



Power grid - Virtual Power
Plant for demand responsive
energy production from
biogas plants



Agenda

- **Background** – Who is Fleco Power?
- **Motivation** - Why demand responsive energy production with biogas plants?
- **Implementation** – How does the Virtual Power Plant work?
- **Results** – What have we learned from the operation?
- **Outlook** – Where do we go from here?



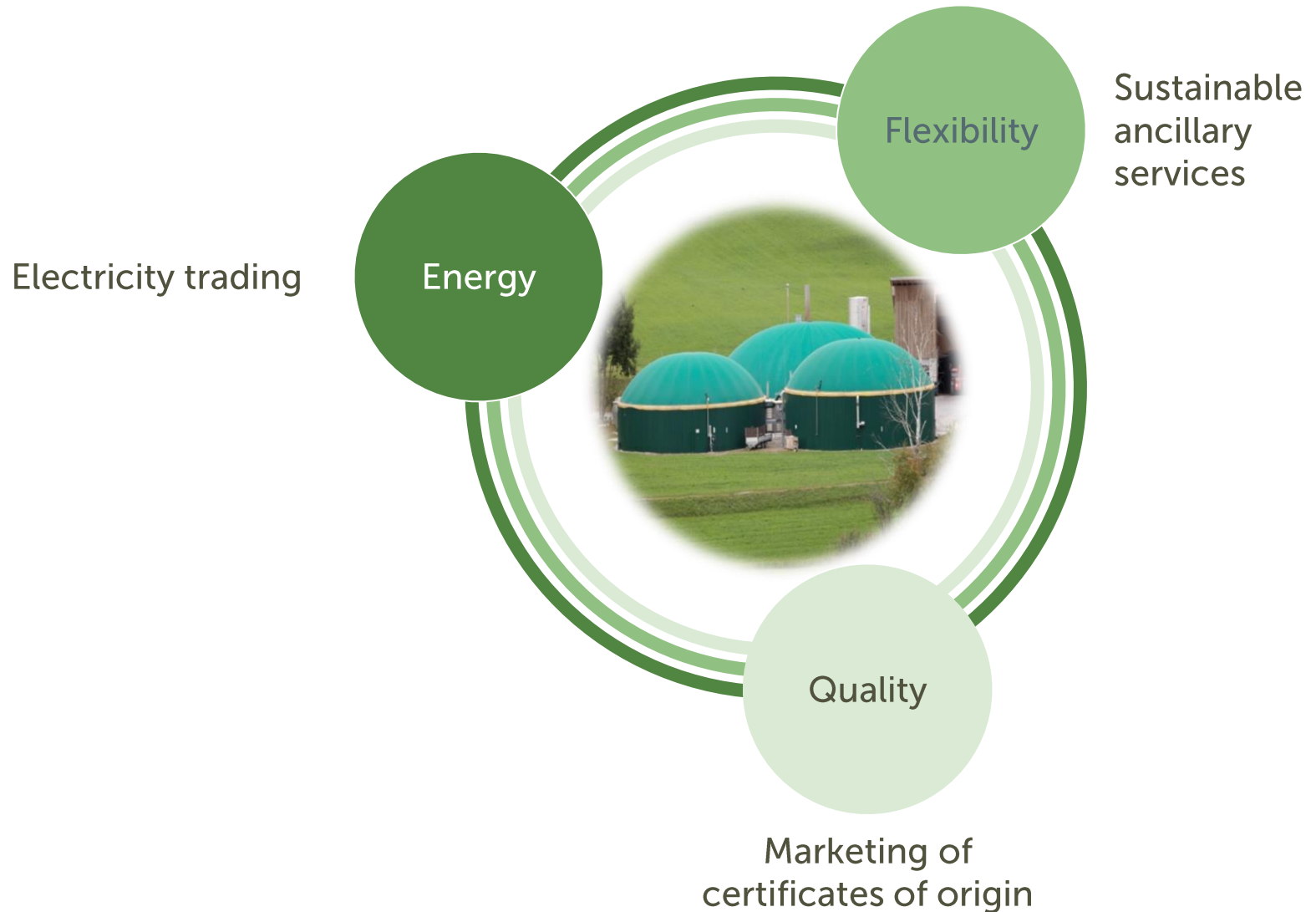
Fleco Power was founded by independent electricity producers to support the buildup and operation of decentralized, renewable generation



Gemeinsam für den Strom von morgen.



