Fostering Energy communities

Eva Winters

TNO

AmsTErdam BiLbao cItizen drivEn smaRt cities

atelier
Positive Energy Districts

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What is an energy community?

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Thesis I: Only by working together we will be able to decarbonize

Some facts about a changing energy market

Production and consumption

Energy markets used to be solely dominated by large scale producers (often fossil based)

Small household customers just ‘use’ energy, they don’t produce

Balancing

For keeping the system in balance at all time: the system operator has agreements with large producers and (industrial) consumers

Grid management

For staying withing the available net capacity the TSO/DSO has agreements with large producers and industrial consumers

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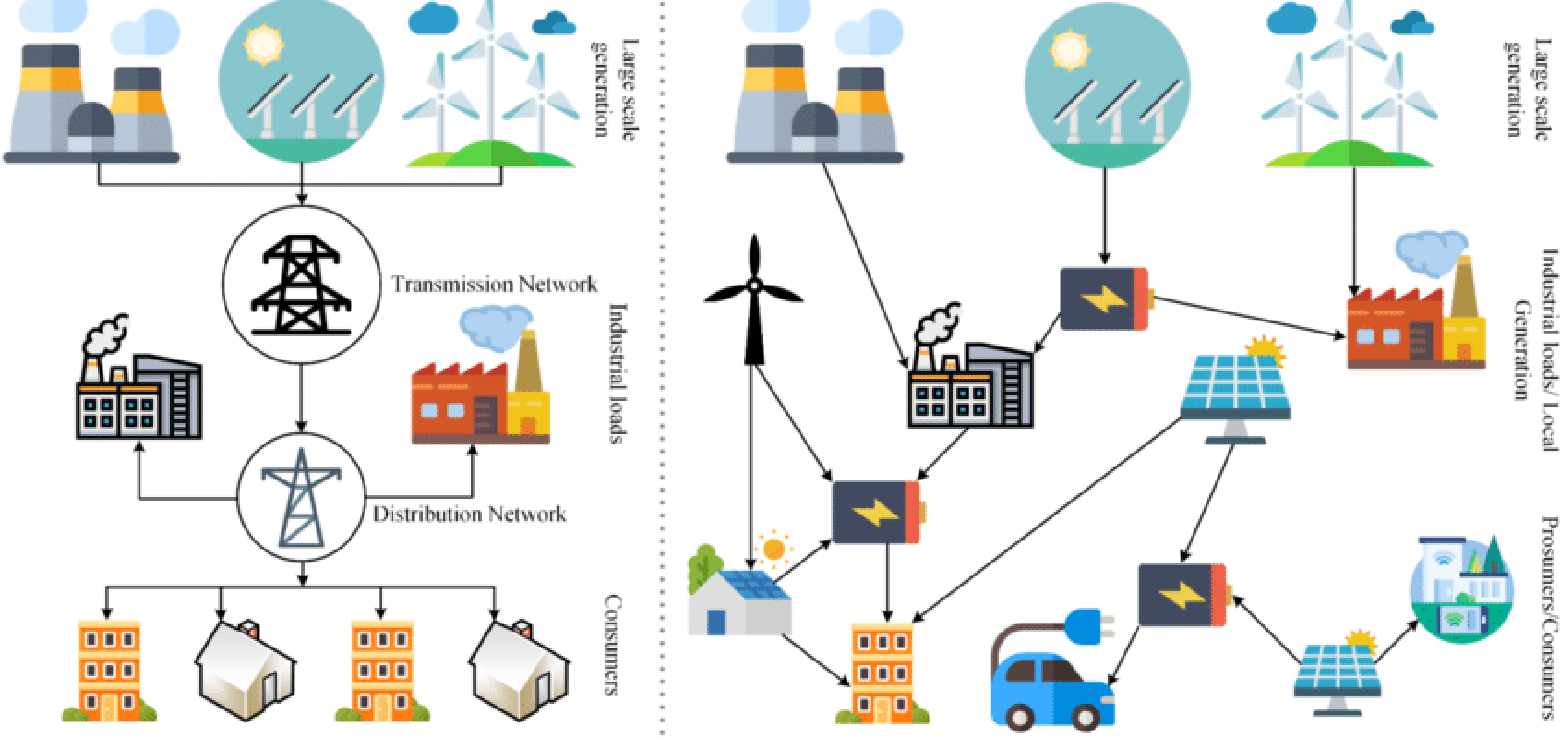
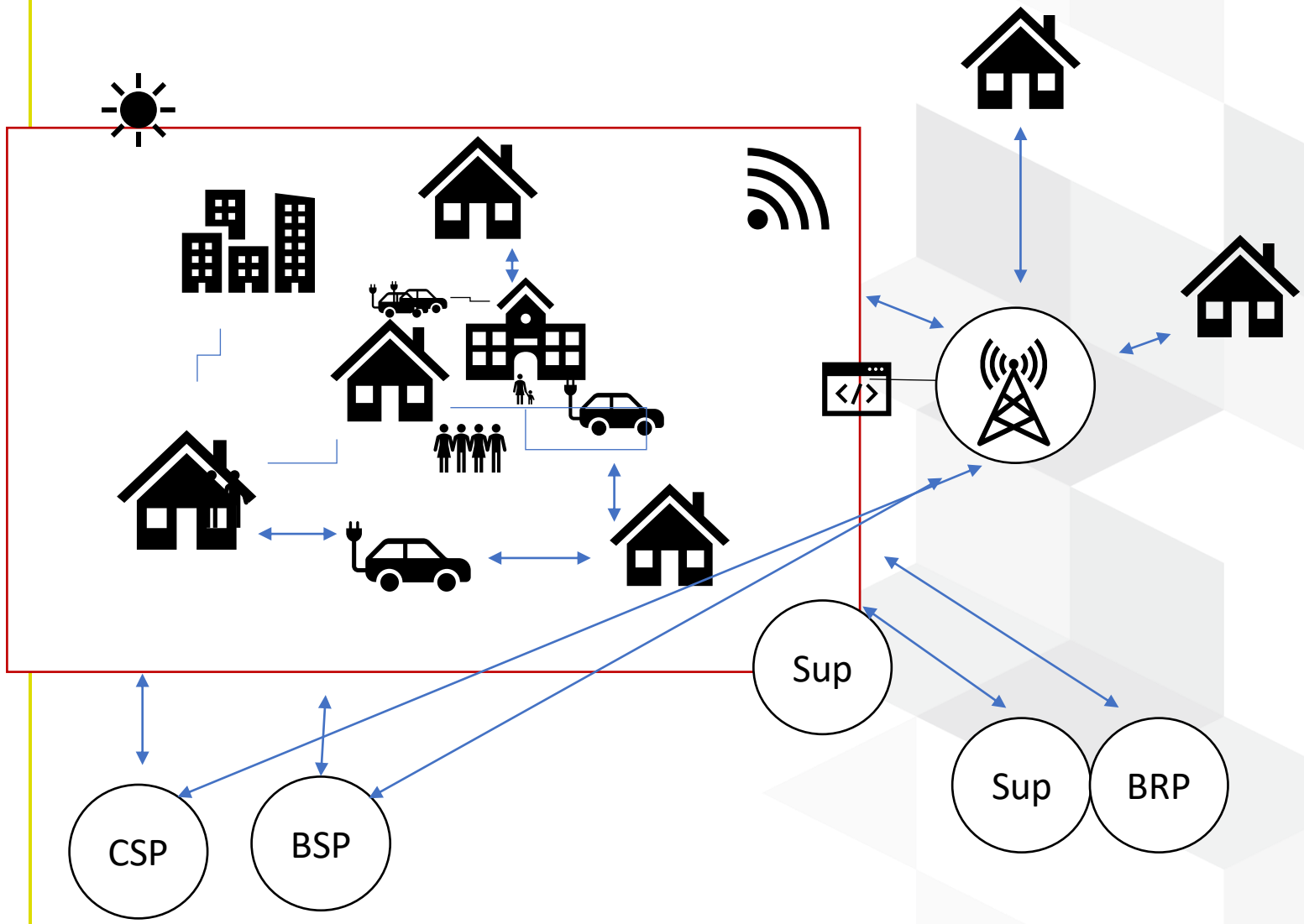


