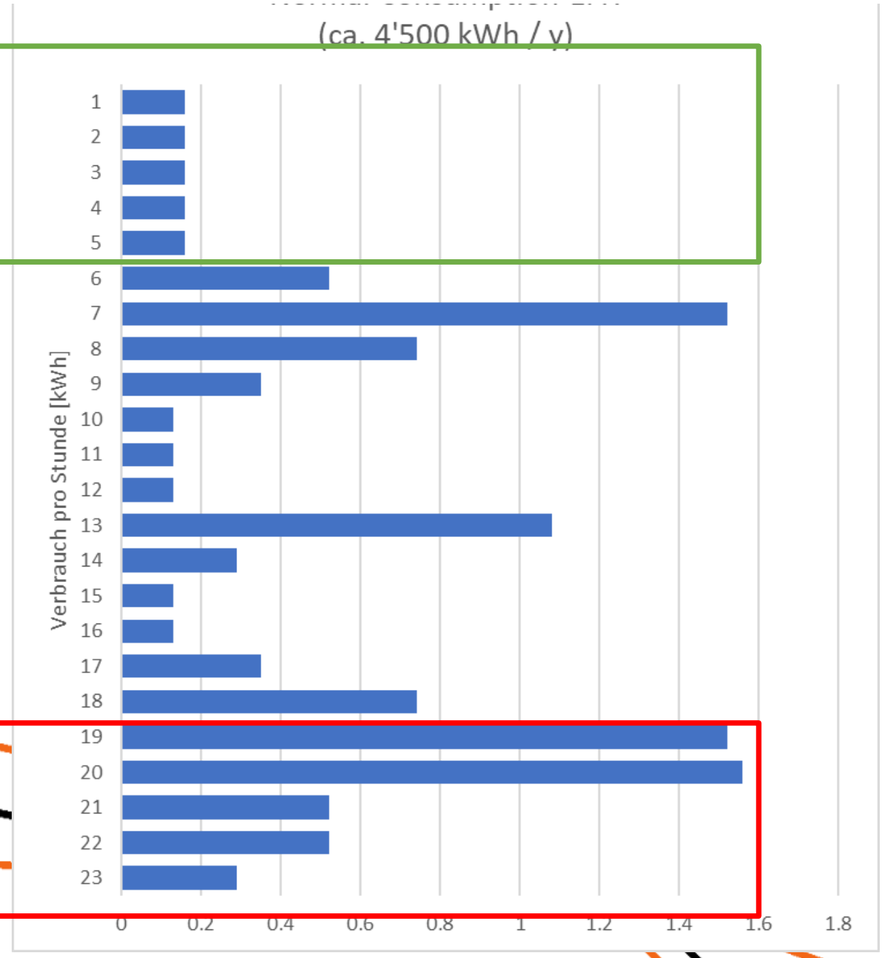
ENERGY DATA HACKDAYS

# Flexibility Potential

Energy Delivered per Hour (Charging Station)




Normal Consumption Housheold (SIA)



ENERGY DATA HACKDAYS

# Discussion

Unsolved Questions:

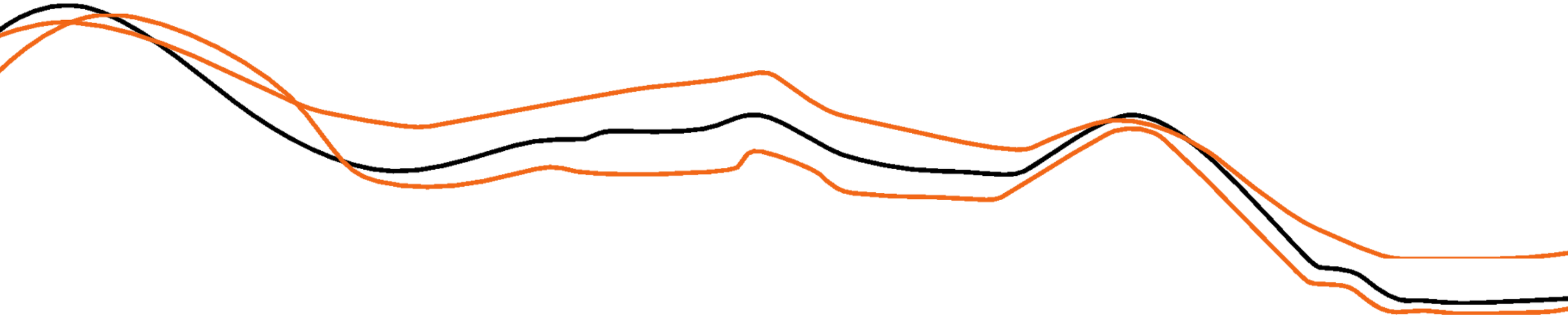
- Charging-Personas ( a) Charge every day / b) when Battery is empty)

Data Improvement:

- Car-Data (not only Charger-Data) with Capacity, State of charge, V2X?

Conclusion DSO

- 18 % People are willing to shift and start charging at 8 PM (Low Tariff starts). To rise rate: More sensibilisation or Price Difference.



02

Energy modelling and building classification in St.Gallen

sgsw


Esther Linder

Taejun Moon

Clara Esteve

Raffael Corrodi

Philipp Ditzel

Wolfgang Korosec

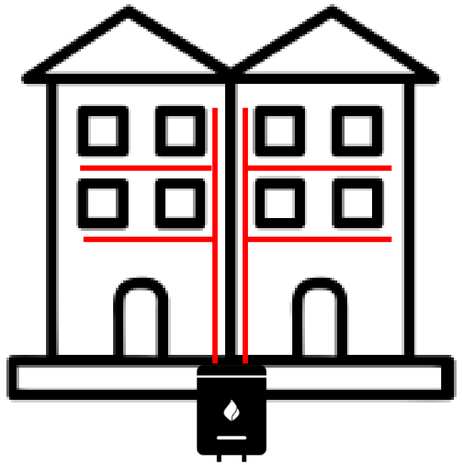
Laure Stadler

Nicola Wullschleger




ENERGY DATA HACKDAYS

# 02 Energy (Heat Demand) modelling in Sankt Gallen with AI methods





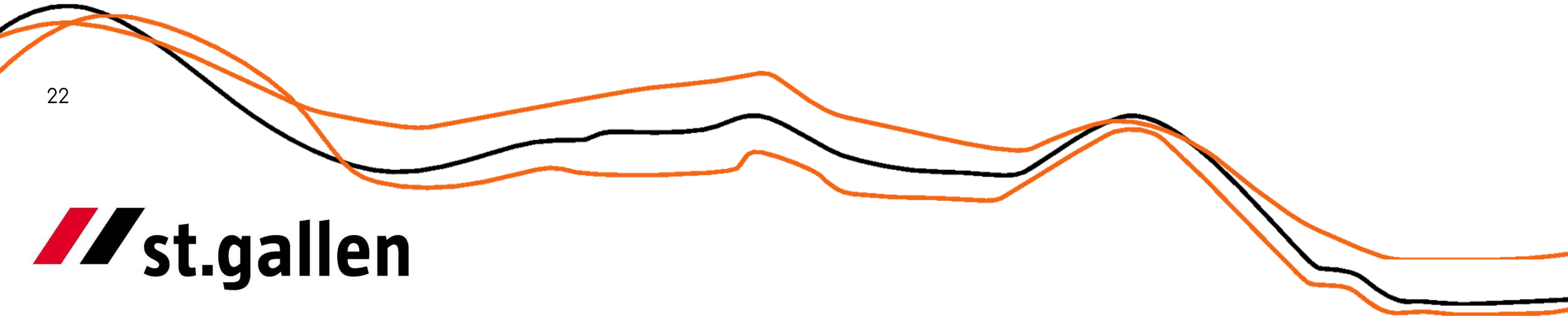


st.gallen

ENERGY DATA HACKDAYS

# Challenge

- Build a model to predict the heat demand of all the buildings in the city of St.Gallen
- Compare the model with the existing „handmade“ model



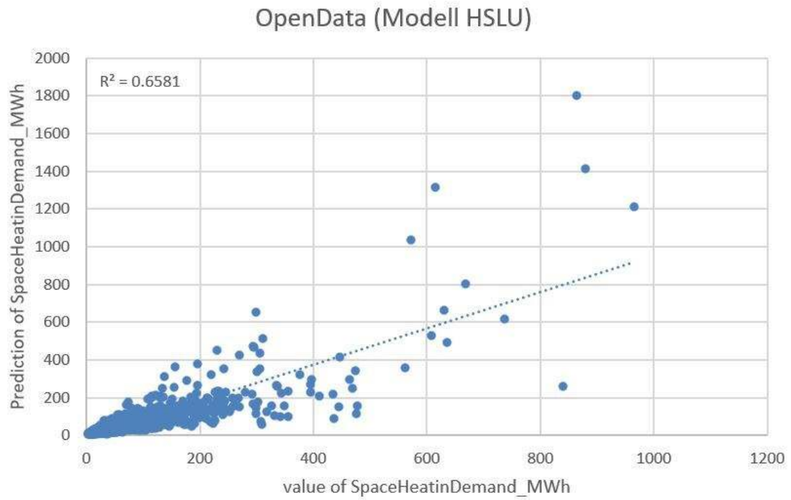


st.gallen

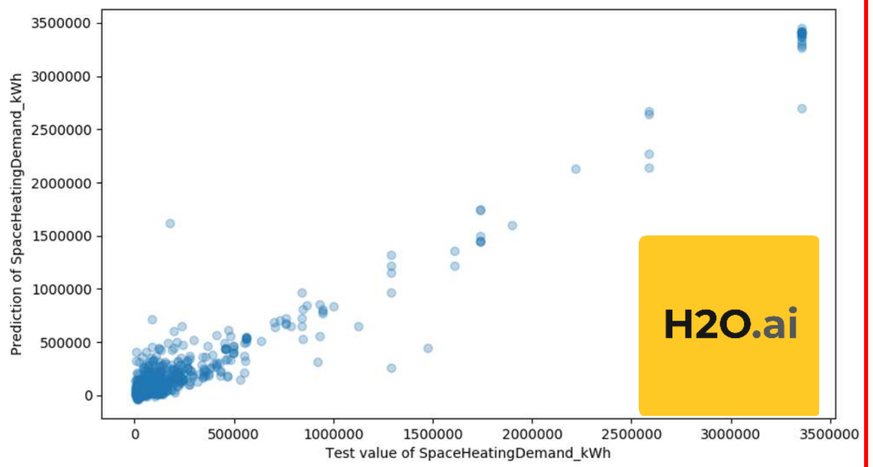
# Model comparison

**Machine learning model with measured data from St.Gallen**

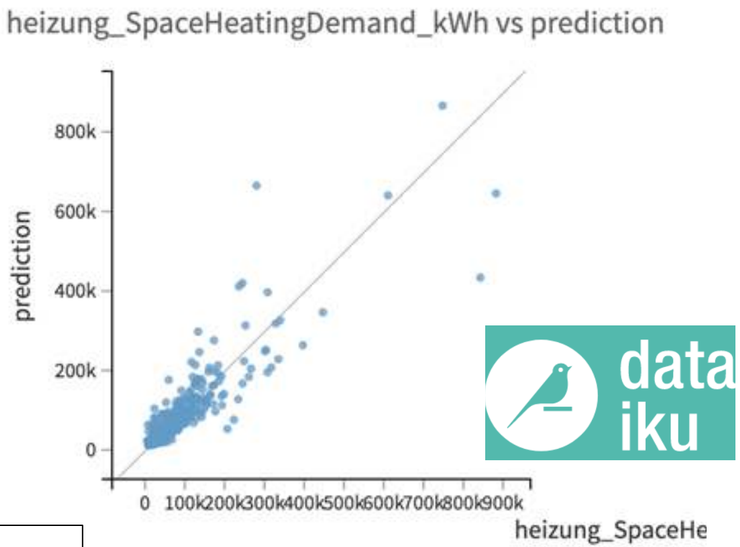
## “SWEET-EDGE” Model with Open Data, no machine learning (GWR)



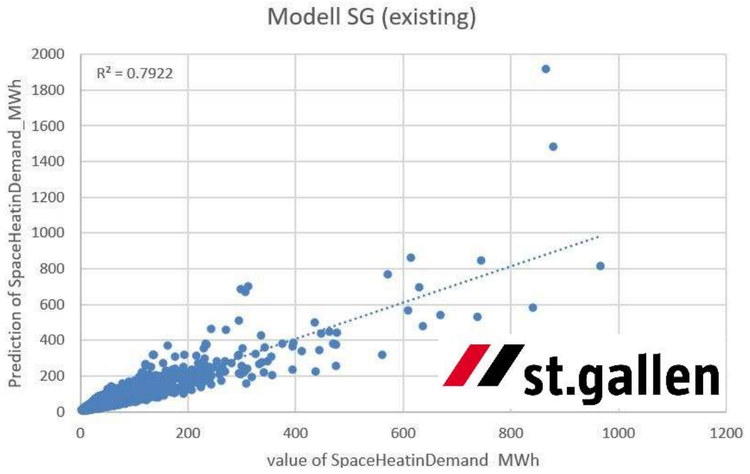

## Open Source AutoML (H2O.ai) R2=0.88




## Dataiku - R2=0.82



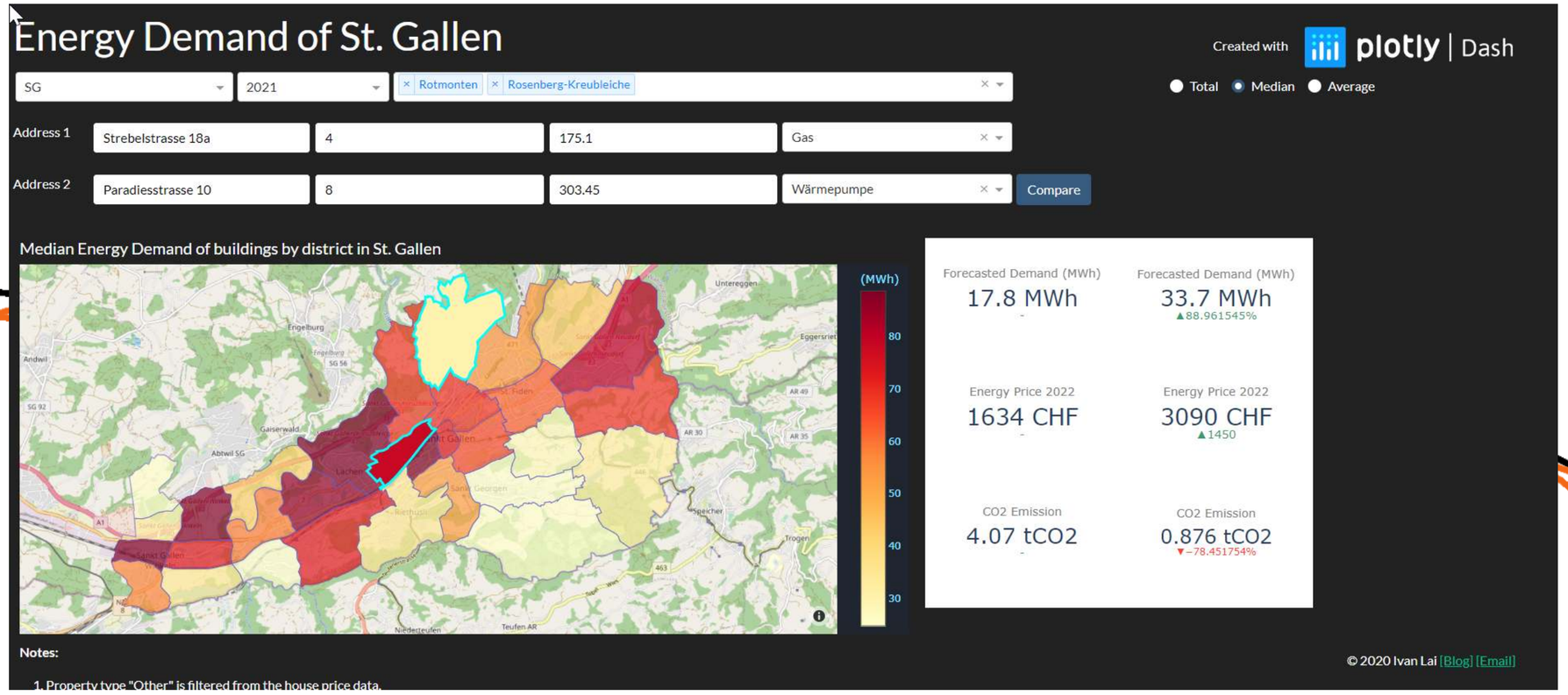

## Existing model of St.Gallen R2=0.79

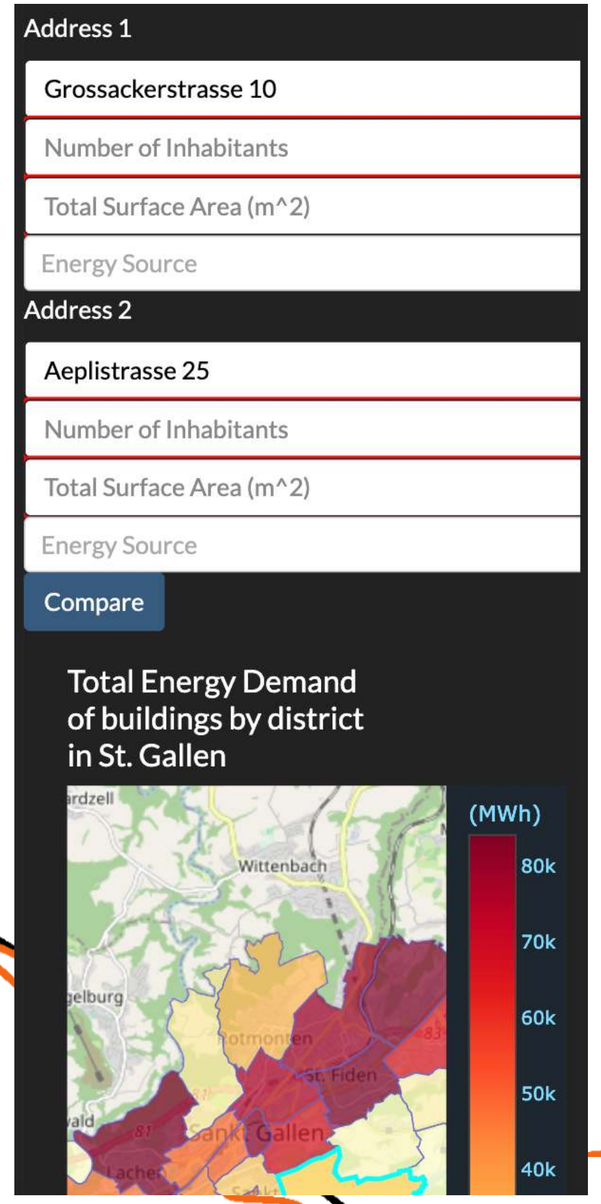


ENERGY DATA HACKDAYS

# User Interface

## heatSG.energy.opendata.ch



ENERGY DATA HACKDAYS

## Learnings

Machine learning basic principles

ML can bring better results than physical models

People, community, Datasets and existing models

## Next steps

Compare models with the same dataset

Develop partnership Stadt SG/HSLU

Bring model in production?

ENERGY DATA HACKDAYS

# Team









03

# Enriching Point Clouds (LiDAR) with Meta Data


Nicolas Wenk

Pascal Leimer

Jens Witzig

Tobias Schmocker

Max Kapustin

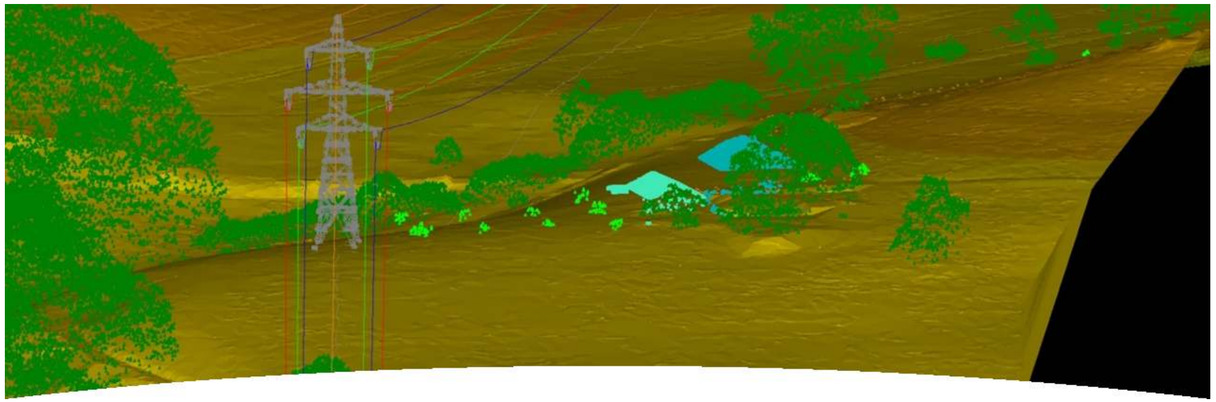
Matthias Burger




# Initial situation

- Find houses too close to power line
  - Depends on type (agricultural, residential, …)
  - Depends on volume

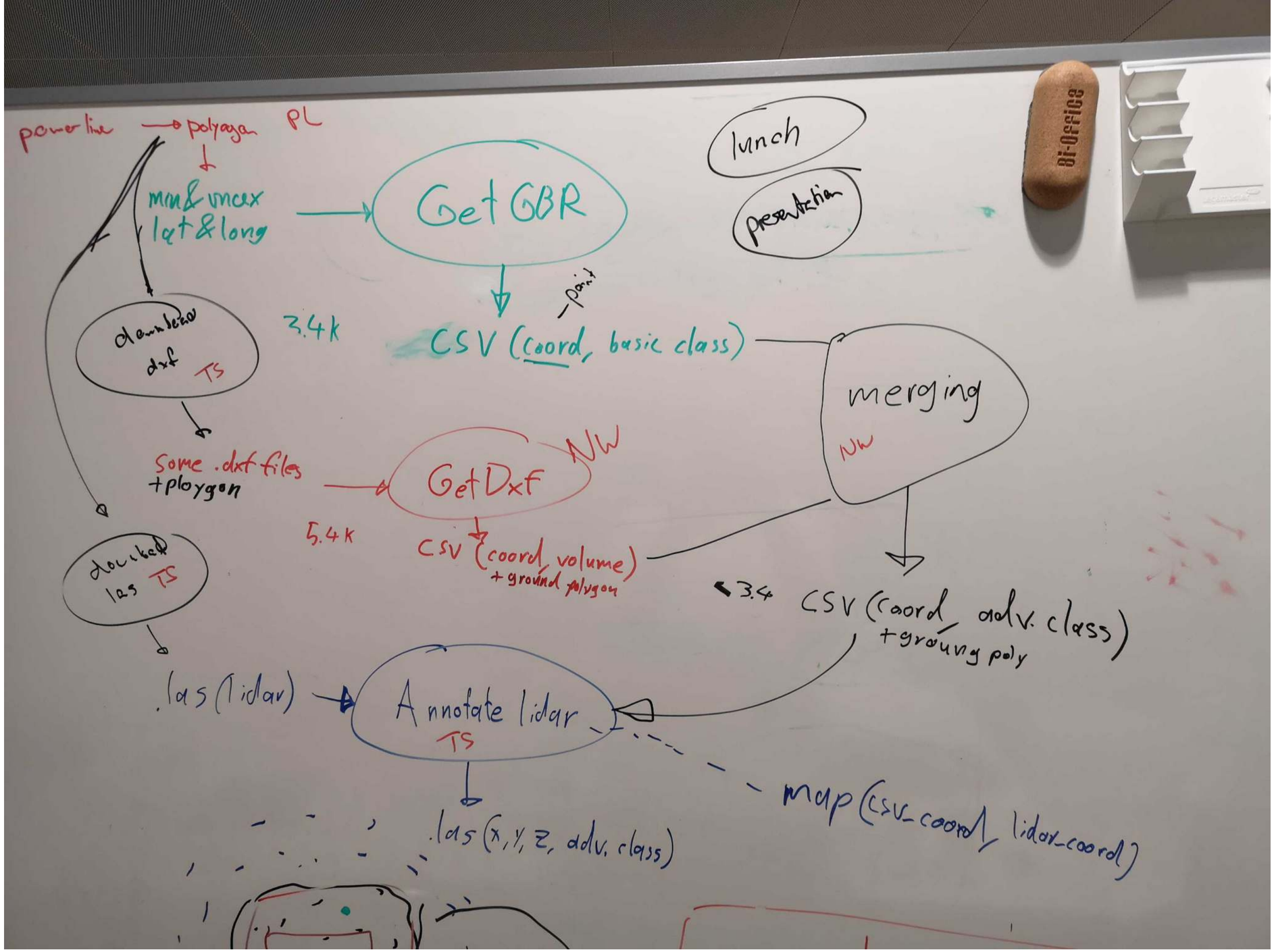
- Commercial software loading .las/LiDAR data





Enriching point clouds with meta data means:

