Advancing SPEN in Europe Drivers, barriers & policy recommendations

Zero-Emission Buildings Academy

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The neighbourhood approach is gaining momentum

Ongoing 2023 EPBD Revisions, EP version:

8 mentions neighbourhood and district approach:

"Member States should take up ***neighbourhood and district approaches*** *to building renovation and renewable heating and cooling in their* ***national building renovation plans*** *and actively promoted them."* Art (46e)

Multiple benefits of the neighbourhood and district approach acknowledged:

*"****Integrated district or neighbourhood*** *approaches allow for overall renovation concepts for buildings that are spatially related such as housing blocks.*

… a more ***holistic approach****, which addresses the* ***broader community ecosystem****, such as* ***transport needs*** *and appropriate* ***sustainable energy sources****, including on-site and nearby renewables or district heating and cooling…*

Therefore, this Directive should promote the wider use of integrated, participative and district-related approaches, which allow for ***synergies and potential energy savings*** *that would remain untapped if the focus were exclusively on individual buildings. Integrated renovation plans can also lead to benefits such as* ***improved air quality****, a reduction in district emissions, and a large-scale* ***alleviation of energy poverty****. Districts should be established by local authorities, in* **accordance with local needs***."* Art (35a)

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Syn.ikia project
Sustainable Plus Energy Neighbourhoods (SPEN)

The syn.ikia innovation project within the EU Horizon 2020 framework involves 13 partners from six countries.
https://www.synikia.eu/

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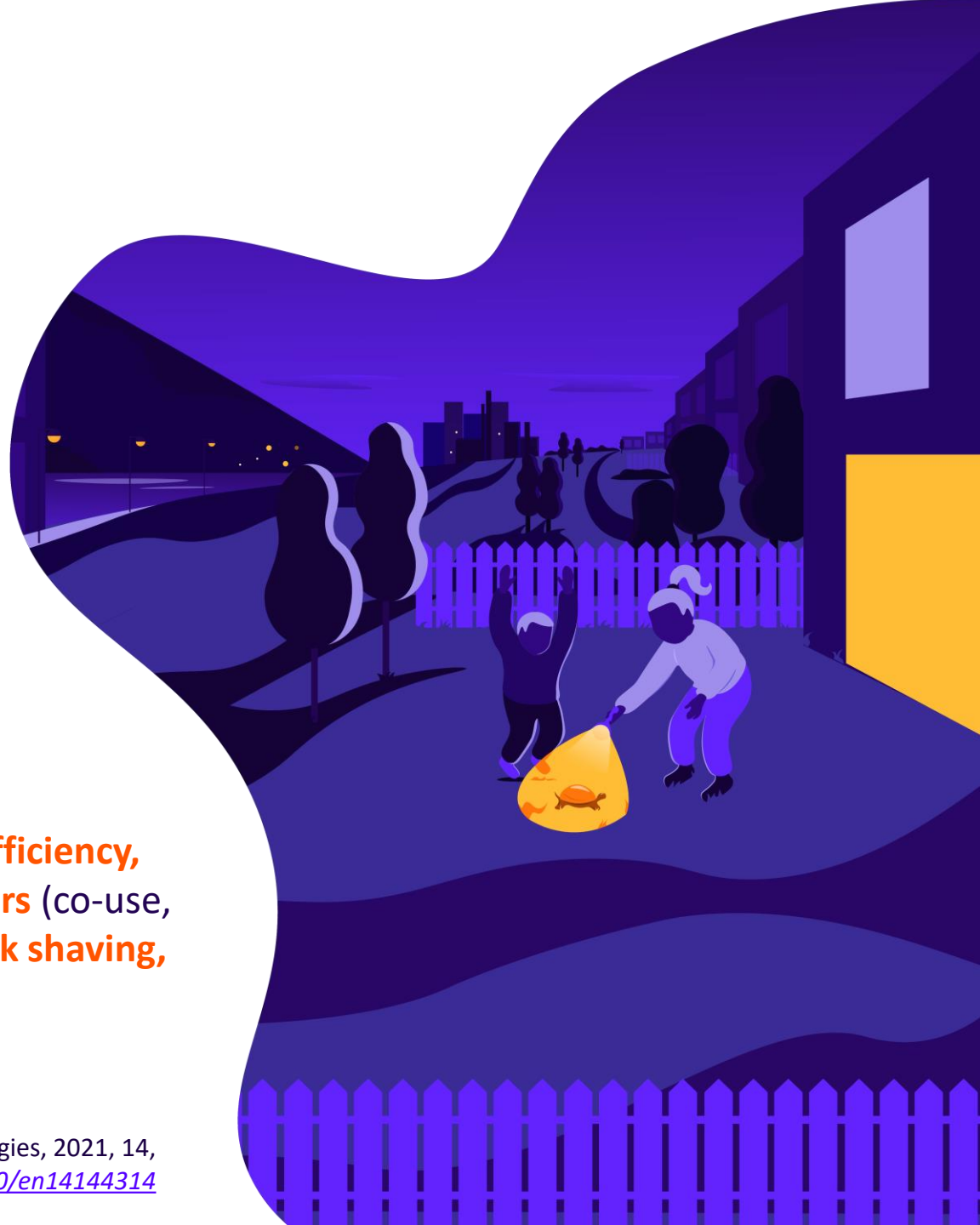
Sustainable Plus Energy Neighbourhoods (SPEN)