Source: Khorasany (2019)

Changing relations



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Some challenges due to a changing energy market

- Increased RES will cause challenges in terms of balancing
- Electrification will be a challenge for grid capacity
- Many new participants will be a challenge for security of supply
- Many small producers will be a challenge in terms of contracting

To solve these challenges we can go roughly two directions:

1. Keep everything as it is: only large players ‘taking care of everything’ (not an option)
2. **Working together**

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The role of the collective in the future energy system and EU energy markets

Energy communities: 4 official definitions of energy communities, active consumers

EU exploring Energy hubs and collaborative approached for businesses

Implementation of aggregation: combining multiple customer loads or generated electricity for sale, purchase or auction in any electricity market

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What are ECs in EU legislation?

Art. 2 (11) (Directive 2019/944)

*'citizen energy community' means a **legal entity** that:*

*(a)is based on voluntary and open participation and is **effectively controlled by members** or **shareholders** that are **natural persons, local authorities, including municipalities, or small enterprises**;*

*(b)has for its primary purpose to **provide environmental, economic or social community benefits** to its members or shareholders or to the local areas where it operates rather than to generate financial profits; and*

*(c)may engage in **generation**, including from renewable sources, **distribution, supply, consumption, aggregation, energy storage, energy efficiency services** or charging services for electric vehicles or provide other energy services to its members or shareholders;*

- ***Governance***
- ***Purpose***
- ***Activities***

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EU definitions of Energy communities

- Citizen energy community (art. 2(11) and 16 EMD 2019/944)
- Renewable energy community (art. 2(16) and 22 RED 2018/2001)
- Active customers (or jointly acting customers) (art. 2(8) EMD 2019/944)
- Jointly acting renewables self-consumers (art. 2(15) RED)

	Renewable energy community	Citizen energy community	(jointly) active customers	Jointly acting renewable self-consumers
Organisation	X	X	-	-
Governance	X	X	-	-
Renewable	X	-	-	X
geographic proximity	x	-	-	X

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Thesis II fostering energy communities takes more than a definition

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What should energy communities be able to do?

Activities:

- Generation
- Distribution (optional)
- Supply
- Consumption
- Aggregation
- Share
- Energy storage
- Energy efficiency services
- Charging services for electric vehicles
- Etc.

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Current status of EC in Latvia

From RESCoop:

- The transposition in Latvia is in progress
- Energy communities are defined by Law
- However it is unclear if supporting laws and regulations are in place

According to the progress report from RESCoop:

- No formal assessment of potential barriers has been carried out
- Removal of unjustified barriers is not assessed
- Technical regulations around energy sharing are currently being developed
- State-aid schemes are explored, but not yet in place

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How to support energy communities? A few examples from the NL

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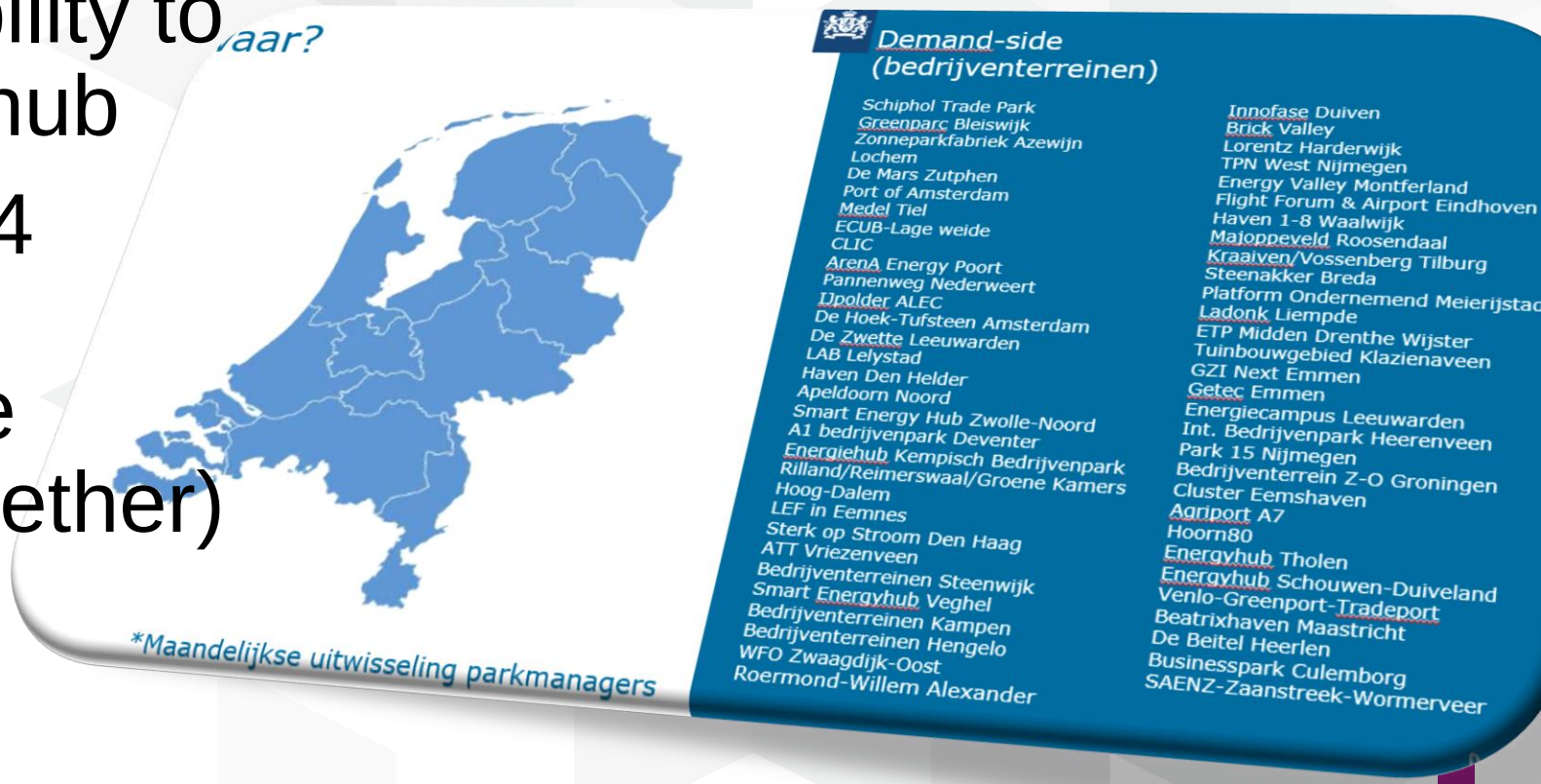
Some Dutch facts

- Today there are around 700 energy communities
- 60+ business parks are exploring the possibility to become an energy hub
- Since approx. 2014 there is a national association; Energie Samen (Energy Together)



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Drivers for energy communities

Subsidy/ state aim schemes for individual and collective RES production

- Since 2004 **individual households** with PV are allowed to deduct the electricity they produce (behind the meter) from the electricity they consume on an individual household level (so called netting). For every kWh they produce they do not pay the sourcing cost (energy component) and energy taxes.
- With the innovation in solar this resulted in a payback period in the resent years (before the energy crisis) of less than 6 years!
- To even out the **inequality between** households with their own roof a households with a **shared roof**, or no roof, a new scheme was introduced for collectives
- Since 2013 collectives, which are either organized under a cooperative or a owners association, get a reduction on the energy taxes + vat. The kWhs are sold to a supplier.

