Quo vadis energy communities? Czech energy communities in the European context

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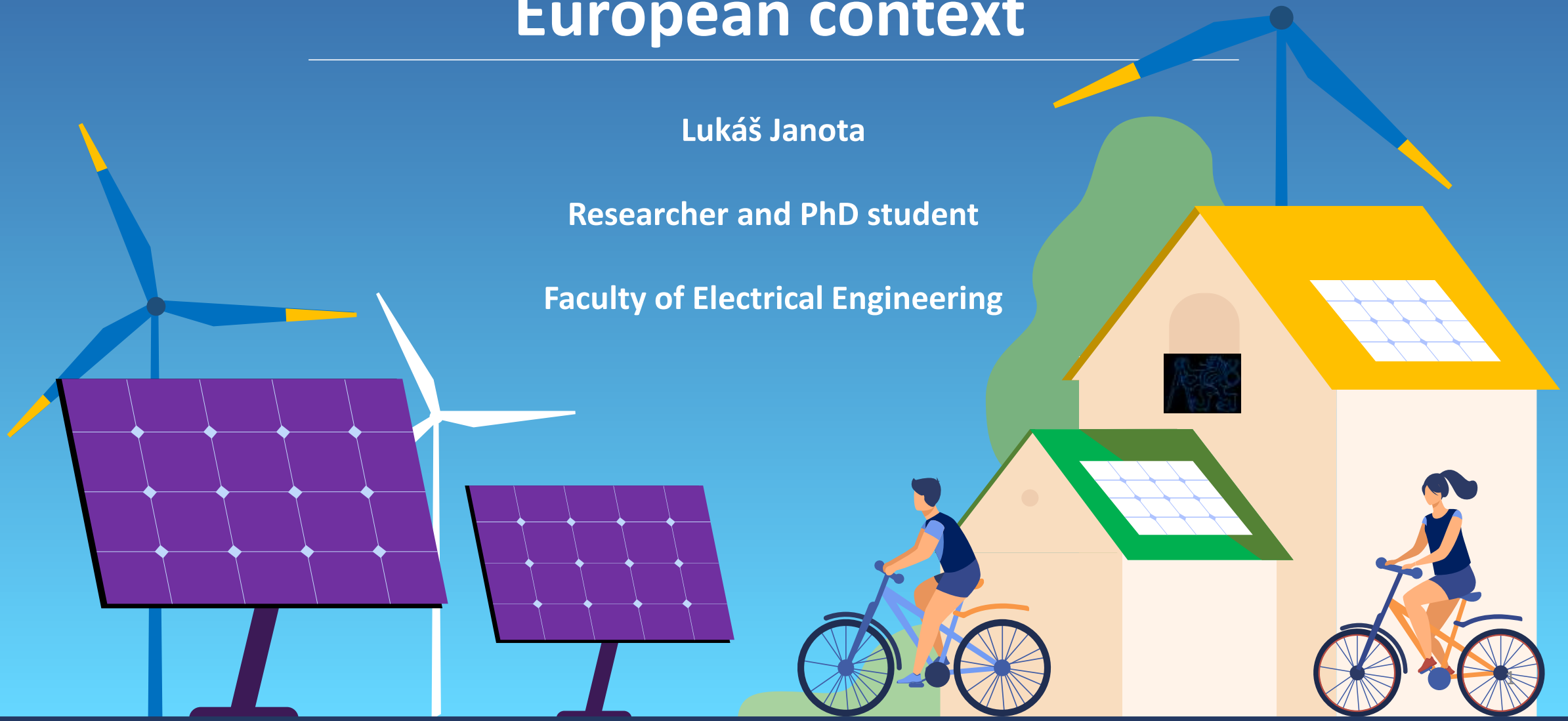

Content of presentation

Evolution of climate and energy policy

Past – 90s

Carbon age

Most of electricity and energy were produced from fossil fuels such as oil and coal, low energy efficiency, careless about environment

90s-now

Age of changes

EU has really started to discuss the problem of global warming and set up a few strategic documents, which should lead the fight against carbon energy.

