



MIDLANDS



CITIES



THE ALPS



SWITZERLAND

# EDGE: Enabling Decentralized renewable GEneration in the Swiss cities, midlands, and the Alps



EDGE consortium → Philipp Schütz (HSLU)



Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra

Swiss Federal Office of Energy SFOE

Sweet Edge is a research project sponsored by the Swiss Federal Office of Energy's SWEET programme and coordinated jointly by UNIGE and EPFL

**sweet** swiss energy research  
for the energy transition  
  
EDGE 

# Aims of EDGE

1. Decarbonisation of Swiss energy system by exploiting **local renewable energy sources**
2. **Focus is on CO2 reduction** supported by technological solutions, business models and policy adaptations
3. **Local focus areas:** cities, midlands, alps

	<b>DecarbCH</b>	<b>EDGE</b>
<i>Application</i>	Heating and cooling	All
<i>Area</i>	Switzerland incl. industry	Focus regions



# SWEET EDGE team



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 Prof. Claudia Binder  
 Prof. Philippe Thalmann

## 18 research teams



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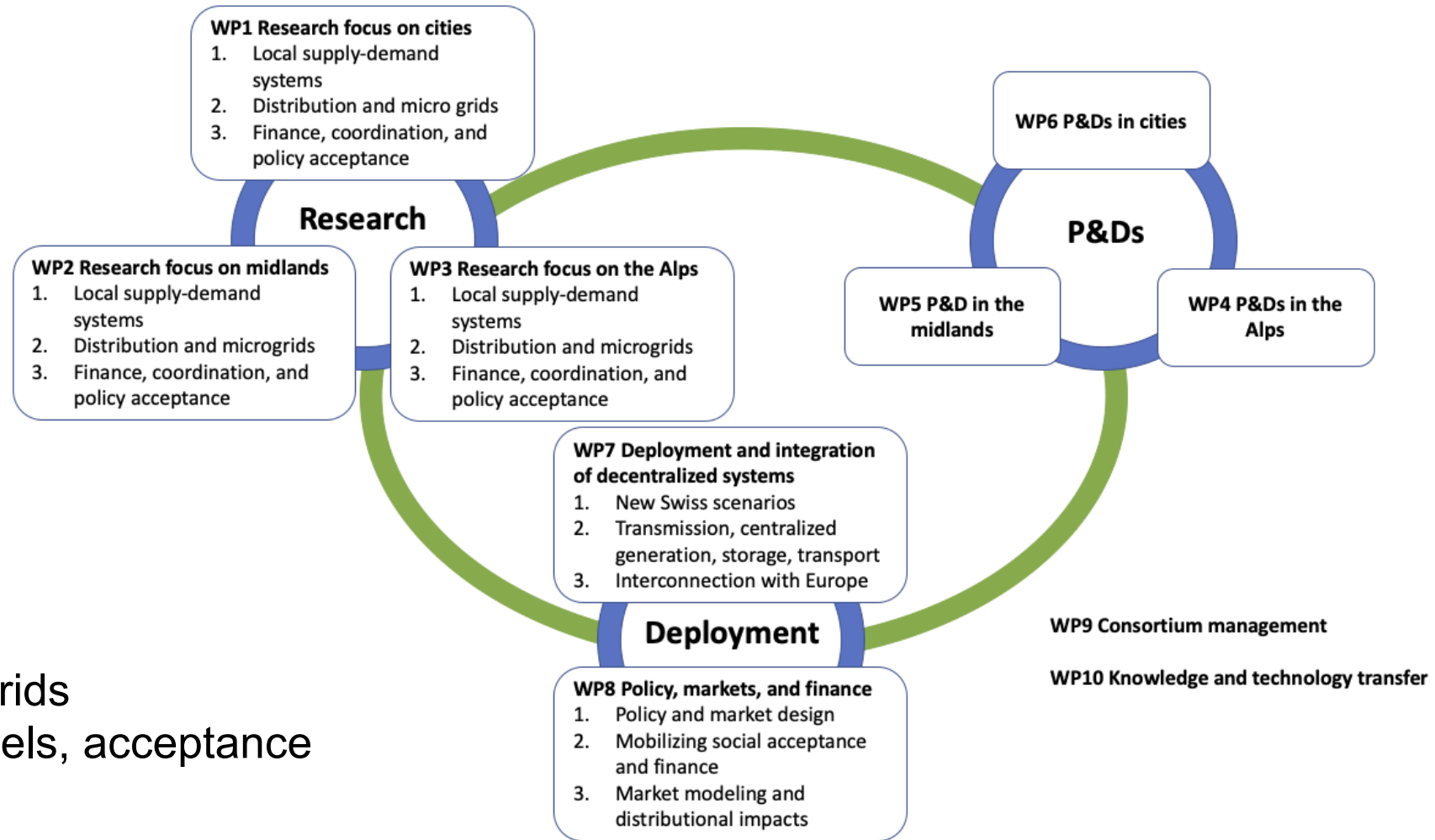
## 20 implementation partners