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Drivers for energy communities II

- I. Cooperatives with members in the proximity can use the tax reduction
- II. Cooperative investing in larger installations can get a feed-in subsidy based on wholesale prices; min price guarantee per kWh
- Today subsidies on the kWh price are hardly needed, however…
- Due to the experience with wind and solar, getting finance is no longer a large barrier; we have key numbers and BC is reliable. Banks are willing to step in.
- However, cooperatives that want to invest in district heating are struggling. There is a lack of experience and financers are reluctant. Development costs are high.

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Legal

What needs to be in place for development of collective RES production is:

- Right to connect
- Right to transport
- Right to collectively own assets
- A reasonable fee for the produced kWh
- A suitable legal entity for the energy community
- A governance structure that puts control in the hands of members (small, non-commercial)
- Cooperation with an energy company f.e. to be in charge of administration and billing, forecasts, nomination, BRP etc. charging a reasonable fee for these services

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Social

- To support energy communities, citizens need to be able to organise themselves.
- Local governments could play an important role in supporting bottom up developments in civic society
- National government could support the development of energy communities by providing open-source information on how to organise and set up an energy community, provide free expertise etc.
- Develop support scheme for the initial development phase
- In the NL the national association for energy cooperative played a major role in representing the energy communities on a national level. They also play an important role in sharing knowledge and hands on expertise (f.e. movent building, legal and financial expertise can be used by the individual cooperations)

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Energy communities can do so much more

Energy communities (and hubs) can not only play a role in generation, but also in:

- Engagement of citizens and other non-energy market players
- Balancing demand and supply
- Avoiding grid congestion (optimal use of existing infrastructure)
- Development of storage and conversion technology
- System integration: electricity and heat, but also power-to-X
- stabilizing energy prices
- Play a role in more integrated planning

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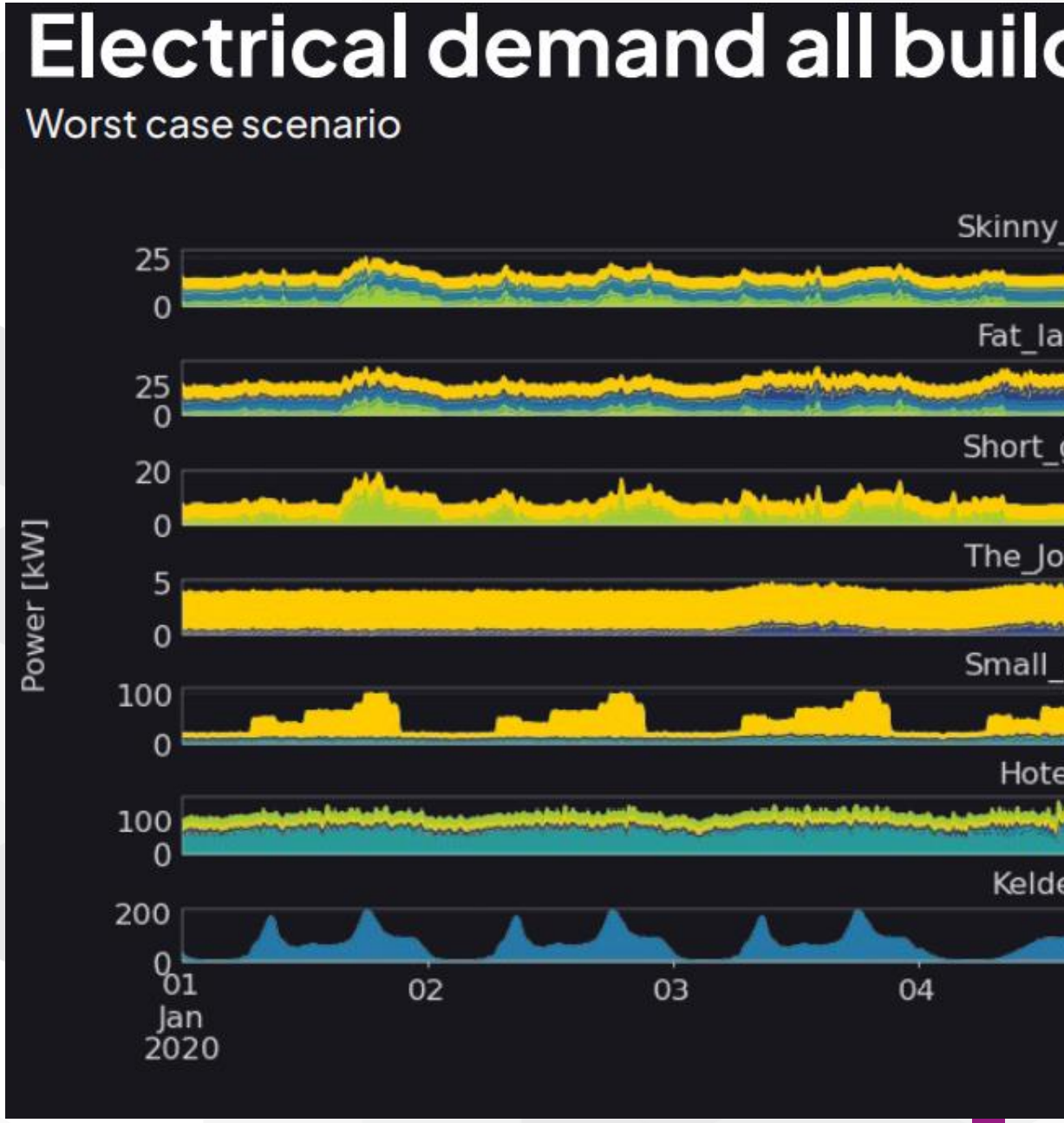
An example from the Atelier project on congestion

- In the Netherlands communities and hubs are contributing in avoiding congestion
- Atelier: energy community Republica has a **transport limitation due to congestion**
  - Flex assets are used to stay under the transport capacity. Only possible due to the community and cooperation between individual connected customers
  - Due to the community more customers were connected and can operate



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Conclusions

- Working together in an energy community (or hub) is needed in a decarbonized, decentralized, integrated and digital energy system
- Groups can contribute to solving many challenges
- Implementation of Energy communities goes beyond defining energy communities in formal laws.
- To really support energy communities and let them contribute to balancing, congestion etc, additional rules are needed and MS should actively remove unnecessary barriers

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To unlock full potential of energy communities

- For the successful deployment of market activities the legislator, DSO and other energy companies play a crucial role.
- **Legislator:** needs to implement a proper aggregator framework, needs to make sure that ECs have market access (generation, supply, aggregation). Look at price incentives and evaluate the market design for possible barriers. Make funds available for the initial design phase
- **DSO/TSO**: become a (flex) customer of the energy community and develop your product/market in such a way that not only large parties but also communities and hubs have access
- **Energy suppliers:** Develop new services and products that support groups in becoming more active. (f.e. forecasting services, aggregator services, billing and administration services) Buy energy from energy communities and facilitate sharing schemes. Be willing to develop new business models that are not focussed on the kWh you sell

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Questions?