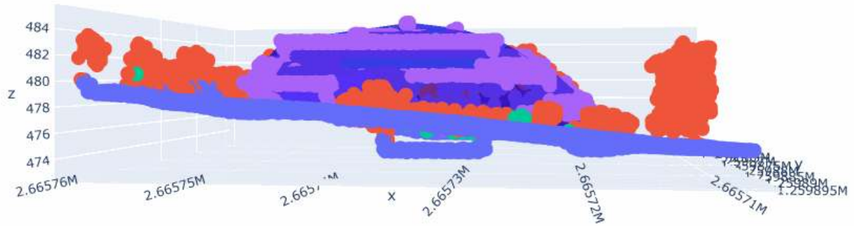
# Endless data sources need to be combined

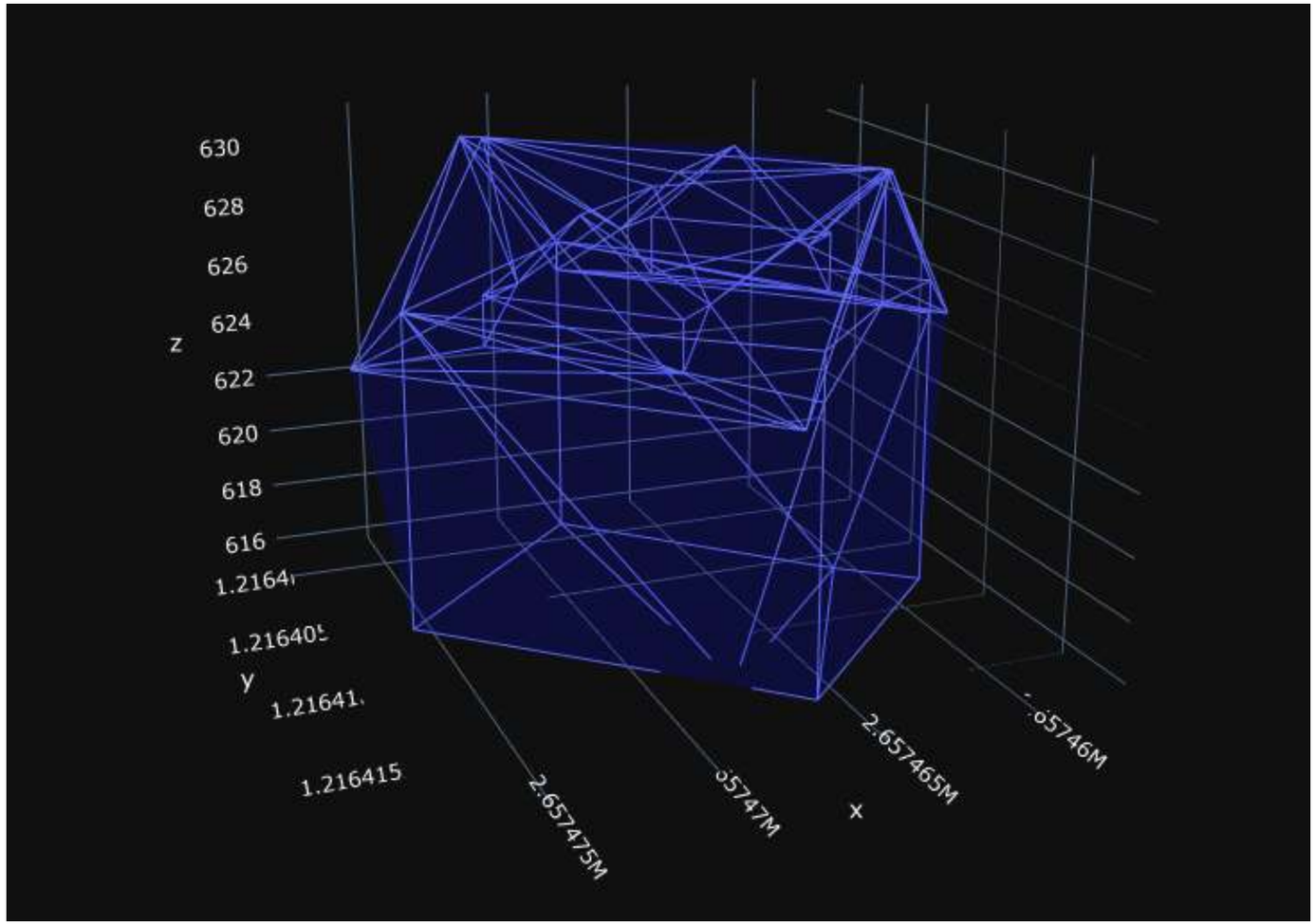


# Calculating the volume of buildings

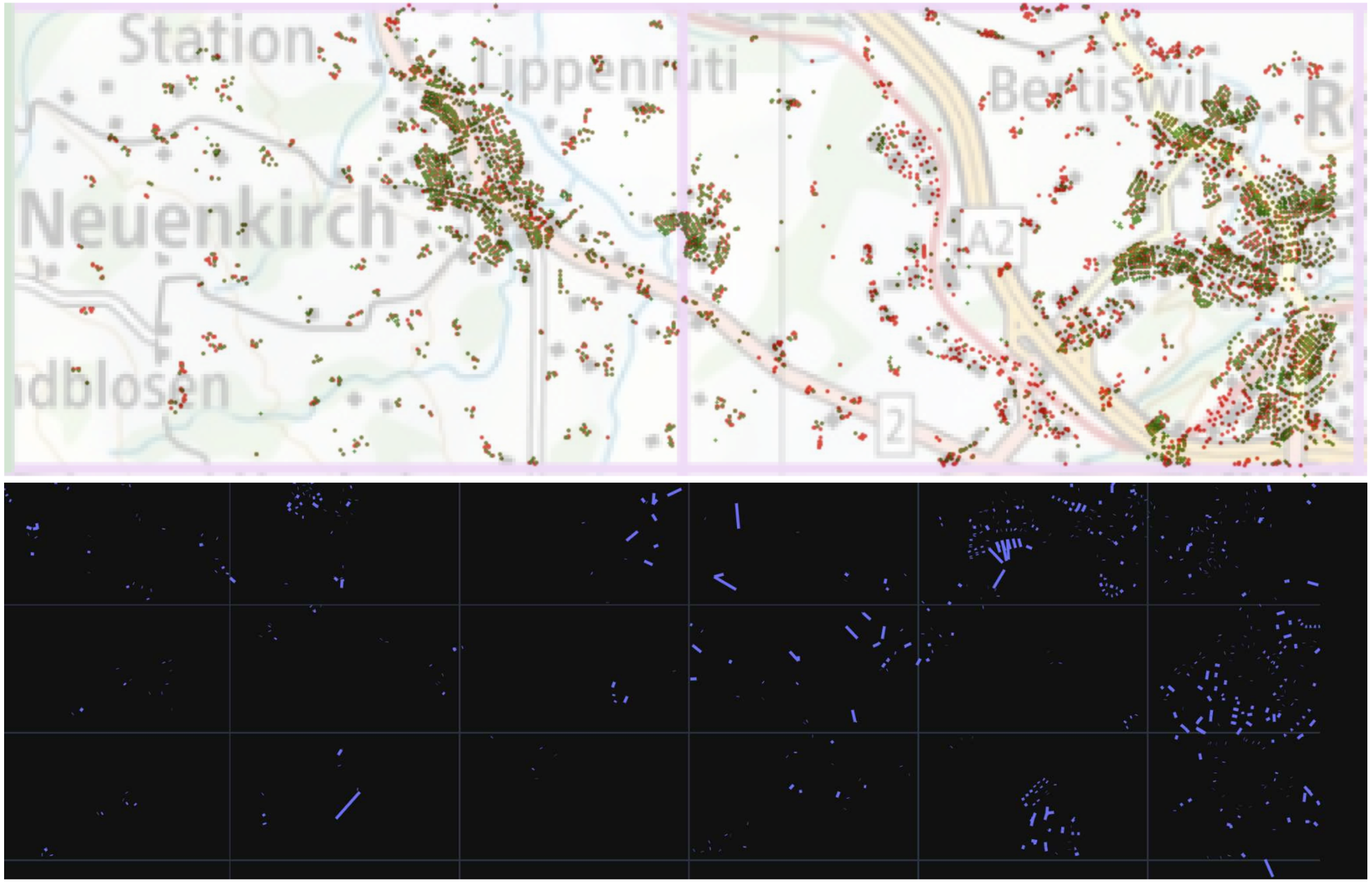
various approaches were followed…





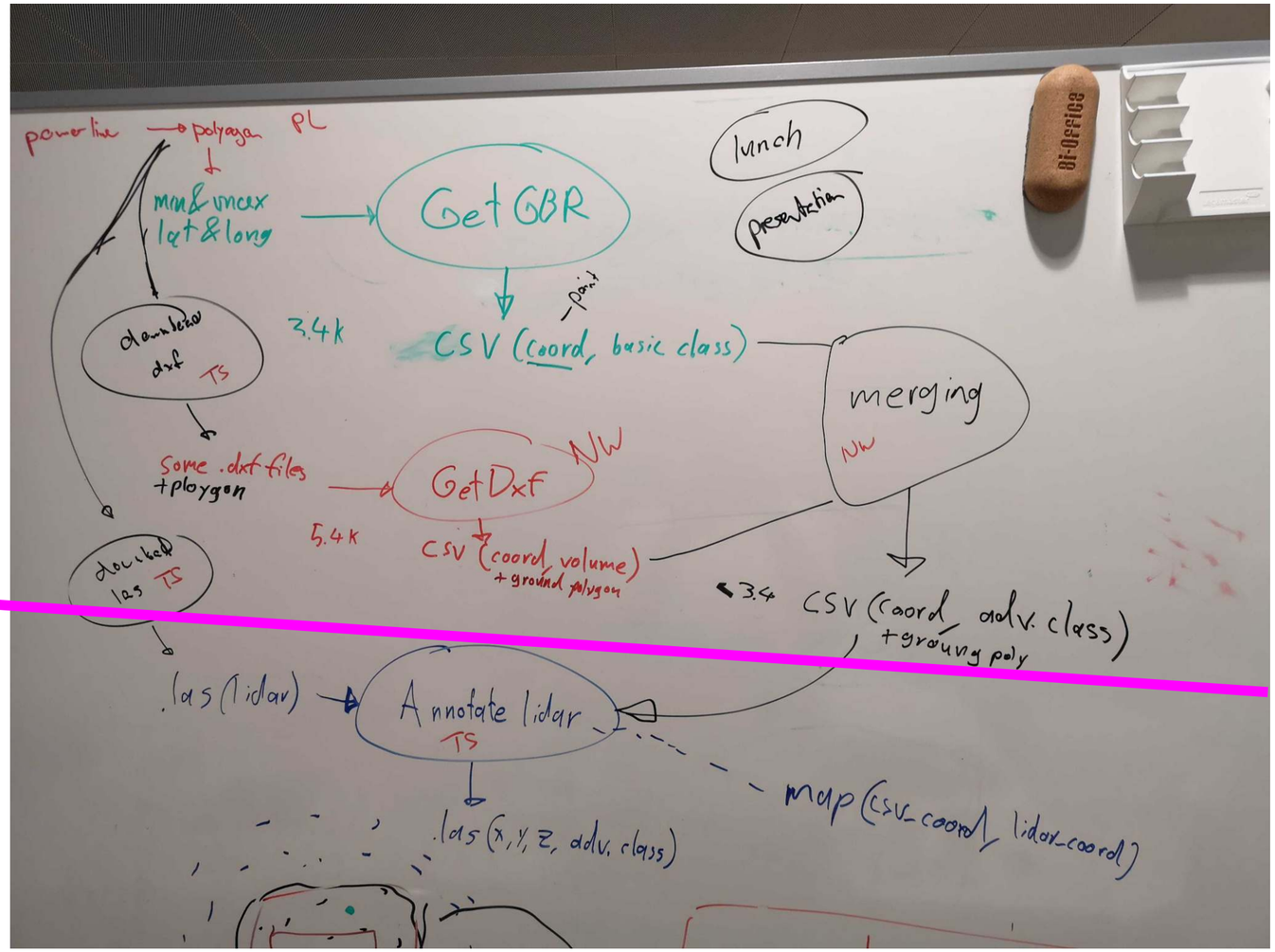



# Matching data points of different data sources



# Results

- Tool which downloads the relevant data sources for a given power line geometry
- Tool which extracts metadata of buildings
- Tool which calculates the volume of buildings
- Tool which combines these datasets




# Next Steps

- Combine the gathered data with LiDAR

04

Eco-friendliness score

Allthisfuture

Tobias Graml

Wolfram Willuhn

Sofiia Kaminska

Lucien Erdin

Marc Holthuizen

Remo Müller

Frederic Nachbauer

Fabian Widmer

Chris Mutel

Peter Allenspach



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# "eco"-friendliness score

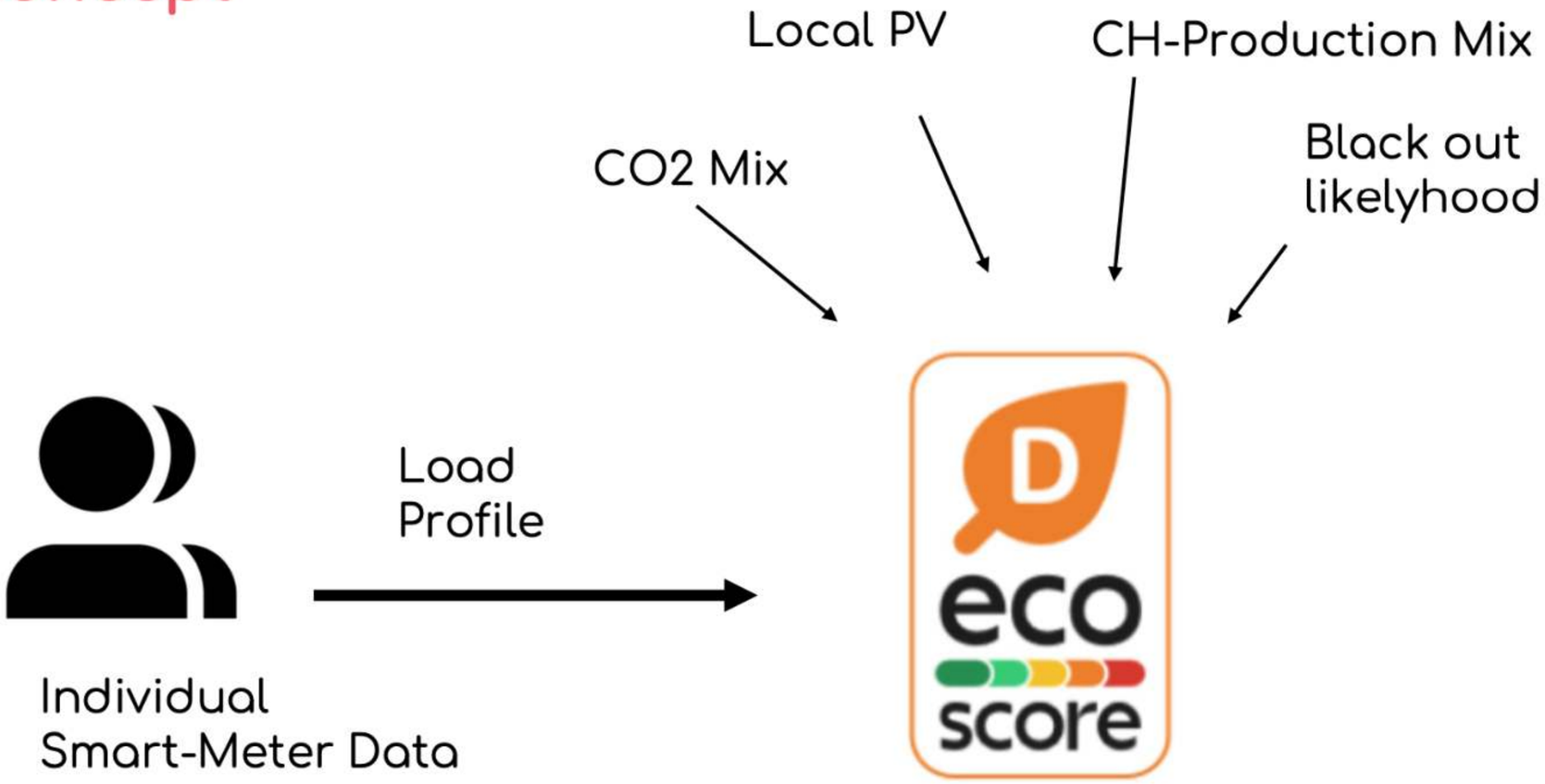


all this future
Das Innovationslabor von WWZ

WWZ

ENERGY DATA HACKDAYS

# Concept



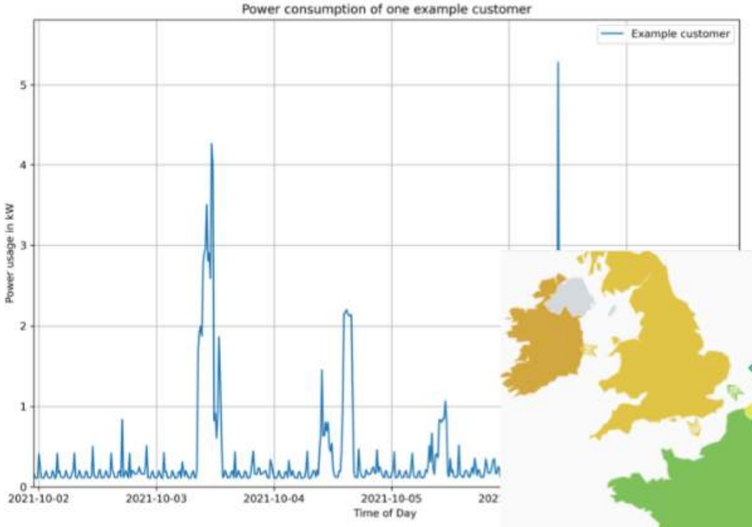


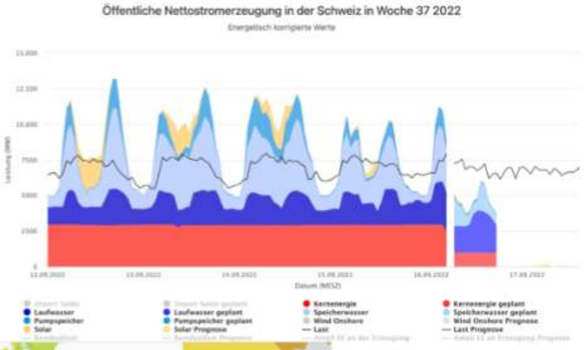

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Das Innovationslabor von WWZ

