ZERO CARBON HUB

Workshop

RENEWABLE COLLECTIVE SELF-CONSUMPTION: ENERGY COMMUNITIES AND MINI GRIDS

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ENERGY REGULATORS REGIONAL ASSOCIATION

Setting the stage: individual vs collective self-consumption in the era of renewables: foundational concepts, key drivers and roles

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BME Zero Carbon Hub

Alternatives to serve demand: market vs. self-production

vs.

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vs.

Pros and cons of ProSumption

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PROS

- Utilization of local renewable resources
- Reduced transportation losses and related pollution
- Likely network benefits (reduced use, increased flexibility)
- Increased energy sovereignty
- Small / moderate CAPEX need
- Easy licensing
- Short development time
- Cost-effective alternative for serving off-grid consumption
- Electricity: electrification alternative for gross domestic energy consumption (lighting, cooking, heating and cooling, transportation)

CONS

- Weak scale economy
- Reduced business opportunity for traders
- Electricity: might require local grid enforcement and support
- Heat (geothermal): might require significant CAPEX to develop

Cost-Benefit considerations are of critical importance!

A typology for renewable energy self-consumption options

Type of self-consumption		Renewable energy resource				
		Hydro	Solar PV	Wind	Biomass	Geothermal
Individual	Household		E,H		H	H
	BtM Industrial	M	E,H	E,H		H
Collective	Condominium		E,H		H	H
	BtM Industrial Park		E,H	E,H		H
	Settlement	E	E,H	E,H	E,H	H

E: electricity; **H:** heat; **M**: mechanical energy

- **Heat**: local RES-H resources compete with transported fossil resources
- **Electricity**: local RES-E resources compete with grid-delivered electricity
- **Major focus of the Workshop**: RES-E self consumption related issues

Geothermal energy self-consumption for meeting both individual and collective heating/cooling needs

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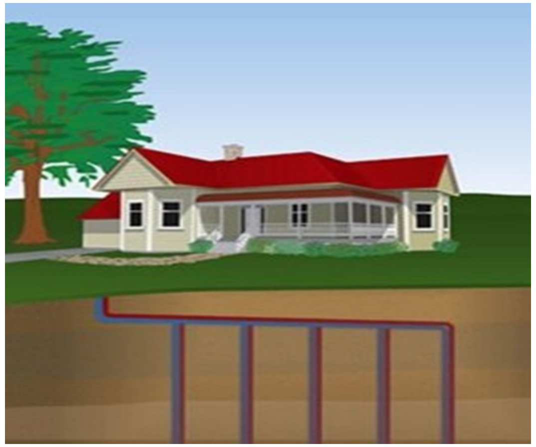
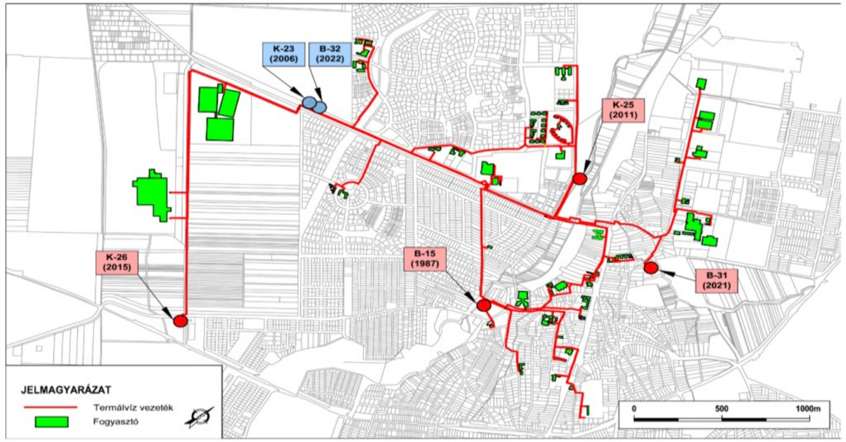
< 100 m: shallow