+ 42 support partners 3

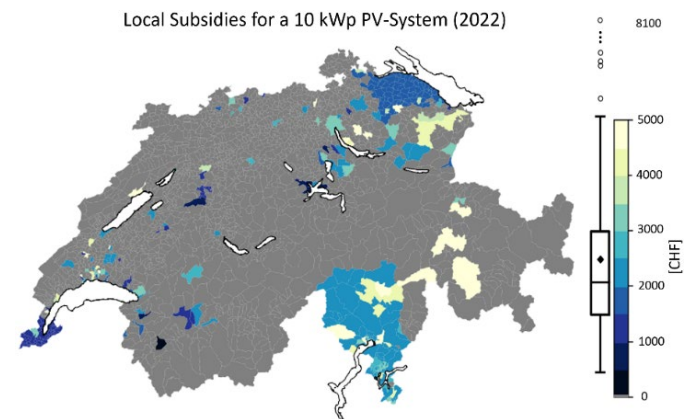
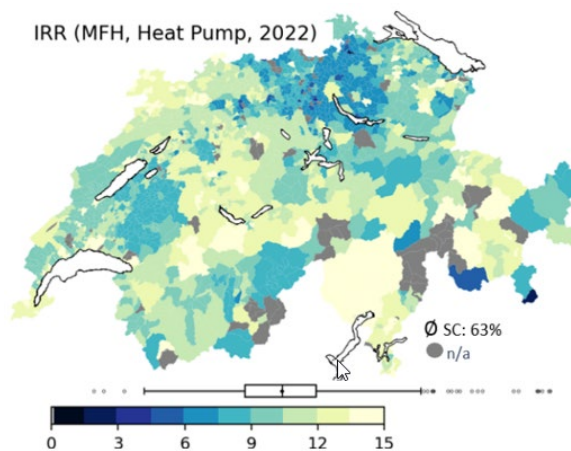
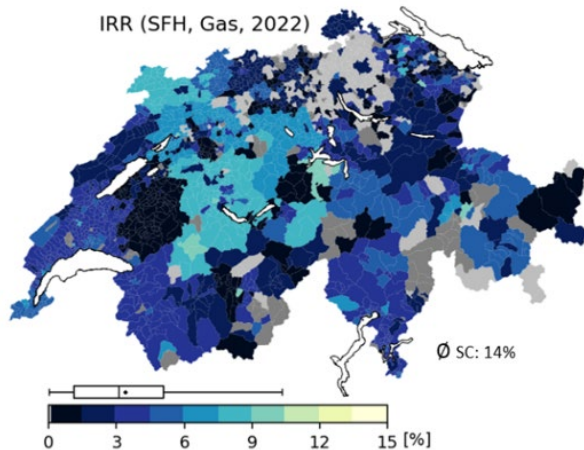
# SWEET EDGE structure

- Three **clusters**
  - Research
  - P&D
  - Deployment
- Three **focus regions**
  - Cities
  - Midlands
  - Alps
- Three **topics**
  - Demand supply
  - Distribution and microgrids
  - Finance, business models, acceptance



# White paper: Quantifying the degree of fragmentation of policies targeting household solar PV in Switzerland

- Swiss energy market and policy is fragmented, but how much?
  - **Step 1:** analysis of existing policies on federal, cantonal and municipal level
  - **Step 2:** Modeling of profitability of optimized PV (+ battery) system for single- and multi-family homes on municipality level (2000+ municipalities)
- Results:
  - Step 1: variation of rules across all three levels and multiple policy instruments/ areas (subsidies, taxes, building codes, solar remunerations, electricity cost...)
  - Step 2: patchwork





# National survey on policy acceptance

**ETH**  
Eidgenössische Technische Hochschule Zürich  
Swiss Federal Institute of Technology Zürich

Energy and Technology Policy Group  
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**A-PRIORITY** **DIE POST**  
075836-009390



Zürich, 25. August 2022

Nationale Befragung: Zukunft der Energieversorgung in der Schweiz

Sehr geehrter Herr Wiesner

Eine funktionierende Energieversorgung ist für die Schweiz von grosser Bedeutung. Die Meinungen darüber, wie die Energieversorgung in Zukunft sichergestellt werden soll, gehen allerdings auseinander: Sollen die erneuerbaren Energien (Wind-, Solar- und Wasserkraft) ausgebaut werden? Wenn ja, mit welchen Instrumenten? Oder soll die Schweiz weiterhin auf Energiegewinnung aus Kernkraftwerken setzen?

Die Bevölkerung soll mitreden können. Deshalb führen die Universitäten Bern, Lausanne und St. Gallen sowie die ETH Zürich in Kooperation mit dem Bundesamt für Energie (BFE) eine Befragung durch. Diese richtet sich an die gesamte Wohnbevölkerung der Schweiz ab 18 Jahren und in allen Regionen der Schweiz. Die Umfrage dauert ca. 25-30 Minuten und wurde von der Ethik-Kommission der ETH Zürich bewilligt (EK 2022-N-109).

Durch ein Zufallsverfahren wurden Sie aus dem Stichprobenregister des Bundesamts für Statistik für die Teilnahme an dieser Studie ausgewählt. Die rechtliche Grundlage ist Artikel 13c Absatz 2 der Statistik-erhebungsverordnung (SR 431.012.1). Ihre Meinung zusammen mit der aller anderen Befragten ergeben so ein gutes Abbild der Schweizer Bevölkerung. Ihre Teilnahme ist also äusserst wichtig!

Bitte füllen Sie den Fragebogen bis zum 31. Oktober 2022 online aus. Zur Umfrage gelangen Sie über untenstehenden Link oder indem Sie den QR-Code scannen.

[www.edge.ethz.ch](http://www.edge.ethz.ch)  
Passwort: 9H2PL

Wir empfehlen,

**u<sup>b</sup>**

UNIVERSITÄT  
BERN

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Swiss Federal Institute of Technology Zürich

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Signora  
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Zurigo, 25 agosto 2022

Sondaggio nazionale: il futuro dell'approvvigionamento energetico in Svizzera

Gentile signora Ginesi,

Un approvvigionamento energetico funzionante è di estrema importanza per la Svizzera. Tuttavia, le opinioni divergono su come garantire l'approvvigionamento energetico in futuro: Le energie rinnovabili (energia eolica, solare e idroelettrica) dovrebbero essere ampliate? Se sì, con quali strumenti? Oppure la Svizzera dovrebbe continuare a fare affidamento sulla produzione di energia da centrali nucleari?

La popolazione deve poter dire la propria opinione! È per questo motivo che le Università di Berna, Losanna e San Gallo insieme al Politecnico federale di Zurigo realizzano un sondaggio nazionale, in collaborazione con l'Ufficio federale dell'energia (UFE). Tale sondaggio si rivolge all'intera popolazione residente in Svizzera di età pari o superiore ai 18 anni, e in tutte le regioni della Svizzera. Il sondaggio dura circa 25-30 minuti ed è stato approvato dal Comitato etico del Politecnico di Zurigo (EK 2022-N-109).

Lei è stato/a selezionato/a in modo casuale dal registro di campionamento dell'Ufficio federale di statistica per partecipare allo studio. Come base legale vale l'articolo 13c, capoverso 2, dell'Ordinanza sulle rilevazioni statistiche (RS 431.012.1). La Sua opinione, insieme a quella di tutti gli altri intervistati, fornisce quindi una buona rappresentazione della popolazione svizzera. La Sua partecipazione è dunque estremamente importante.

l'approvisionnement énergétique en Suisse

l'approvisionnement énergétique en Suisse. En manière d'assurer l'approvisionnement énergétique à l'avenir. Les énergies renouvelables (éolien, solaire et hydraulique) doivent-elles être renforcées? Si oui, avec quels instruments? Ou faut-il miser sur la production d'énergie à partir de centrales nucléaires?

