Blockchain technology and peer-to-peer trading in energy communities: A regulatory perspective

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Energy communities in the Clean Energy Package and beyond

European Union‘s Clean Energy Package (2016/2018)

- shall bring EU and member states on track for climate targets
- includes several legal acts, e.g.,
  - revised Renewable Energy Directive (EU) 2018/2001 (RED)
  - revised Electricity Directive (EU) 2019/944 (ED)

Deadlines for national transposition:

- ED until December 2020
- RED until June 2021

Austrian draft (March 2021) expected to come in force in summer - fall 2021

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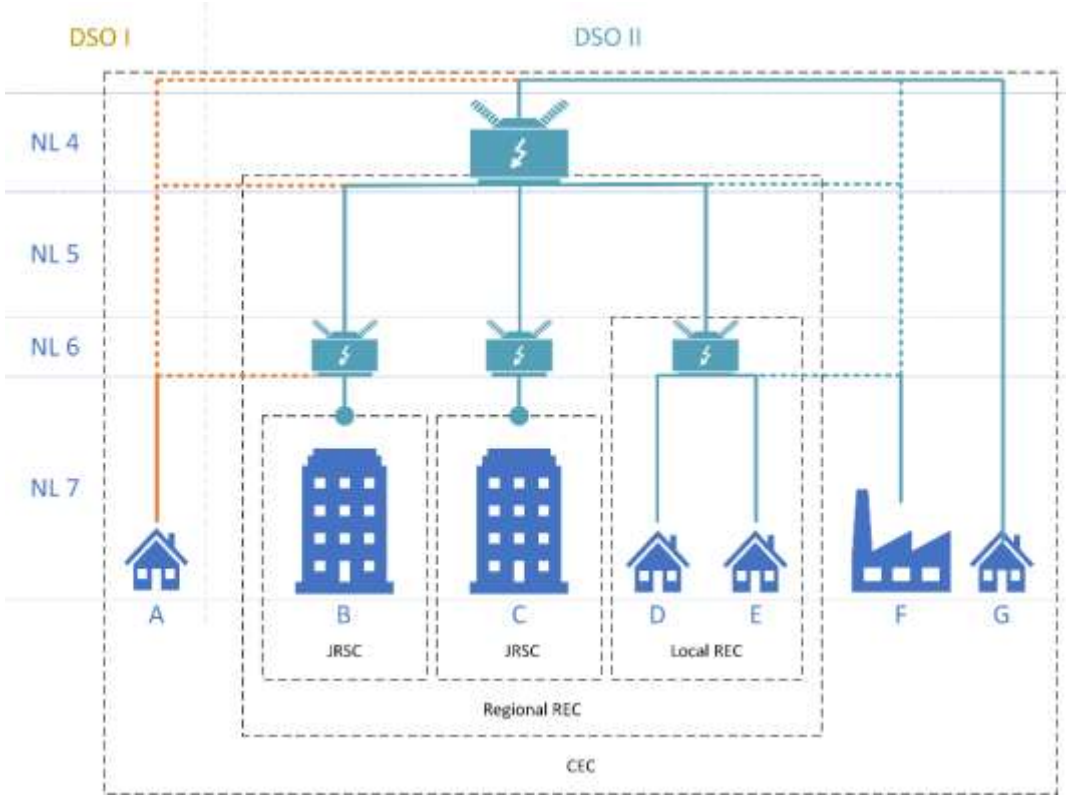
Energy communities in the Clean Energy Package and beyond

They introduce several new actors to the energy market:

- **Level 1 (Single houses):**
  the ‘renewables self-consumer’ (RSC)
- **Level 2 (Multi-apartment buildings):**
  the ‘jointly acting renewables self-consumers’ (JRSC)
- **Level 3 (Local or regional communities):**
  the ‘renewable energy community’ (REC)
- **Level 4 (Larger-scale communities):**
  the ‘citizen energy community’ (CEC)