2020

Green Paper Main goals:

20% cut in **greenhouse gas** emissions (from 1990 levels)
20% of EU energy from **renewables**
20% improvement in **energy efficiency**

2030

CEP Main goals (RED II):

At least 40% cuts in **greenhouse gas emissions** (to 1990 levels)
At least 32% share for **renewable energy**
At least 32.5% **energy efficiency of energy consumption**

2050

Success 0% CO2

Fully decarbonized and decentralized energy production, high-efficiency energy consumption, stable operation and safety of supply for all Europeans.

Evolution of climate and energy policy

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2020

Green Paper Main goals:

20% cut in **greenhouse gas** emissions (from 1990 levels)
20% of EU energy from **renewables**
20% improvement in **energy efficiency**

2030

Fit for 55 (RED III):

At least 55% cuts in **greenhouse gas emissions** (to 1990 levels)
At least 42.5% share for **renewable energy**
At least 36% **energy efficiency of energy consumption**

2050

Success 0% CO2

Fully decarbonized and decentralized energy production, high-efficiency energy consumption, stable operation and safety of supply for all Europeans.

What is Energy Community?

- New innovative energy concept/approach that offers a wide range of collective actions that help include citizens in the energy transition
- EC was officially defined on the EU level within the CEP in 2019
- Citizen-led community energy actions will play a significant role in overall energy transition, especially decentralization and RES development
- The basic purpose of the energy community is to generate social, economic and environmental benefits **rather than the focus on generating profit**

Why is Community Energy so important?

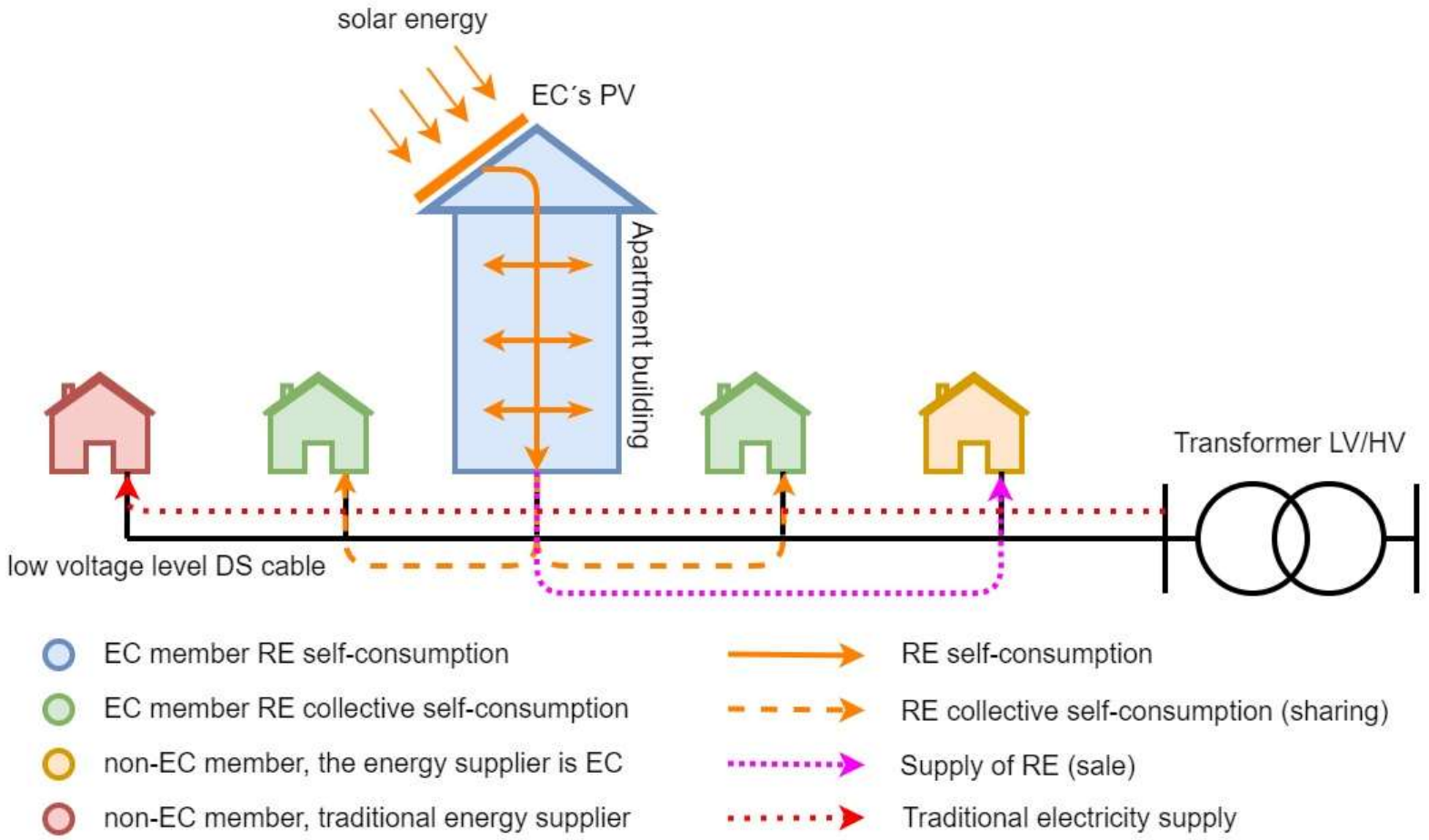
- To successfully achieve ambitious EU climate and energy policy, it is crucial that all of the stakeholders will participate in the energy transition
- Household energy consumption accounts for 26.3% of the total final energy consumption in the EU in 2019 (935 Mtoe)
  - **total energy consumption of industry is 25.6%**
- The widespread development of local community projects brings the necessary private finance to the European energy transformation
- **Financial potential of civic investment reaches up to 176 billion EUR available for the development and implementation of RES**