C'est pour cette raison que les Universités de Berne, Lausanne et St. Gallen ainsi que l'ETH Zurich en coopération avec l'Office fédéral de l'énergie (OFE) mènent une enquête en coopération avec l'Office fédéral de l'énergie (OFE) de la population résidant en Suisse, dès 18 ans révolus, dans le but de recueillir l'avis de la population suisse. Votre participation est donc extrêmement importante.

Le registre de l'échantillonnage de l'Office fédéral de l'énergie est l'article 13c paragraphe 2 de l'Ordonnance sur les relevés de la population suisse. Votre participation est donc extrêmement importante.

22. Vous pouvez accéder à l'enquête



Disclaimer: All findings presented in the following are «draft results»



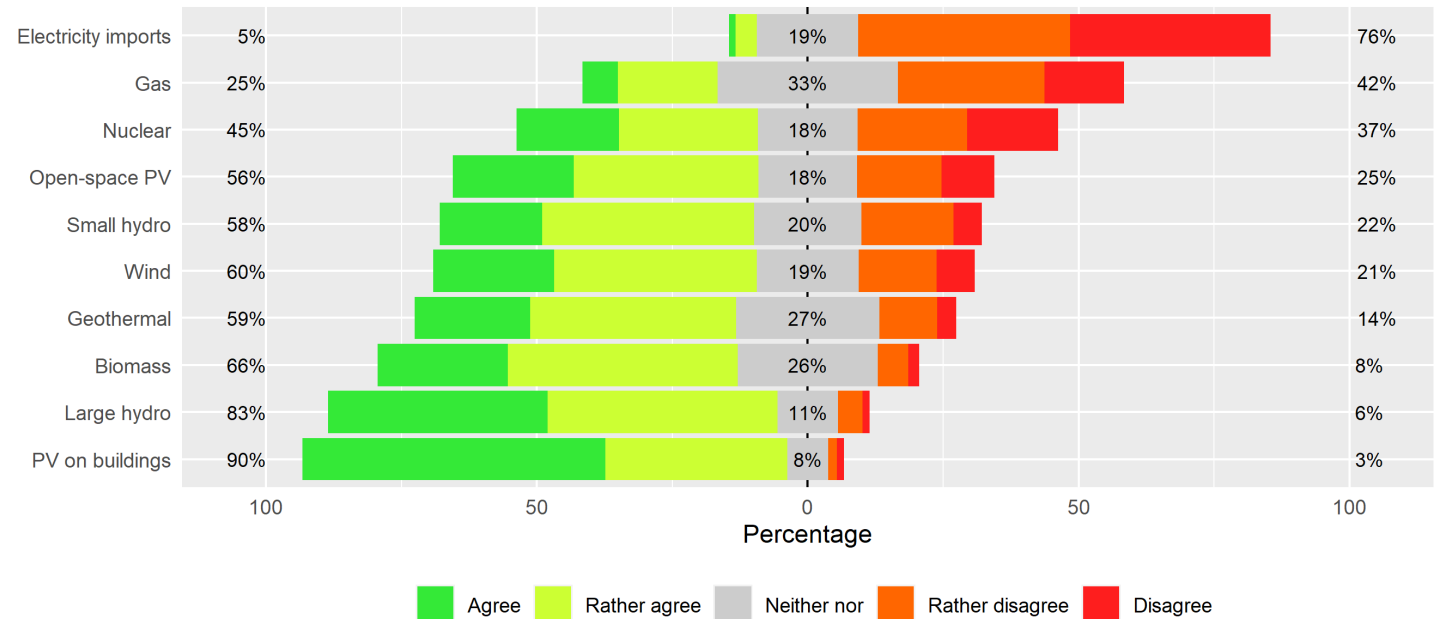
# Energy preferences in the context of the energy crisis

## ▪ Main pattern

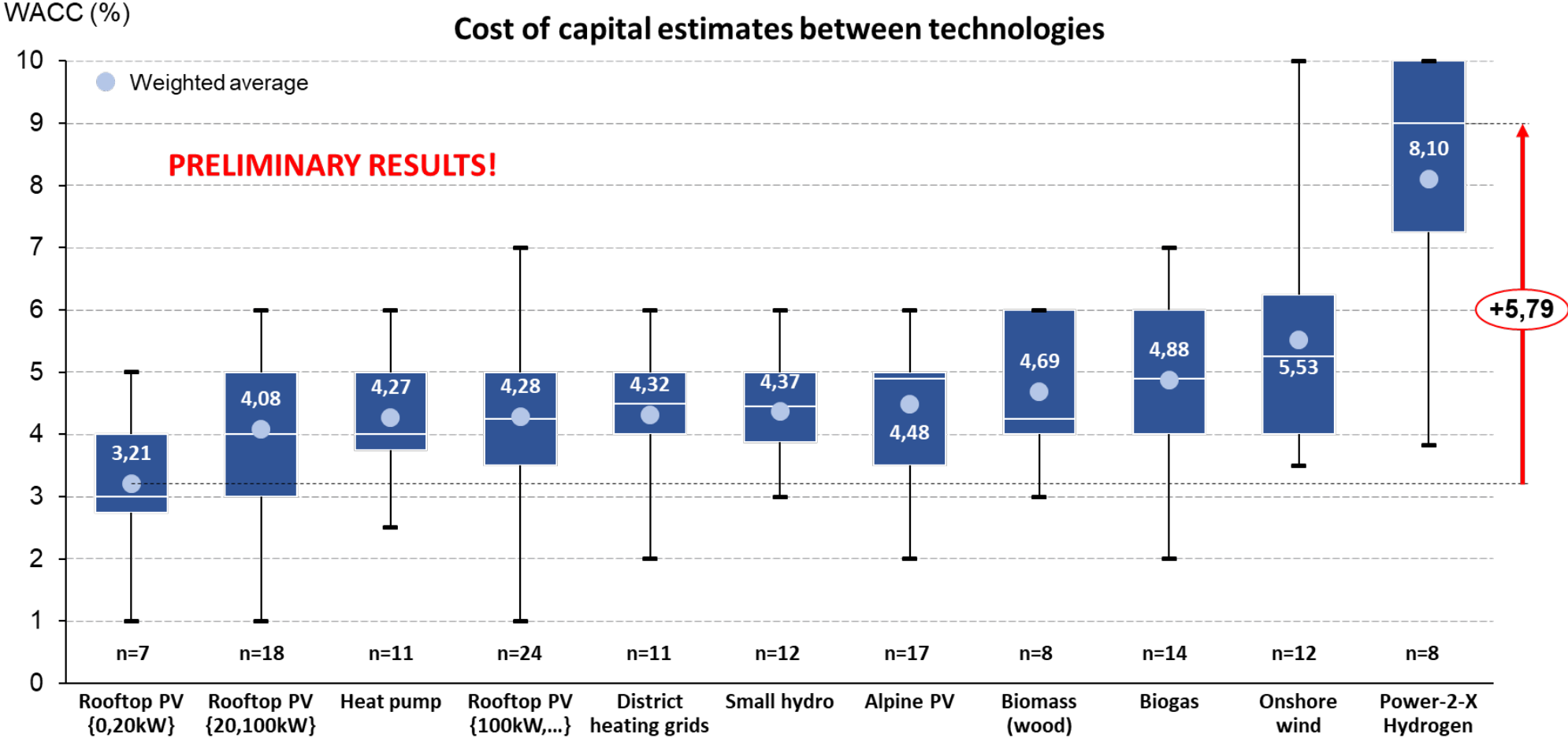
- Strong support for renewables, especially (small) PV and (large) Hydro
  - Almost no support for electricity imports
- ⇒ This is not new but more pronounced than in earlier survey (see data 2016: <https://ipwenergy.shinyapps.io/preferences/>)