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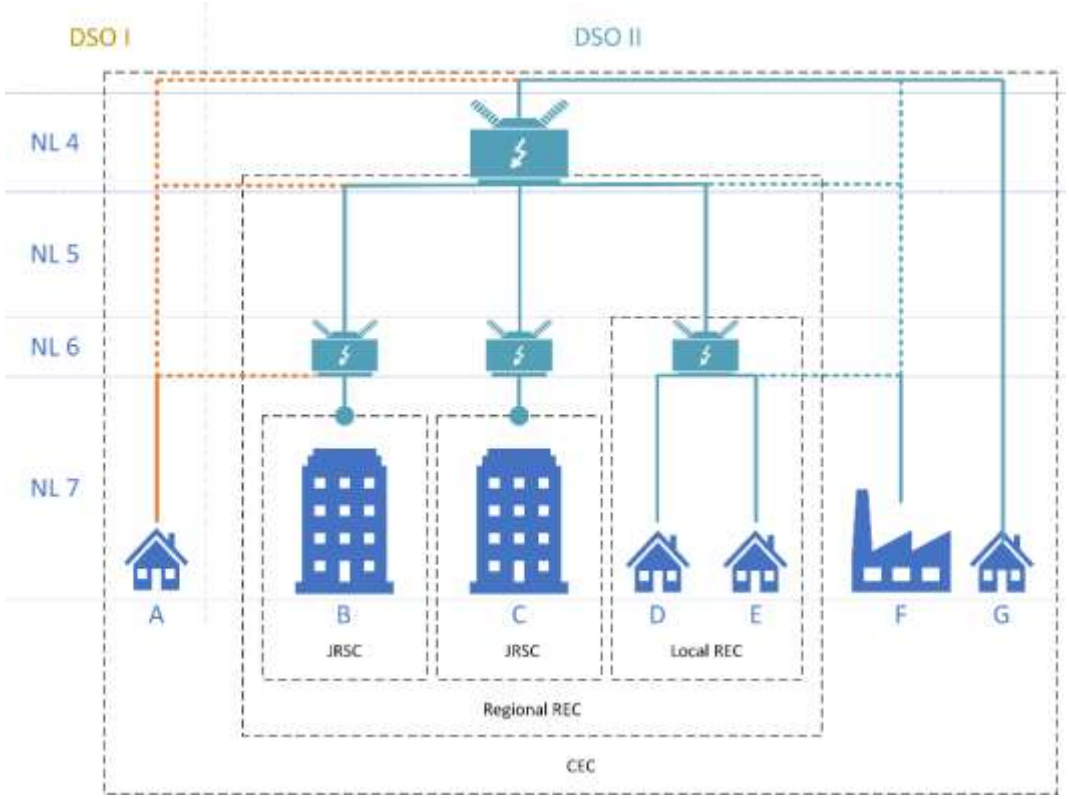
Energy communities in the Clean Energy Package and beyond

- Financial profits shall not be the *primary* focus of the community, but rather environmental, social, and economic community benefits.
- However, individual savings will be an important factor for possible participants to decide on joining.
- Austria foresees reductions of grid tariffs, taxes, and fees for REC participants.



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Energy communities are gaining significance as energy market players

Energy communities

- gain significance to become an essential element of future energy systems
- contribute to abating the effects of climate change
- provide local countermeasures against blackouts
- are recognized as important players in several national energy and climate plans.

RED: “The participation of local citizens and local authorities in renewable energy projects through renewable energy communities has resulted in substantial added value in terms of local acceptance of renewable energy and access to additional private capital which results in local investment, more choice for consumers and greater participation by citizens in the energy transition. […] Measures to allow renewable energy communities to compete on an equal footing with other producers also aim to increase the participation of local citizens in renewable energy projects and therefore increase acceptance of renewable energy.”