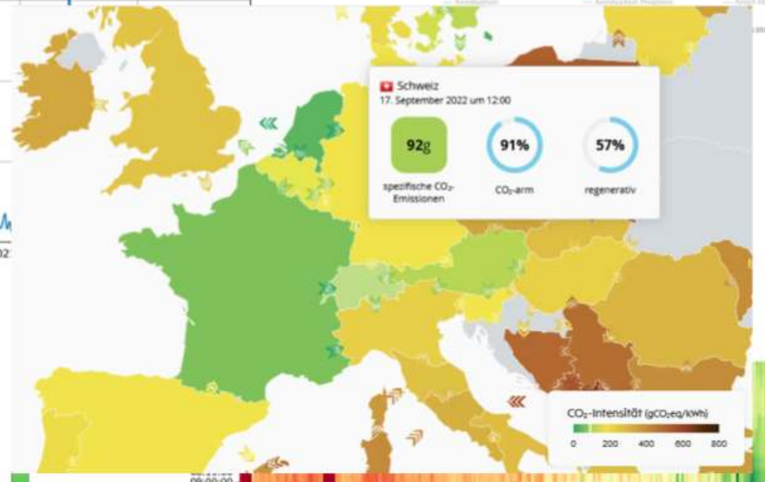
WWZ

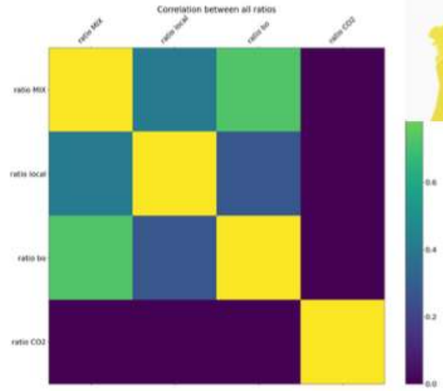
ENERGY DATA HACKDAYS

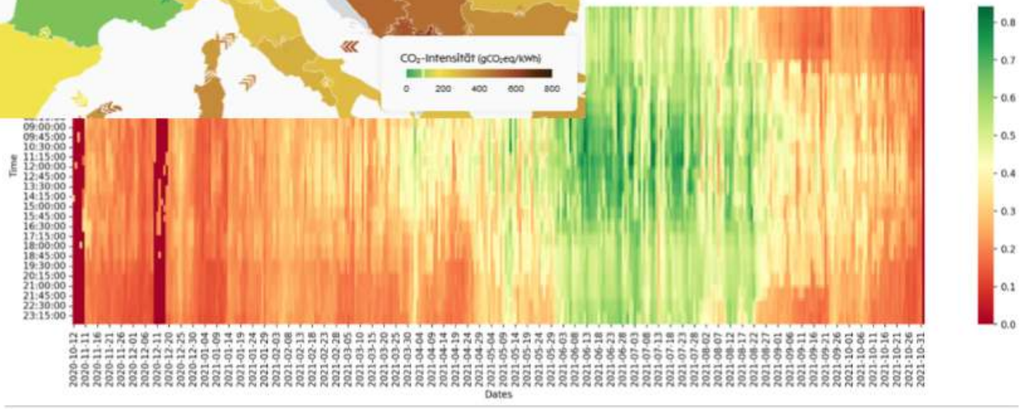
# Inputs/Outputs



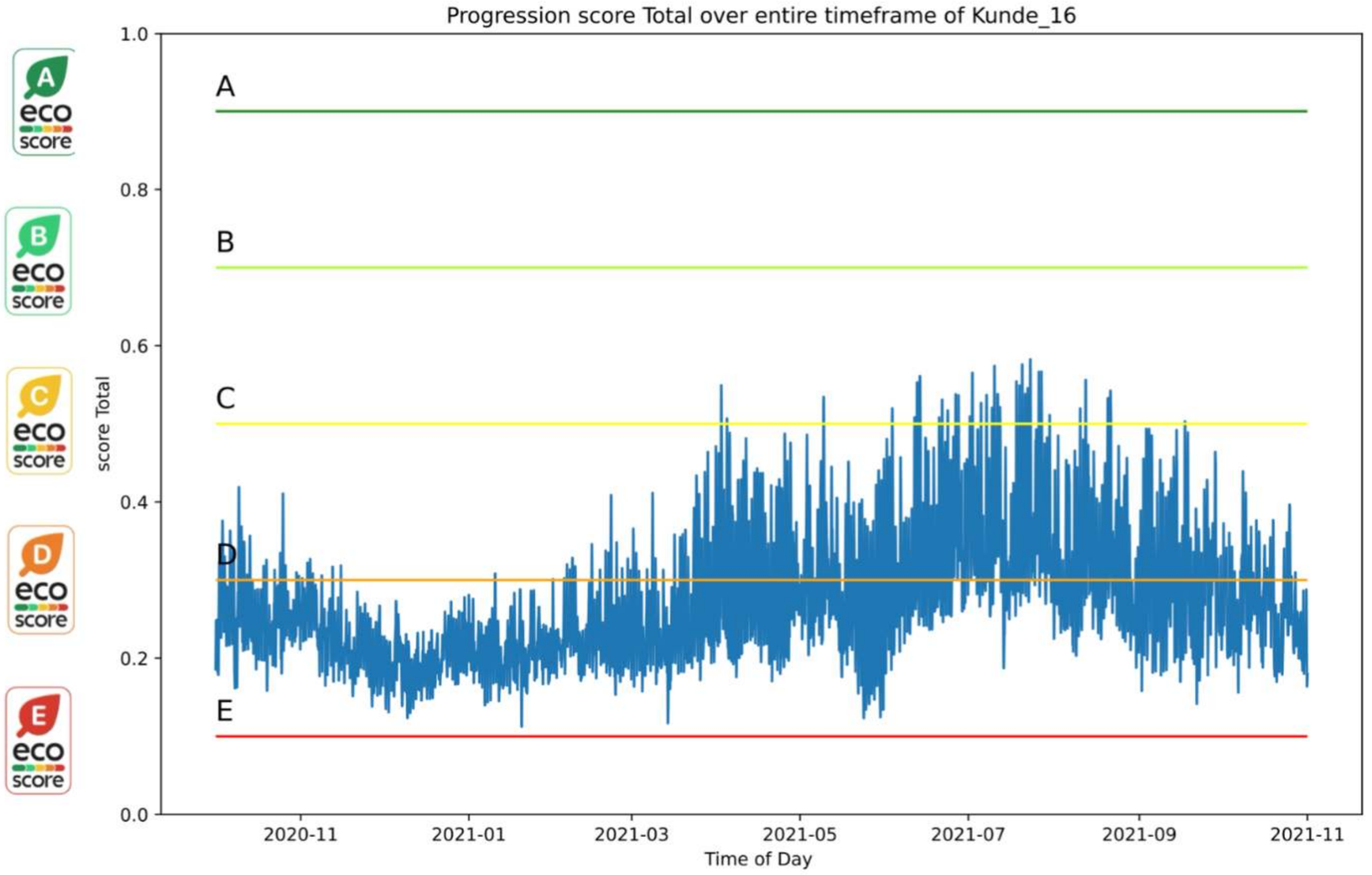



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WWZ

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# Score over the year



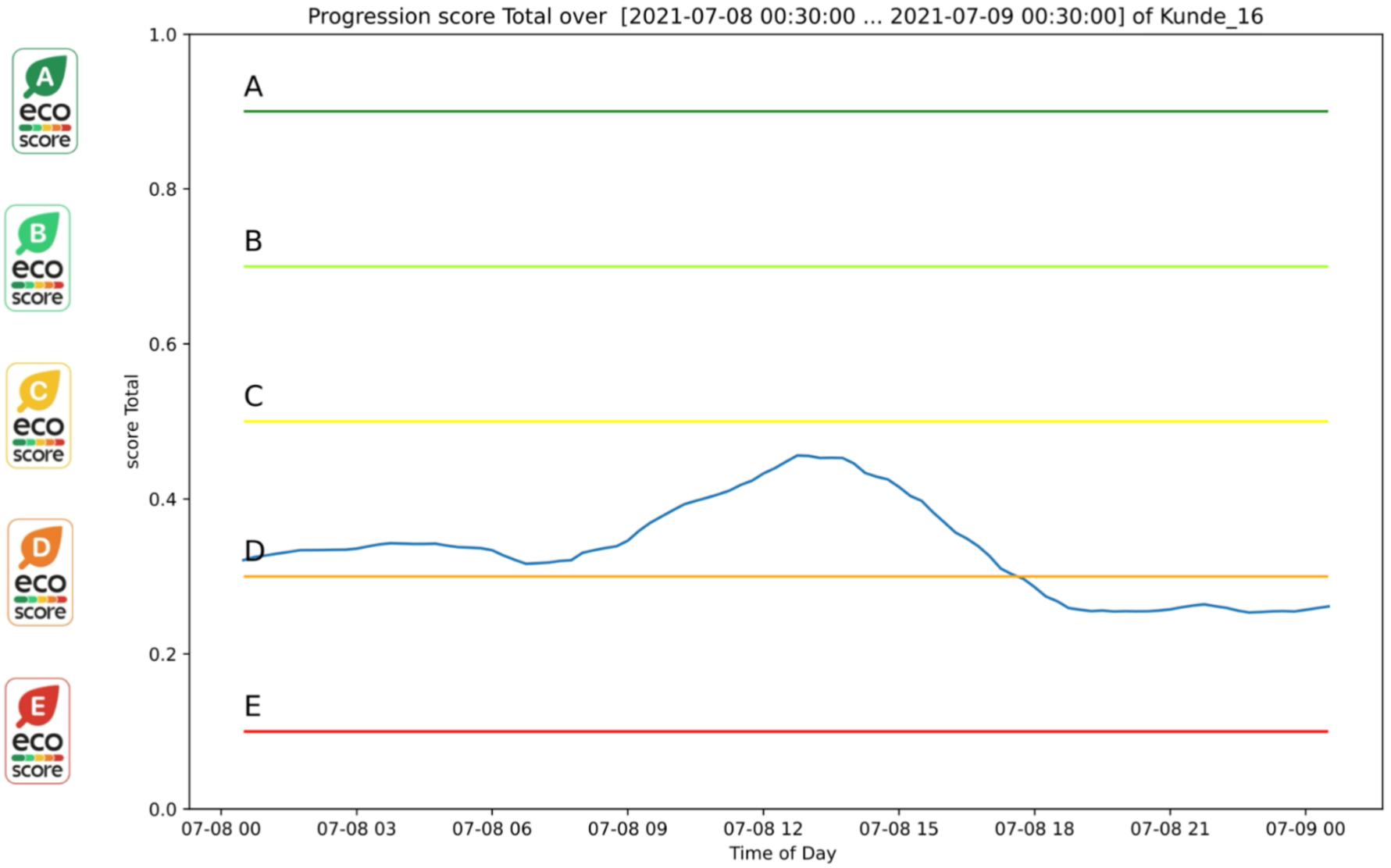



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# Score over time of day



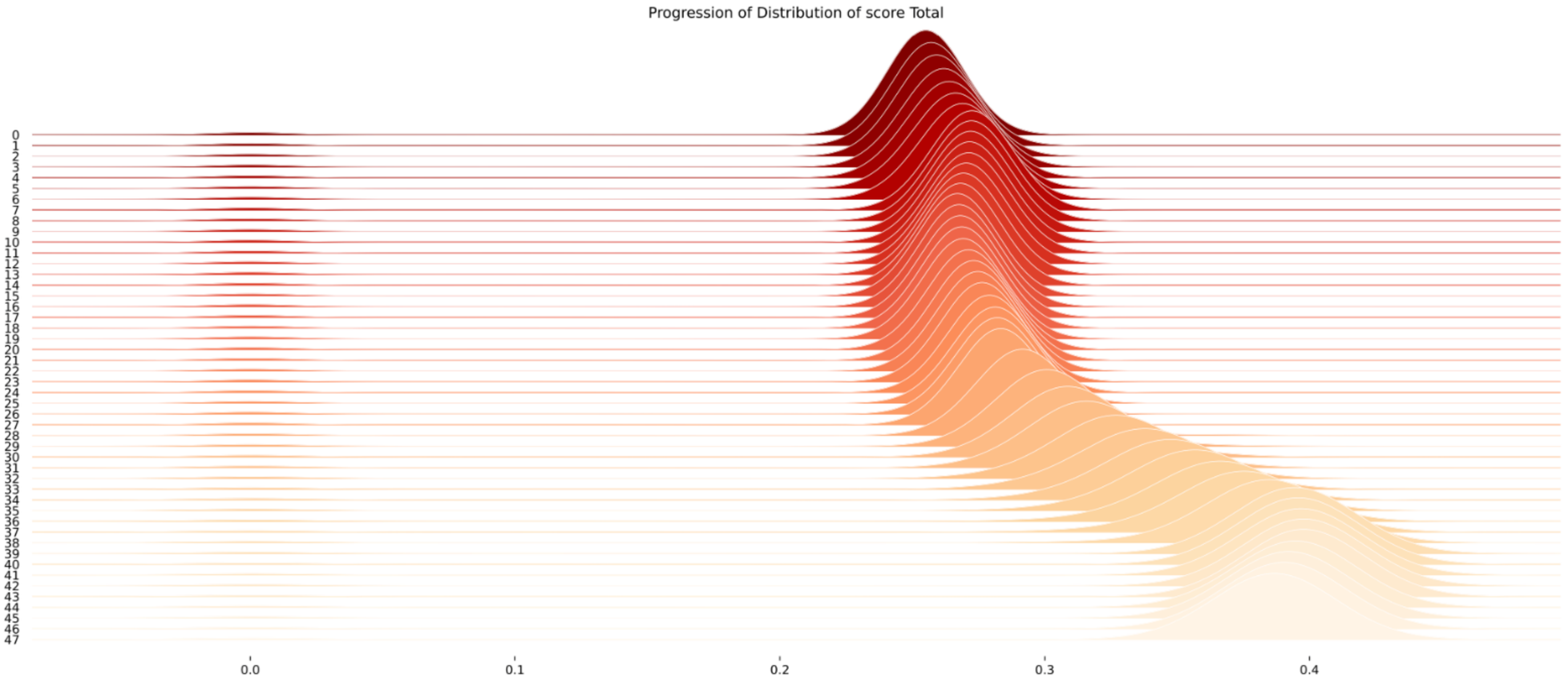



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# Distribution of all scores






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# Impact

## Compareability

Current level
Own progression
Neighborhoods

## Advice on measures

Intra day shifting
Seasonal impacts
Impact of savings

## Simulation of investments

PV + Battery
EV
Local Renewables

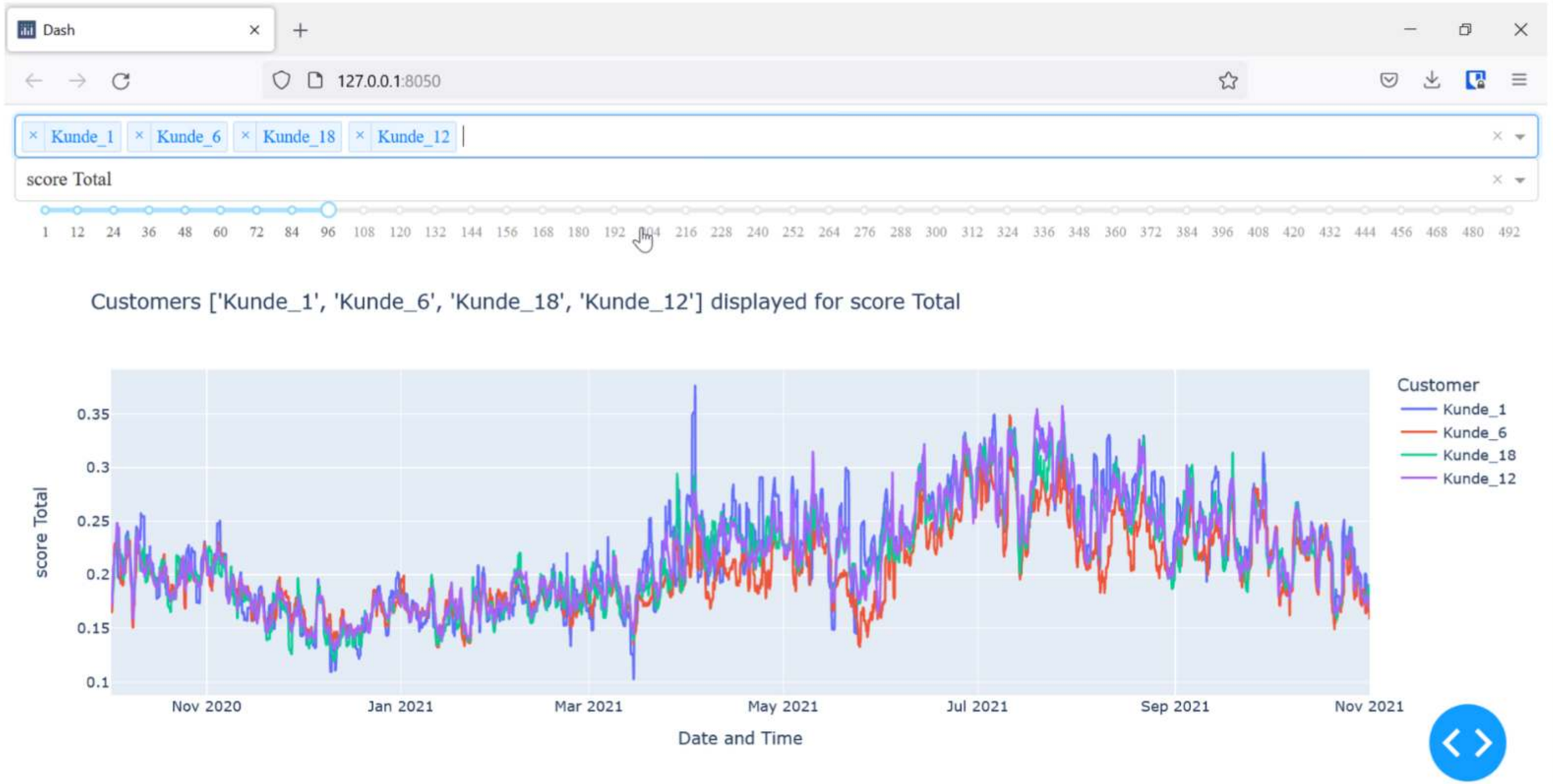


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WWZ

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# Tool Demo






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WWZ

05

# Optimizing short-term active power losses forecast

swissgrid


Flavio Müller
Marius Giger
Kathrin Puthiyedathu
Christoph Rothert
Constantin Le Clei
Beatriz Alvarez
Xiying Liu
Ralph Machunze
Nataliia Kovalchuk




# Challenge Background

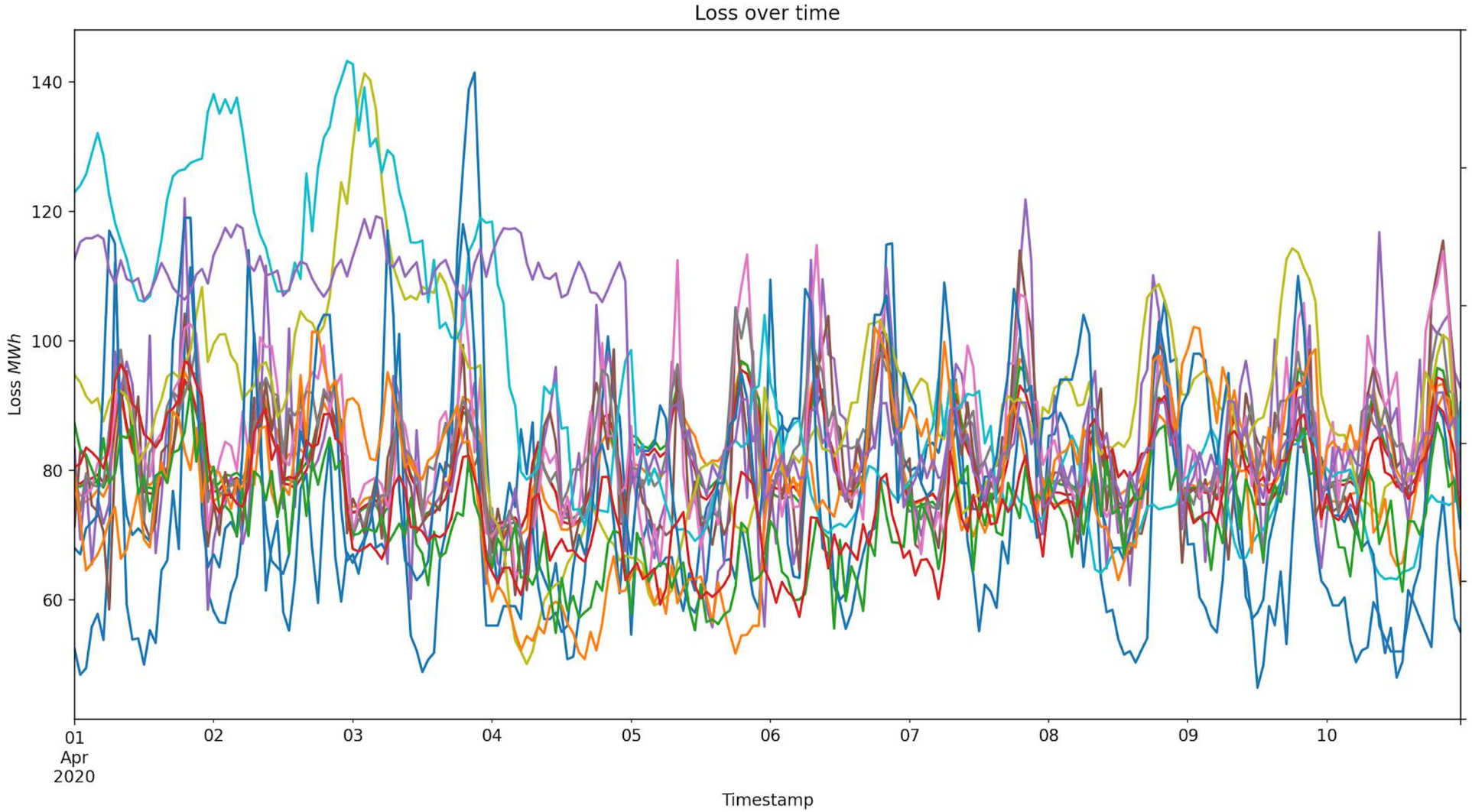
ENERGY DATA HACKDAYS

- Forecasting thermal losses due to line resistance
- Losses must be compensated
- Energy is procured according to loss predictions (day-ahead market)
- Swissgrid uses different models for loss prediction

The better the model the less risk for the system

👉 How to optimize the prediction of the active power loss?

# Data




| Timestamp | Loss | M1 | M2 | M3 | M4 | M5 | M6 | M7 | M8 | M9 | M10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/9/21 0:00 | 103,6448 | 110,468279 | 113,7751231 | 110,8574755 | 117,8421402 | 112,9657974 | 103,8231674 | 110,8770828 | 82,5178 | 126,2853 | 87 |
| 1/9/21 1:00 | 124,0071 | 115,5224498 | 118,4141897 | 115,4755564 | 128,2089081 | 92,73298645 | 110,5460496 | 113,7244131 | 87,9264 | 127,3334 | 97 |
| 1/9/21 2:00 | 143,4712 | 116,3726882 | 119,8605911 | 116,9378768 | 121,4829025 | 120,5465622 | 115,9639247 | 122,616391 | 92,4957 | 127,6337 | 106 |
| 1/9/21 3:00 | 158,8572 | 114,6046607 | 116,9972784 | 114,1465841 | 86,2817688 | 116,1719284 | 95,62954421 | 117,0397167 | 97,4901 | 128,84 | 115 |
| 1/9/21 4:00 | 158,8108 | 113,9091166 | 114,7376655 | 112,26232 | 116,8781738 | 121,2733459 | 100,2675454 | 116,1627798 | 101,5937 | 128,5777 | 121 |

# Models

ENERGY DATA HACKDAYS

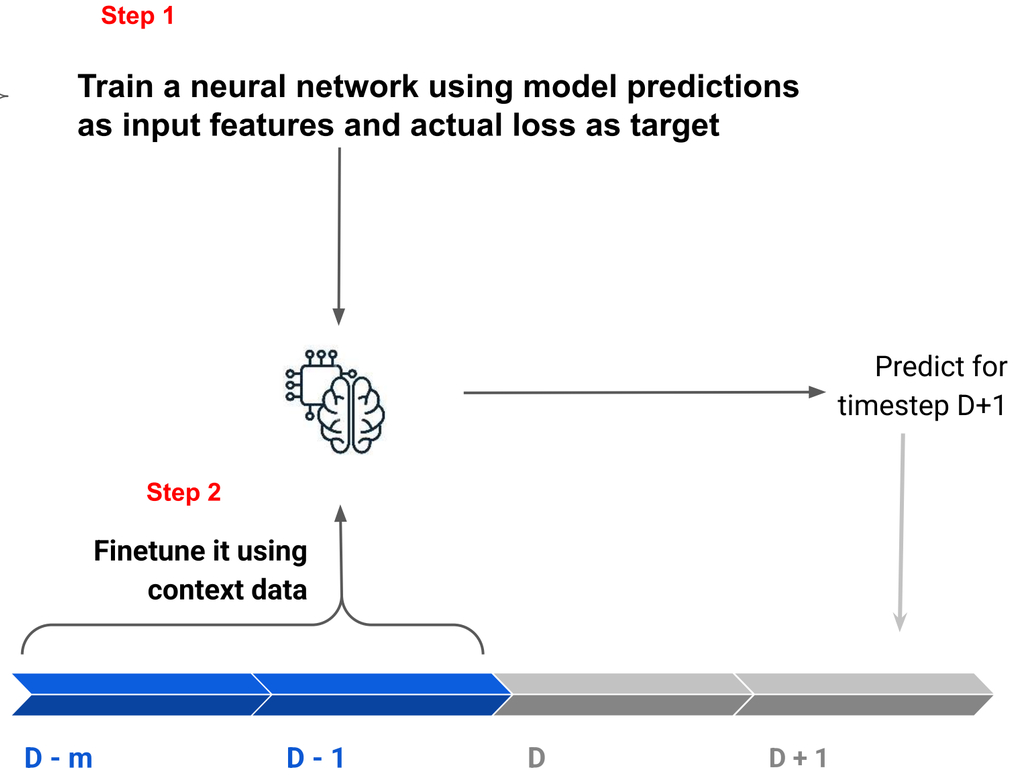
- Many different approaches were tried
- **Baseline approaches**
  - Numerical combinations (averaging, weighted average, median)
- **Machine learning**
  - Model selection (RandomForestClassifier)
  - Base predictions as features (Neural Network)

# Our selected method

ENERGY DATA HACKDAYS

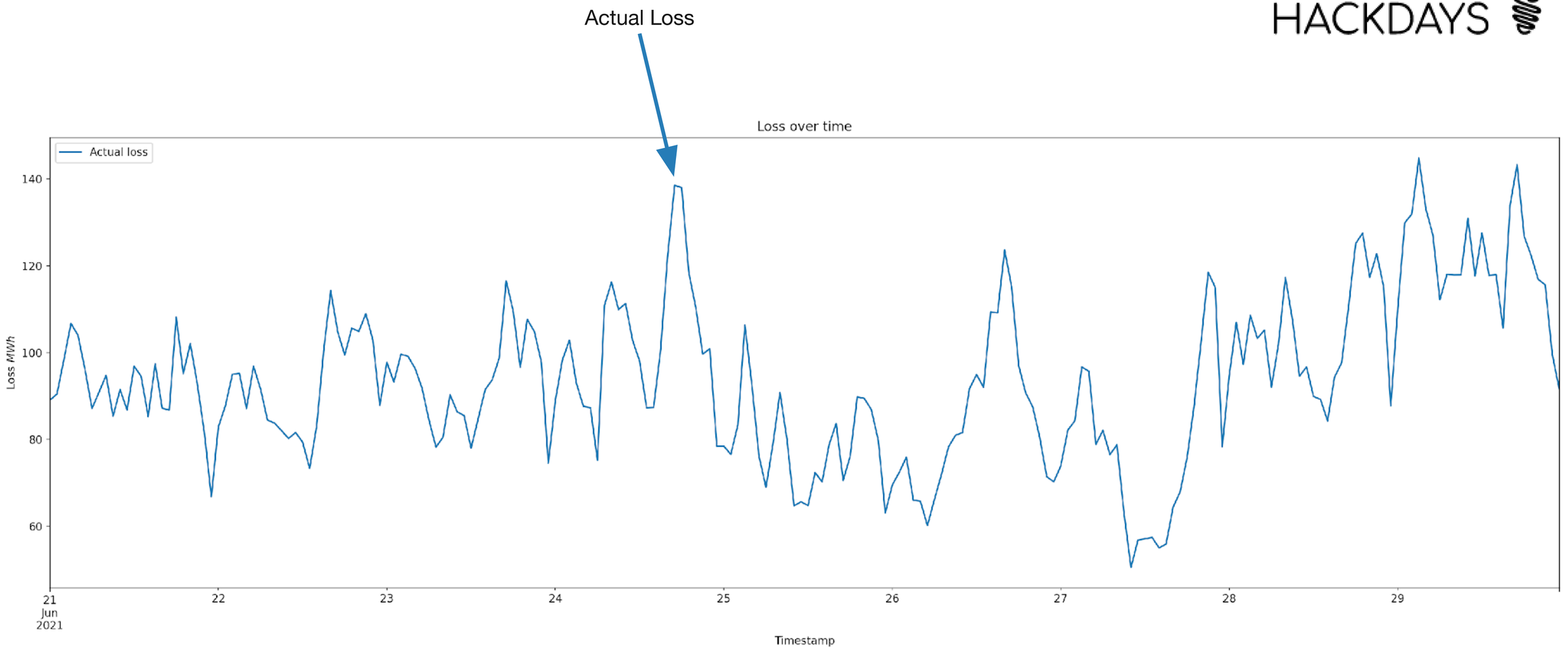
2020 data (Training)

| Actual loss | M1 | M2 | ... | M14 |
|---|---|---|---|---|
| 103,6448 | 110,468279 | 113,7751231 | | 117,8421402 |
| 124,0071 | 115,5224498 | 118,4141897 | | 128,2089081 |
| ... | ... | ... | | ... |
| 158,8572 | 114,6046607 | 116,9972784 | | 86,2817688 |