## ▪ Noteworthy

- Population split on nuclear energy (however: more popular than 2016!)
- Not unexpected but first time data: open-space PV is more similar to wind than to “small” PV

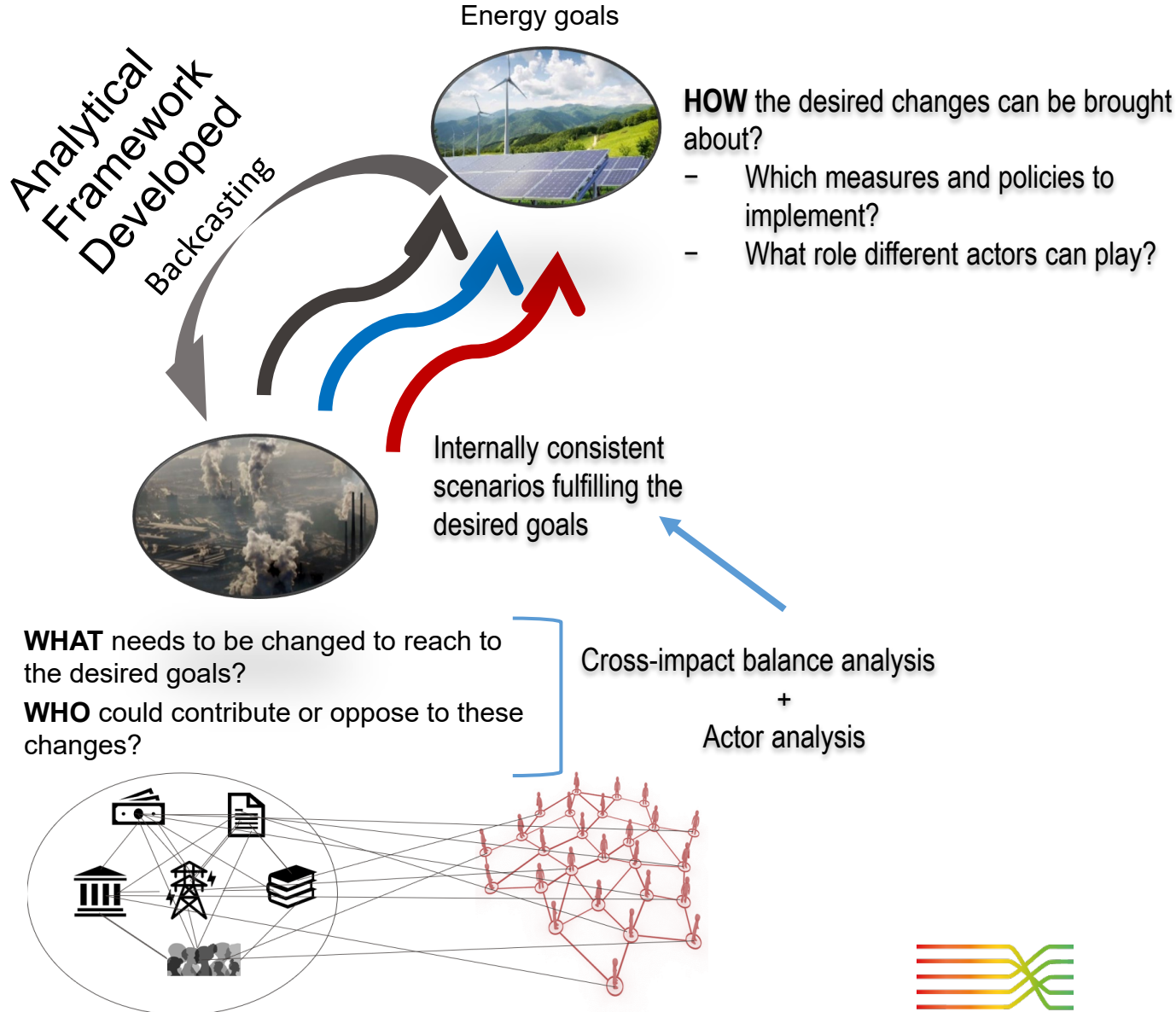


# Cost of capital estimates between technologies





# Governance aspects



## Case Studies/Workshops



## Acceptance of siting areas

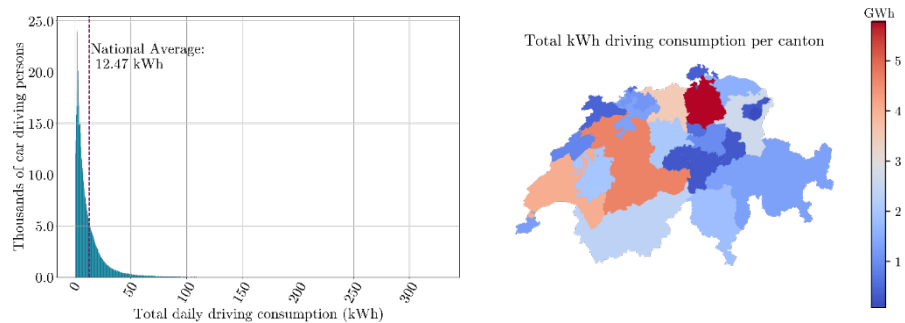
- Survey data is collected
- Co-funded projects in skiing areas and on farms are the least preferred siting areas
- “Interesting” finding for EDGE as these options are supposed to play an important role in midlands and Alpine regions



# Mobility profiles, synthetic low-voltage grids, PV integration

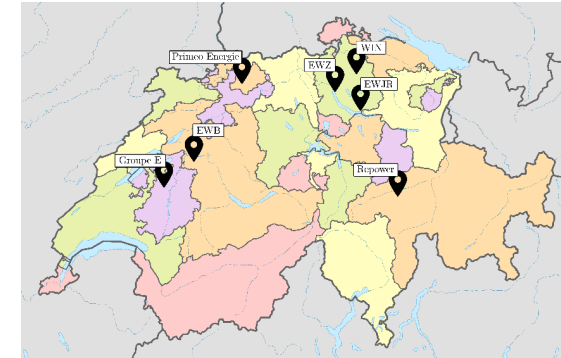
## Model for Private Mobility Electrification in CH

- 30 h passenger car mobility patterns information: MATSim
- Electric energy expenditure calculation tool for large fleets based on: emobpy