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Energy sharing

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What is energy sharing and what to consider when implementing energy sharing models?

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Energy sharing

A special activity for Energy Communities and Jointly acting renewable self consumers

Proposal for amending Electricity market directive: new article on energy sharing

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European Commission

ENTEC

Energy Transition Expertise Centre

Harmonized view on energy sharing implementations in Europe

Report – Multi-supplier models and decentralized energy

TNO innovation for life

Universiteit Utrecht

Part I EMD energy sharing

Proposed art. 15a

Right to energy sharing

1. All **households, small and medium sized enterprises and public bodies** have the right to participate in energy sharing as active customers.

(a) **Active customers** shall be entitled to share renewable energy between themselves based on private agreements or through a legal entity.

(….)

(c)Member States shall **ensure that active customers participating in energy sharing**:

(d)are entitled to have the **shared electricity netted** with their total metered consumption within a time interval **no longer than the imbalance settlement period and without prejudice to applicable taxes, levies and network charges**;

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Part II EMD energy sharing

(f) **have access to template contracts with fair and transparent terms and conditions** for peer-to-peer trading agreements between households, and for agreements on leasing, renting or investing in storage and renewable energy generation facilities for the purpose of energy sharing;

(g) are not subject to unfair and discriminatory treatment **by market participants or their balance responsible parties**;

(….)

(i) Member States shall ensure that relevant **transmission or distribution system operators or other designated bodies**:

(j)**monitor, collect, validate and communicate metering data related to the shared electricity** with relevant final customers and market participants at least every month, and in accordance with Article 23;

(k)provide a relevant contact point to **register energy sharing arrangements**, receive information on relevant metering points, changes in location and participation, and, where applicable, validate calculation methods in a clear, transparent and timely manner.

2. Member States shall take appropriate and non-discriminatory measures to ensure that energy poor and vulnerable households can access energy sharing schemes. Those measures **may include financial support measures or production allocation quota**.

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Basis for energy sharing now

Renewable energy directive (2018/2001)

Art. 15: jointly acting renewable self consumers (JARSC): sharing in a building

Art. 2 (16) jo art. 21 Renewable energy community: Renewable energy communities should be able to share between themselves energy that is produced by their community-owned installations

Electricity market directive

Art. 16: the ability to arrange “the sharing of electricity that is produced by the production units owned by the community” among their members or shareholders based on market principles, even over the public network.

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Energy sharing

- Energy sharing is the activity of administratively attributing renewable energy to consumers where the renewable energy installation is controlled by these consumers in a shared role of a non-professional or not-for-profit producer
- Having control is possible via ownership or by leasing or renting
- Whether energy sharing is energy supply is not something to be discussed without context!

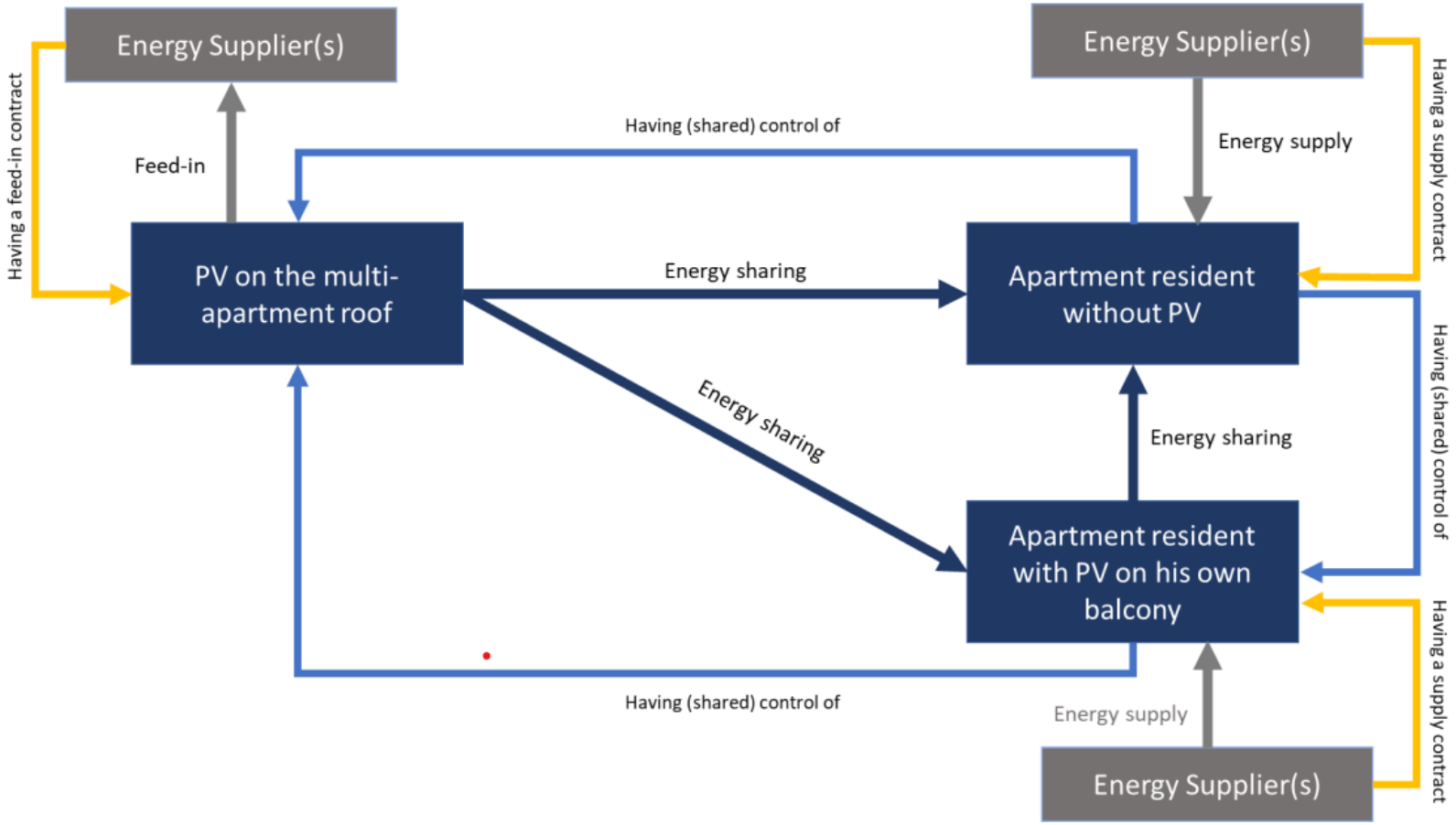

Figure 1 **Illustrative example where energy is shared from the PV installation of a multi-apartment building**