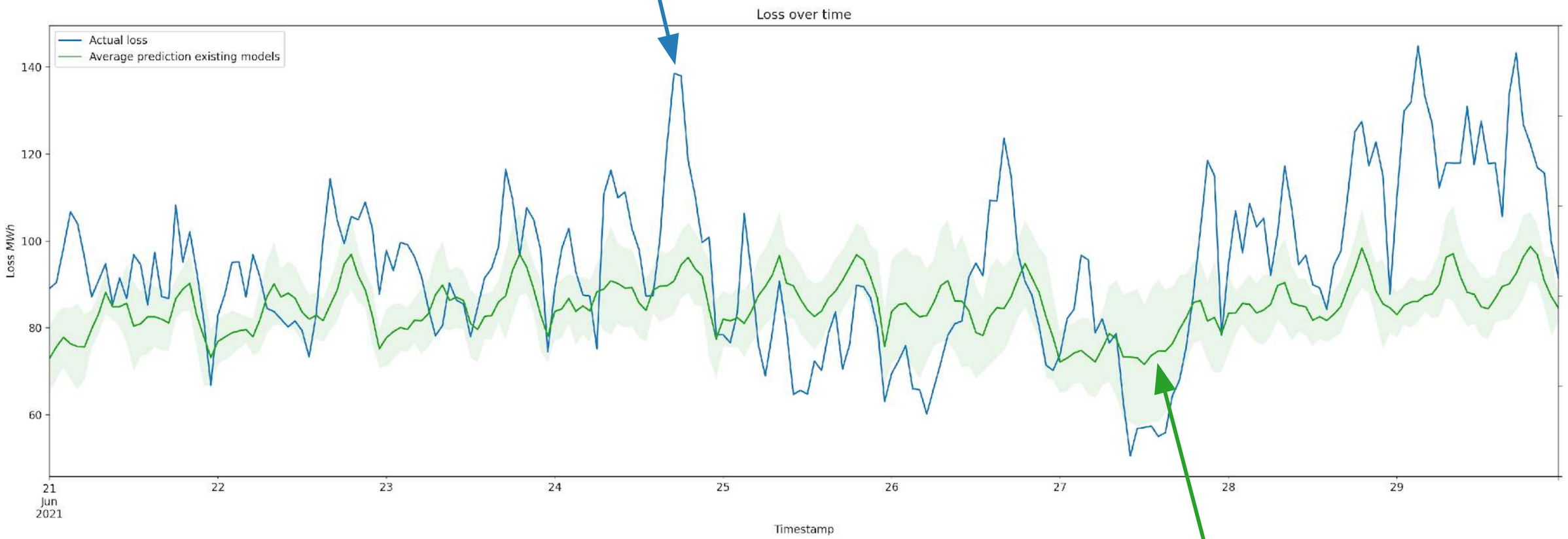



Target: 2021 data

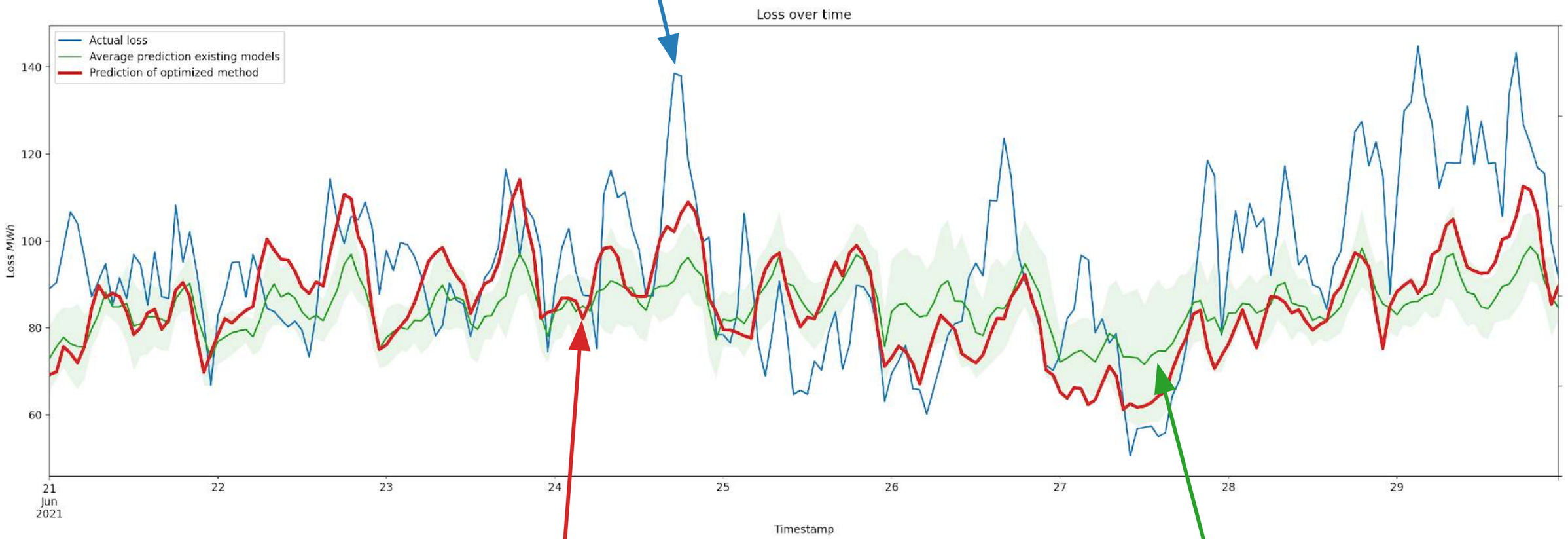
ENERGY DATA HACKDAYS



ENERGY DATA HACKDAYS



ENERGY DATA HACKDAYS




Actual Loss

Predictions of our method

Average prediction of existing models

# Models

ENERGY DATA HACKDAYS

(value in 2021)

| Model | MAE | Overall monetary representation of the forecasting errors |
|---|---|---|
| **Baseline: Average** | 18.75 | EUR 18.64 Mio. |
| **Model selection: Random Forest Classifier** | 19.54 | EUR 19.79 Mio. |
| **Step 1 Neural Network** | 18.48 | EUR 19.29 Mio. |
| **Step 2 Neural Network (Adaptive Window)** | **18.24** | **EUR 18.30 Mio.** |

# Key Learnings

ENERGY DATA HACKDAYS

- New optimized method (improvement of the error equivalent to EUR 340’000 for the year 2021)
- Average of existing models (baseline) outperforms most ML-based methods we tried (ensembling)

- Next steps
  - **Price-aware:** Include forecasted price into model as a performance evaluation criterion
  - **Interpretability:** Include more explanations for the choice of model

07

Alternative pathways to net zero

ETH ESC

Robert Stanton
Stéphane Bisinger
Bill Zollinger
Adriana Marcucci
Lea Ruefenacht
Tristan Gollmart



ETH zürich

Energy Science Center

# The Energy Explorer

**Challenge # 7-8**

Alternative pathways to net-zero: visualization of energy scenarios

# The problem

How can **policy-makers** take decisions based on model-driven energy scenarios?

**Current state:**

- Many scenarios
- Very detailed information
- Not easy to extract conclusions



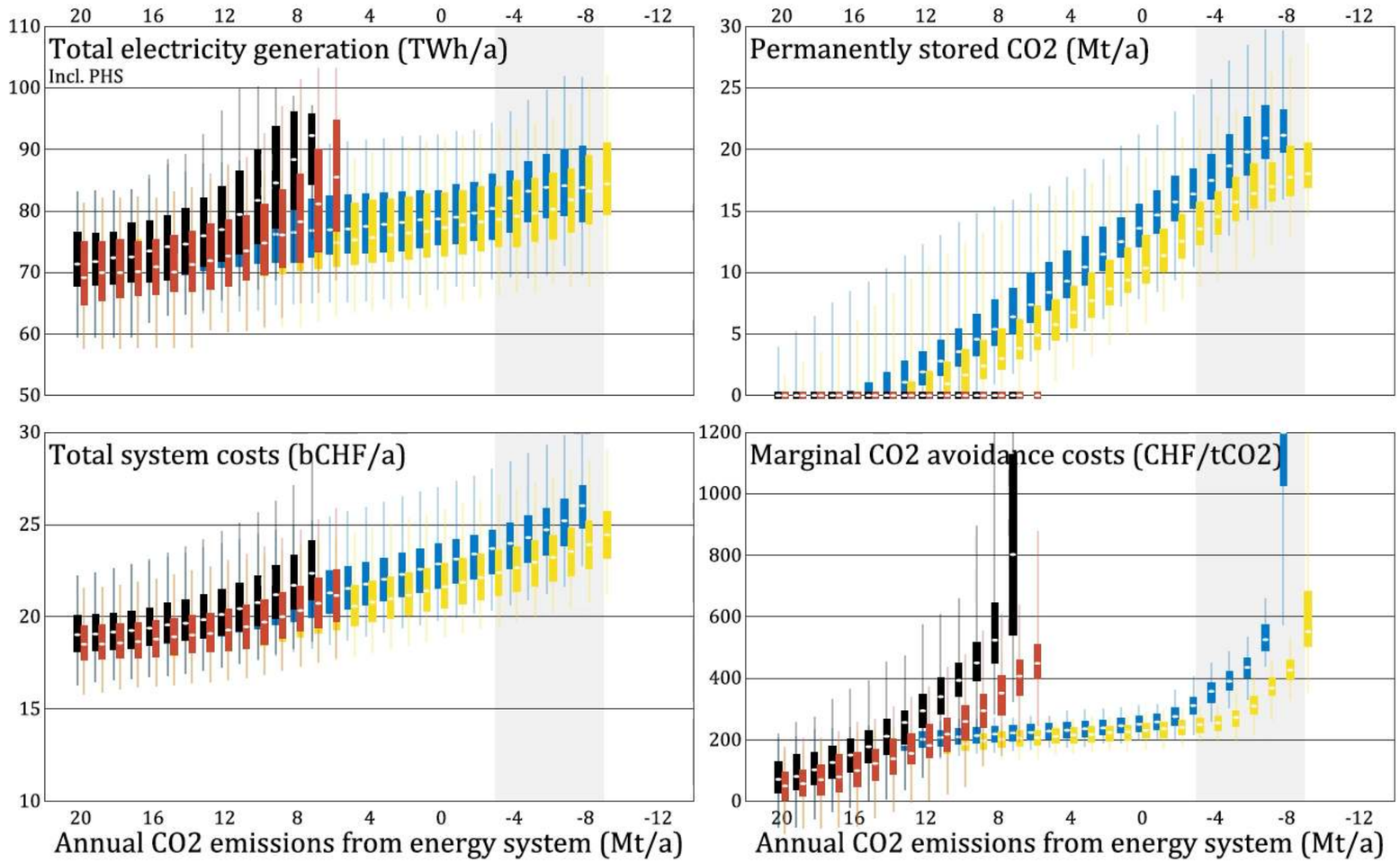



Figure 2.2: Selected model results at different $CO_2$ targets in the four scenario variants Yesterday, Revolution, Come together and Imagine

of energy from one form to another. We distinguish three energy streams: resources, demands and

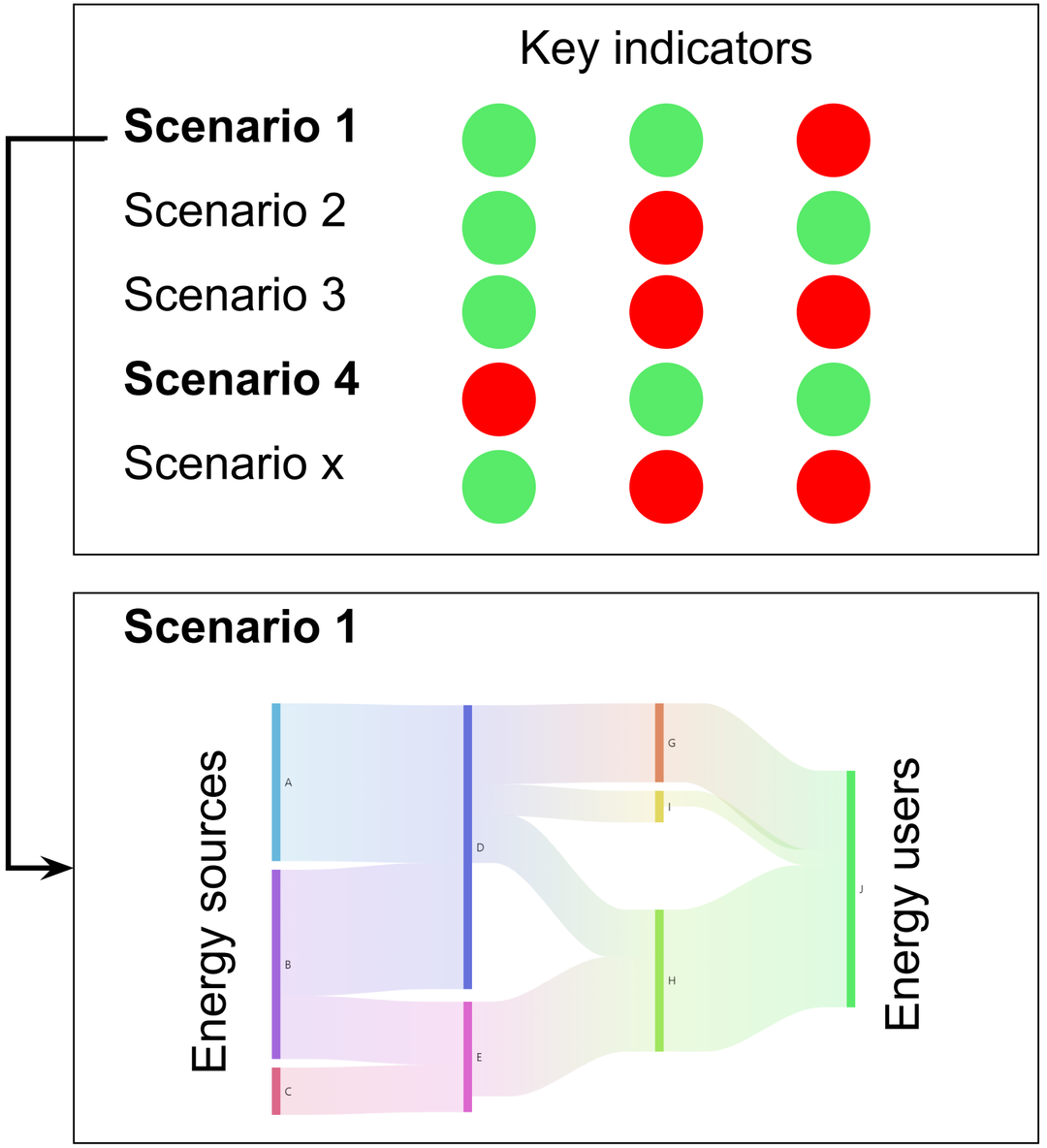
# The goal

A decision-making tool to explore and compare multiple energy scenarios

**Target audience:** policy-makers

**Key indicators:**

- $CO_2$ emissions
- Foreign vs domestic
- Total costs

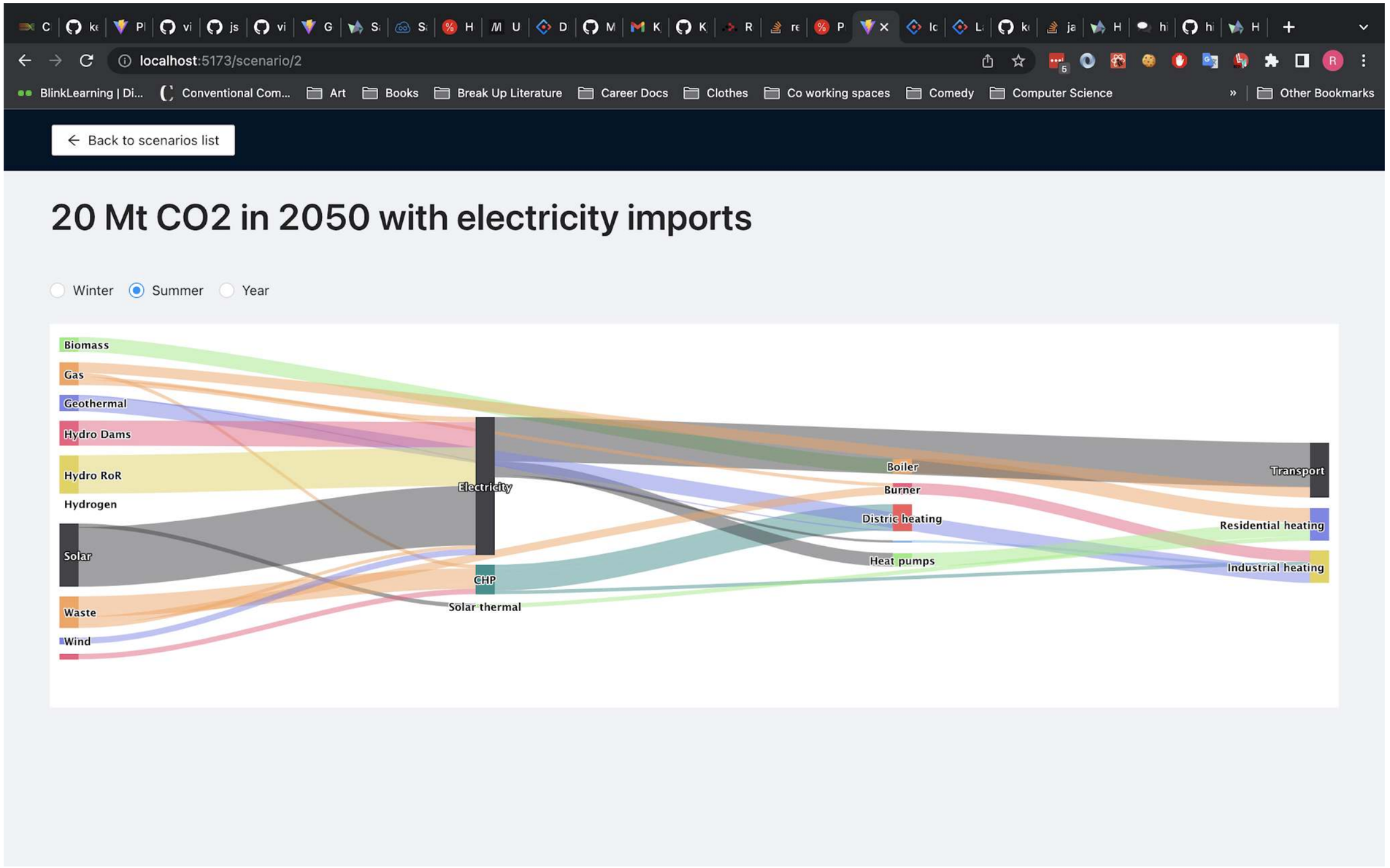


# The Energy Explorer

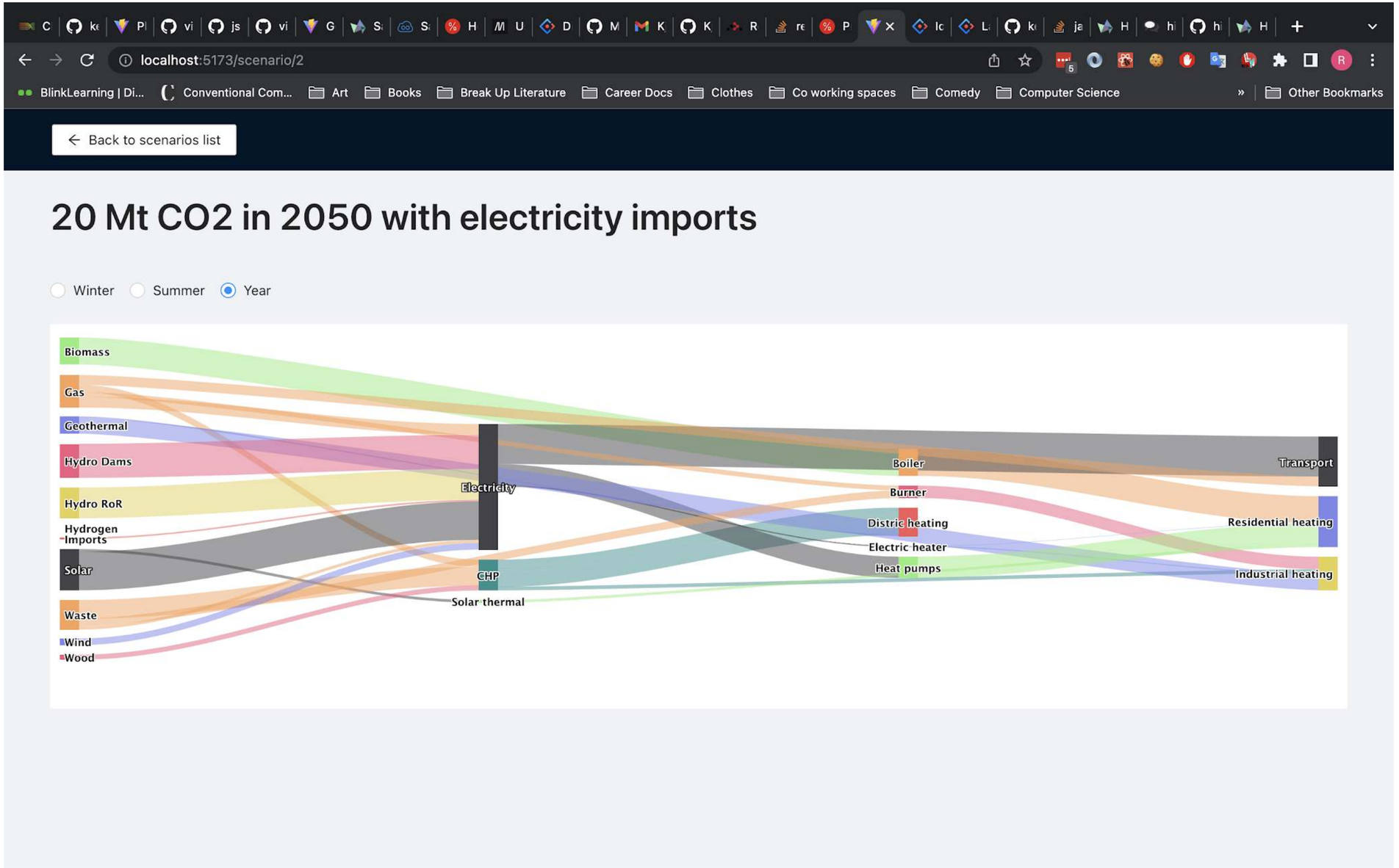
## Available scenarios

| | CO2 | Cost | Domestic |
|---|---|---|---|
| Scenario 6 | 0 GW/h | 28450.24 CHF | 25492% |
| Scenario Net-zero_typical_days_gwh_2035 | 25 GW/h | 22372.64 CHF | 2% |
| Scenario Net-zero_typical_days_gwh_2020 | 53 GW/h | 23305.04 CHF | 2% |
| Scenario 7 | -5 GW/h | 30668.20 CHF | 27375% |

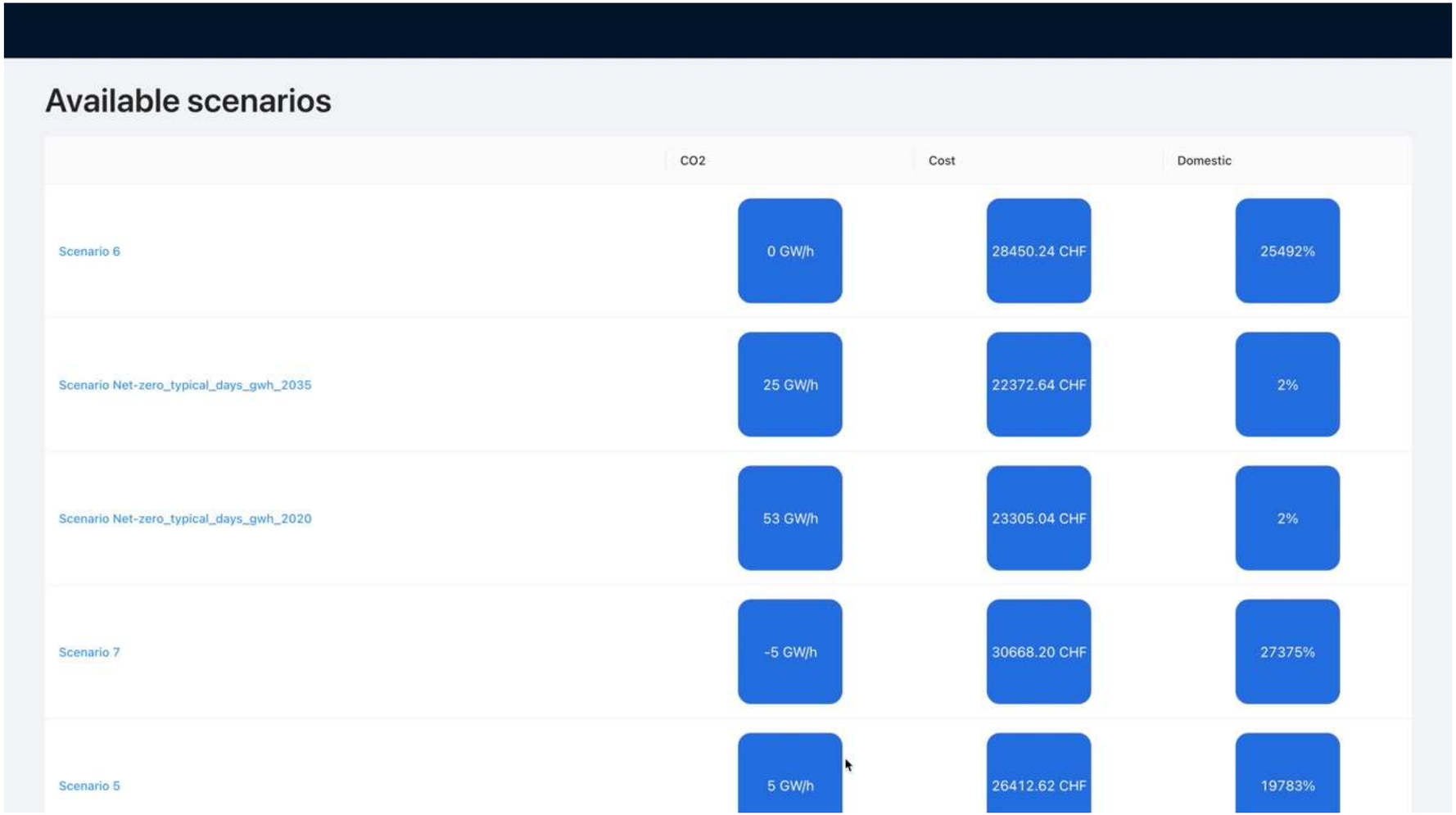
# The Energy Explorer



# The Energy Explorer



# It works!


Available scenarios
CO2
Cost
Domestic
Scenario 6
0 GW/h
28450.24 CHF
25492%
Scenario Net-zero_typical_days_gwh_2035
25 GW/h
22372.64 CHF
2%
Scenario Net-zero_typical_days_gwh_2020
53 GW/h
23305.04 CHF
2%
Scenario 7
-5 GW/h
30668.20 CHF
27375%
Scenario 5
5 GW/h
26412.62 CHF
19783%

# The Energy Explorer

- We (ETH as part of SFOE projects) will use it to:
  - Compare scenarios
  - Compare models
  - Give real input to policy makers, to industry… to people

- It will stay open source:
  - Come and help us if you want!