- Distributed or aggregated analyses – high geographic and time resolution

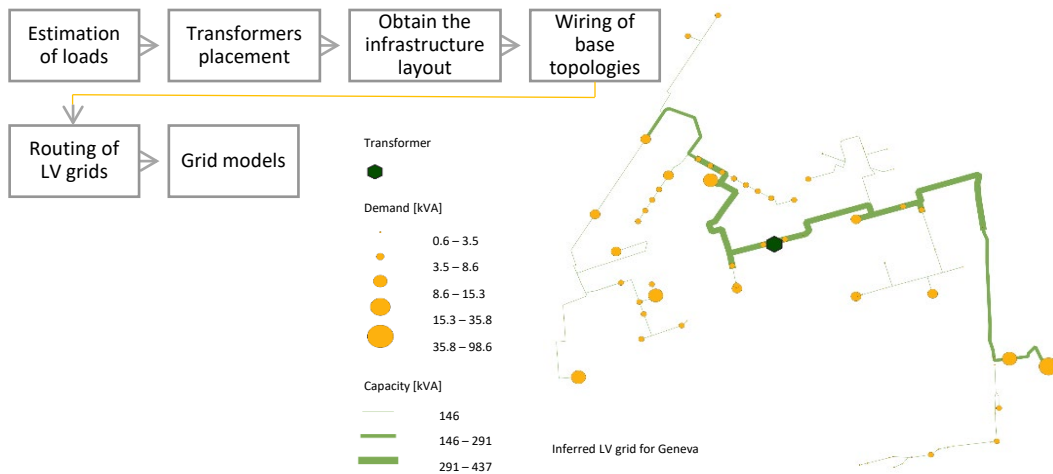


## Portfolio of Real Distribution Networks

- Collaborations with Swiss Distribution System Operators
  - ☑ Primeo Energie, Groupe E, EWB, EWZ, Repower
  - ☒ WIN, EWJR

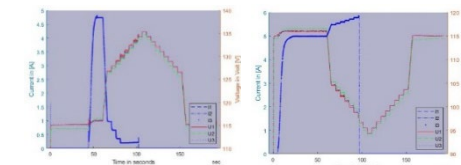
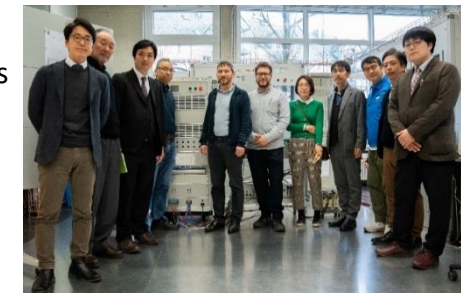


## Synthetic Low-Voltage Power Grids for CH



## PV Integration

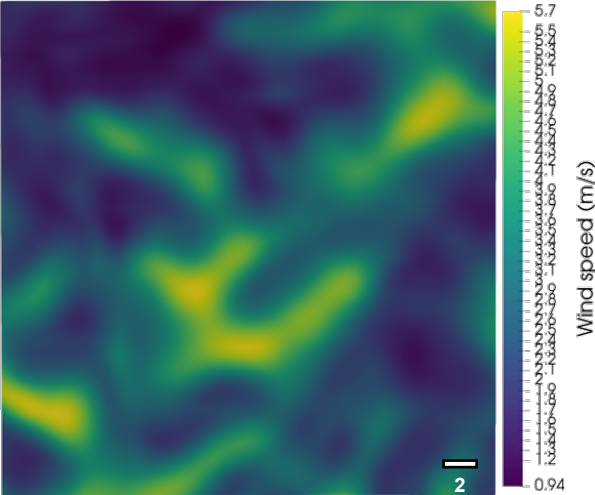
- Build-up of PV- and Inverter-Test Lab
- Contributions to (inter)national standards
  - WD IEC63409-4: parts confirmed in the inverter lab, committee draft in revision
  - WD IEC63409-6: parts confirmed in the inverter lab
  - IEC Online Meeting held in Burgdorf 16./17. January 2023
- Public information events:
  - Fachtagung Netzanschluss 2022
  - Fachtagung Netzanschluss 2023