The key to an economical operation of renewable production units lies in a comprehensive marketing of all potentials





To unlock these potentials Fleco Power operates the first «Virtual Power Plant» in Switzerland with exclusively new renewable energies¹



- Through the «Virtual Power Plant», we are **in the market** providing **sustainable ancillary serves around the clock**
- Our experience shows that **decentralized production units** can be **efficiently marketed and controlled through a central stakeholder**



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Controllable generation is necessary to keep electricity consumption and production in balance – decentralized generation can make an important contribution





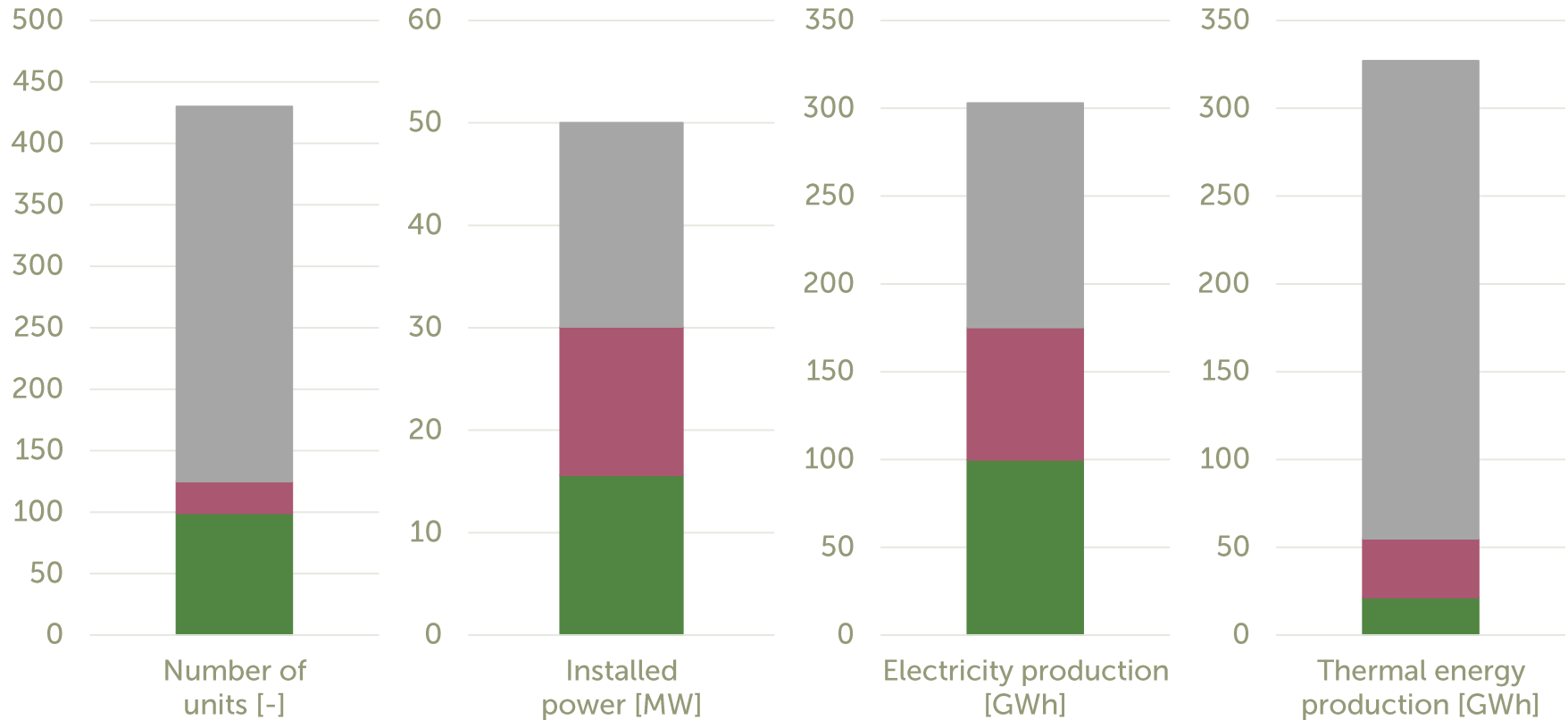
Biogas is very well suited to demand responsive energy production because it is controllable and contains gas storage within the process at no extra cost



Local boundary conditions like minimum power levels, heat delivery contracts or limits in the gas storage **can lead to constraints on the available flexibility.**



The installed base for biogas in Switzerland is substantial, with agriculture, industry and wastewater providing the biggest contributions



The Swiss biogas potential is only partially utilized. A Swiss government white paper estimates an additional potential of almost 2 TWh_{el} per year.