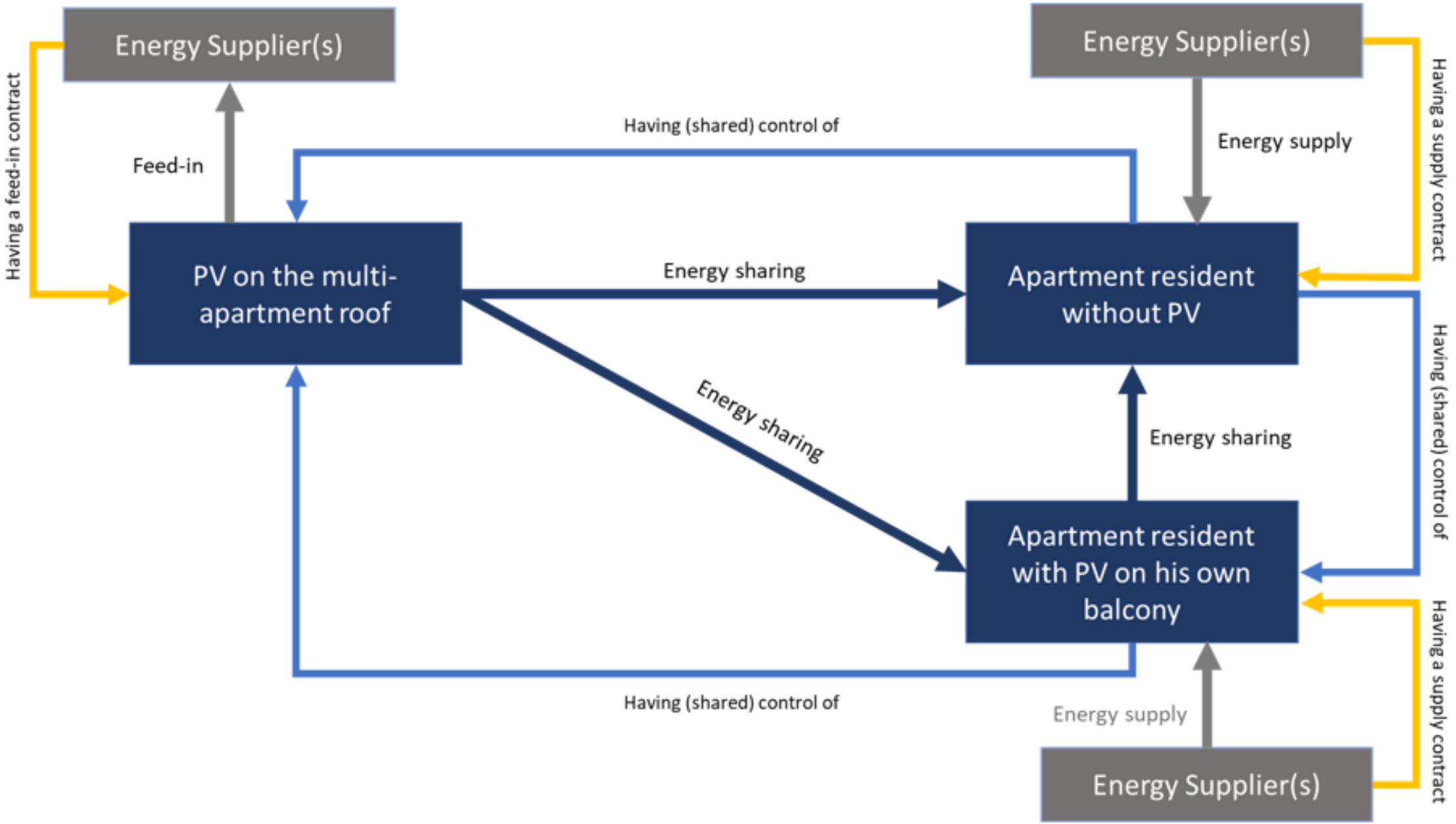

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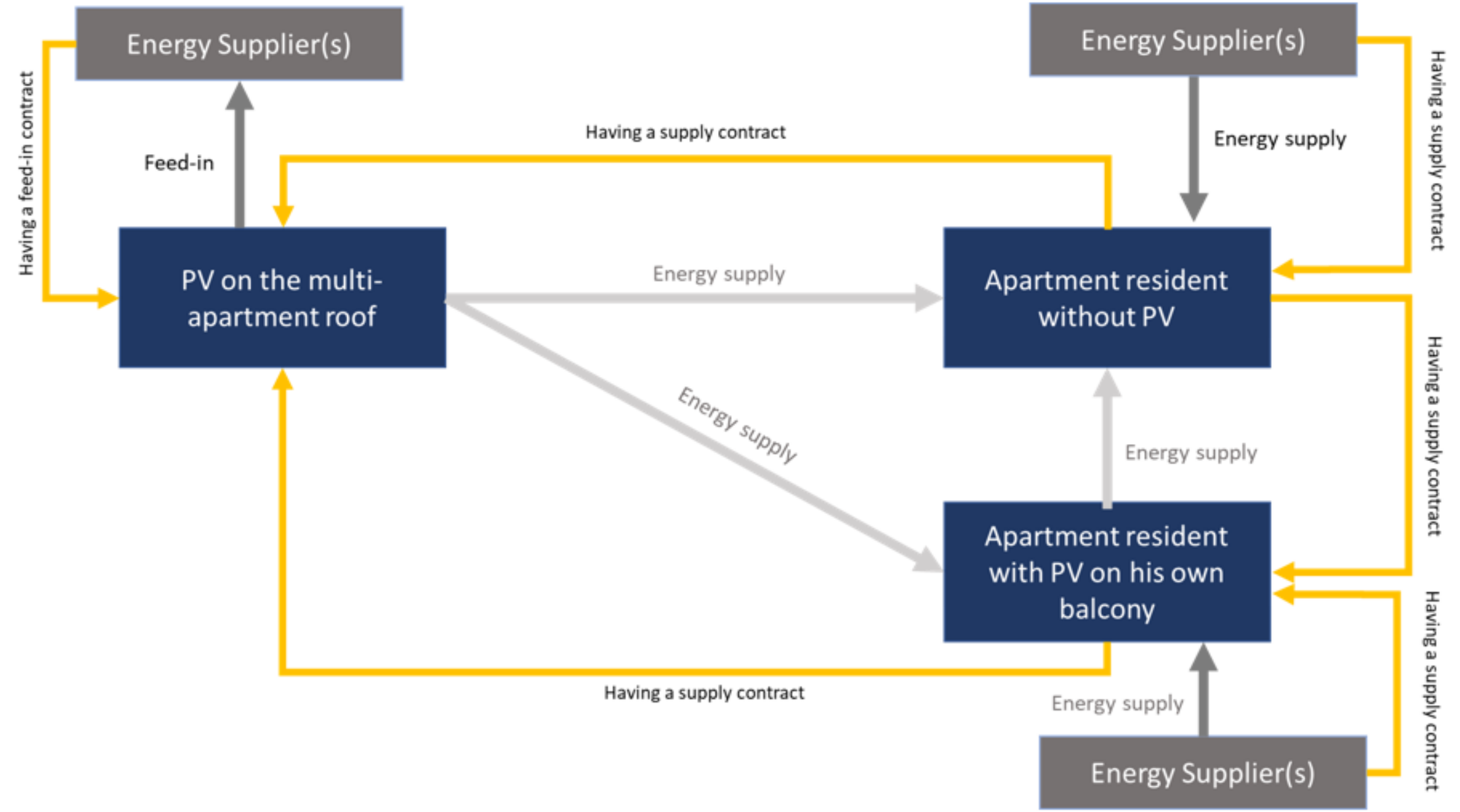
Figure 2 **Same situation as in Figure 1 but now energy is supplied but not shared**



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Main goal of energy sharing

Main goal:

- The main goal of energy sharing is to give all consumers access to renewable assets, meaning they have the ability to participate in renewable energy projects and benefit from them.