Forms of energy communities

- **Citizen Energy Community**
- Internal Electricity Market Directive
- No obligation to limit geographical proximity to the location of the operated energy source
- All CEC activities must be related to the production, consumption, sale or storage of **electrical energy**
- CEC is under no obligation to deal exclusively with renewable energies
- Wider portfolio of possible operated activities

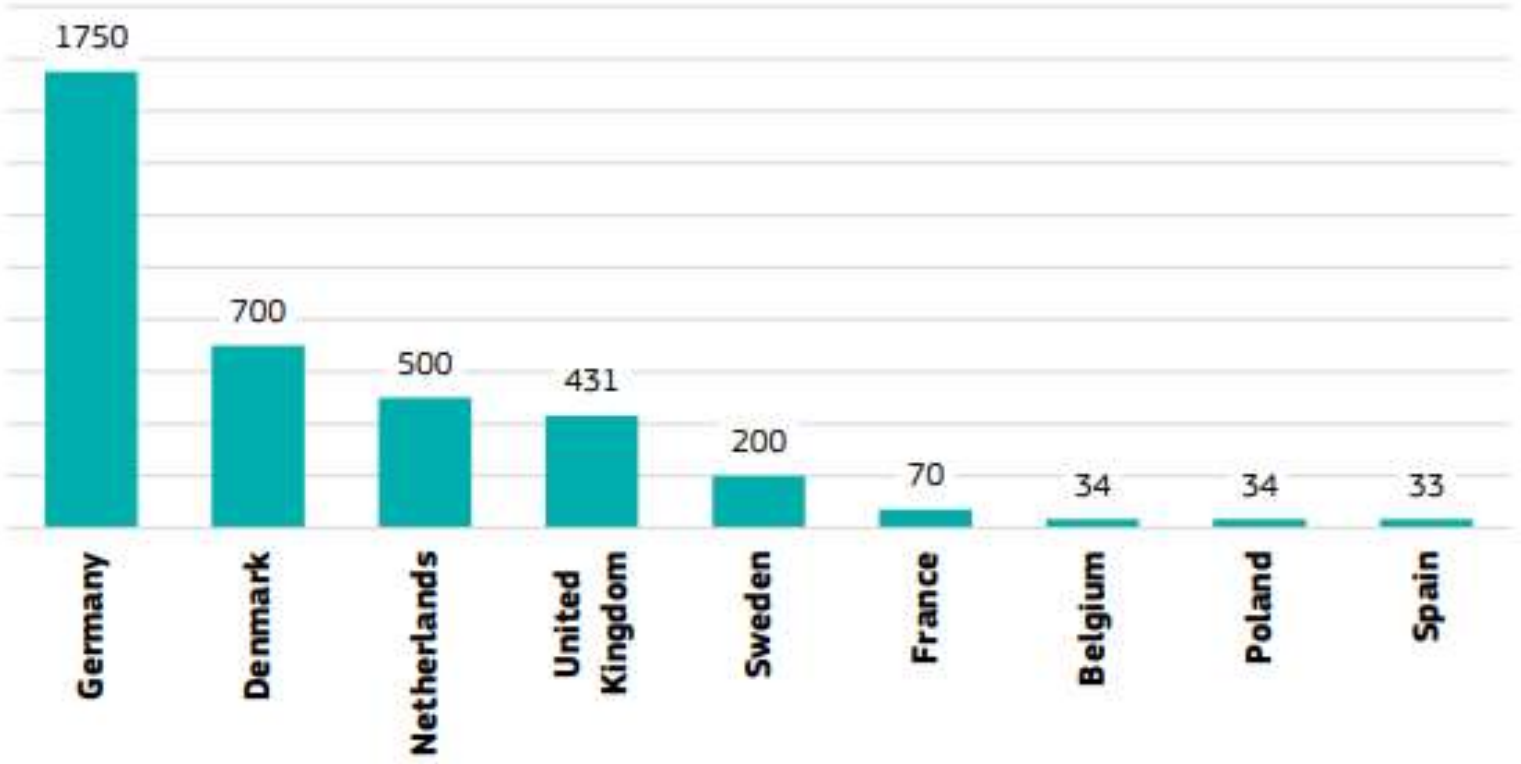
- **Renewable Energy Community**
- Renewable Energy Directive
- The REC operation must be connected only with energy coming from renewable energy sources
- REC is not limited to using only electrical energy but can also use other forms of energy (heat, cold), but must come from RES
- Condition of geographical proximity of subjects of effective control from the operated renewable energy source

Basic activities of CEC



Energy communities within EU

- REScoop study Mobilizing European Citizens to Invest in Sustainable Energy, more than 3,500 so-called renewable energy cooperatives



Motivation, Risks, and Barriers to EC Development

Technical

Economic

Social

Legislative/Regulatory

Technical benefits of EC

- Support the development and integration of renewable energy sources at all voltage levels
- Reducing energy dependence and increasing local self-sufficiency
- Use of modern and energy-efficient technologies (heat pump, storage, etc.)
- Smartening the energy grid

Technical barriers and risks connected to EC development

- Intermittent generation from RES and load fluctuation in the power grid
- Low CAPACITY factor of RES
- Effective seasonal accumulation is still lacking
- Lack of smart meters and inverters
  - Current market state
- Increasing demands for power balance management in the electricity system
- Increasing the technical requirements, especially of the distribution network
  - Strengthening of cable lines
  - Strengthening the capacities of transformation stations