Lea
Robert
Stephan
Adriana
Bill
Tristan

09

# Graph Neural Network of a Wind Farm – Modelling Wake Interactions

OST

Thomas Losinger
Tobias Jucker
Florian Hammer



# The Problem

**Wind turbines influence each other due to their wakes**



Build a data-driven model that can answer the following questions:

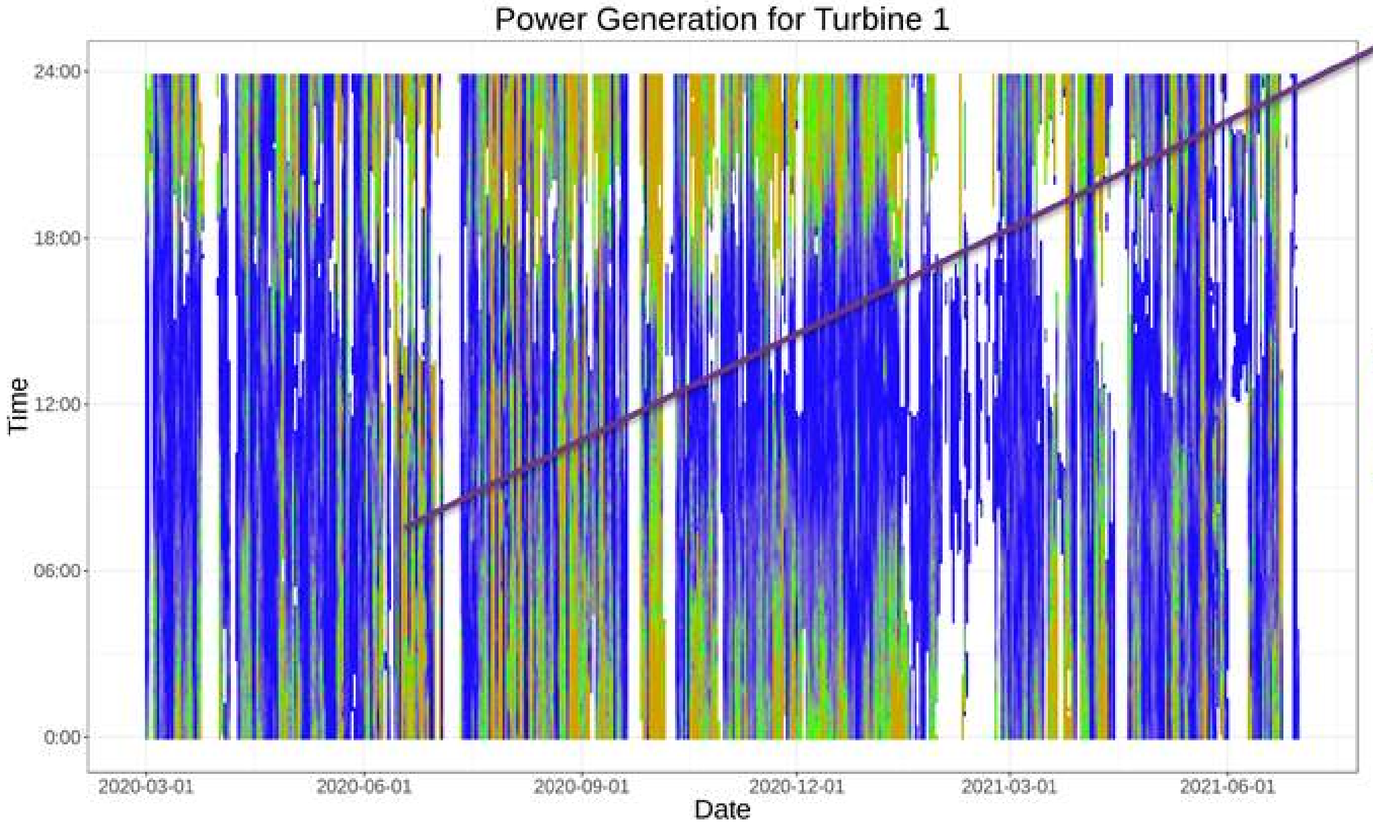
- What is the power output for each turbine considering wake interactions?
- Which turbine has the largest contribution?

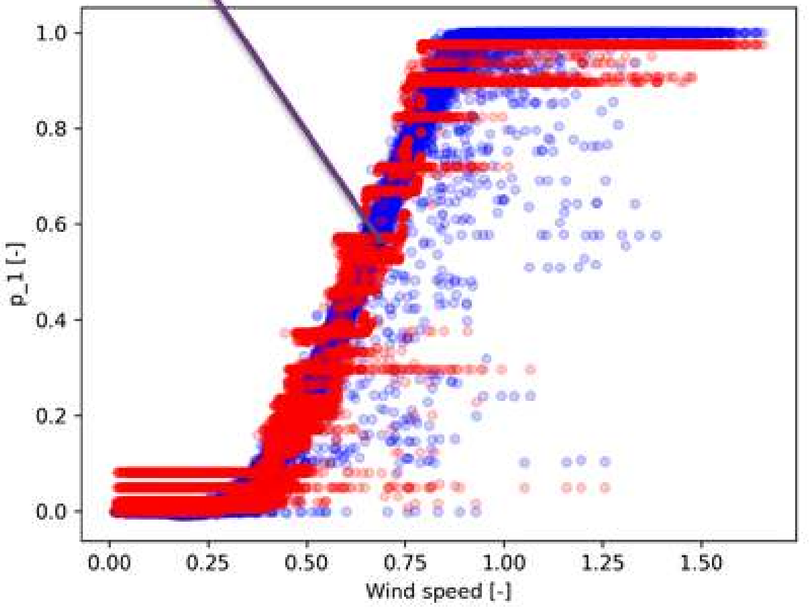


OST

# Visualization

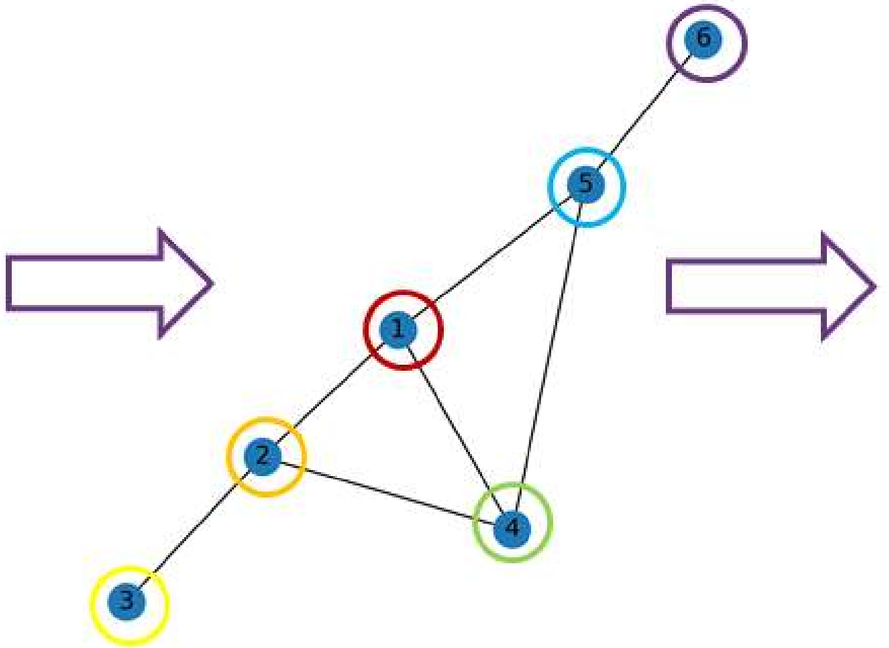
$$P = \sum_{i=1}^{6} p_i$$



# The Idea






$$G = \begin{pmatrix} 1 & 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 1 & 1 \end{pmatrix}$$

$$min\,||P - \langle 1\,|G|\,p\rangle||_2^2 \qquad \forall t \in T$$

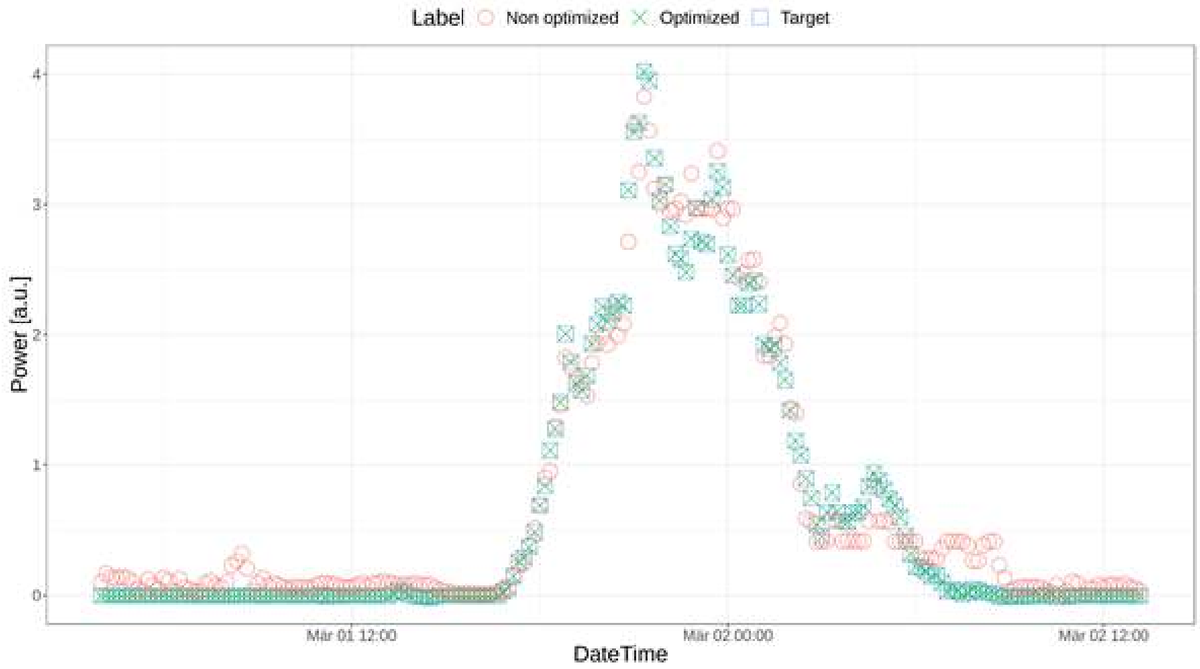


OST

# Results

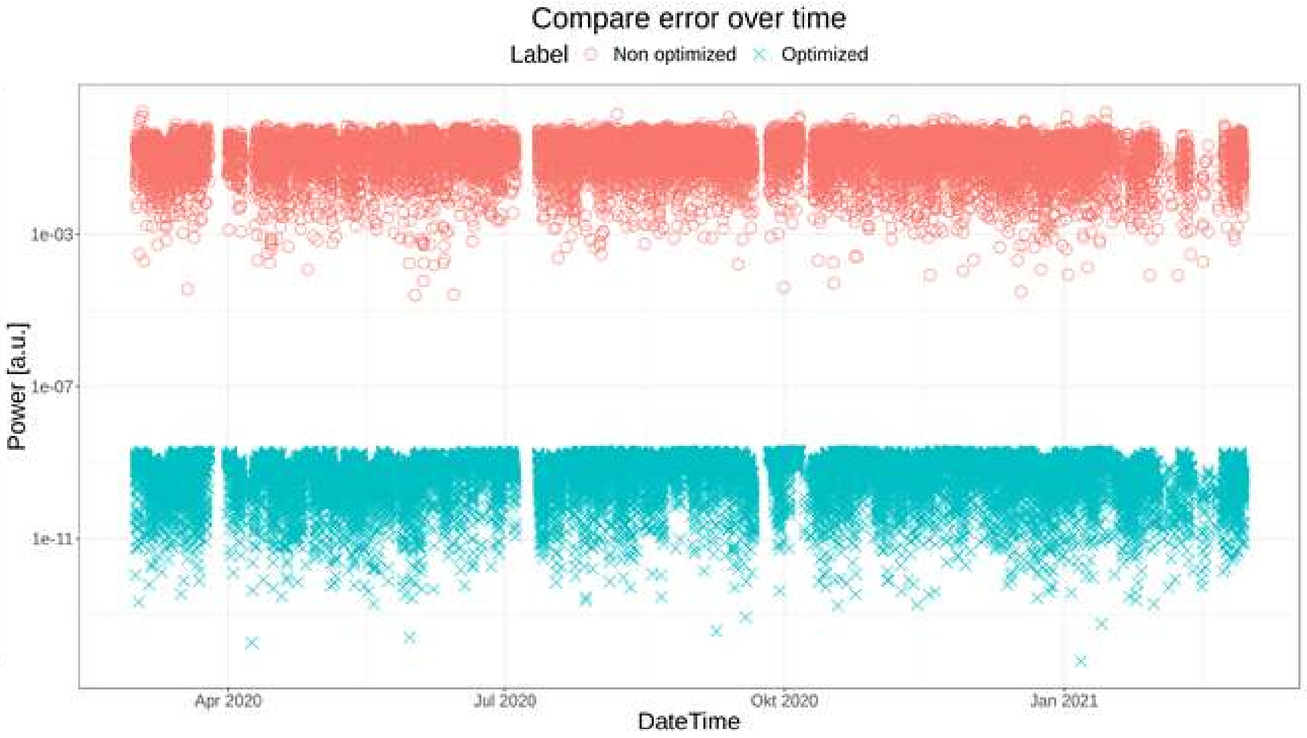
## Prediction

non-optimised vs optimised




## Errors

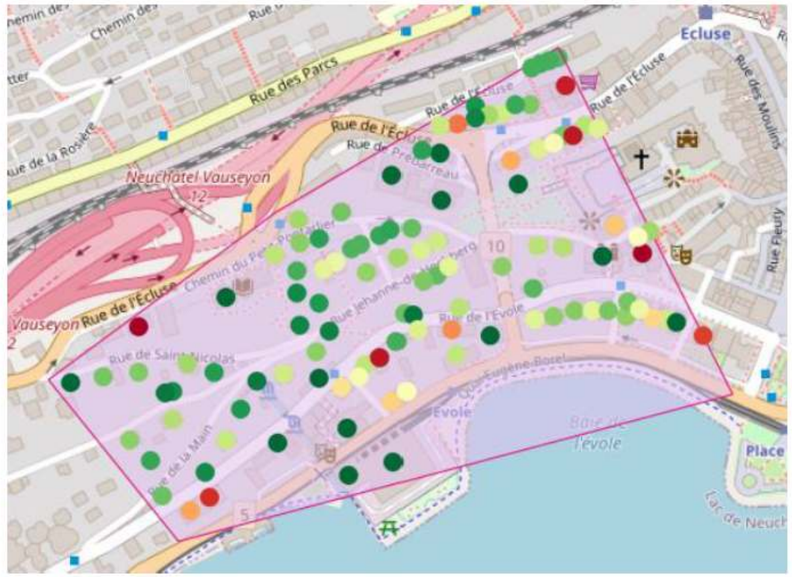
non-optimised vs optimised



# Group #10: Interface for district heating system planning

ENERGY DATA HACKDAYS

r 2022 in Brugg, Switzerland




How could we visualise, select, and explore these buildings and their energy needs?

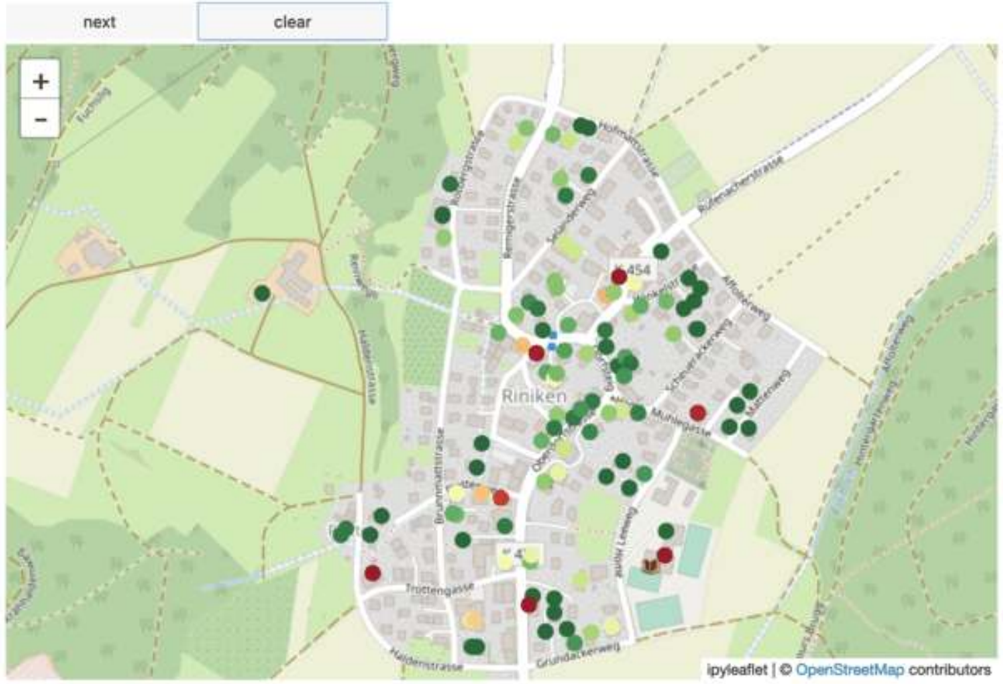
Group members:
Jonathan Chambers Vildana Smajic Deniz Tepe Samuel Gilliéron Philipp Schütz Lucien Porta

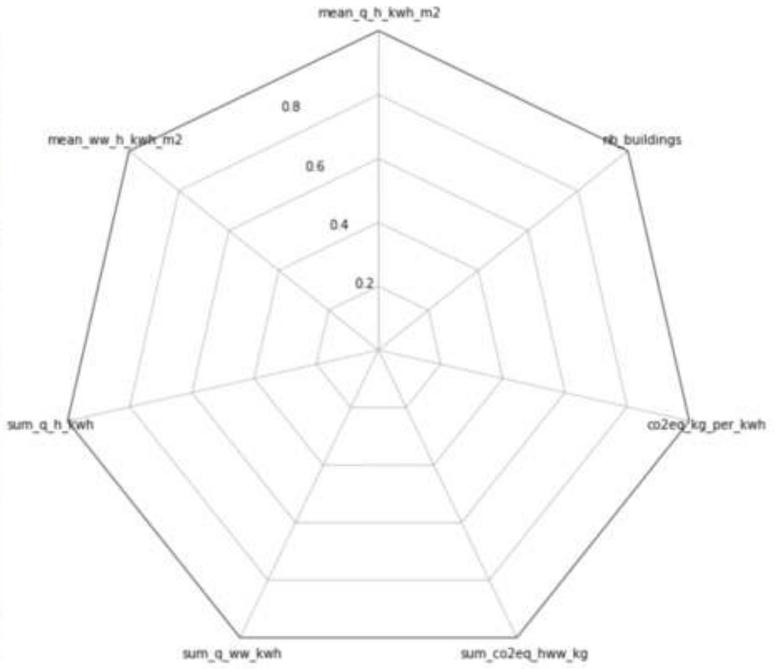
# New interface: Smart building selection

Tessa

ENERGY DATA HACKDAYS

16-17th of September 2022 in Brugg, Switzerland




Filters

- Only modern buildings
- Buildings with high demand
- Buildings with low efficiency
- …

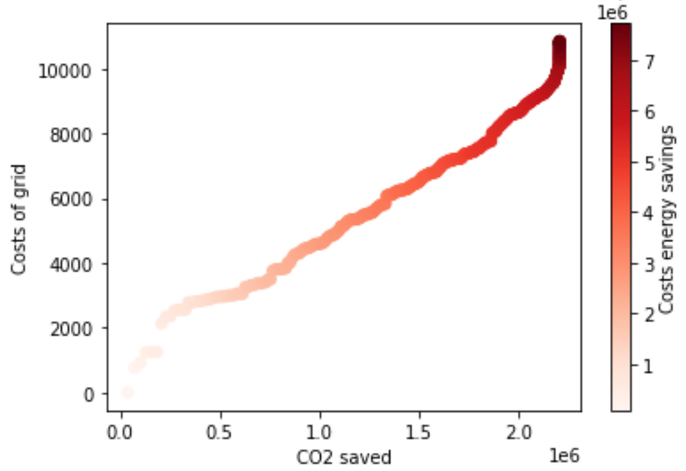
# In-depth analysis

Tessa

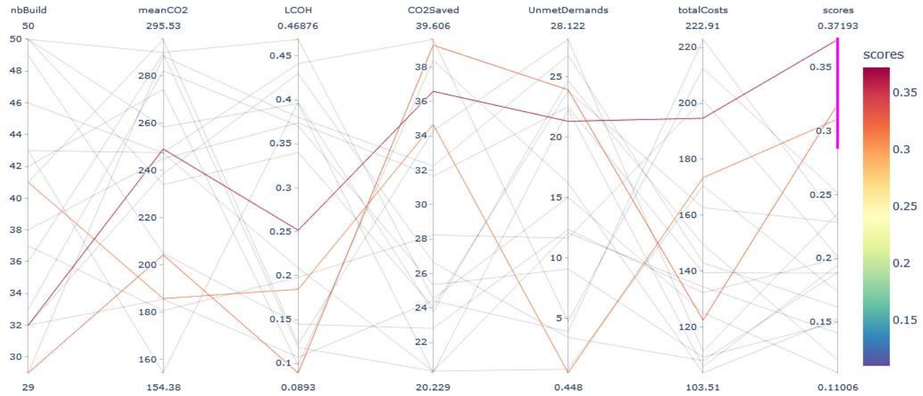
ENERGY DATA HACKDAYS

16-17th of September 2022 in Brugg, Switzerland

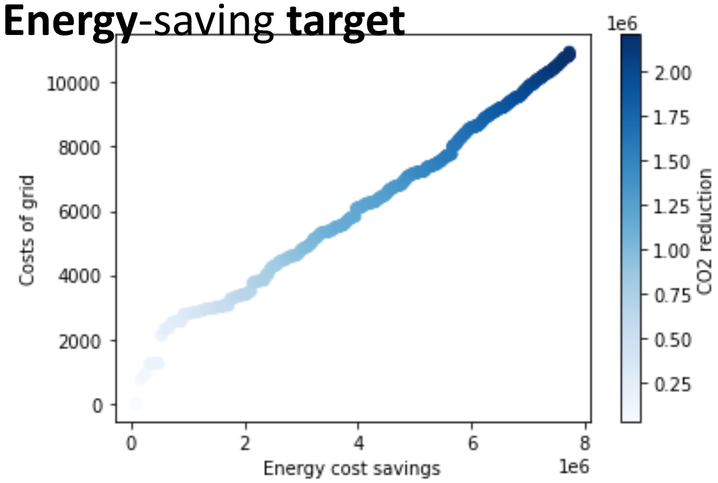
## Which investment for **CO2**-saving **target**



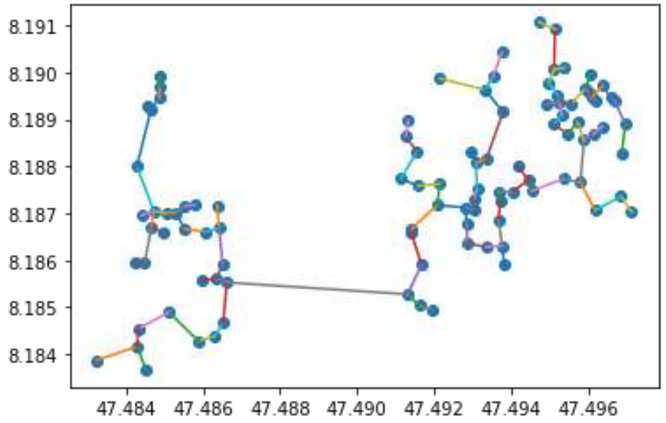

## Score-based weighting of solutions




## Which investment for **Energy**-saving **target**




## Minimum grid installation estimation



12

Mapping of Swiss PV power production in real time


Robin Bühler
Nicolas Vetsch
Mathis Dedial
Ivan Olexyn
João Eccel
Till Richter
Simon Neidhart
Marc Hauser
Ueli Schilt
Matthias Meier