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The buildup of the Fleco Power «Virtual Power Plant» has been supported by the Swiss Federal Office of Energy through funding for a pilot project



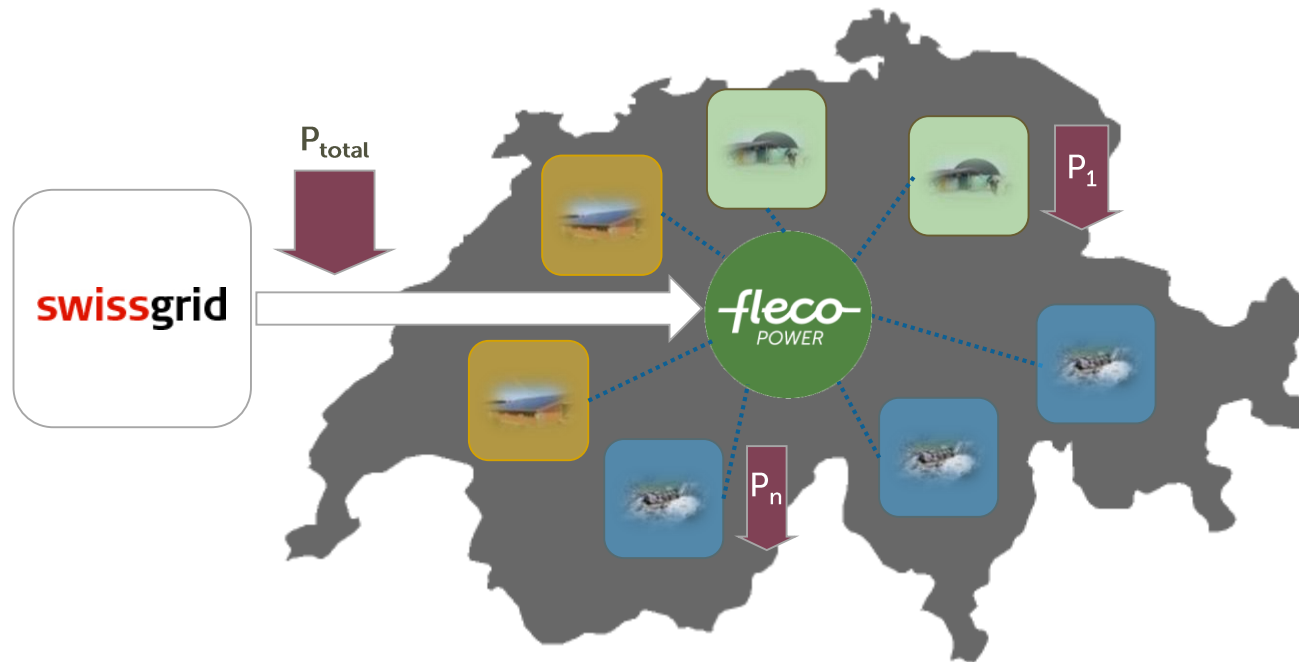
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Bundesamt für Energie BFE

The main application at the moment is the provision of **tertiary negative balancing power** for the Swiss Transmission Grid Operator **Swissgrid**.