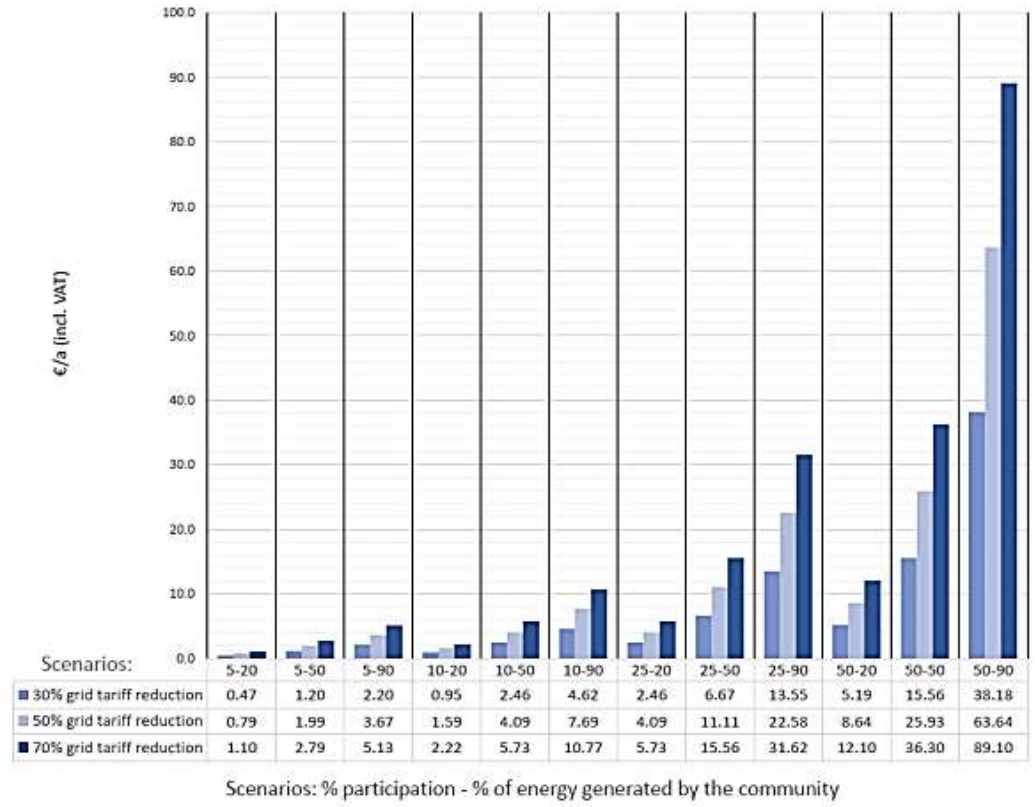
Economic benefits of EC

- Reduction of electricity costs for citizens and households
- Reducing the threat of energy poverty
- The possibility of participation of low-income households in the energy transformation
- Creation of local green investment projects
- Emergence of local value chains and support of regional development

Economic barriers and risks connected to EC development

- The threat of deviation from the original intention of "non-profit" collective actions and the emergence of business opportunities for large companies
- **The threat of unfair distribution of economic benefits among members of the community**
  - **SOLUTION = OPTIMIZATION OF THE ALLOCATION KEY AND THE POWER OF RES installed within the EC**
- **Reduction of collection of the total volume of network fees/charges of regulated stakeholders in the electricity market**
  - **Threat of passing of regulated costs to other non-community end customers**
  - **Closely linked to the legislative and regulatory framework of each EU member state**
  - **The need for a new perspective on the tariff structure - DYNAMIC TARIFFS**

Additive costs for non-participants of energy communities



- total lost revenues are subsequently distributed to the remaining customers and expressed as an increase in costs for the average household customer
- the participation rate of consumers in energy communities
- the energy produced and consumed by the community
- the amount of network fee reduction