Ground probe heat pump systems

- Fit for heating / cooling residential complexes or smaller ind / com customers
- Available on >90% of Hungary
- Moderate CAPEX need with no heat source risk

< 2,500 m: deep geothermal



Settlement heating systems

- 50-80 °C thermal water needed
- Applied in 16 settlements
- CAPEX needed for drillings and the development of the local heat distribution system
- Typically managed by the local government

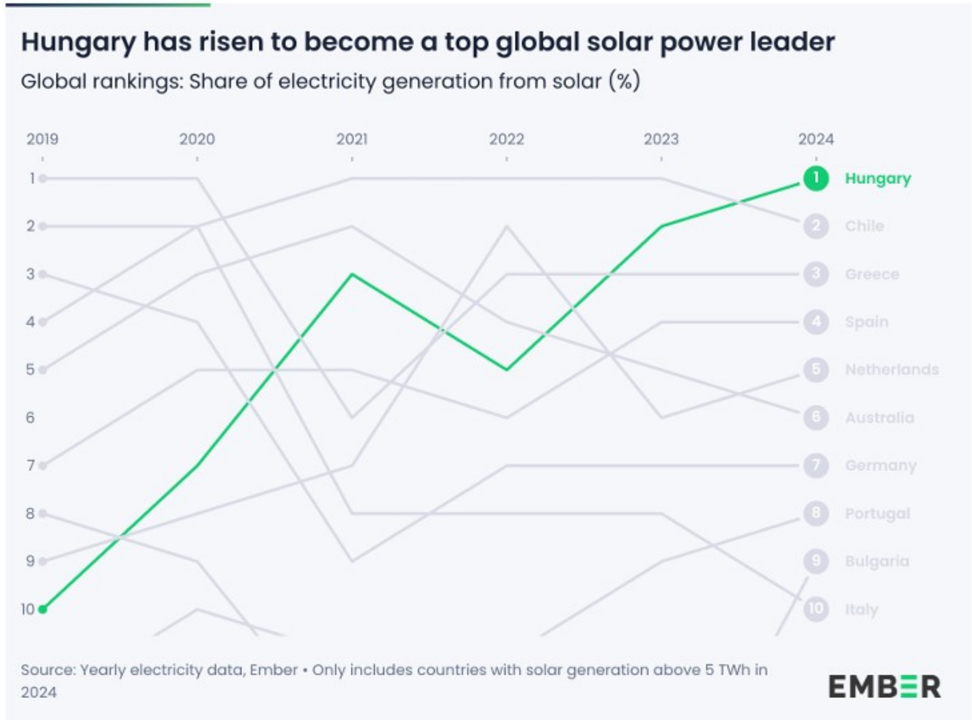
> 2,500 m: deep geothermal

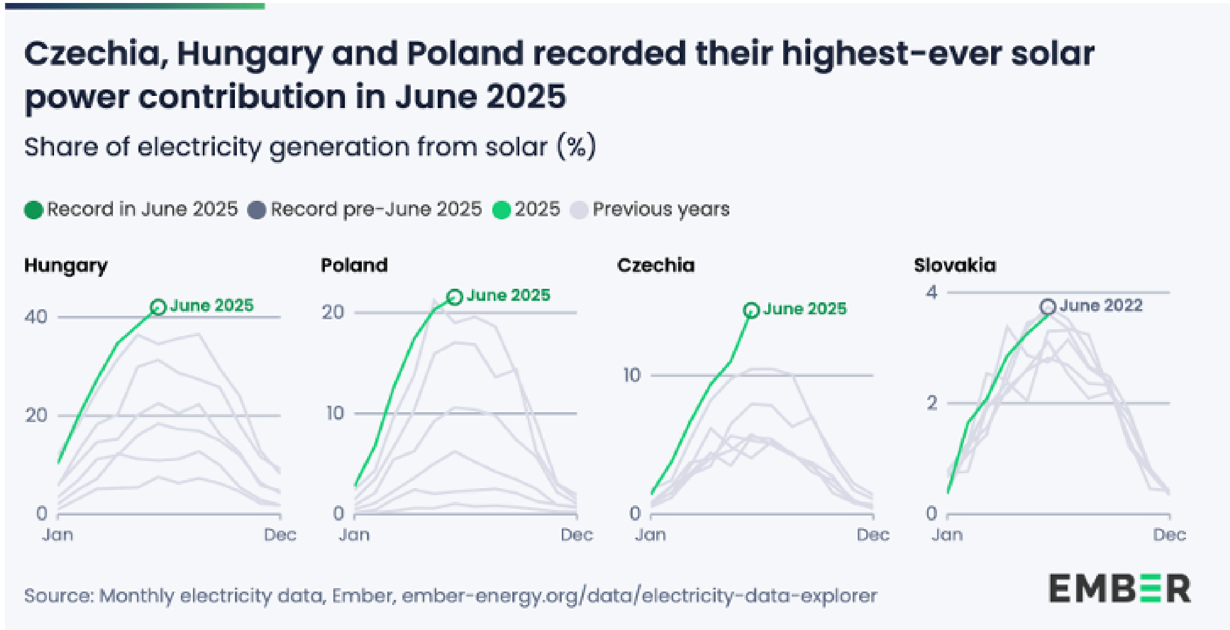
Classic district heating systems

- 90-100 °C thermal water needed
- Applied in 11 settlements
- CAPEX needed for drillings and the connection to the local district heating system
- Typically managed by the project / district heating company

Sufficiently high relative gas prices can make these projects competitive

Solar PV is the most widely utilized modern renewable energy resource in Hungary





- **Commercial scale utilization** is the most typical in the country (58%)
- **Individual self-consumption** is typical for **household** and **industrial** PV projects (35% and 7%, respectively)
- **Collective self-consumption** is an option for **industrial parks**, **condominium** and **settlement** energy community projects

Most important market players in collective self-consumption and their roles

- **Producers**: prosumers, local generators
- **Consumers**: prosumers, households, SMEs, institutions