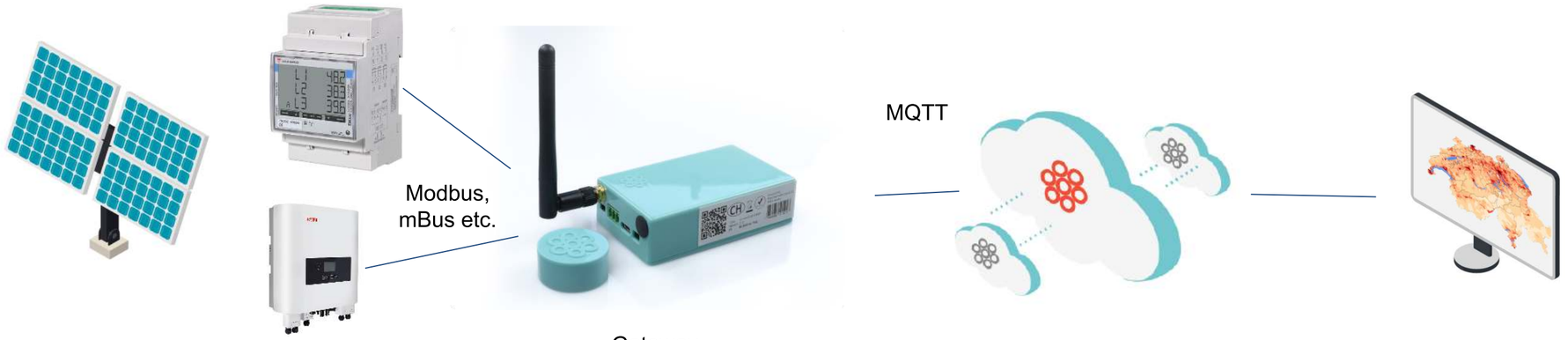


ENERGY DATA HACKDAYS

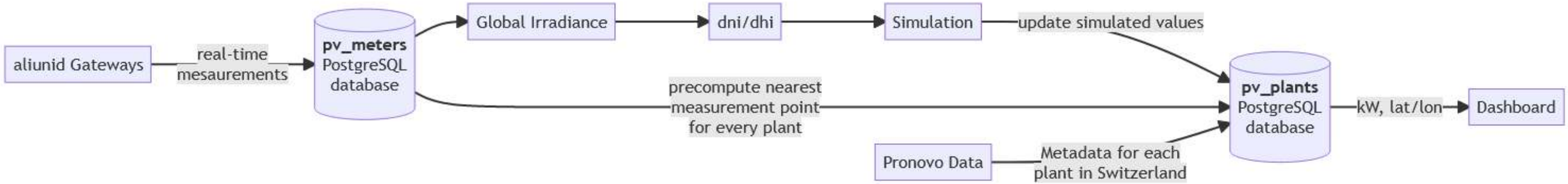
aliunid

## Challenge

Based on real-time data from aliunid and public datasets, simulate and map the total PV power produced in Switzerland in real-time

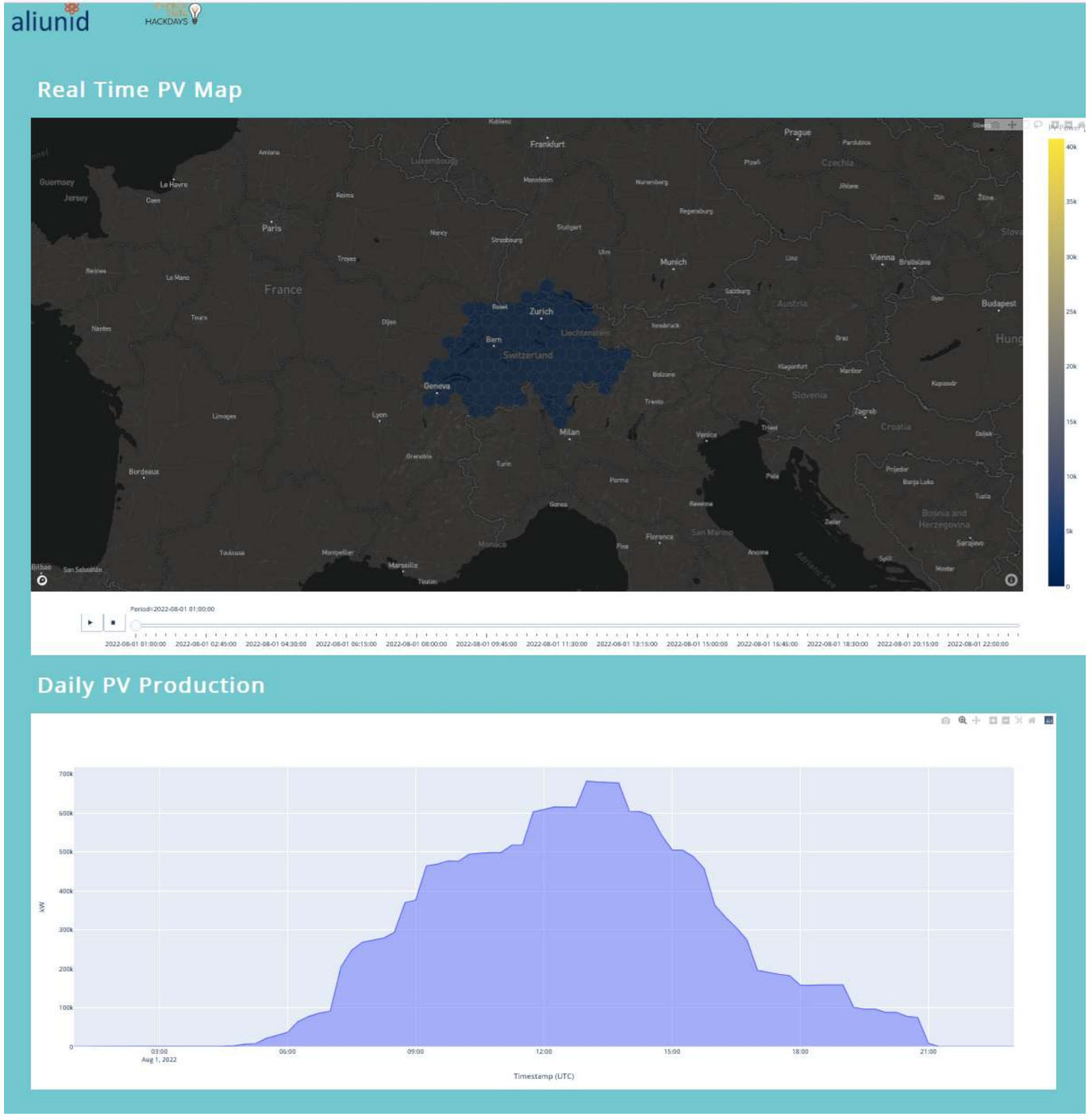



## Technical approach (Execution)



**Link to video:**

https://vimeo.com/751093978




ENERGY DATA HACKDAYS

aliunid

ENERGY DATA HACKDAYS

aliunid

# Challenges

- Connecting the different steps with data interfaces
- Limitations in computing time for the PV simulation and server performance for our large datasets

# Learnings

- Always have a plan B
- Have good communications between the different subtasks of the project

# Outlook

- Add EV charging stations to the map
- Put the dashboard online with real-time data

15

Regional Energy Information in High Resolution

GeoImpact

Jan-Philipp Sasse
Manuel Meyer
Baptiste Jordan
Thilo Weber
Alexander Thommen
Matthias Pauli
Peter Janes
Lukas Oberholzer
Emilie Boillat
giuseppe caponetto
Lucas Tochtermann
Peter Robineau



# 15 Regional Energy Information in High Resolution



Shutterstock _732678970

# Policy context and challenge

- Energy policy goals are known on national level
- Less clear energy goals on municipality level
- Which municipalities have set energy policy goals?
- What are activities in municipalities to reach goals?

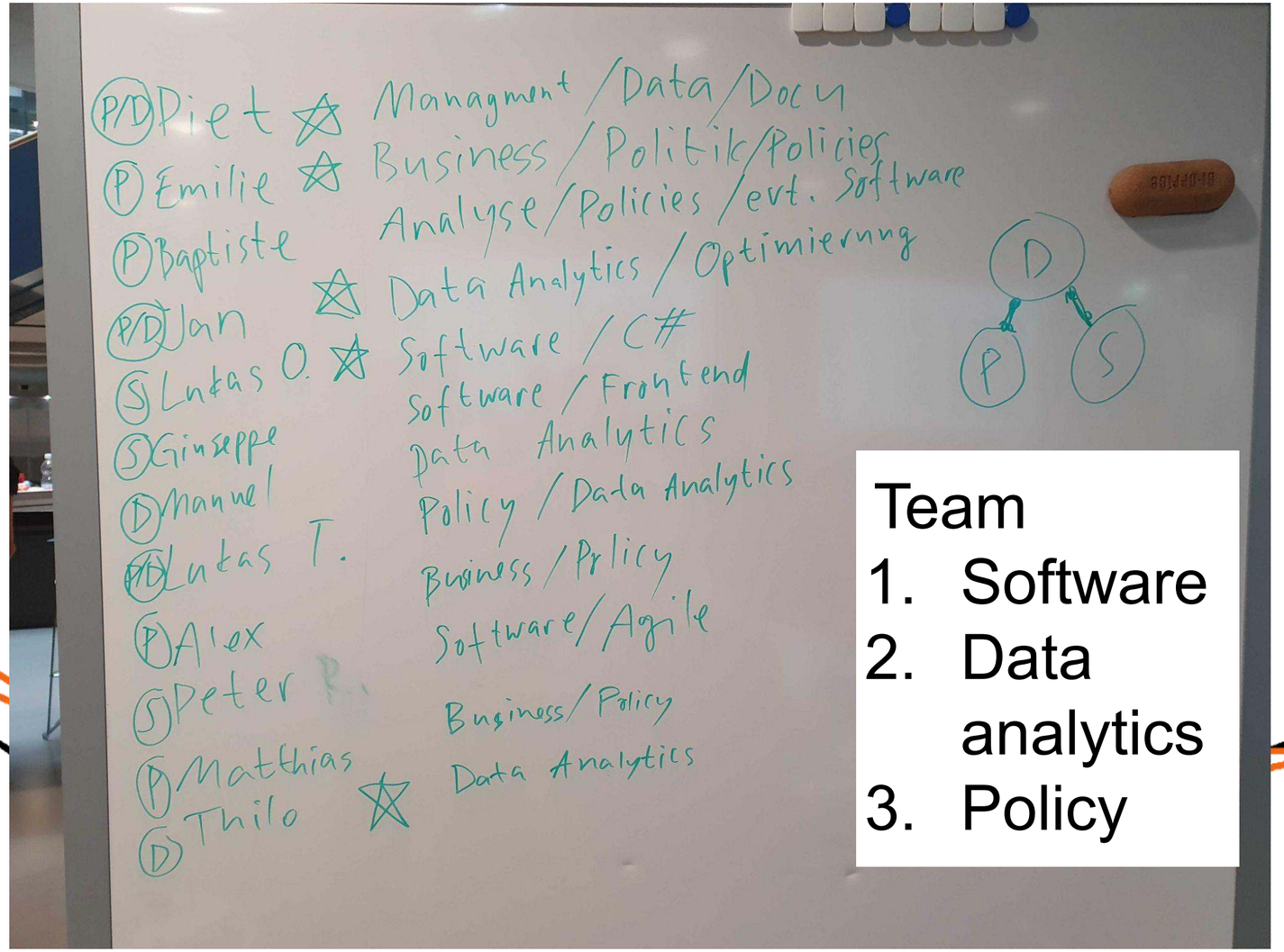


ENERGY DATA HACKDAYS



ENERGY DATA HACKDAYS

# Team




Team

1. Software
2. Data analytics
3. Policy



energieschweiz

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

geoimpact

Bundesamt für Energie BFE
Office fédéral de l'énergie OFEN

ENERGY DATA HACKDAYS

# Approach

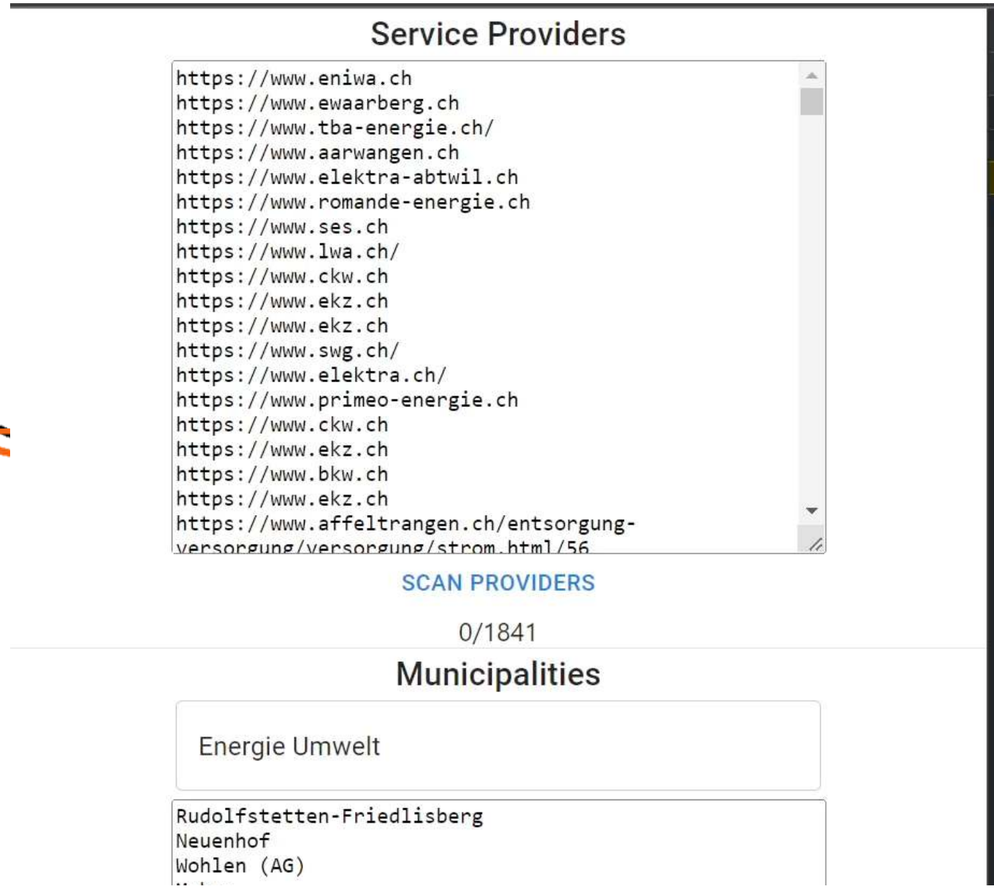
geoimpact

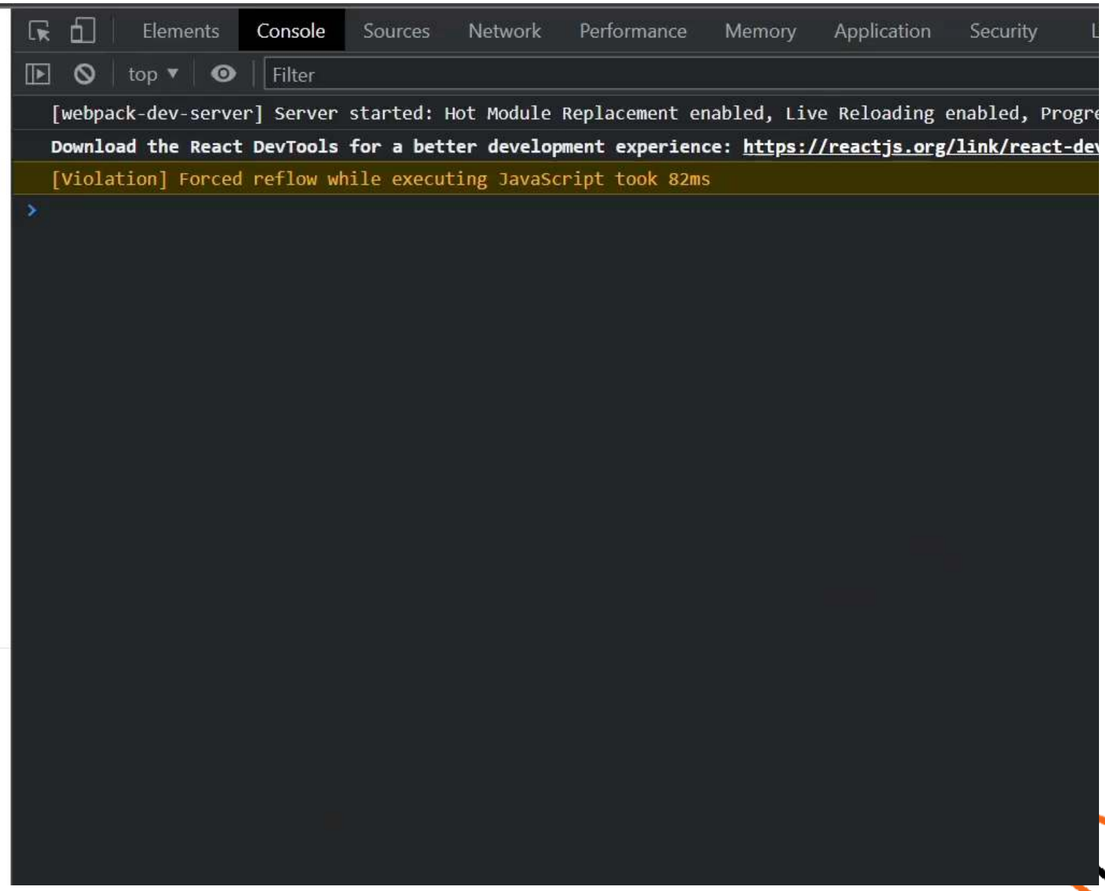
energieschweiz

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Bundesamt für Energie BFE
Office fédéral de l'énergie OFEN

Energy goals, categories → Scraping → Keywords, Sentiment → Validation



# Scraping, keywords, sentiment analysis

Detected keywords  Negative sentiment

| gemeinde | kategorie | keyword count | positive | neutral | negative | keyword score (-1,1,2) | detected sentences |
|---|---|---|---|---|---|---|---|
| Aadorf | Technologie | 6 | 0 | 5 | 1 | 4 | '[ Finanzielle Unterstützung für Massnahmen zur rationellen und sparsamen Verwendung von elektrischem Strom.‘, ' Bau von Anlagen zur Produktion von erneuerbaren Energien mit Finanzierung durch einen Stromzuschlag.‘, ' Persönlicher Stromrechner im Internet.‘, ' Zwei grosse private Fernwärmenetze mit Holzschnitzelheizungen.', , An Hand eines Massnahmenkatalogs wird die Situation in sechs wichtigen Gebieten untersucht: Bau und Planung, Energieversorgung, Wasser / Abwasser / Abwärme, Verkehr und Transport, Öffentlichkeitsarbeit, Interne Organisation.‘, ' Insbesondere bei der Fassade stellt sich oft die Frage, ob die bestehende Putzschicht bereits ersetzt werden muss\xa0 und eine neue Aussenwärmedämmung rentabel ist.'] |
| Aadorf | Energieplanung / Plan climat | 10 | 0 | 10 | 0 | 10 | ['\xa0 Arbeitsgruppe Energiestadt Die Arbeitsgruppe Energiestadt ist verantwortlich für die Begleitung und den Erhalt des Labels Energiestadt sowie für die Umsetzung des Energierichtplans.', 'ch Leistungen der Energiestadt Aadorf Die folgenden Punkte zeichnen die Energiestadt Aadorf aus: Kostenlose Energieberatung für alle EinwohnerInnen.', ' Finanzielle Unterstützung für Massnahmen zur rationellen und sparsamen Verwendung von elektrischem Strom.', ' Arbeitsgruppe Energiestadt mit dem Auftrag die Vorgaben aus dem Energierichtplan umzusetzen.', ' Was ist Energiestadt Gemeinden jeder Grösse können das Label Energiestadt erhalten, wenn sie ausgesuchte, energiepolitische Massnahmen realisiert oder beschlossen haben.‘, …] |
| Aadorf | Förderbeiträge/Subventions | 0 | 0 | 0 | 0 | 0 | [] |
| Aadorf | Energieberatung | 1 | 0 | 1 | 0 | 1 | ['ch Leistungen der Energiestadt Aadorf Die folgenden Punkte zeichnen die Energiestadt Aadorf aus: Kostenlose Energieberatung für alle EinwohnerInnen.'] |
| Aadorf | Labels | 7 | 0 | 7 | 0 | 7 | ['\xa0 Arbeitsgruppe Energiestadt Die Arbeitsgruppe Energiestadt ist verantwortlich für die Begleitung und den Erhalt des Labels Energiestadt sowie für die Umsetzung des Energierichtplans.', ' Aadorf Roland Büchi, Häuslenen Kurt Gnehm, Solargenossenschaft Nino Heider, Aadorf Andreas Müller, Amt für Bau und Umwelt\xa0 Markus Roos, Häuslenen Patrik Stacher, Aadorf Beratend: Sebastian Frenzel, Energiestadtberater Protokoll: Natalie Aeby, Amt für Bau und Umwelt Kontakt: Natalie Aeby, Gemeindeverwaltung Aadorf, Tel.', 'ch Leistungen der Energiestadt Aadorf Die folgenden Punkte zeichnen die Energiestadt Aadorf aus: Kostenlose Energieberatung für alle EinwohnerInnen.', ' Arbeitsgruppe Energiestadt mit dem Auftrag die Vorgaben aus dem Energierichtplan umzusetzen.‘, …] |
| … | … | … | … | … | … | … | … |

# Result and validation (Aadorf)

## Result

Thermal network

High renewable capacity

Energy city

… Fernwärmenetze mit Holzschnitzelheizungen

Bau von Anlagen zur Produktion von erneuerbaren Energien mit Finanzierung durch einen Stromzuschlag.

Die folgenden Punkte zeichnen die Energiestadt Aadorf aus …

## Validation

Thermal network

High renewable capacity

Energy city




https://map.geo.admin.ch/?bgLayer=ch.swisstopo.pixelkarte-farbe&lang=en&topic=ech&layers=ch.bfe.energiestaedte,KML%7C%7Chttps:%2F%2Fgeodesy.geo.admin.ch%2Freframe%2Fdownload%2FKarte_Wind_Solar_Dichte_kW_pro_Kopf_13176942437043182000.kml,ch.bfe.energiestaedte-2000watt-areale,ch.bfe.thermische-netze&E=2711304.03&N=1261899.01&zoom=5.751190104551835&layers_opacity=0.6,1,1,1

16

SolarDAO - The Digital Energy Cooperative

e-swissolar

Vasileios Panagiotidis
Jonathan Lehner
Aurelien Pelissier
Mou Lin
Chang Li



# SolarDAO – The Digital Energy Cooperative

**Current challenges:**

1

Difficult access to funding for Photo-Voltaic (PV) projects with **large investment**

2

Relying on **active participation** of citizens and involvement of stakeholders

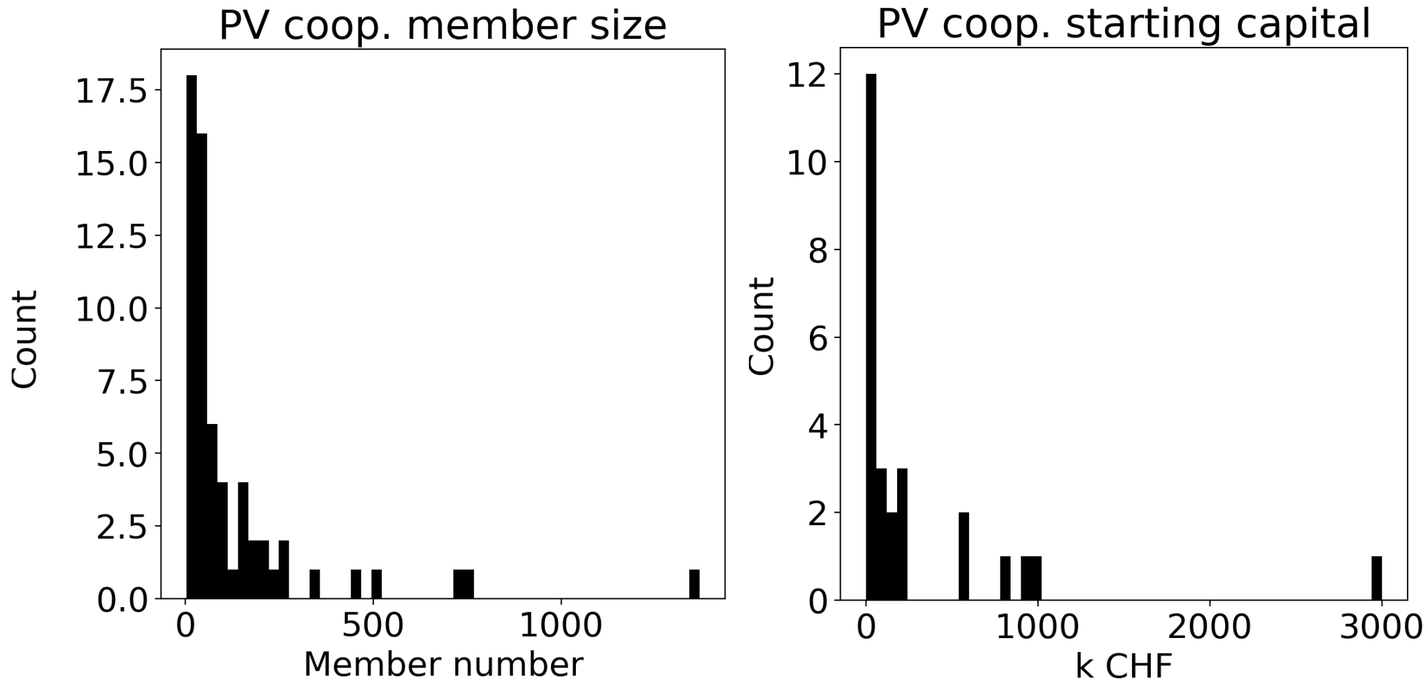
3

Problem with **member organization** and **transparency**

# SolarDAO – The Digital Energy Cooperative

**Swiss PV coop. landscape**

- Survey of 67 PV coop. across Switzerland.
- Small organisation (< 200 members).
- Small starting capital (< 200k chf).



