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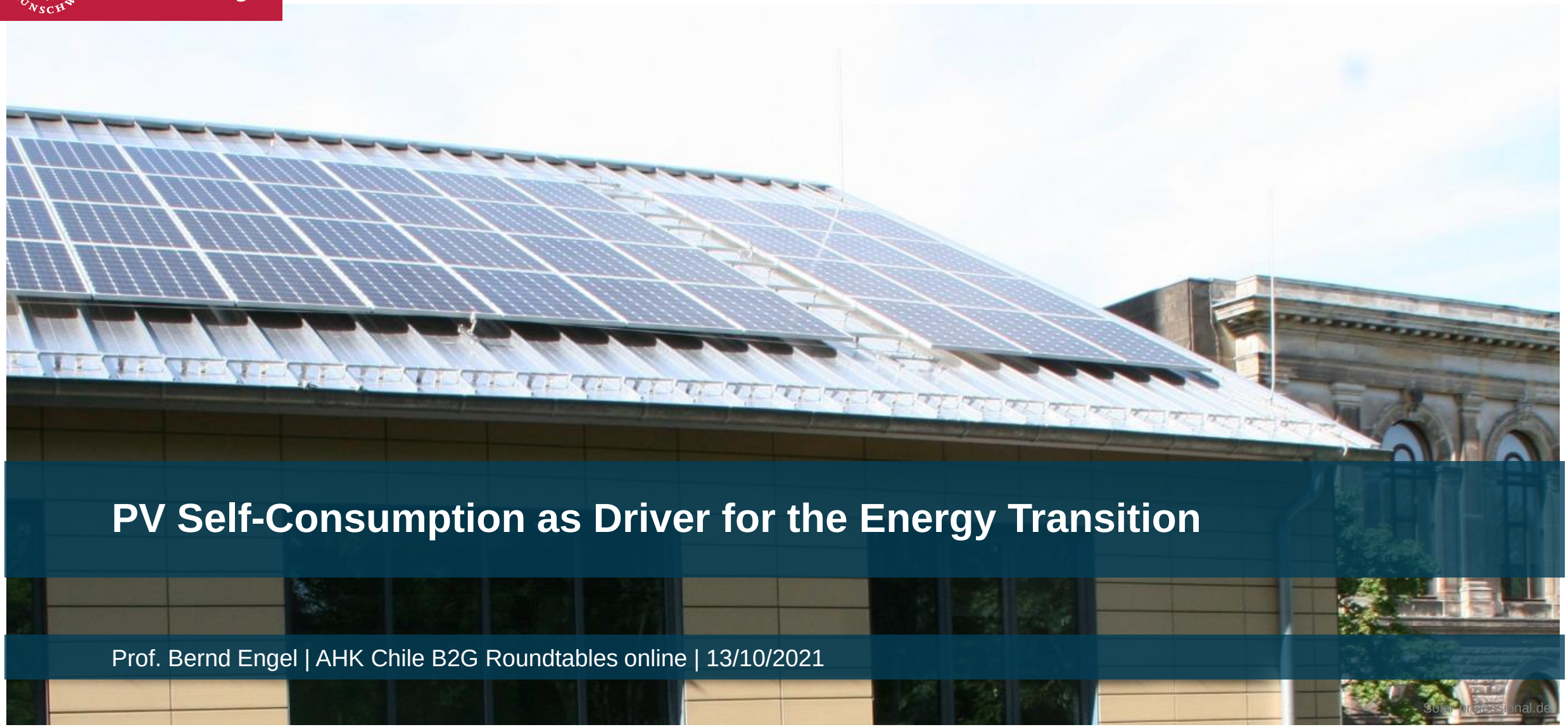
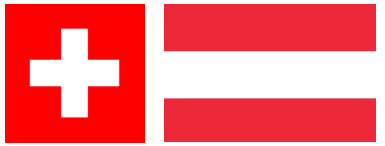