- **EC coordinator**: local government or project company
- **Cooperating trader** procures non-EC related electricity and balancing services
- **Regulator**

- Let’s see some examples!

Household PV self-consumption: the HMKE-boom

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- Drivers:
  - annual settlement – virtual storage provided by the national grid (cancelled in 2025)
  - decreasing CAPEX cost and government CAPEX subsidies
- Technology issues:
  - no general metering and inverter standards
- Regulatory concerns:
  - production monitoring, forecasting and balancing
  - missing incentives to discourage production in negative price periods

- > 300,000 installed HMKE system
- 35% of PV production provided by HMKEs

Industrial PV self-consumption: BMW in Debrecen, a Fossil-Free Factory

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- Drivers:
  - mission – ESG
  - avoiding high wholesale prices and system use charges
- Technology issues:
  - PV and smart storage combined
- Regulatory concerns:
  - The impact of self consumption of system use charges

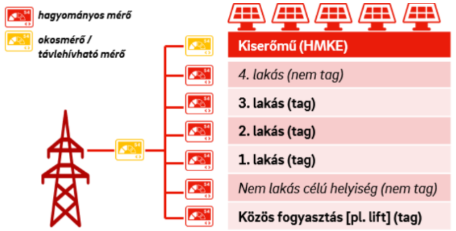
Industrial and Commercial PV provides 7% of PV production

- No connection to the Hungarian gas grid
- 43 MW on-site solar park (rooftop and land-based)
- Excess power is stored in a 1,800 m³ / 130 MWh thermal tank, which helps balance loads and keep systems running on weekends
- Quarter of the factory’s annual energy needs covered