SPEN is a highly energy efficient and energy flexible neighbourhood with a surplus of energy from renewable sources.

The syn.ikia definition of a SPEN follows a **similar procedure as described for PEB**, but the geographical boundary is physically or digitally expanded to the entire site of the neighbourhood development, including local storage and energy supply units.

Moreover, the SPEN framework includes a strong focus on **cost efficiency, indoor environmental quality, occupant satisfaction, social factors** (co-use, shared services and infrastructure) and **power performance (peak shaving, flexibility, self-consumption)**.



An evaluation framework for Sustainable Plus Energy Neighbourhoods, Energies, 2021, 14, 4314. https://doi.org/10.3390/en14144314

Sustainable Plus Energy Neighbourhoods (SPEN)

- A SPEN is embedded in an **urban and regional energy system** and is driven by renewable energy to provide optimized security and flexibility of supply.

- A SPEN is based on a high level of **energy efficiency,** in order to keep annual local energy consumption lower than the amount of locally produced renewable energy.

- A SPEN enables increased use of **renewable energy** within the local and regional energy system by offering **optimized flexibility** and by **managing consumption** and **storage capacities** according to demand.

- A SPEN couples the built environment with sustainable energy production, consumption, and **mobility** (e.g. EV charging) to create added value and incentives for the consumers and the society.

- A SPEN makes optimal use of **advanced materials**, local RES, and other low carbon solutions (i.e. local storage, smart energy grids, demand-response, cutting-edge energy management systems, user interaction, and ICT).

- A SPEN offers affordable living, **improved indoor environment**, and **well-being** for the inhabitants.

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Sustainable Plus Energy Neighbourhoods (SPEN)

1. Sufficiency → **2. Energy efficiency** → **3. RE**

Shared space, services

(EV sharing),

infrastructure

(heat pumps, heat storage, PV, batteries)

Quantification of social and environmental KPIs

Multiple benefits

Reduce energy demand at building and neighbourhood level

Positive energy buildings

(insulated building envelope, efficient HVAC)

Definition of boundaries

Local production, storage and sharing of energy (heat and electricity)