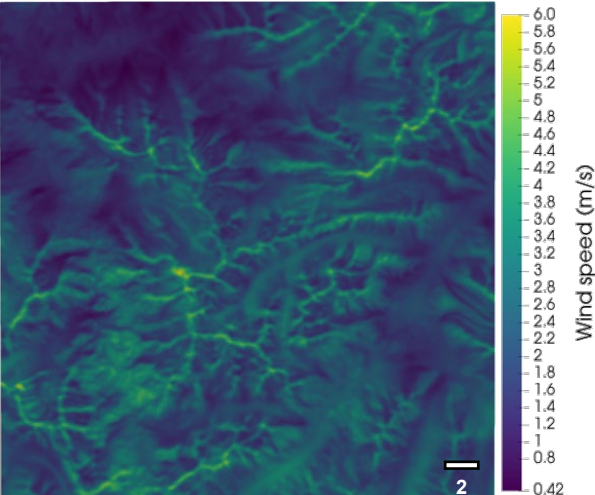
# Local wind prediction and optimum placement of PV and wind plants

Wind-Topo: New ML model for assessment of wind power resources in the mountains at high spatial and temporal resolution

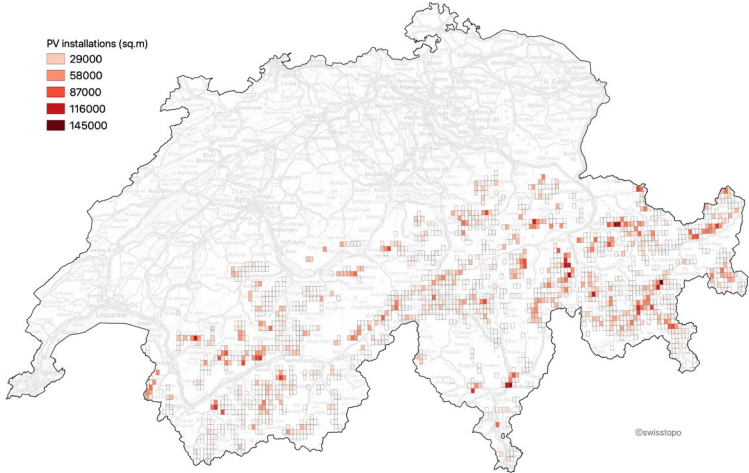
COSMO-1



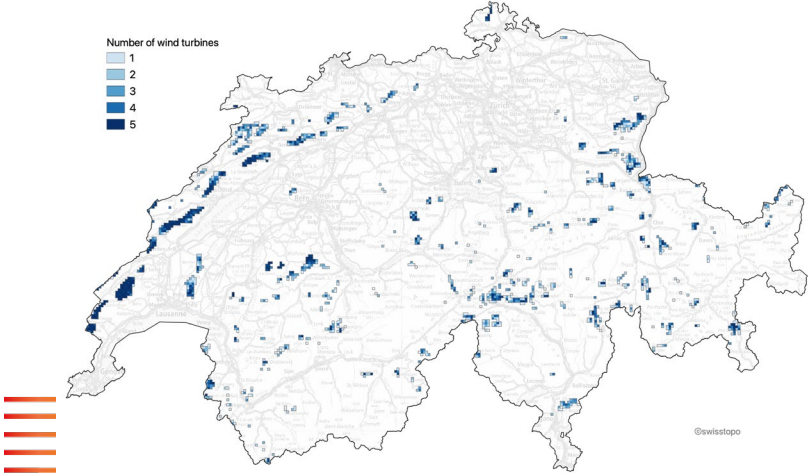
Wind-Topo



Optimal PV installations: 4.44 GW<sub>peak</sub>



Optimal wind power installations: 13.41 GW<sub>peak</sub>



OREES Model: Optimizes siting of PV and wind installations for minimizing import or maximizing revenues. Shown is an optimal siting for optimal winter production (low import).



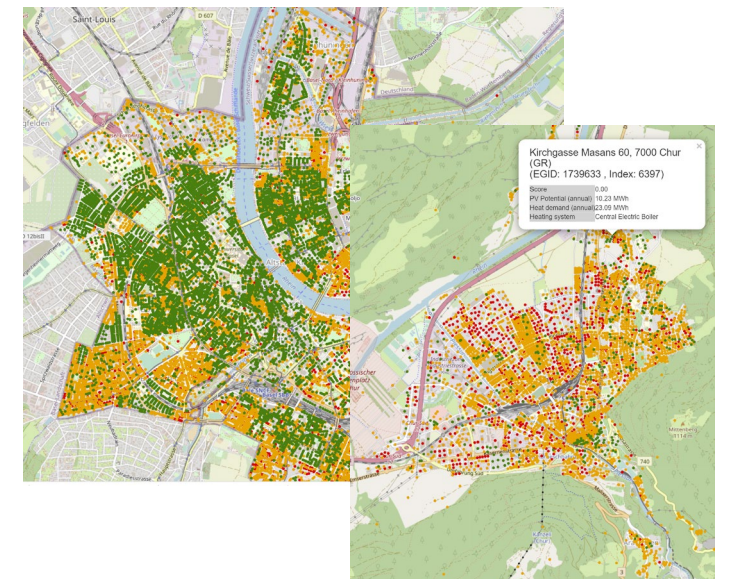
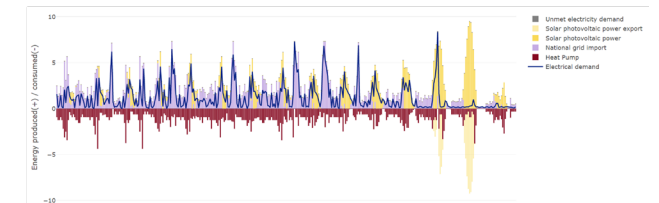
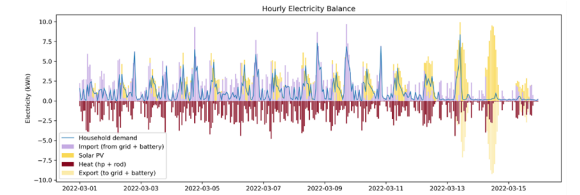
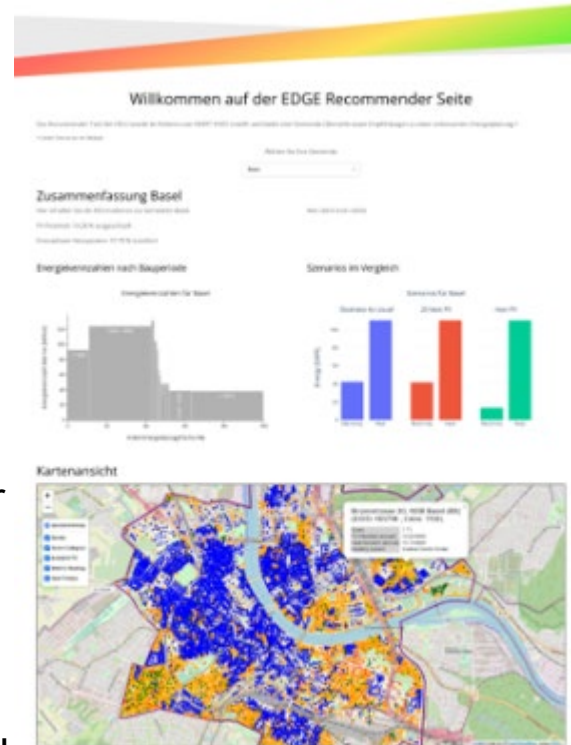
# Community-wide assessment of energy system options: Recommender tool