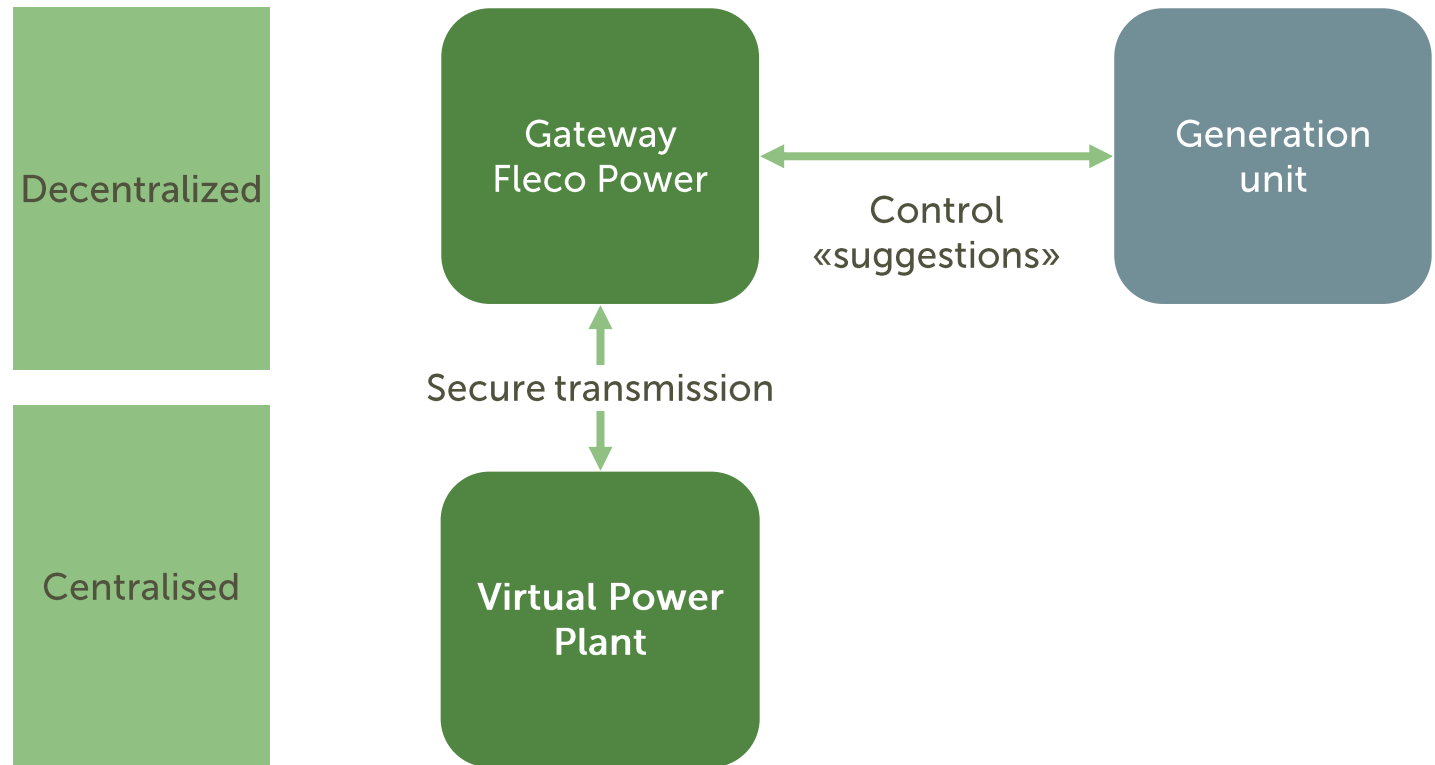
The «Virtual Power Plant» is an IT Platform through which Fleco Power controls the output of connected decentralized renewable generation assets



The central control system forwards the control commands to the individual systems.



The individual generation units are connected to the «Virtual Power Plant» through a Fleco Power communications gateway

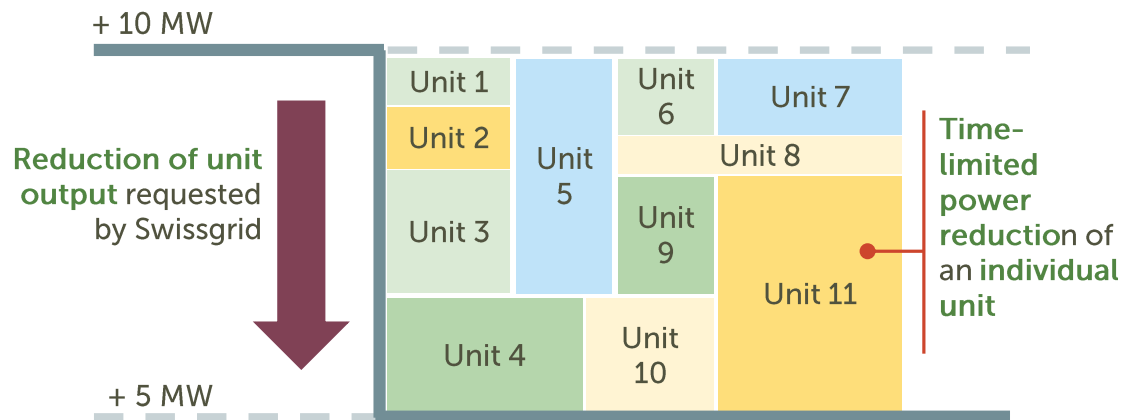


The Fleco Power system gives precedence to local operations, control signals are «suggestions» that will be executed only if circumstances allow. This strengthens the operators' trust that their processes will never be adversely impacted.