DSF to maximise self-consumption

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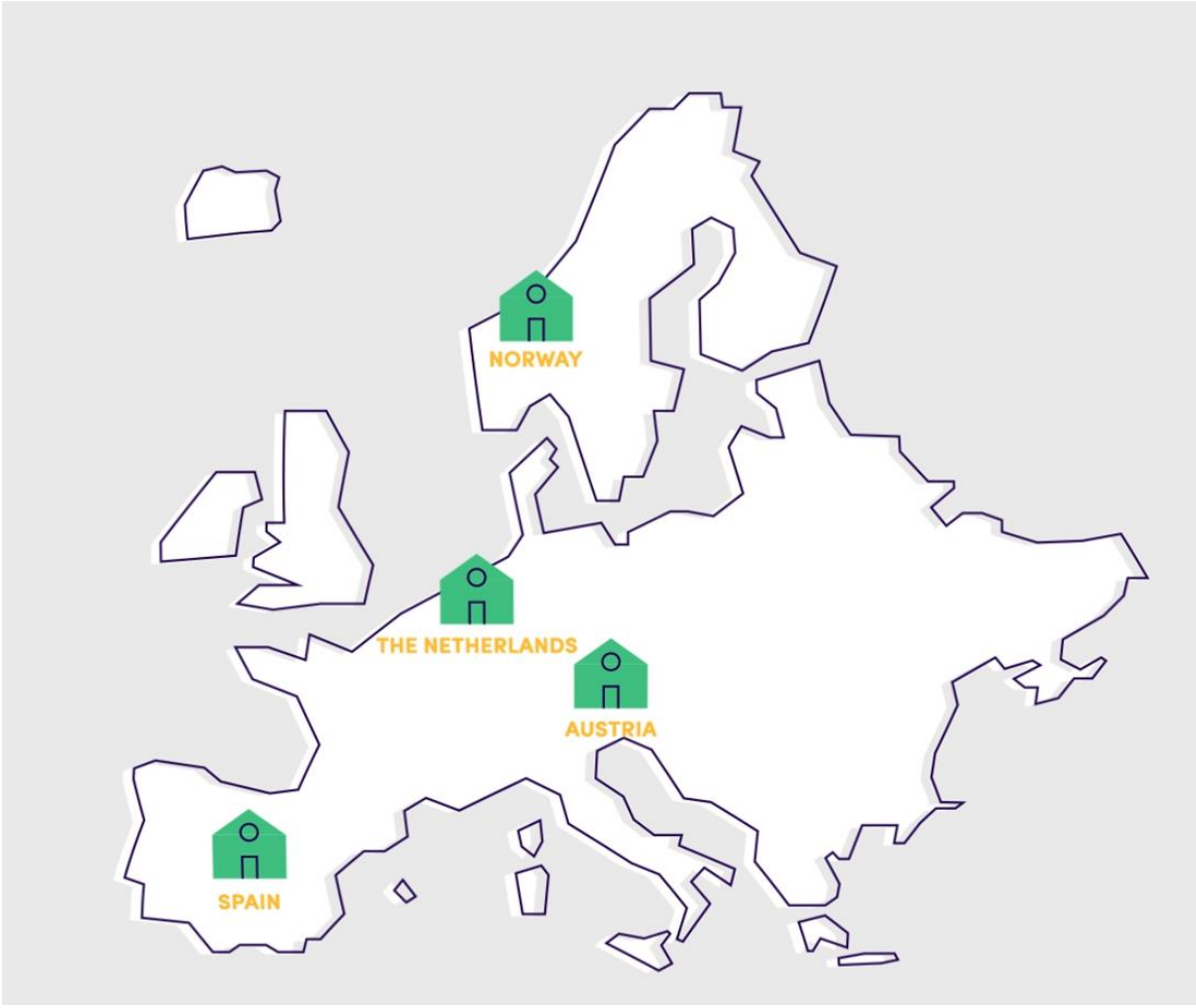
Positive Energy Neighbourhoods SPEN

Four demo projects

Enable the development of SPEN in different climates, regulatory and markets context.



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Key Performance Indicators will be assessed

at two spatial levels

to evaluate the demos

- **Building**

- **Neighbourhood**

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Demo Neighbourhood Austria

Gneis District | Salzburg
Developer | Heimat Österreich

- New built and renovation
- 250 social housing dwellings
- 40 apartments distributed through Caritas to residents with special needs.
- A kindergarten

Passive systems

- Optimised insulated building envelope,
- Triple glazing and airtight building.