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Benefits of energy sharing

- Reduction in CO2: increase uptake of RES
- Grid use (given there are locational incentives)
- Energy sharing can be an effective means to empower consumers that do not have access to roofs or other available space, or financial means to self-generate/ and/or store renewable electricity

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Process of Energy Sharing

Contract	Validate	Calculate	Register	Settle

1. Energy sharing contract between sharing parties: incl. who will represent them
2. Sharing is validated by an authority that checks if there are any constraints (can be a role assigned to DSO)
3. Sharing result calculator: calculates the result of energy sharing
4. Registration of the results of sharing and administers the results
5. Settlement: includes reduction of grid fees and taxes, paying the facilitator, compensate other stakeholders which were impacted, financial settlement

Energy suppliers are informed of the sharing, since it is registered

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Sharing keys

There are different ways to determine how much energy can be shared:

- **Proportional sharing key**: Based on the ownership of the participant sharing (1/10 of the installation means you always get 1/10 of the solar generation),
- **Pro-rate:** Based on the participant's consumption (if you consume less than 1/10, someone else gets the energy).

A choice can also be made between fixed distribution keys or dynamic distribution keys.

- **Fixed distribution**: key easy to predict for energy suppliers; the situation is not very different from when someone has solar panels at home.
- **Dynamic allocation keys**: the amount of generation allocated to a consumer changes and depends on several factors, including the generation of other participants in the collective.

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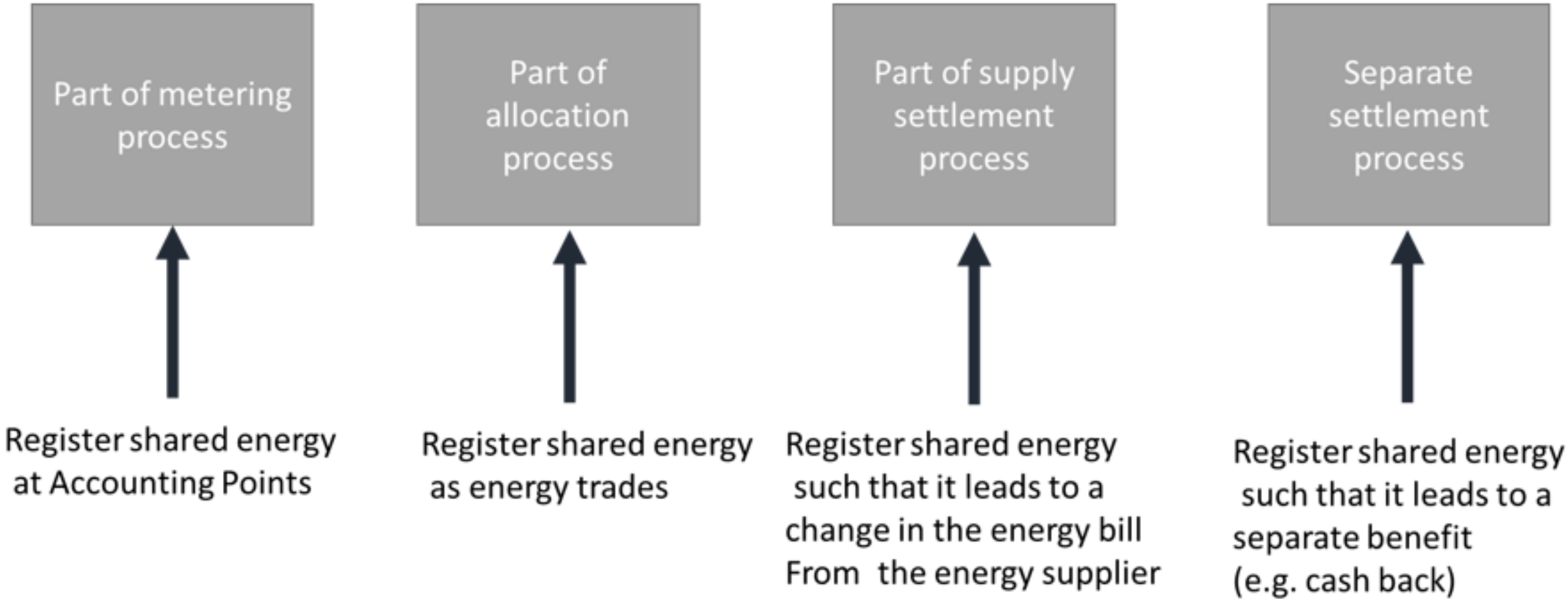
Registration models: Where to administrate energy sharing results?

Figure 6 **Registration of shared energy: where to do the administration?**



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Requirement for the different models

Different models can lead to an impact on responsibilities of the Energy Supplier.

Where such impact applies, there is a need to share information about the impact.

Table 4 The impact of the registration of energy sharing on Energy Supplier responsibilities

Sharing is registered as part of	Balance responsibility	Collection of grid charges and taxes
Metering process	Yes, the energy sharing leads to a change in volumes that fall under a certain Energy Supplier and so a certain BRP.	If a reduction on grid charges or taxes applies for energy sharing, the Energy Supplier has to take this into account when he invoices his customers involved in sharing arrangements.
Allocation process	Idem.	Idem.
Supply settlement process	No, volumes on the perimeter of the BRP do not change under influence of energy sharing.	Idem. Furthermore, the Energy Supplier might change his procedure to calculate the volumes that apply to grid charges and taxes, since he should also take into account the energy sharing: he cannot take the values registered at the Accounting Points.
Dedicated settlement process	No impact.	No impact. If a reduction of grid charges or taxes applies, this is taken care of in the dedicated settlement process.

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Impacts and costs of sharing

Impacts

- Sourcing costs: Supplier made costs for sourcing the energy but did not receive benefits from the consumer
- Change of balance position due to sharing, if sharing is part of metering or allocation process (models where sharing is part of the supply process)

Costs

- 5 steps of energy sharing need to be facilitated
- Investment costs in contracting, validation, calculation (ICT should be in place for: collecting the relevant metering data), dedicated administration of sharing, settlement; calculating grid and tax charges, making one energy bill, etc.

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Facilitating Energy Sharing

1. The **DSO** as main facilitator
2. The **Energy Supplier** as main facilitator
3. **Energy Sharing Group** as main facilitator

In the proposed adjustment of the EMD MS need to appoint a facilitator this can be the DSO or another designated body

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Impact on the energy bill

The bill consists of various components:

Three main categories:

1. **energy** (sourcing/wholesale energy costs for either consuming or feeding in energy, including balancing and administration fees),
2. **taxes** (VAT, energy taxes and possibly levies for sustainable energy support) and
3. **network**-related costs (grid charges including costs for grid losses).

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Location

A *locational constraint* for energy sharing arrangements could apply when the ability to share energy between a production location and a consumption location is limited, due to the 'distance' between the two

The distance can be described in **kilometres, address distances** (postal codes / house numbers) or by **grid topology distances** (same LV grid area, behind the same transformer, etc.)