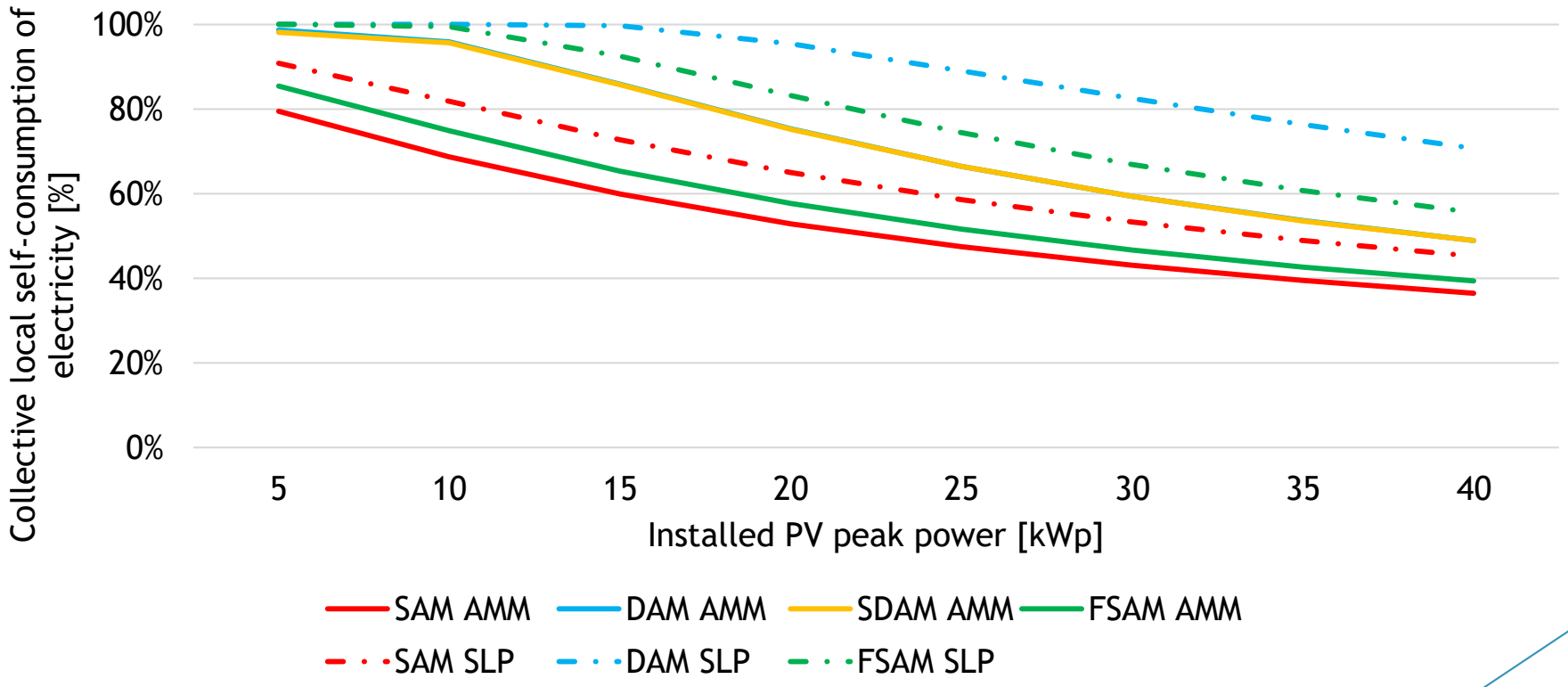
Our ongoing research of EC development

1. **Design and optimization of the operation of EC and energy management algorithms within the energy community**
2. Technic, economic, environmental, and social impacts and barriers to the development of energy communities
3. The effective setting of the legislative framework and setting of its regulation in the energy sector (design market aspects)