PV Self-Consumption as Driver for the Energy Transition

Prof. Bernd Engel | AHK Chile B2G Roundtables online | 13/10/2021

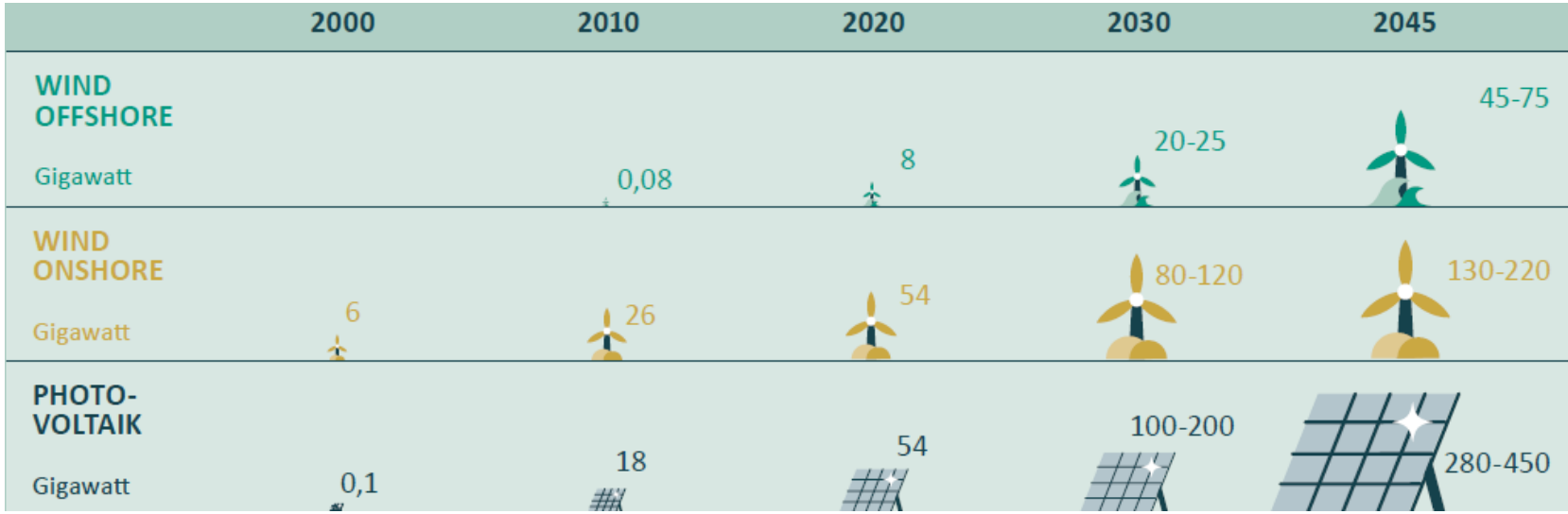
Content



Wind and PV are essential for climate neutrality by 2045 (German Climate Law)

Germany has ambitious RES plans

- main sources: PV and Wind Onshore & Offshore



Share RES	**6 %**	**11 %**	**46 %**	**> 65 %**	**ca. 100 %**

Source: ACATECH

PV and Wind capacities in 2020 have to be at least **quadrupled** until 2045

PV plants decentral or central: Sector Coupling und System Integration

Sector coupling with heat und mobility can be realized easily with decentral rooftop PV.
Market and grid integration with advanced ancillary services are more feasible with utility-scale solar.

10 kWp rooftop PV for self-consumption **(Prosumer)**

- Feed-in tariff (7.1 ct/kWh = 67 CLP/kWh)
- installed by **private persons**
- with **BESS** and **energy management** (> 50 %)
- **sector coupling** (**heat pump** and **electro mobility**) is possible and increasingly common
- Funding rules of state-owned ‚KfW-Bank' for BESS mandate a feed-in limit of **only 60 %** of the installed PV capacity for better grid integration
- contributes to **local voltage control Q(V)** and to **frequency control P(f) beyond** control power market (50 Hz ± 0.2 Hz)
- can delay grid expansion necessary due to electric mobility and heat pumps

Utility-scale solar power station (e.g. 85 MWp)