Active systems

- PV power plant;
- Ground and waste water source heat pump

Innovations

- Integral Energy Management
- Digital Cloud Hub
- Grey Box Models for SPEN-level optimization
- Smart EV charging at neighbourhood level
- Agent-based modeling of an energy community
- User engagement via FeedMe app

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Benefits of the neighbourhood approach versus individual building approach

Shared assets for energy production and storage

- Valorise the renewable energy potential at neighbourhood scale
- Shared PV, heating systems, storage, EV charging, EV car sharing

Mix of building typologies

- Different energy use patterns for residential, tertiary, hospitals, kindergarten, etc.

Integral smart systems and energy management within SPEN

- Need for an energy manager for the SPEN – new business case opportunities!
- Opportunity to assign different shares of RE for each building based on modelling to optimize savings on the bills

SPEN as a market player within REC or CEC

- Sell the surplus of RE and flexibility services to REC/CEC or to the grid

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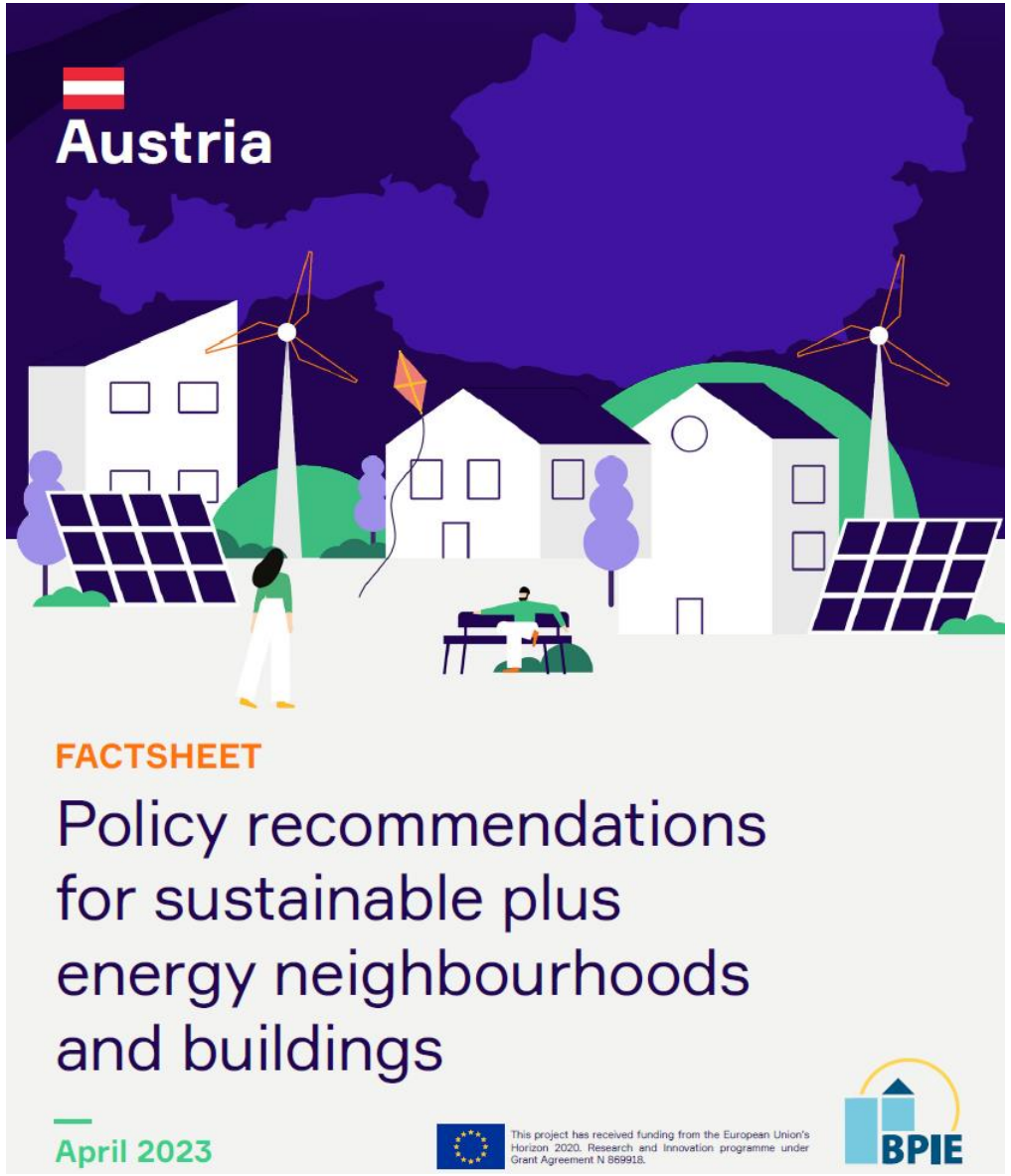