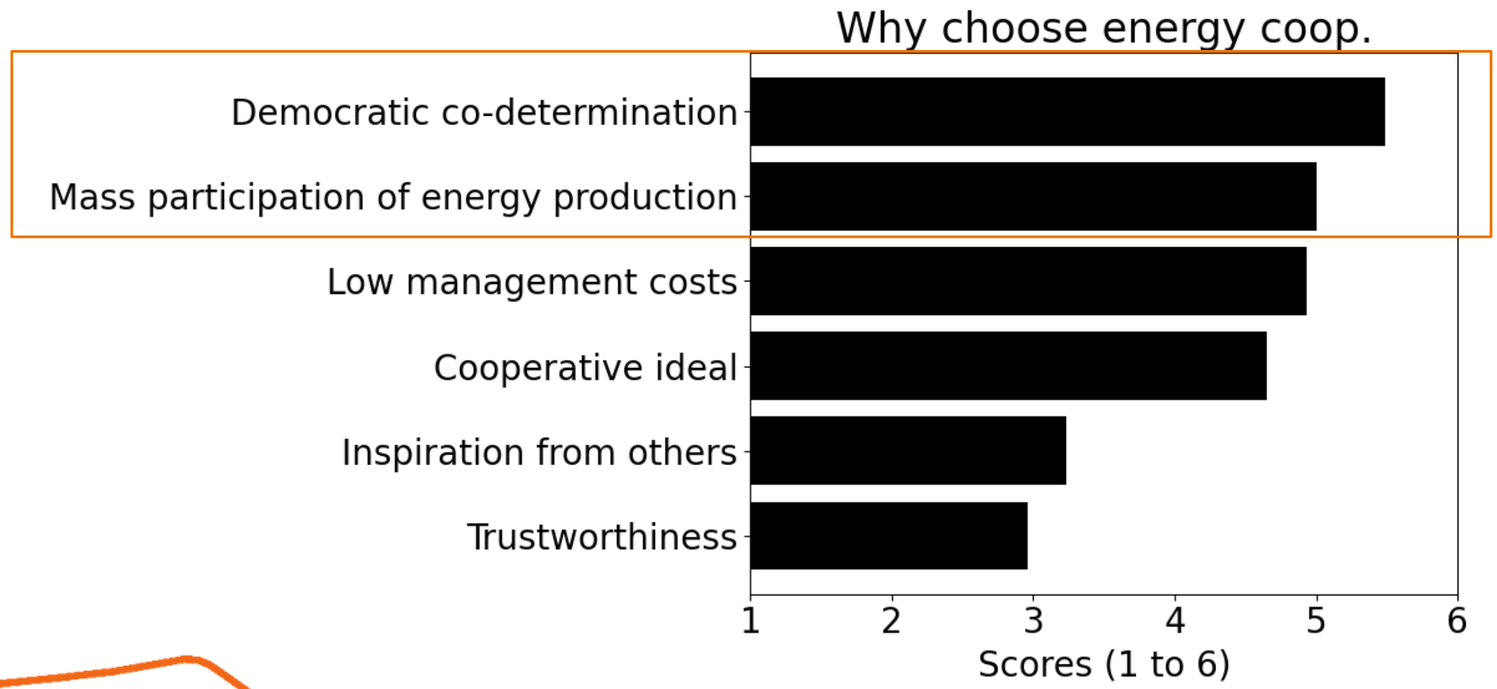



* Schmid, B. (2019). *Energy Cooperatives in Switzerland: a Study of Energy Cooperatives and Their Interrelations with Local Governments in the Swiss Federalist System* (Doctoral dissertation, Philosophisch-naturwissenschaftliche Fakultät der Universität Bern).

# SolarDAO – The Digital Energy Cooperative

## Swiss PV coop. landscape

- Survey of 67 PV coop. across Switzerland.
- Small organisation (< 200 members).
- Small starting capital (< 200k chf).
- Strong desire of democratic co-determination and mass participation.



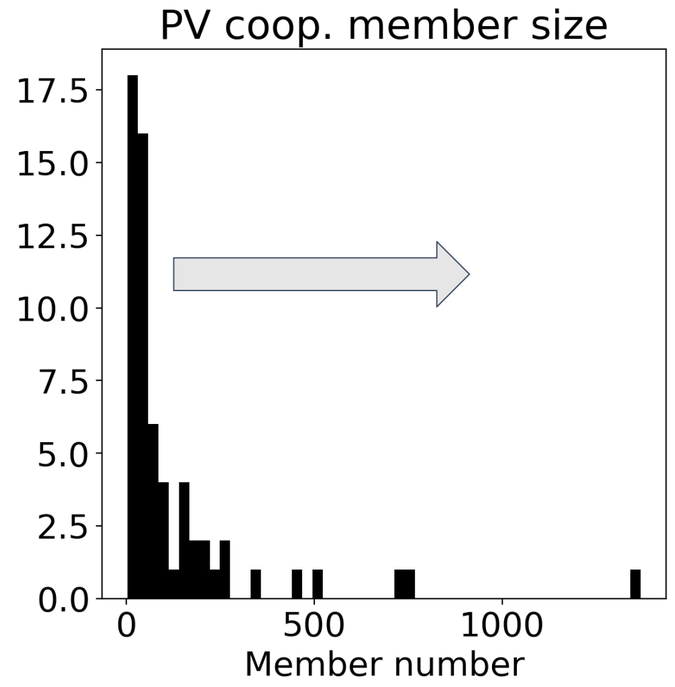


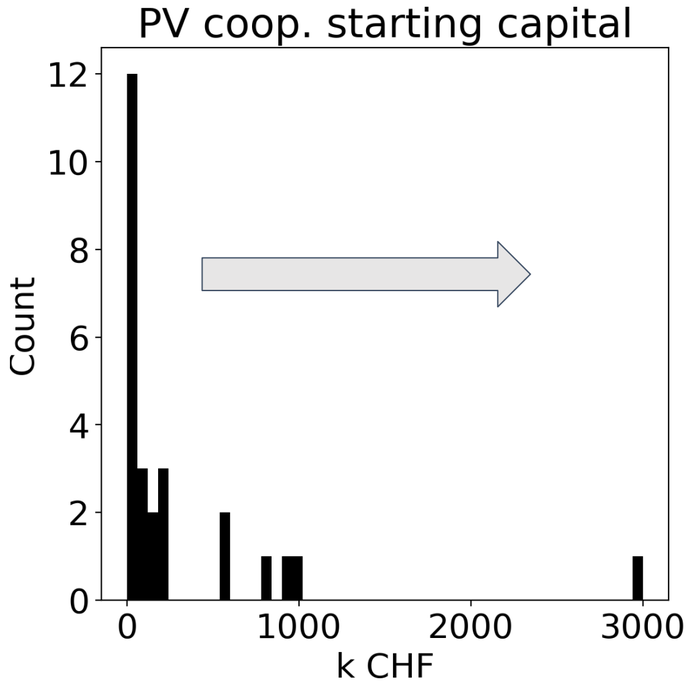

* Schmid, B. (2019). *Energy Cooperatives in Switzerland: a Study of Energy Cooperatives and Their Interrelations with Local Governments in the Swiss Federalist System* (Doctoral dissertation, Philosophisch-naturwissenschaftliche Fakultät der Universität Bern).

# SolarDAO – The Digital Energy Cooperative

## Swiss PV coop. landscape

- The Decentralized Autonomous Organization (DAO) would help energy cooperatives to become bigger, more powerful and more organized

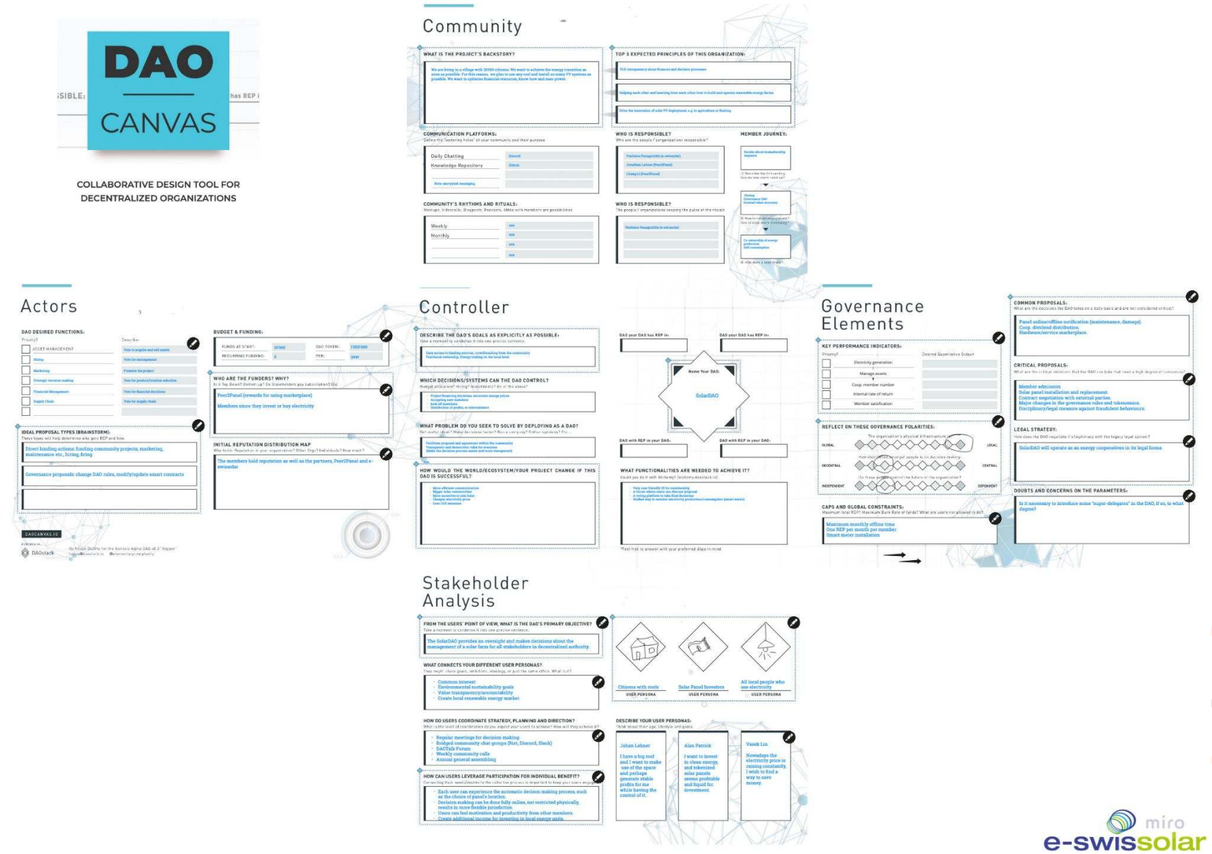




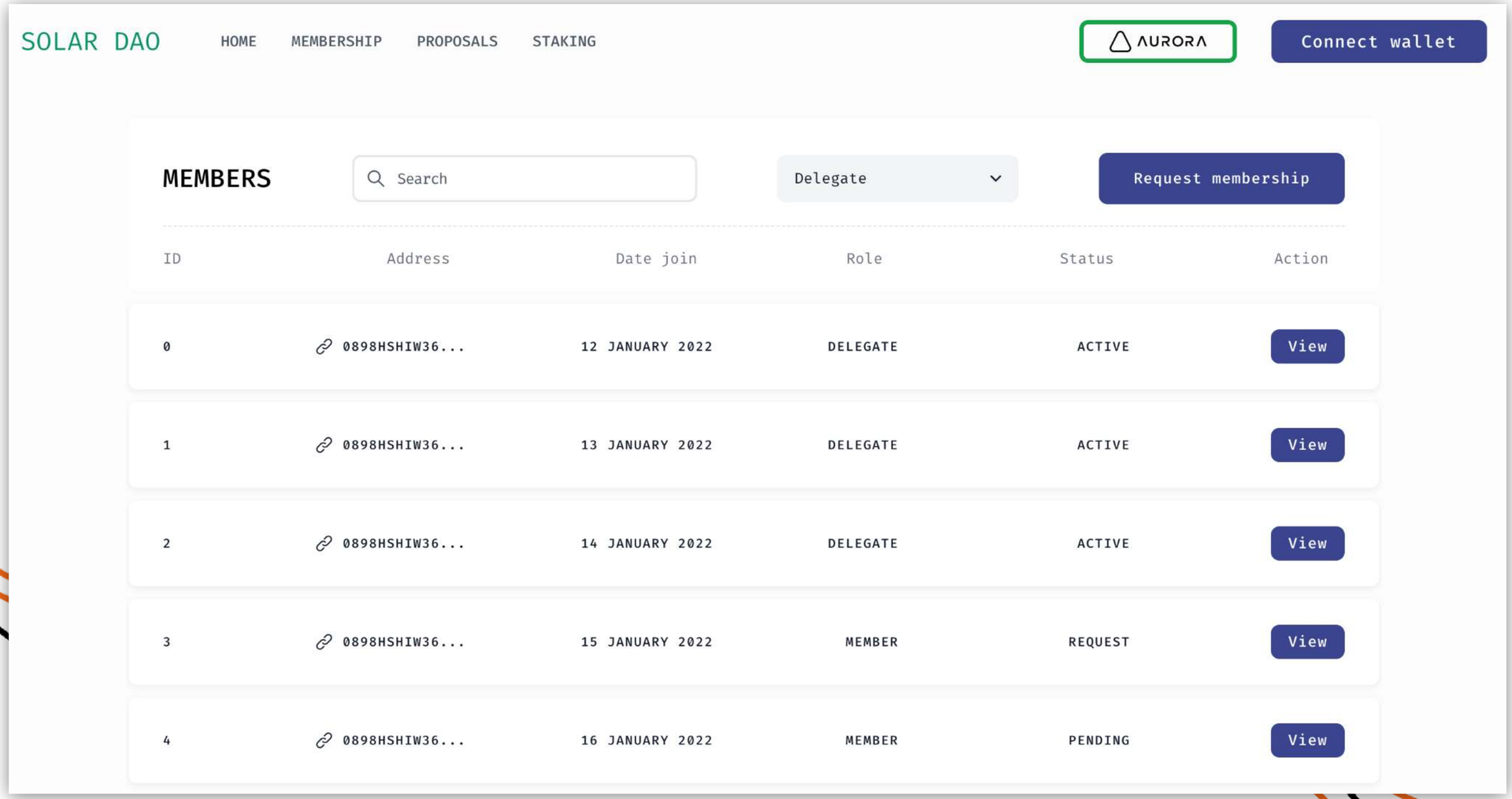

* Schmid, B. (2019). *Energy Cooperatives in Switzerland: a Study of Energy Cooperatives and Their Interrelations with Local Governments in the Swiss Federalist System* (Doctoral dissertation, Philosophisch-naturwissenschaftliche Fakultät der Universität Bern).

# Main takeaway from the DAO canvas




- Structural way to prototype the DAO
  - Community
  - Governance
  - Stakeholder
- Benefits of the DAO-based coop.

# SolarDAO Demo – Membership



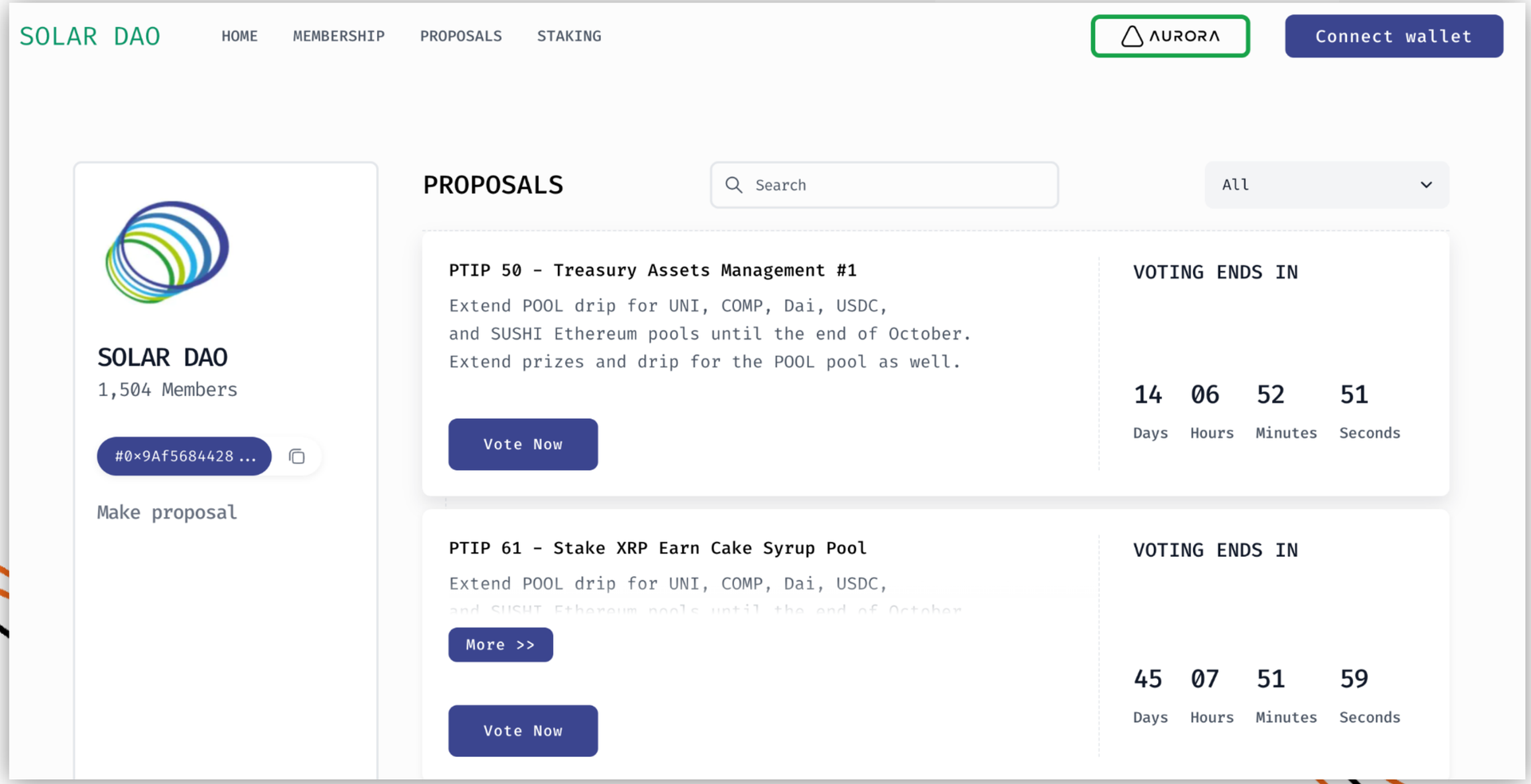



Solution:

Create tools for financing and governance

=> Give access to more fundings.

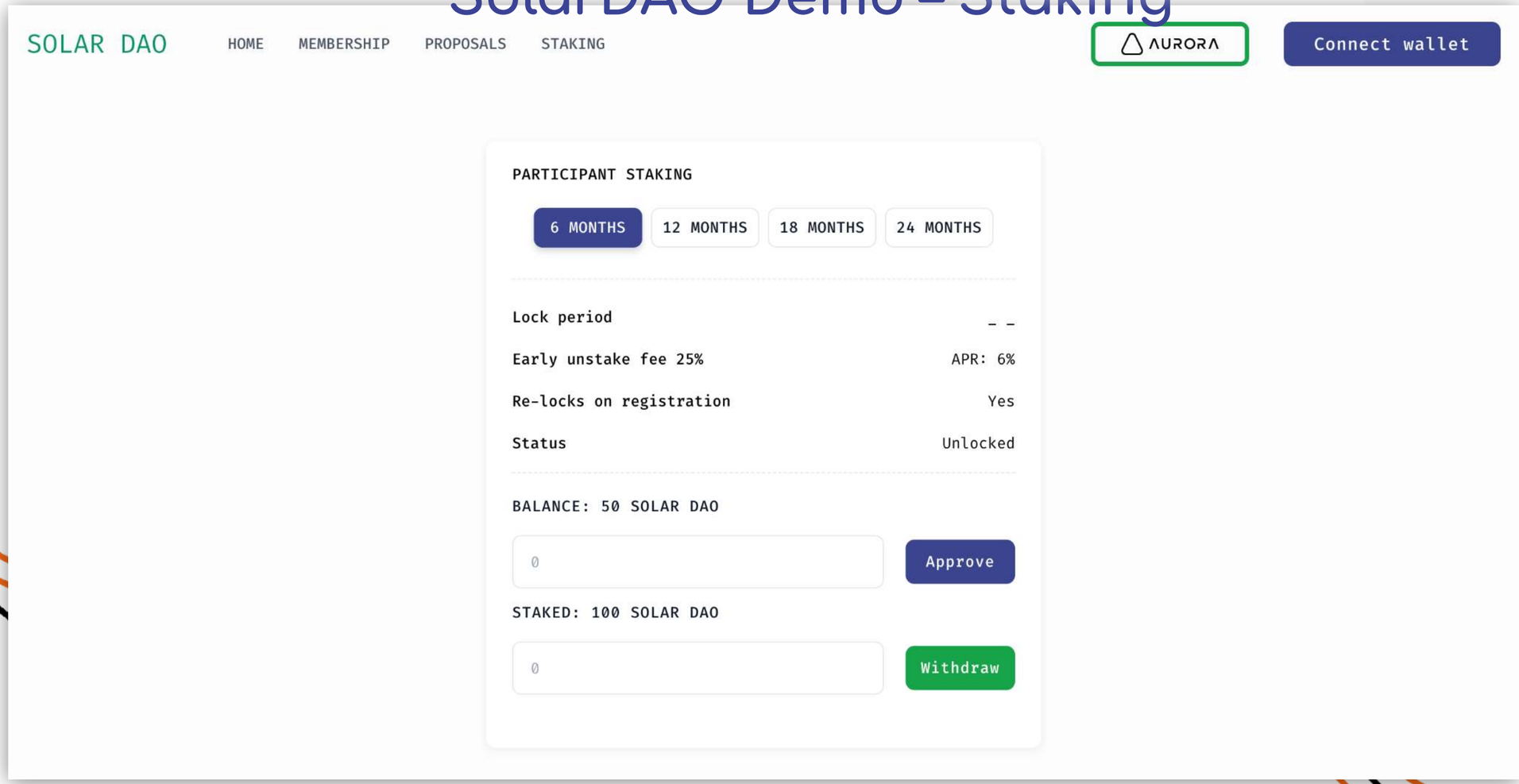
# SolarDAO Demo – Proposals






Solution:
Create tools for financing and governance
=> Give access to more fundings.

# SolarDAO Demo – Staking



# SolarDAO – Team



**Vasileios Panagiotidis**

Dipl. Ing.(FH),

MBA – Founder of e-swissolar AG
Co-Founder e-greeksolar Ltd.



**Jonathan Lehner**

PhD fellow from ETH Zurich.

Computer scientist.



**Aurelien Pelissier**

PhD fellow from ETH Zurich.

Web3 Blockchain developer.



**Mou Lin**

PhD student from EPFL in renewable energy.



**Chang Li**

Master student from Uni Mannheim, specializing in IT security and Finance.