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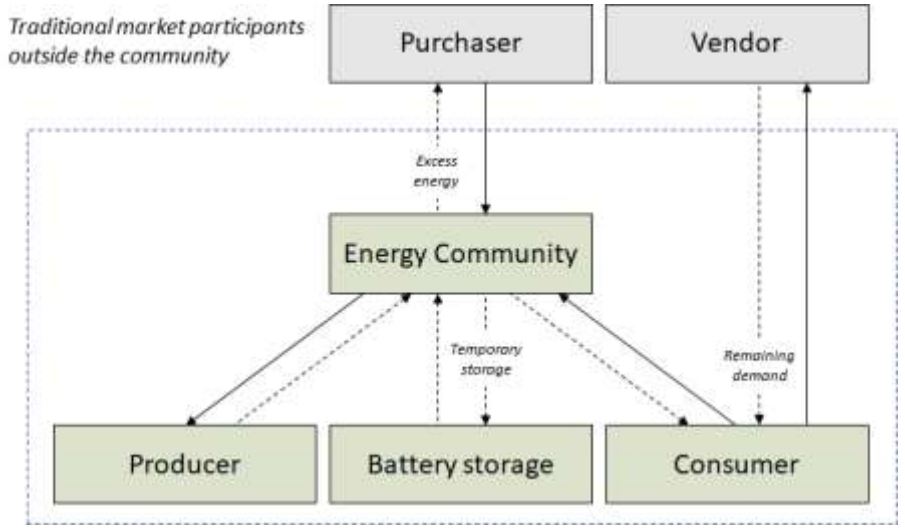
Structure of an energy community

Concrete organizational structures of energy communities differ depending on whether they are operating in an urban or a rural area.

However, in every community there will be

- producers/prosumers (e.g., houses equipped with photovoltaic panels),
- some consumers (e.g., houses as well as e-car charging points), and
- potentially a (community-owned) storage unit.



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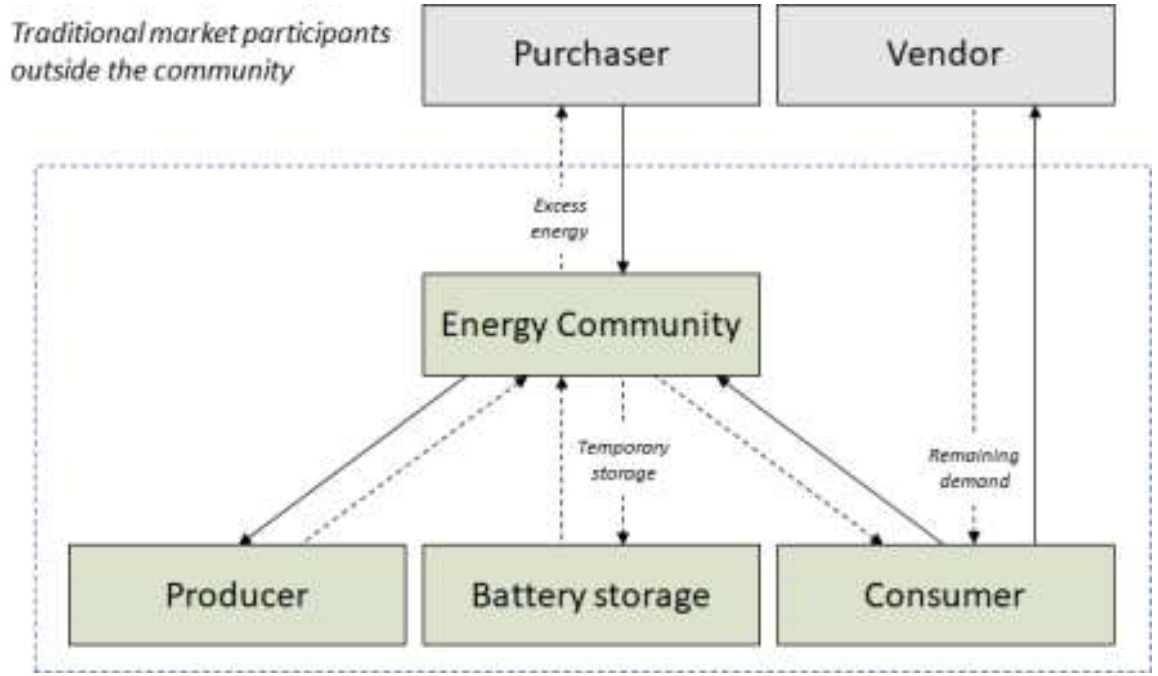
Structure of an energy community

- Energy community can temporarily store energy
- further excess energy can be sold.
- Demand that cannot be met by the community itself is purchased from a traditional supplier.