## Aims:

- **Support communities/utilities** to integrate high share of local renewables
- **Impact analysis** of different configurations
- **Modelling framework** for local energy systems

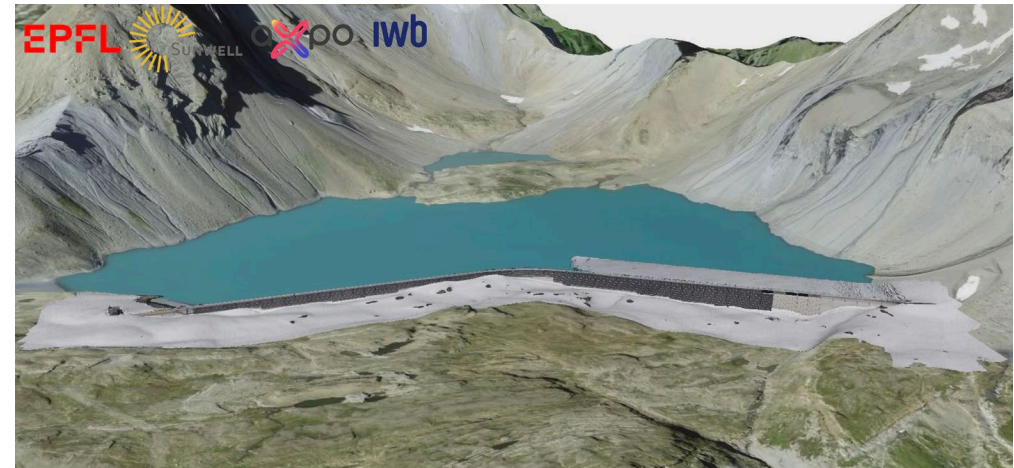
## Current status:

- **Decision support maps:** Quick overview over installed heating systems, PV systems, PV potentials, district heating systems etc.
- **Prototype of recommender tool** comparing different energy system options based on resources, local renewable potentials and local demands
- **Interviews** with communities, cantonal offices, planners and associations to identify key needs



# P&D Alps: Axpo Muttsee – True high-Alpine production site

- Real (mid – scale, 2MW) project on existing infrastructure (dam)
  - Can be compared to Totalp experimental site
  - Can be compared to »urban« production