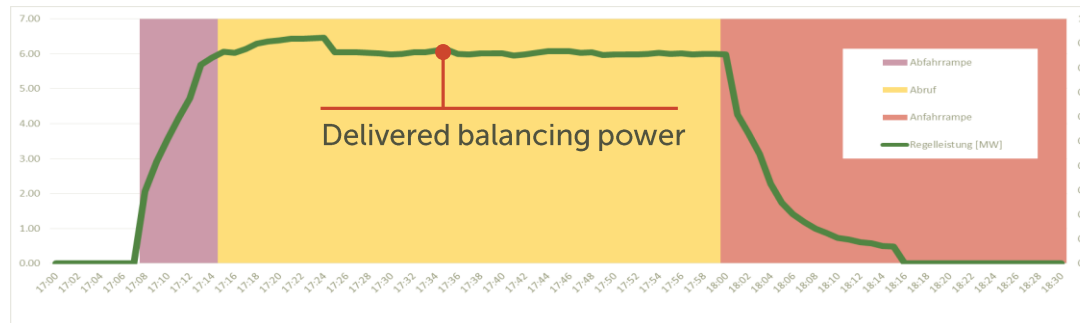
The flexible production is delivered through the combination of many individual units – as the example of tertiary negative ancillary services shows

Concept



Fleco Power deals with all required tasks such as production forecasts or schedule management

Experience



- 6 MW over 45min
- 37 decentral Units active



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Our experience of operating the «Virtual Power Plant» has shown that the concept adds value for all involved stakeholders

Electricity producer

- **Proven solution:** Participation in the ancillary services market with **minimal effort**
- Plants directly **support the stability of grid**
- **Development of new capabilities** without compromising **operative independence**

Additional income with minimal impact on daily operations

Transmission system operator

- **Single point of contact:** Large number of small units accessible through single aggregator
- **Testing ground** for a sustainable energy future (i.e. integration of solar PV)
- **Competitive pressure** on balancing power prices

Building the control infrastructure of the future energy system

Fleco Power

- **Revenues** through provision of services to independent producers
- Technical **proof-of-concept for new ideas**
- **Foundation for new services** and business opportunities