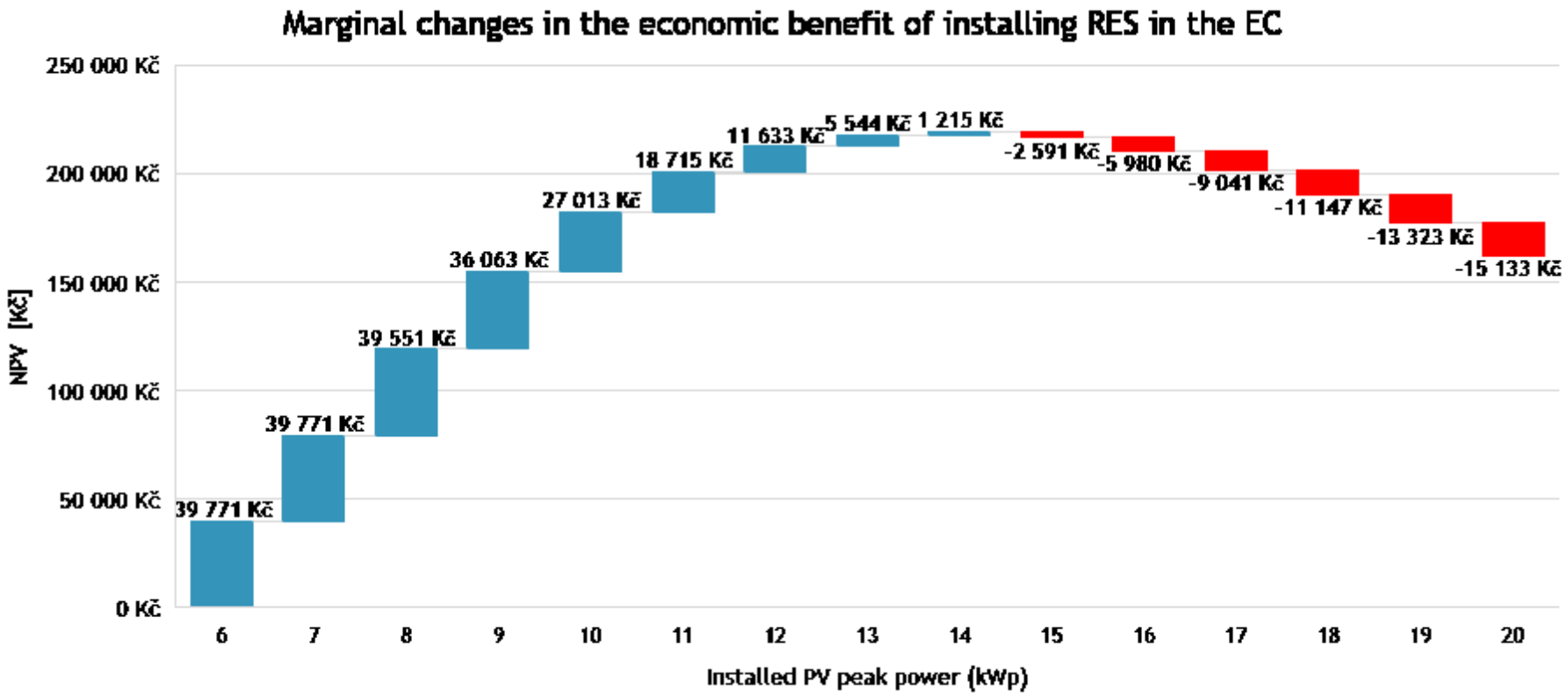
Examined allocation keys and model´s main inputs parameters

- Static allocation method (SAM)
- Floating static allocation method (FSAM)
- Static-dynamic allocation method (SDAM)
- Dynamic allocation method (DAM)
- 48 consumption points (households)
- Total aggregated EC consumption 65 MWh
- Installed PV power of 20 kWp
- Data evaluation time stamp 15 min

Sensitive analysis of the effect of different allocation keys and Pin



Optimization methodology



Main questions connected to EC development

1. **How should the tariff structure consider the local electricity production and its subsequent consumption among active energy community members?**
2. **How to achieve the maximization of economic and environmental benefits within community energy?**
3. **Can the more dynamic development of community energy threaten the stable operation of distribution systems?**

Conclusion

- ECs are an economically efficient solution under current market conditions and bring real financial savings to their members and a short payback period at OPTIMAL DESIGN
- The need for a comprehensive and integrated view of the EC and the identification of all parameters to MINIMIZE the impacts of the wider development of energy communities on the EC and the management and development of the network
- The need for a new market design and a change in approach in setting network fees

Thank you for your attention

Any Questions?