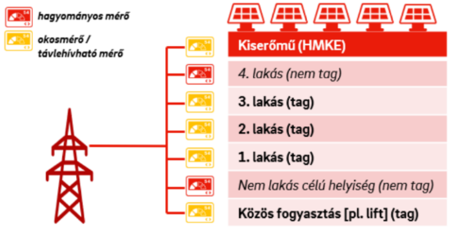
Condominium PV self-consumption: the new story

- Drivers:
  - supportive regulatory changes (introduced in 2025)
  - CAPEX subsidies and simple metering and settlement rules
- Technology issues:
  - metering
  - internal grid reinforcement needs
- Regulatory concerns:
  - internal grid use rules
  - settlement regime
  - PV production sharing rules

With traditional meters



With smart meters



Collective self-consumption by Industrial Parks

- Drivers:
  - mission – ESG
  - avoiding high wholesale prices and system use charges – estimated price advantage of collective self-consumption: EUR 70/MWh
  - utilizing the Park's excess connection capacity by its renters (e.g. for EV charging)
- Technology issues:
  - PV and storage combined can provide 60-70% of green self-consumption
- Regulatory concerns:
  - BtM network access and energy sharing rules?

- cc. 200 Industrial Parks
- 20-30 TWh/y annual electricity consumption + significant gas and heat consumption to electrify
- Several problems: outdated energy infrastructure; insufficient connection capacity; lack of land for RES-E development

Promotion of more complex energy communities in Hungary

- Hungary 2020: climate neutrality by 2050
- Hungarian NECP 2020: ≈ 200 energy communities by 2030
- Energy innovation tender for energy communities (2020): 34 applications, 7 winners
- Tender condition included regulatory analysis and proposals for regulatory amendments / innovation to support the establishment of energy communities
- No project has been completed to date…

Characteristics of the seven pilot projects

- 6 local energy communities
- 1 apartment house
- Combination of load, generation (PV) and storage

ZKK to mentor energy community pilot projects - Innovation related issues

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- **Technical innovation** - microgrid solutions, metering, settlement…
- **Electricity system integration requirements** – how do the EC and the market interact?
- **Business model innovation** – economic viability of a non-profit local renewable energy community?
- **Regulatory innovation** – incentives to promote the production of social benefits and to get network companies on board
- **Social innovation** – encouraging cooperation and local government involvement

ZKK stakeholder workshops

- Information exchange
- Sharing best practices
- Balancing competition and cooperation
- ZKK providing regulatory analysis

Collective self-consumption by settlements: easier to say than to do

- Drivers:
  - local resource utilization
  - harvesting available subsidies
  - reducing the total cost of electricity (energy) supply
  - supplying cheep electricity for local government managed institutions
- Technology issues:
  - metering
  - conditions to use and pay for local DSO assets
- Regulatory concerns:
  - electricity sharing and settlement rules
  - ensuring DSO justified costs
  - connection between the EC and the market

- 8 registered energy community by the regulator
- No real operational EC yet
- RES resource utilization: PV, biogas, wind, storage
- Load: households, SMEs, institutions, EV charging

Innovation to combat deep poverty by renewable energy communities in Hungary

- Government program for 300 settlements in deep poverty
- Invented and managed by Hungarian charity service of the order of Malta + EON Hungaria
- Charity owned solar park to provide revenue to support customers in need
- Clean Electric heating for „One room per house" is the objective of the charity
- Prepaid meters guarantee a sustainable business model for the electricity supply company

HTTPS://WWW.YOUTUBE.COM/WATCH?V=KVFZOV_JKGE

Conclusions

- Cost-Benefit Analysis – and not ideology – should be the basis for establishing incentives to promote RES self-consumption
- Individual self-consumption: significant individual and social benefits and cost-efficient implementation
  - Limited need for additional incentives
- Collective self-consumption: more complex technology and regulatory needs, less apparent social benefits
  - Potentially significant network related benefits and increased RES utilization potential
- Regulatory and social innovation need is significant

THANK YOU FOR YOUR ATTENTION!

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