Developing a portfolio of services for decentralized generation



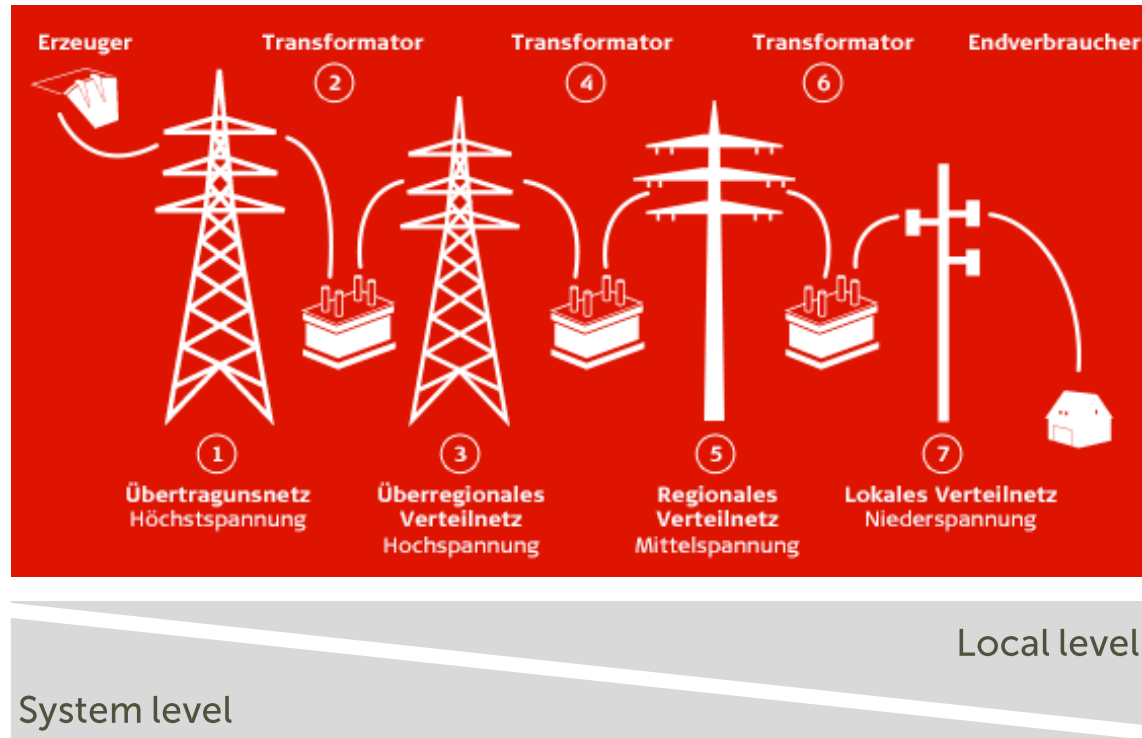


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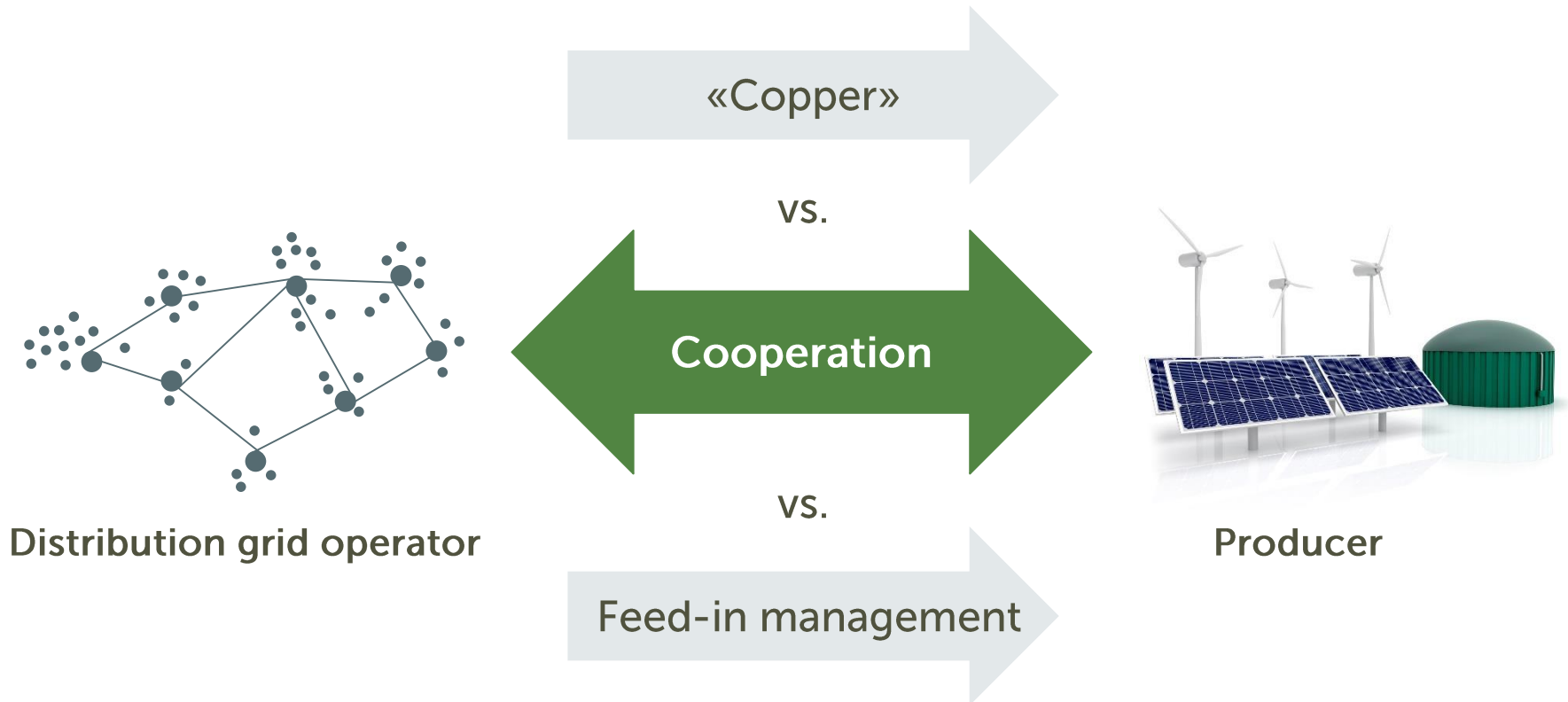
By taking into account local conditions, the flexibility can be given an even higher value, for example through the avoidance of network extensions



Fleco Power is currently developing a **market-based concept** for the **cooperative use of flexibility** in the distribution grid



Our vision is a cooperative approach to integrating and optimizing decentralised generation in the distribution grid





We look forward to your questions and contact



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