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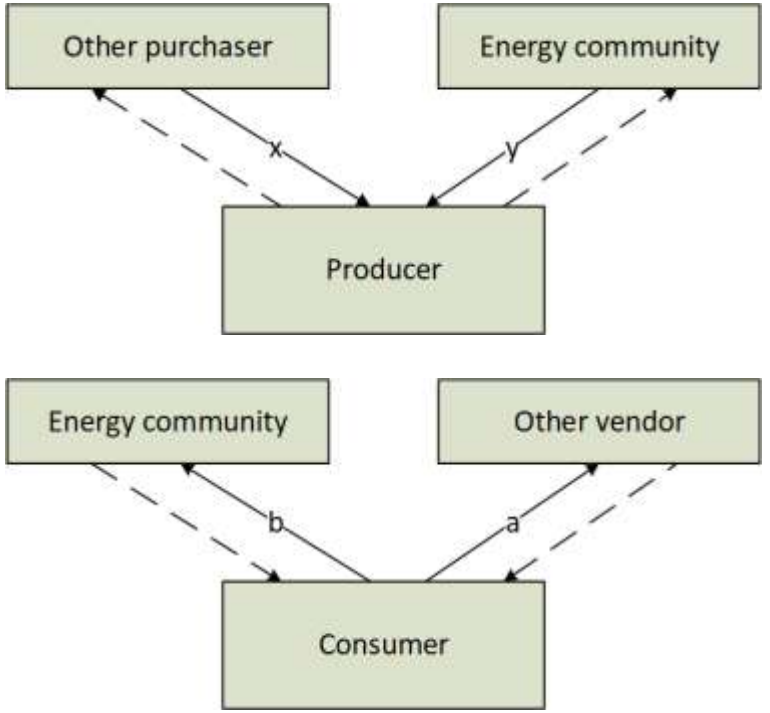
Structure of an energy community

Excess energy primarily allocated to consumers within the community to maximize consumption within the community:

- Producer should receive more money for selling energy to the community than to other traditional purchasers ($y>x$).
- Consumer should pay less money for purchasing energy from the community than from traditional supplier ($b<a$).
- Energy community is not expected to make a profit, break-even is sufficient ($y<b$).



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Blockchain for the implementation of energy communities

- Use of Blockchain technology increasingly trialed and implemented in several areas, including the energy sector.
- Provides attractive properties for implementing smart automated applications in energy communities
- Questions on how Blockchain-based solutions for energy communities should be regulated, either by EU regulations, directives, or national regulations.
- Participation in RECs is restricted; they shall be ‘autonomous from individual members and other traditional market actors that participate in the community as members or shareholders’. DSOs and traditional energy supplier are precluded.
- Thus, there is no specifically designated authority for the operation of the energy community.
- However, directives require energy communities to be incorporated in some legal form.

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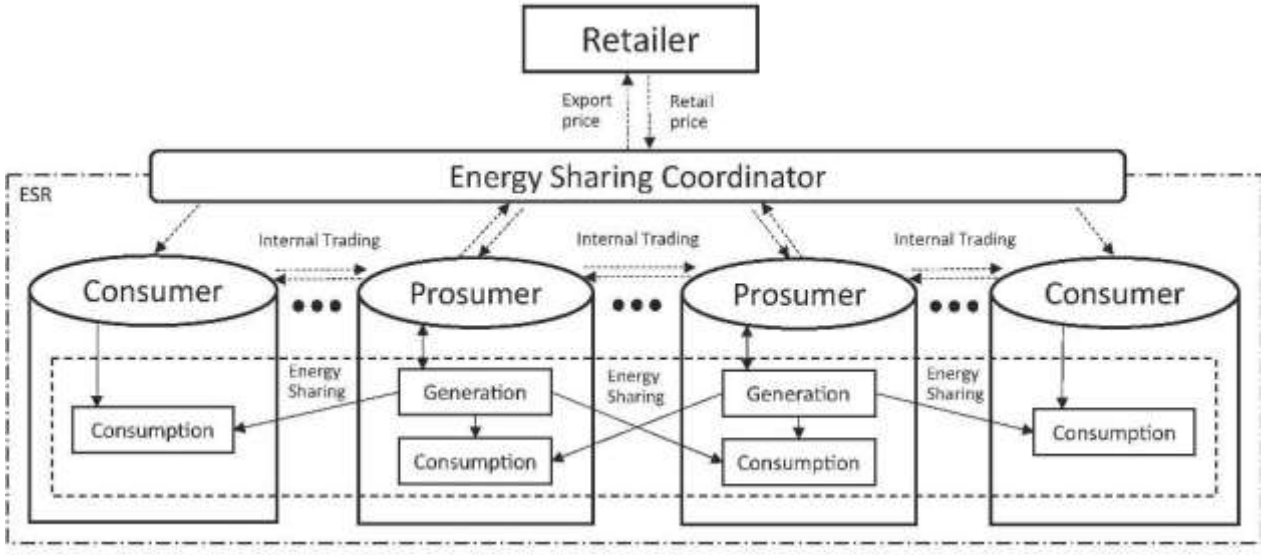
P2P energy trading