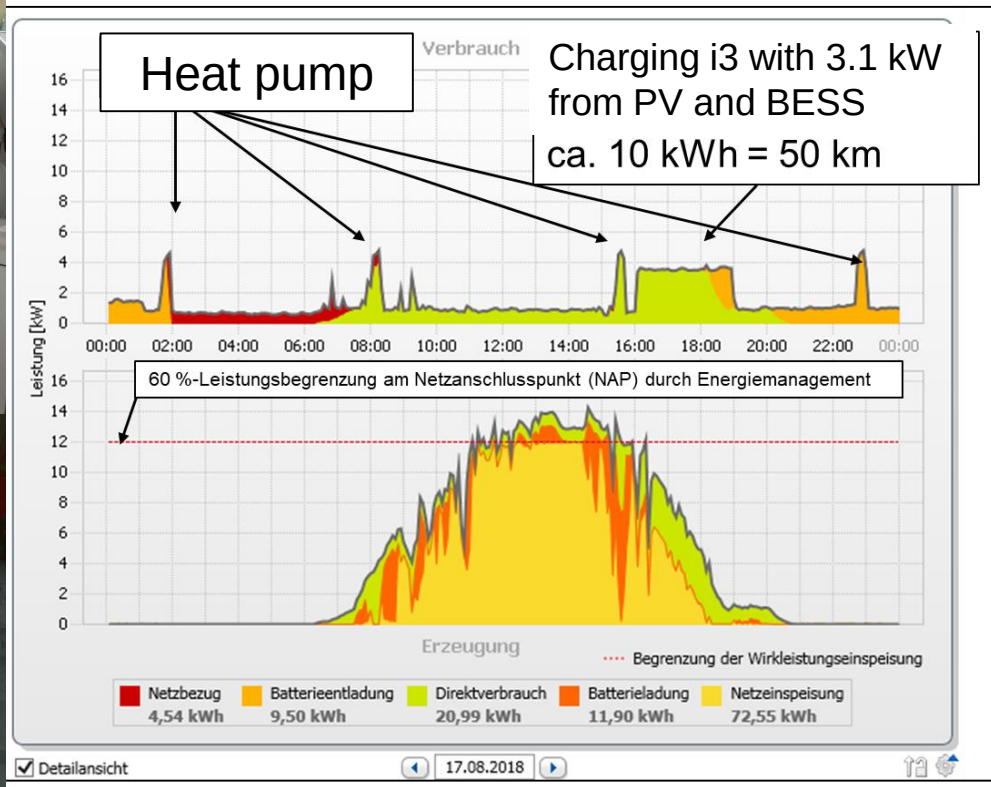
- Payment via **PPA** (Power Purchasing Agreement) with big energy suppliers and other companies beyond renewable energy law and feed-in tariff
- **advanced ancillary services**, e. g. for frequency and voltage control

Prosumer Household Engel: rooftoop PV feeds my BEV and the heat pump

Despite sector coupling with heating and mobility, the all-electric house is an energy-plus building

Prosumer plant of the Engel familly:

- **20 kWp PV** installed (> 20 MWh yield/a)
- **BESS 18 kWh** with 18 kW **gridforming inverter for backup**
- House with **KfW-EnEff 40+** standard (**60 % limit for feed-in at grid connection point**)
- Water/water **Heat pump (3 drillings 90 m deep) – PV to heat**
- **BMW i3** e-car – **PV powered mobility**
- **Feed-in energy 2018: 15,9 MWh**
- **Load energy 2018: 6,8 MWh**
- **Supply** für remaining electricity:
  BS Energy Naturstrom Gold with certificate “Green Electricity Label“



European laws are revolutionary for Prosumer („active customers“)

Both the RED II Directive and the Electricity Internal Market Directive give rights to active customers and renewable energy communities that have not yet been fully implemented in Germany

The Renewable Energy Directive ("**RED II**") (EU Directive 2018/2001

- in Art. 21 „ **Self-supplier** in the field of **renewable electricity“**
- in Art. 22 **„Renewable Energy Communities“**

gives broad rights to

> *"generate renewable energy, including self-supply, and to store and sell, including through renewable electricity purchase contracts, supply agreements with electricity suppliers, and peer-to-peer commercial arrangements..."*

and obligations to member states that, for example,

> *"...unjustified legal and administrative barriers to renewable energy communities are removed…”*

Implementation until **30.06.2021**

The Internal Electricity Market Directive (EU Directive 2019/944-valid as of 01.01.2021) defines "**active customer**" in Art. 2. The term

> *"...defines a end customer or a group of end customers acting jointly, who consume or store electricity generated or sell self-generated electricity on site within defined boundaries or - if a Member State permits - at another location...".*