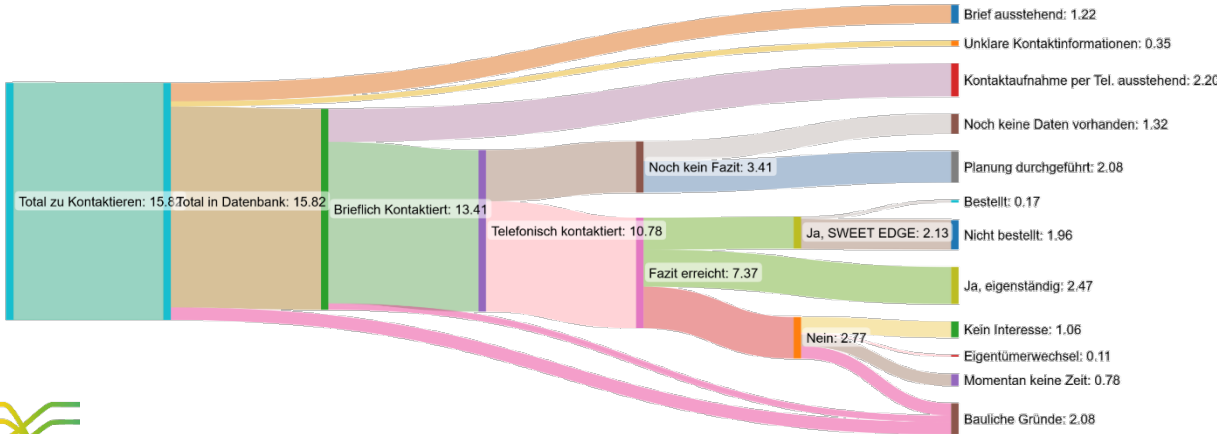
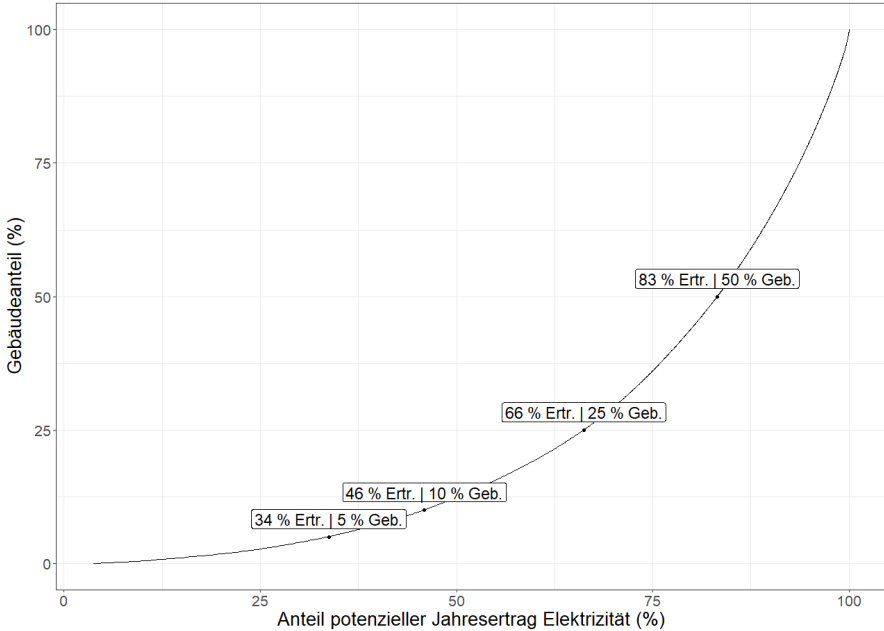
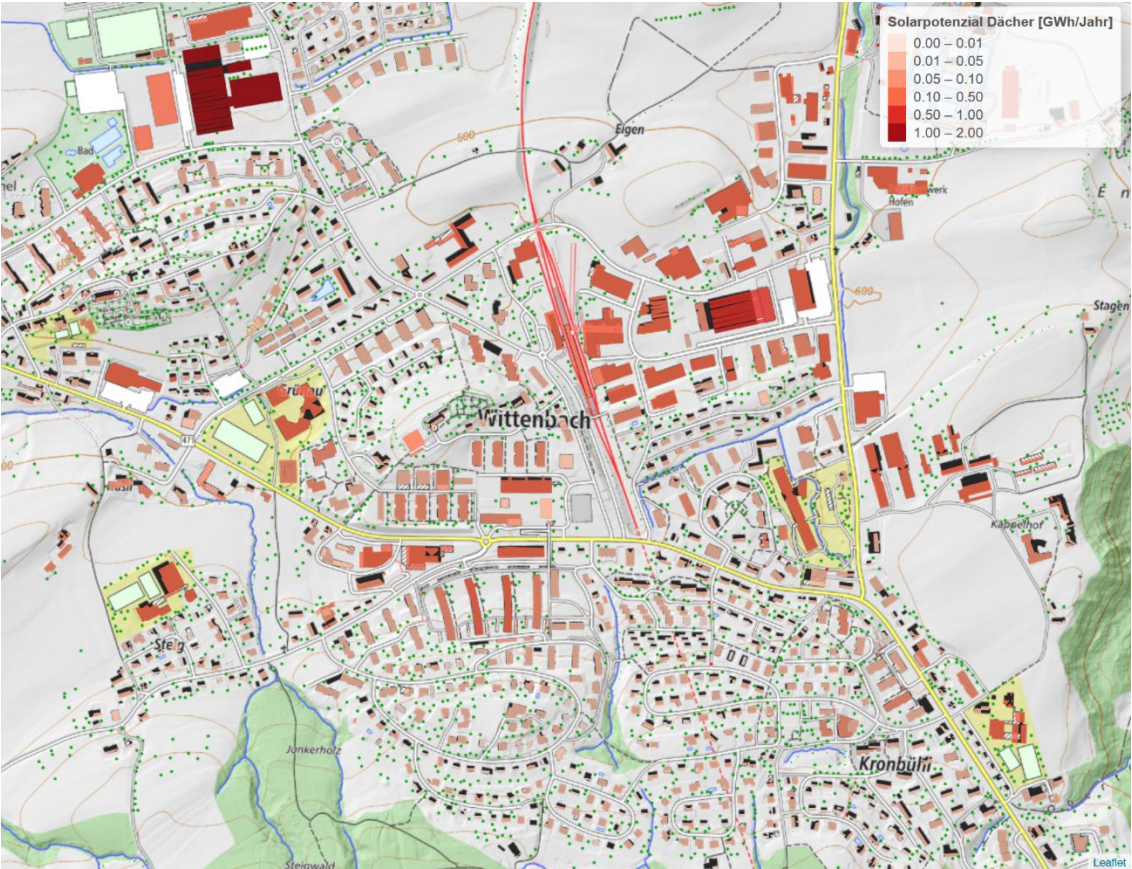


- Other projects: Gondo Solar (18 MW) and La Stadera (Wind and Solar)





# P&D Midlands: PV-Boom in Wittenbach (SG)





# P&D Cities: Thermal storage/grids, PV prosumers and community consulting

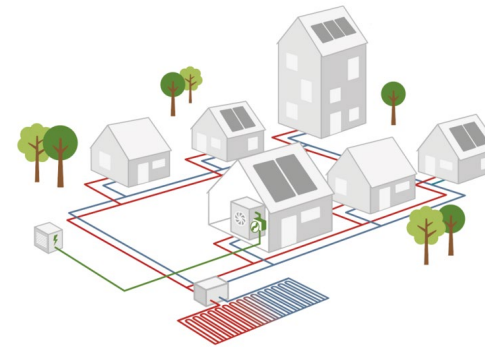
## Qube Project (Lucerne)

*Aim:* Evaluation of driving factors for storage



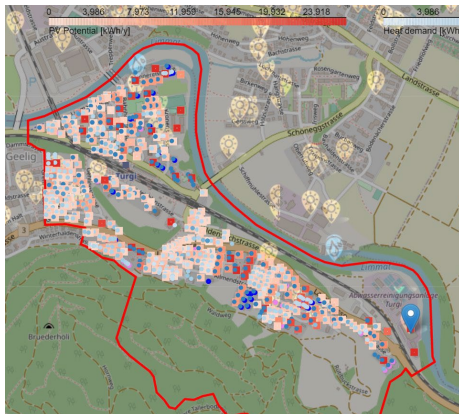
## Nano district heating (in preparation)

*Aim:* Demonstration of shared energy system



## PV Prosumer (Turgi)

*Aim:* Increasing share of renewable energies



## Heating/cooling strategy (multiple communities)

*Aim:* Support communities in development of energy strategy



# What are we aiming for?

- Showcase the maximisation of local renewable energy exploitation to decarbonise the Swiss energy system
- Identify key road-blocks preventing their integration (technical, financial, social)
- Providing templates, tools and recommendations to enable new projects



# Collaboration possibilities for DeCarbCH-EDGE

- Studies for integration and interoperation with energy system
- (Policy) acceptance, business cases, financing of renewable technologies
- Collaboration for P&D projects



# Thank you for your attention !

Please contact us for any questions or comments

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