In the study a generic description of locational constraints (**house, building, close proximity and whole country)** is used instead of how the distance is calculated to allow comparisons between various Member States

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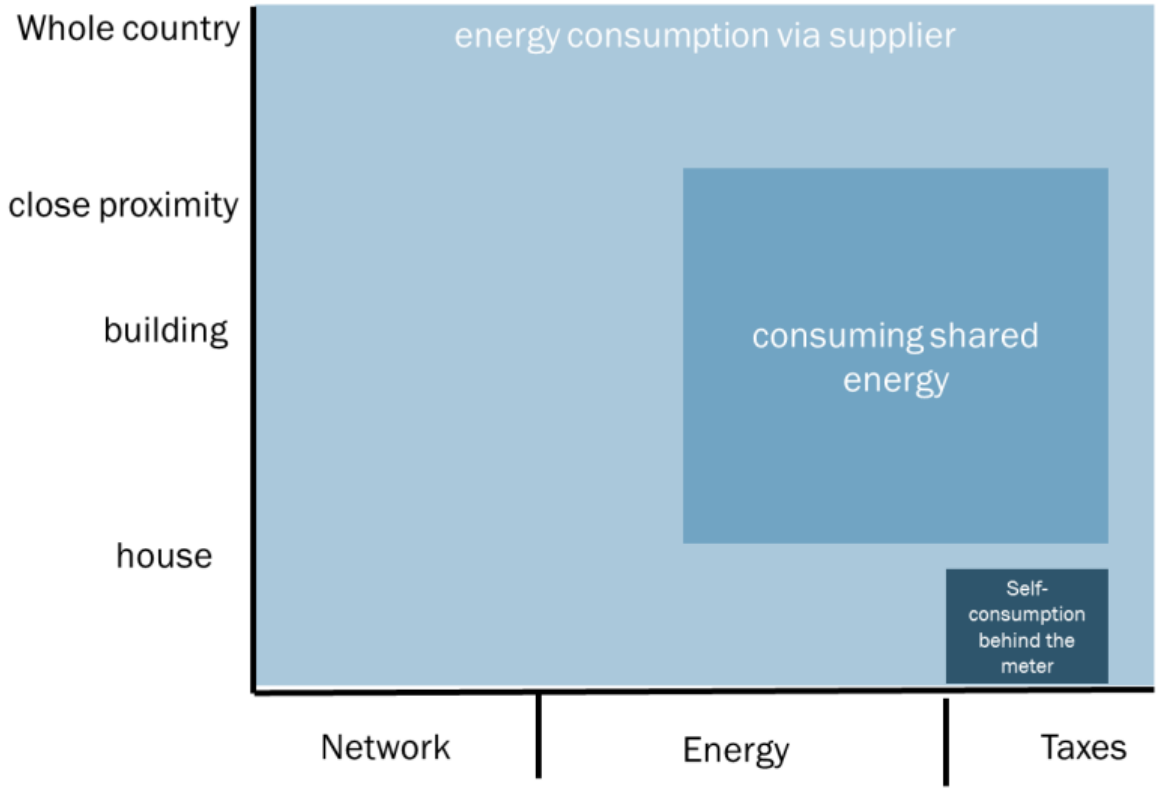
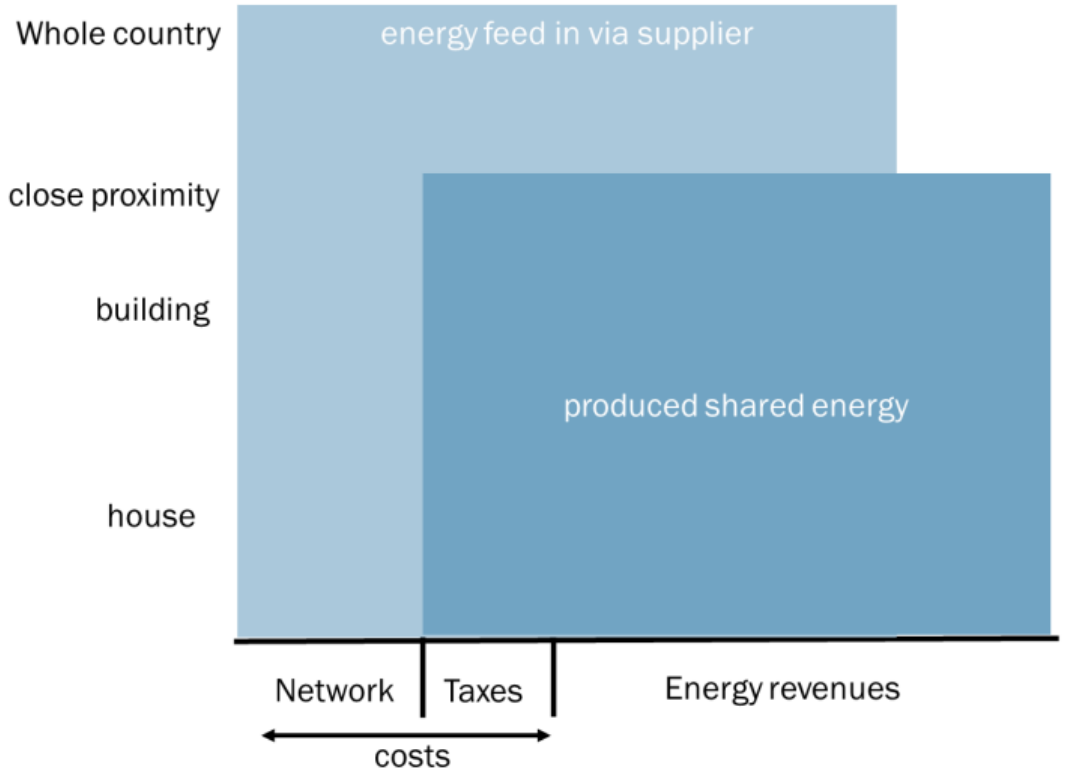
Financial benefits for prosumers