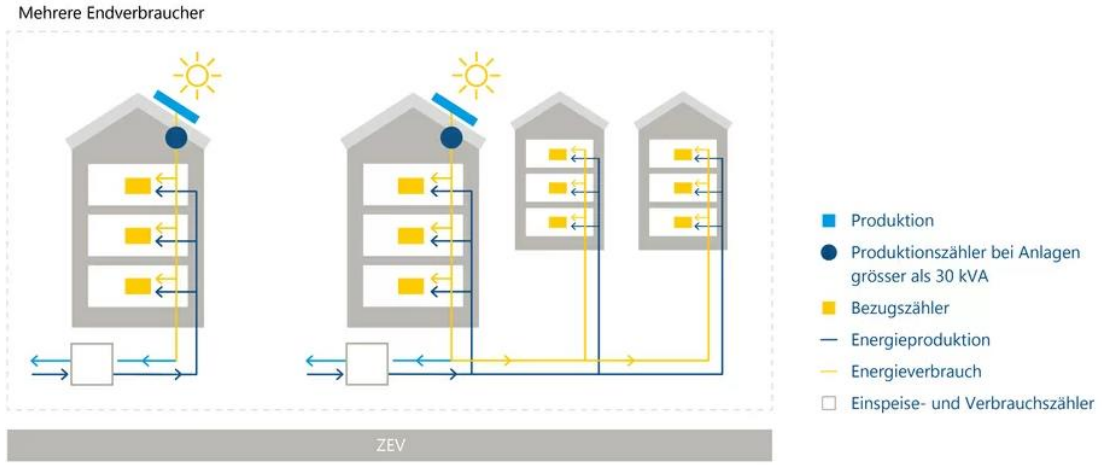
Besides that, there is the "**citizen energy community**" as "...a legal entity,

> *that is based on voluntary and open membership and is owned by members or shareholders that are natural persons, local governments, including municipalities, or small businesses, ...*
>
> *and (c) which may be engaged in generation, including from renewable sources, distribution, supply, consumption, aggregation, energy storage,...".*

Switzerland: Self-consumption merger (ZEV=Zusammenschluss zum Eigenverbrauch)

About 30 % of the PV market in Switzerland is already ZEV and enables sector coupling

- In Switzerland, 2500 bis 3500 PV plants are already feeding **self-consumption mergers**, („Zusammenschluss zum Eigenverbrauch“ (**ZEV**))
- 120 MWp ZEV out of 445 MWp in 2020 installed
- Preferred application: **apartment buildings**, followed by **industry** und **businesses**
- **Plant size**: 20 kWp -1 MWp.
- Feed-in tariff: ca.10 ct/kWh – 100 CLP/kWh (for electricity plus certificates of origin).



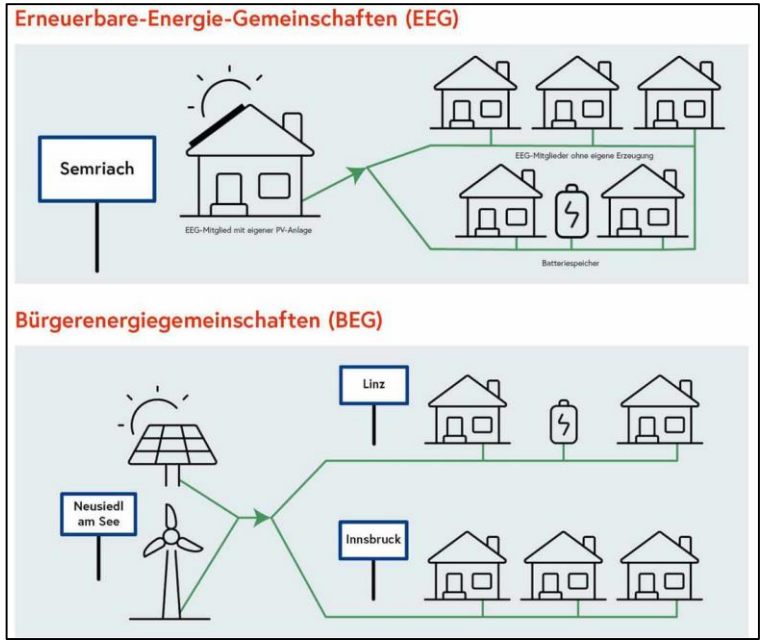
https://www.ewl-luzern.ch/privatkunden/energie/strom/produzieren/eigenverbrauch/#11800