17

Smart-Meter CII Interoperability with Smart-Home Systems

Gantrisch Energie

Hermann Hüni, Remo Inderbitzin, David Föllmi, Paul Graf, Urs Abplanalp, Simon Furrer, Philippe Ayer, Thomas Strösslin, Christoph Broennimann, Derrick Oswald, Peter Kreutzer



# Smart-Meter CII Interoperability with Smart-Home Systems

## Enable your Smart-Home-System to know your energy data

### Intro

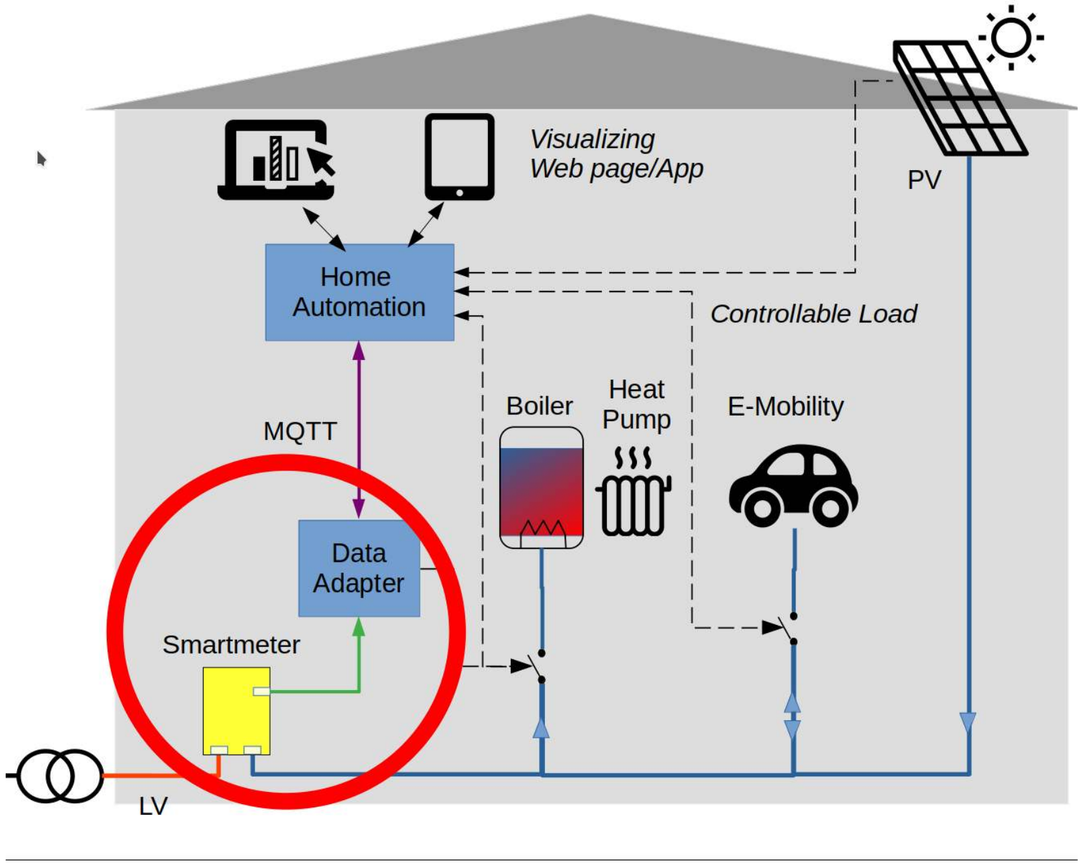
- All Smart Meters (SM) are required to offer a **local interface** (CII).
- Various types of SM use different CII types to push different data sets.

### Motivation

- Allow customers to know their power consumption in real time
- Reuse original SM data instead of private energy counters
- Customers, innovations and other systems need **interoperability** !

### Requirements

- Works with > 90% of Swiss private customers
- Hardware cost for Smartmeter Interface < CHF 50.-
- Plug and Play
- User-Friendly interface
- Integrates with all major Home automation through open standards



# Smart-Meter CII Interoperability with Smart-Home Systems

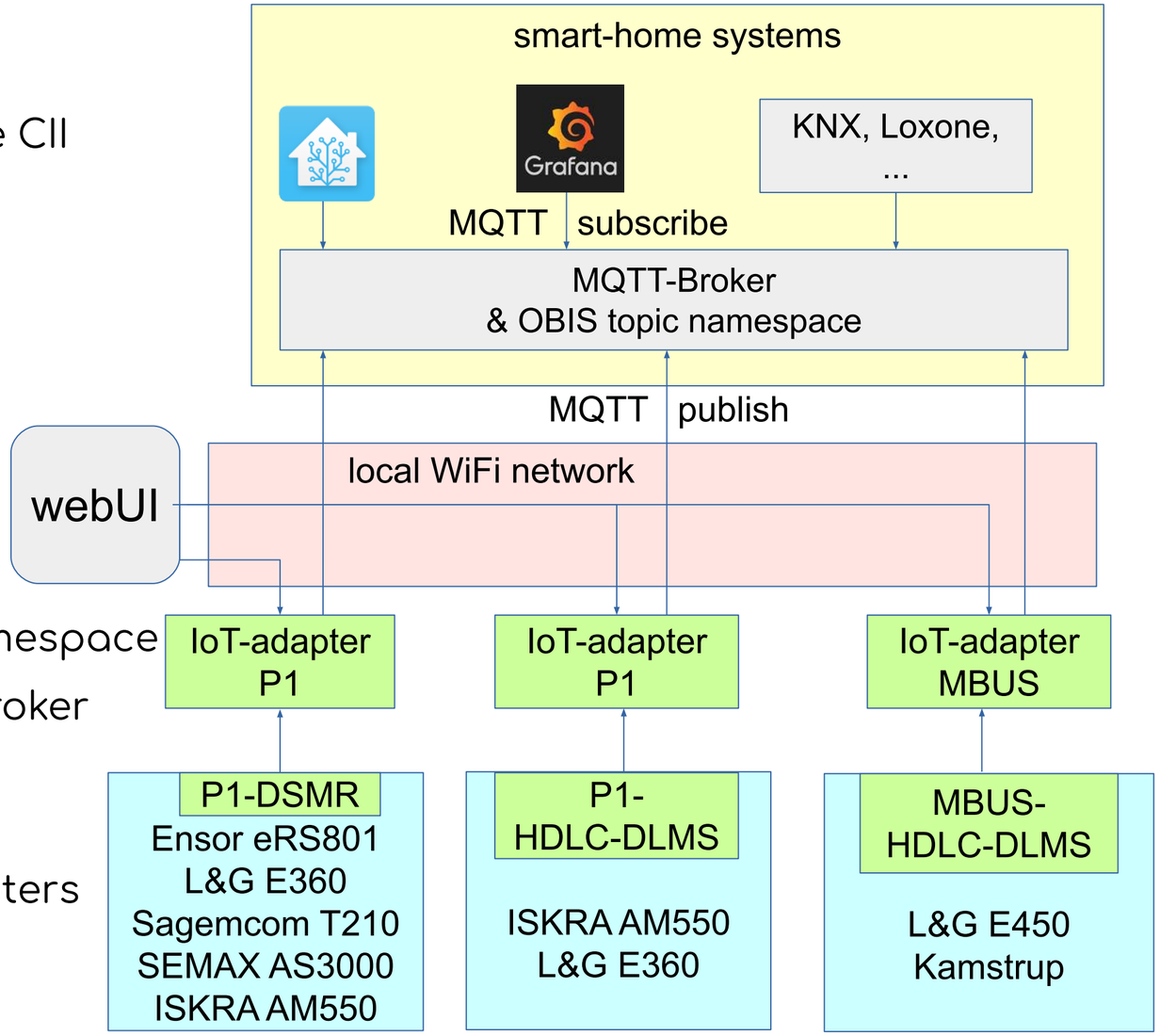
## Enable your Smart-Home-System to know your energy data

- Data
- Up to **86 MB/day** energy-data may be pushed over the CII
- 3-phase instantaneous power, voltage, current, energy-counters, etc.
- The customer legally owns this data
- Data protection is important (DSG)



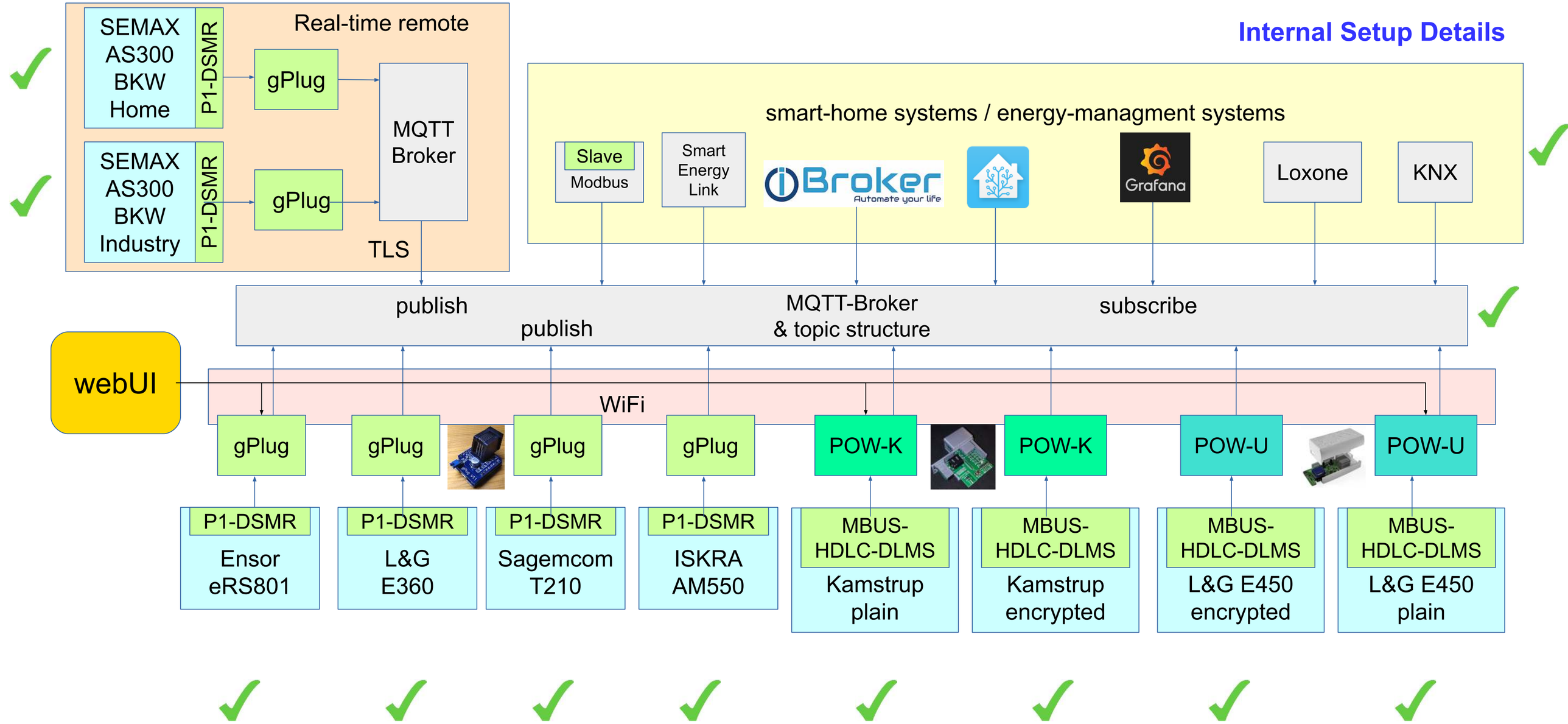
- Tasks

1. Install 10+ SM together with specific IoT-adapters
2. Setup network, MQTT-broker and define topic namespace
3. Install & connect smart-home systems to MQTT-broker (Home-Assistant, ioBroker, Loxone, KNX, SEL, etc.)
4. Transform data into interoperable format
5. DSG compliant visualization for webUI of IoT-adapters
6. Integrate ENTSO-E hourly price forecasts
7. Document the SM-CII and the working solutions

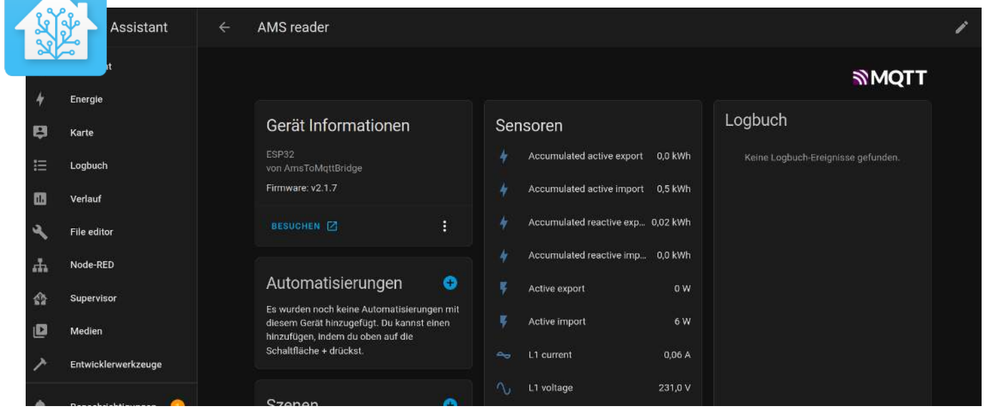


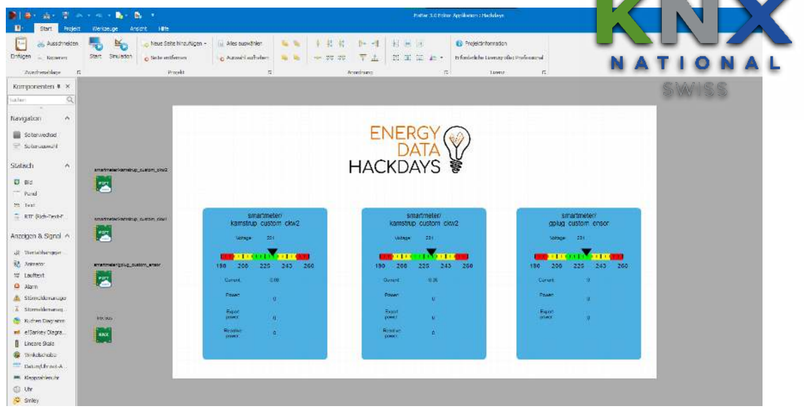
# Smart-Meter CII Interoperability with Smart-Home Systems

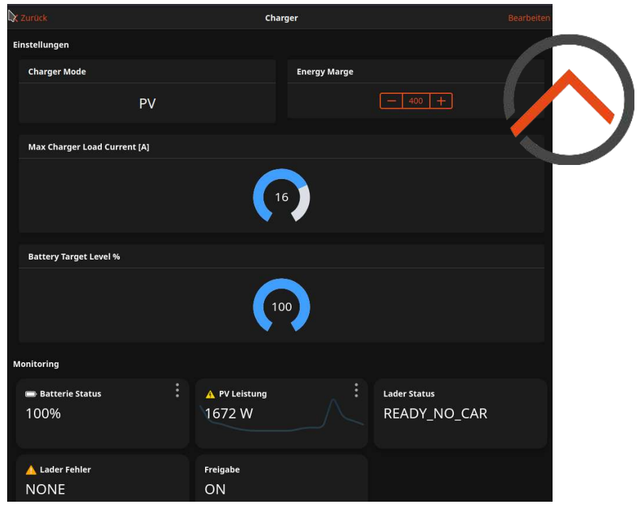
## Enable your Smart-Home-System to know your energy data



# Data driven Application



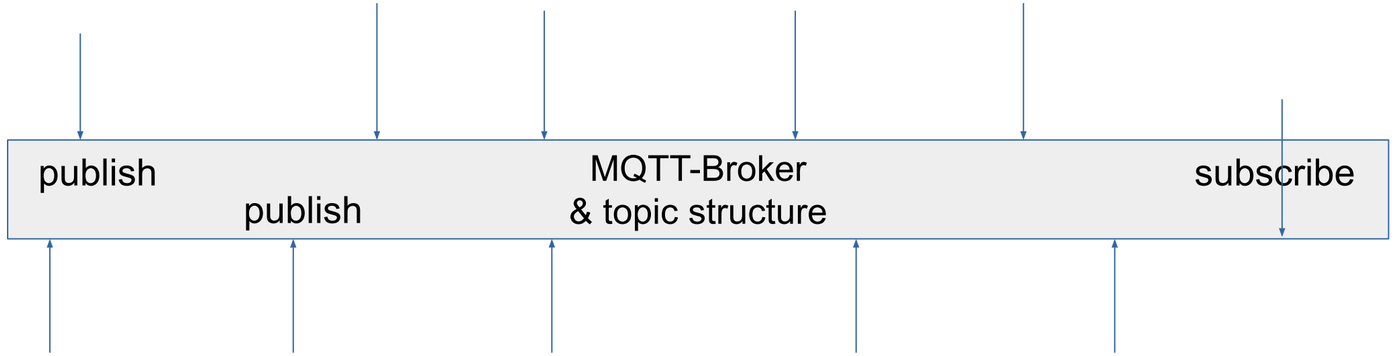



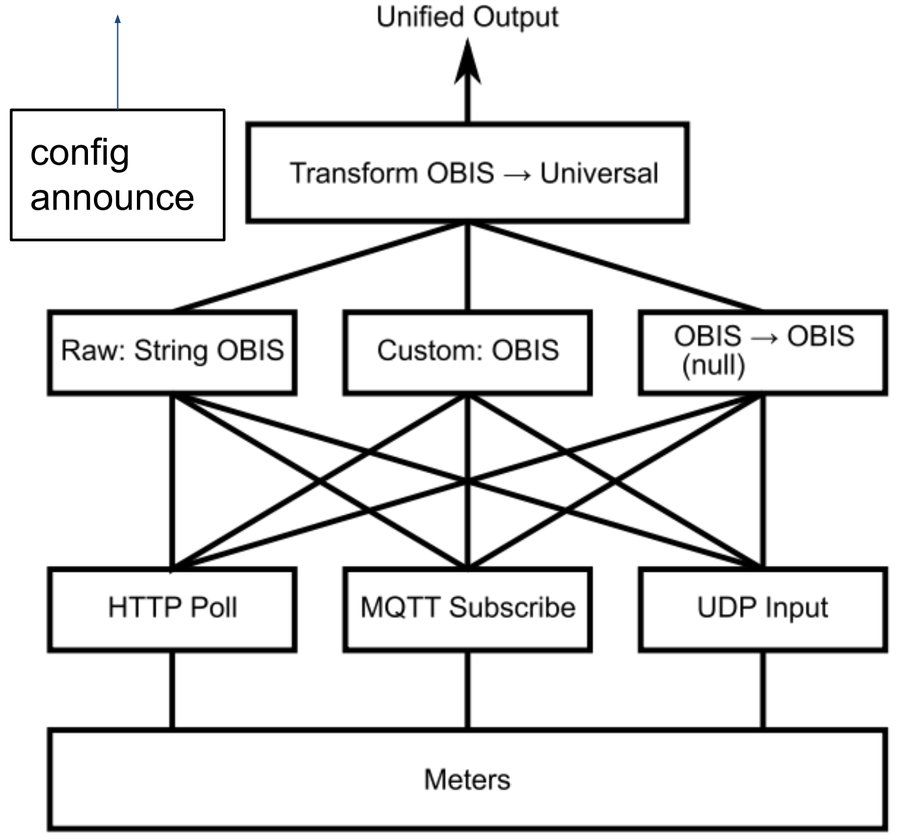




Data enable multiple applications:

- visualization of data to improve understanding of energy consumption
- actively control loads in the consumption based on the state of grid connection , e.g. EV charge control on PV exceed
- building automation integration to optimize energy in larger building complex

# Easy of integration - new middle layer
# Allow to announce configuration description
# to automate the integration of different meter types





```
# Input(s) of gPlug
{"Time":"2022-09-17T14:21:01","z":{"1-0:32.7.0":231.3}}
# Input Kamstrup
{"lv":"","id":"","type":"","P":6,"Q":0,"PO":0,"QO":0,"I1":0.06,"I2":0.00,"I3
":0.00,"U1":231.00,"U2":0.00,"U3":0.00,"PF":1.00,"PF1":1.00,"PF2":1.
00,"PF3":1.00}
# Output Unified
{
   "SERIAL_NUMBER": null,
   "MODEL": null,
   "POWER": null,
   "POWER_EXPORT": 0,
   "REACTIVE_POWER": null,
   "REACTIVE_POWER_EXPORT": null,
   "CURRENT_L1": 0,
   "CURRENT_L2": 0,
```


Topic: /smartmeter/friendlyname/ value = collected OBIS code + values as JSON

# Limitations and next steps

**Limitations**

- MBUS import adapters is too expensive (sells for CHF ~100.-)
- Configuration of middleware requires light coding skills (GUI is missing)
- Our project covers ~80% of all Swiss market

**Next Steps**

- Establish strong standards (VSE, SwissMig in charge)
- enhance documentation (especially MQTT profile)
- Integrate remaining large DSO’s Smartmeters

vimeo.com/750696951

**EMF WALK**

~~~~!~~~~~!~~~!~~~~~

Energy Data Hackdays
Brugg, Switzerland
17.09.2022

a 3 minute video feat.
**Markus, Gaston, Oleg**

Music by **Static In Verona**
~~~~

# Next Steps

# SEEDtalks

Diskussionsrunden zu innovativen Nachhaltigkeitsansätzen im Dreiland, in der Architektur und der Kulinarik

# SEED 2.0

## art for a sustainable future

**Datum:** 18.09.2022, 17:00 – 19:00
**Ort:**
Haus Salmegg, Rheinbrückstrasse 8, 79618 Rheinfelden (Baden)

**Raum:** Dietschy Saal
**Veranstalter:**
ASF - a leap forward, 4310 Rheinfelden

HIGHTECH ZENTRUM AARGAU

**TALK No.3**

**Kulinarik und Nachhaltigkeit – Food and the good life**

Essen und der nachhaltige Umgang damit ist nicht nur eine Frage des guten Geschmacks, sondern eine Einreihung der eigenen persönlichen Werte in die ewige Nahrungskette der Biosphäre unseres Planeten.
Wie können wir uns in diese komplexen Zusammenhänge nachhaltig einbringen?

Welche Produktion von Nahrungsmitteln ist nachhaltig, benötigt es für nachhaltige Agrikultur? Bei diesem Gespräch mit dem Küchenchef **David Heisch** vom Hotel Schützen in Rheinfelden, **Rafael Waber**, CEO SwissShrimp AG und **Knut Schmittke**, Leiter Innovation des Forschungsinstitut für biologischen Landbau (FIBL) als Gäste geht es ums Eingemachte, ums Lebige und das gute Leben.

**Peter Morf** leitet durch diese Gespräche.

HIGHTECH ZENTRUM AARGAU

KONTAKT LOGIN

MISSION INNOVATION ANGEBOT TECHNOLOGIEN PROJEKTE NEWS & EVENTS ÜBER UNS



EVENT

# Energiezukunft: Herausforderungen und Lösungen

**Datum:** 25.10.2022, 08:30 – 16:30
**Freie Plätze:** 108 / 140
**Anmeldefrist:** 18.10.2022
**Ort:** TECHNOPARK® Aargau
Badenerstrasse 13, 5200 Brugg, Schweiz

Solar Agentur Schweiz
Agence Solaire Suisse
Swiss Solar Agency



## 32. SCHWEIZER SOLARPREISVERLEIHUNG 2022

DONNERSTAG 27. OKTOBER 2022, AARAU

**09.30-15.45 Uhr**

**Kultur - und Kongresszentrum Aarau**

Schlossbergplatz 9

5000 Aarau

HIGHTECH ZENTRUM AARGAU

# GLAMHACK 2022

## TICINO EDITION

## 3-5 NOVEMBER

Organized by

SUPSI

Under the framework of

open science

SUPSI DACD campus
Via Flora Ruchat-Roncati 15,
Mendrisio

# rethink journalism hackathon

25. & 26.11.22

save the date


Energy
Lab

We need
Pioneers



pioneer city

Be a pioneer–pitch yourchallenge/ project!

mail to
peter.janes@pioneercity.ch

# Pioneer Forum Energy
# 26.01.2023

pioneercity.ch

# Du lebst. Du liebst.

Du liebst Freunde, Bäume, Sport. Du liebst Sonne, Kids, Songs. Du liebst Kaffee, Party, Lachen. Du liebst Projekte, Hunde, Ferien. Doch vergiss nie, dass alles, was du liebst, ein Zuhause hat: Deinen Planeten. **Hilf mit, dass sein Klima gesund bleibt.**

**Nicht irgendwer und irgendwann, sondern du und hier und jetzt.**

SCAN ME




**Erkläre deinem Planeten die Liebe – und spare $CO_2$**

ENERGY DATA HACKDAYS

# Brightcon 2022: Sept. 26-30, Luxembourg

Organizers:

DÉPART DE SENTIER

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY | LIST

- Conference (28-29), Hackathon (29-30), ~~Workshops~~
- Open sustainability software and data
- All talks include interactive examples
- Focus on Brightway life cycle assessment framework
- Registration is 220€ (Conference/Hackathon)

https://brightcon.link



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LernWerk

Gaston Wey

Florin Hasler

Fabienne Engel

Lorraine Engelbrecht

Oleg Lavrovsky

YOU

# Energy Data Hackdays 2022 Team



MATTHIAS EIFERT
All things!



OLEG LAVROSVSKY
all IT, tech & open data



DARIENNE HUNZIKER

all things challenges, ideation, mediation



NADINE ZIELENSKI
all things photos & Comms



BERNHARD ISENSCHMID

all things HTZ



PETER MORF
all things

MERCI MERCI M