- Direct (horizontal) energy trading between prosumers and consumers without requiring an intermediate party for allocation, selling and accounting.
- Concept is not restricted to energy communities and their participants.



- RED addresses ‘peer-to-peer trading of renewable energy’ as *“the sale of renewable energy between market participants by means of a contract with pre-determined conditions governing the automated execution and settlement of the transaction”* → appears to legally consider Blockchain including smart contracts.

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Legal aspects of Blockchain and P2P trading in (R)EC

- Various legal disciplines need to be considered for the use of Blockchain technology.
- Privacy-preserving implementation of an REC prototype in previous work:
  It can be implemented in accordance with the legal requirements, certain compromises will be necessary.
- Energy consumption data of households are personal data;
  smart meters with high-resolution readings will be required for an adequate operation of energy communities.
- Operation and reading of the meters in Austria are responsibilities of the DSO,
  needs to be specified when and how data will be delivered to the energy community operator

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Legal aspects of Blockchain and P2P trading in (R)EC

Fundamental consumer rights (e.g., data protection) not trivial to reconcile with inherent properties of Blockchain:

- GDPR requires personal data to be kept only as long as required for the legitimate reason.
- Personal data must be corrected when wrong and can be demanded to be deleted.
- ‘Controller’ as responsible party for compliance with the GDPR,
  but who takes over this role in a Blockchain environment?
- Requirements cannot be met by a Blockchain per se, as data on the Blockchain is inherently immutable and eternal, and there is usually not one designated operating authority.
- However, in the observed use case, a responsible authority is available (energy community needs to be incorporated in a legal form).

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Legal aspects of Blockchain and P2P trading in (R)EC

Two further novel GDPR concepts applicable to Blockchain and P2P:

- New inventions designed in a way that privacy is considered from the beginning and not as a subsequent add-on (**Privacy by Design**).

- **Data protection impact assessment (DPIA)** to reduce the risks of misusing personal data if the processing operation is 'likely to result in a high risk to the rights and freedoms of natural persons'.
  DPIA is appropriate:
  - if new technological solutions are used,
  - if data processing is carried out on large scale or
  - if automated processing leads to decisions that have a legal effect for natural persons

    → all criteria applicable to the use of Blockchain technology.

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Smart contracts

- Trading traditionally formalized by a contract between at least two parties.
- Automatically executed contracts often referred to as ‘smart contracts’.
- They use software, programmed to act in a certain way, to execute transactions once determined conditions are met.
- For energy market use cases: allocation of energy within a community, archive in Blockchain and subsequent accounting.
- Smart contracts fall under ‘automated decision making with legal or similar effects’ according to GDPR and thus pose additional issues regarding data protection.
- Not clear whether and how national regulations will support or allow innovative approaches such as auction-based allocations.

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Conclusions

- Current European energy policy centered around integrating renewable energy sources and new technologies into the energy systems and markets; consumer to be the cornerstone.
- (R)EC can ensure active participation of consumers, covering their demand, generate savings and value for themselves and the community.
- Blockchain is not specifically mentioned in the current European regulatory framework and several issues, esp. with data protection exist.
- As P2P trading has only recently been addressed to a very limited extent in the RED, questions arise how it can be operationalized (e.g., role of the DSO, data exchange) and on the utilization of smart contracts (regulatory context and their connection with traditional contracts).
- **Enabling conditions for Blockchain technology need to be further acknowledged in the regulatory framework, while legally mentioning P2P trading was a first step.**

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