Felix Austria: Renewable Energy and Citizen Energy Communities

Austria implements the EU-Directives to a great extent enabling self-consumption and citizen participation
Target until 2030: 100 % RE

- Implementation of EU Directives („RED II“ and internal electricity market)
- Decision „Erneuerbaren-Ausbau-Gesetz“ in National Council 9/7/2021
- **1. Renewable Energy Communities (EEG)**
  Common use of **regionally produced renewable energies**
- **2. Citizen Energy Communites (BEG)**

  Austrian **citizens own commonly different RES** and are supplied by them

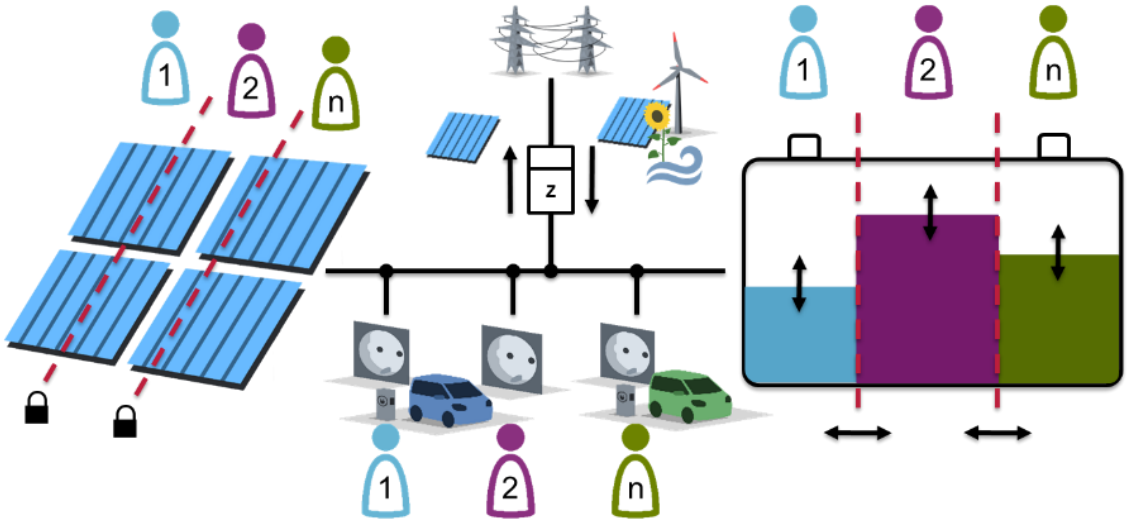


https://www.emcaustria.at/2020/08/30/mit-energiegemeinschaften-werden-buergerinnen-und-buerger-teil-der-energiewende/

Germany: Over-bureaucratic regulatory obstacles

In Germany, there is a need for a paradigm shift concerning self-consumption and citizen participation

- In Germany the energy ministery and the regulator do not see a need for action to implement EU Directives
- Hope for new government



Research project *Melani* with Naturstrom AG, SMA Solar Technology AG etc.:

- Multi use of a battery storage in apartment building
- Implementation with current regulation: Horror!

Conclusion

PV self-consumption of “active customers“, “renewable energy communities“ and “citizen energy communities“ enables sector coupling und citizen participation

- Only with **sector coupling** (use of **renewable energy** in the **heating and mobility sector**) enables the achievement of **climate protection targets in all sectors**
- Self-consumption in **Heat pumps** und **electric mobility** applications should be promoted
- **EU Directives** („RED II“ and internal electricity market) are very **positive** for **self-consumption**
- **Switzerland**[1)] und **Austria** are spearheading
- **Germany** needs a paradigm shift
- **Germany** should **be leading** in the **implementation** of EU Directives
- Self-consumption of „active customers“, „peer-to-peer-business“ „Renewable Energy Communities“ and „ citizen energy communities“ **is reducing electricity cost** and helps **refinancing** rooftop PV with BESS – with **reduced feed-in tariffs**
- facilitates **participation** und **acceptance** of citizens for energy transition

PV with self-consumption is a driver for the energy transition

[1)] Switzerland is not an EU member

Thank you!

Q & A

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