The consumer perspective



The producer perspective

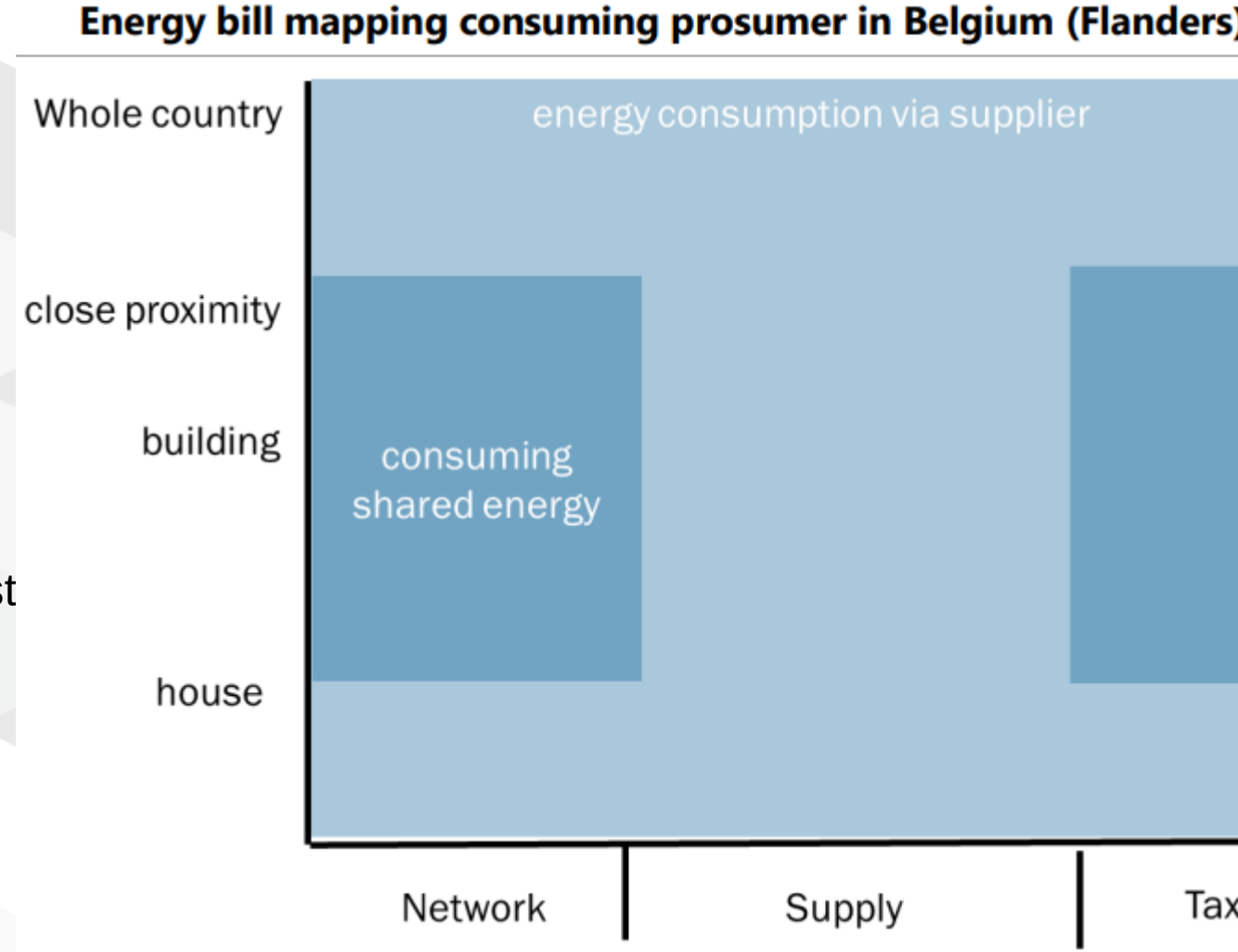


Current status of energy sharing
Some examples

Belgium:

Definition: a ‘costless’ allocation within one Imbalance Settlement Period of all or part of the self-produced renewable energy injected into the distribution grid or other local grid between active consumers in a building, members of energy communities, or between grid entry points owned by the same active consumer

- **Facilitated by DSO**
- Sharing group needs to appoint contact for sharing group
- Energy bill effect: Network charges and taxes are not affected by sharing, sharing is at no cost (‘kosteloos’): the producer cannot charge any price for the energy shared from the consumer
- **Administration**: part of supply settlement: change in supply energy bill
- Compensation for Energy supplier
- Facilitating costs are socialised



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Italy

Definition:

In Italy energy can be shared within time windows of **60 minutes**. JARSC must be located within the **same building** or **multi-apartment block**, and RECs consumers and producers must be connected **to low-voltage grids connected to the same medium- to low-voltage transformer substation** (extension to primary high to medium voltage transformer station is under discussion).

- **Facilitated by DSO**
- Contact point: REC or the building association
- Energy bill effect: There is **a monthly cash-back for the network tariff reduction**.
- Incentive tariff in (in €/kWh) for producers
- There is no supply-sharing administration integration so energy sharing is **administrated in a dedicated process**: resulting in a monthly cash back
- Costs are socialised

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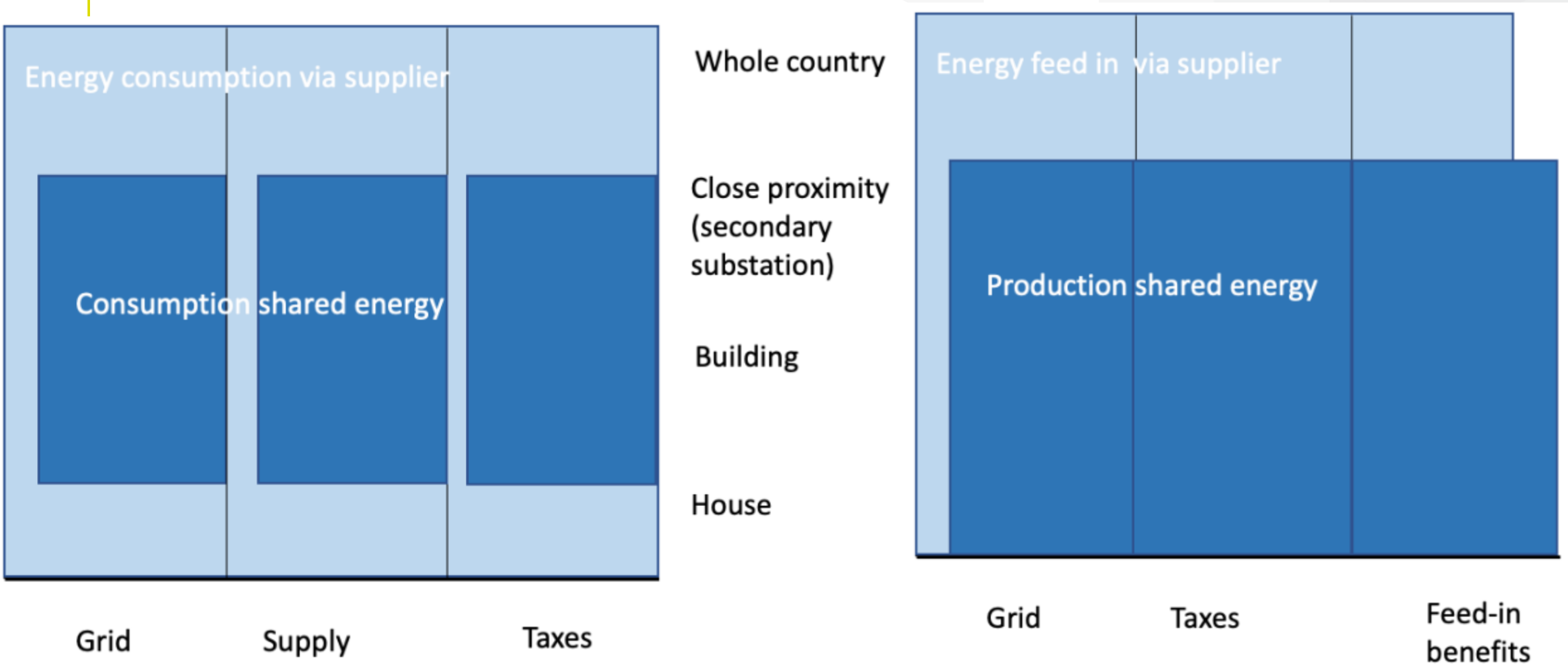
Italy: Energy bill effect consumer and producers



Conclusions and recommendations

Main goal of energy sharing is to give access to renewable assets

Having control over the assets is a core requirement

Local constraints/ incentives can help matching local production and consumption

What should be in place:

- Agreements between energy sharing group members on how to share
- Validation of the sharing agreements
- Calculation of the results of energy sharing
- Administration of the results of energy sharing
- Settlement of the financial effects of energy sharing including compensation of stakeholders such as the Energy Supplier

Energy sharing is most likely only attractive if it is more attractive than not sharing (selling/buying via an energy consumer)

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There is room for MS

Registration

Sharing keys

Facilitation

Remuneration

Cost division

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Thank you for your attention

- For questions: eva.winters@tno.nl

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