Country Factsheets

Policy recommendations for sustainable plus energy neighbourhoods and buildings

Austria
The Netherlands
Norway
Spain

https://www.synikia.eu/library/

https://www.bpie.eu/publication/policy-recommendations-for-sustainable-plus-energy-neighbourhoods-and-buildings/

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Legal frameworks for production, storage and sharing of energy

REDII 2018 Jointly acting renewables self-consumers Collective self-consumption (CSC)

(66) With the growing importance of self-consumption of renewable electricity, there is a need for a definition of 'renewables self-consumers' and of '**jointly acting renewables self-consumers**'.

(15) 'jointly acting renewables self-consumers' means a group of at least two jointly acting renewables self-consumers in accordance with point (14) who are **located in the same building or multi-apartment block**;

4.Member States shall ensure that renewables self-consumers located in the same building, including multi-apartment blocks, are entitled to engage jointly in activities referred to in paragraph 2 and that they are permitted to arrange sharing of renewable energy that is produced on their site or sites between themselves, without prejudice to the network charges and other relevant charges, fees, levies and taxes applicable to each renewables self-consumer. Member States may **differentiate between individual renewables self-consumers** and **jointly acting renewables self-consumers**. Any such differentiation shall be proportionate and duly justified.

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Legal frameworks for production, storage and sharing of energy

REDII 2018

Jointly acting renewables self-consumers Collective self-consumption (CSC)

(14) ‘renewables self-consumer’ means a final customer operating within its premises located within confined boundaries or, where permitted by a Member State, within other premises, who generates renewable electricity for its own consumption, and who may store or sell self-generated renewable electricity, provided that, for a non-household renewables self-consumer, those activities do not constitute its primary commercial or professional activity;

*(67) Empowering **jointly acting renewables self-consumers** also provides opportunities for renewable energy communities to advance energy efficiency at household level and helps **fight energy poverty** through reduced consumption and lower supply tariffs.*

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Legal frameworks for production, storage, sharing and selling of energy

Energy sharing within SPEN

Collective self-consumption (CSC)

- '**jointly acting renewables self-consumers**' in REDII 2018
- Differentiation from 'individual renewables self-consumers' (single family building) and '**jointly acting renewables self-consumers**' (e.g. apartment building)
- **No need for a legal entity**
- Scale: within a building/property (Austria/Norway), within 2km range (Spain, France)

Selling excess of energy outside SPEN
SPEN as a market player

Renewable energy community (REC)

- REDII (**heat and electricity**, all types of RES, not only PV)
- **Legal entity**
- Membership limited to natural persons, SMEs or municipalities, does not include large companies
- Governance requirements
- Geographical boundaries: low or medium voltage grid (Austria), municipality, a case-by-case approach

Citizen energy community (CEC)

- EMD (limited to **electricity**)
- **Legal entity**
- Membership limited to natural persons, SMEs or municipalities, governance requirements
- **No geographic limitation** (national or in some cases open to cross-border participation)

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Legal frameworks for production, storage, sharing and selling of energy

	Collective self-consumption (CSC)	Renewable energy community (REC)	Citizen energy community (CEC)
Austria	2017 Electricity Act (ElWOG) Allowed only within a building	2021 Austrian Renewable Energy Act (EAG)	Electricity Industry and Organisation Act 2010 (Modified by the Gazette BGBl. Nr. 150/2021 on 27 July 2021)
Norway	Prop. 1 LS (2021–2022) punkt 9.6 Høringen til RME Allowed on private networks within one property	No framework available	No framework available
Spain	Royal Decree 244/19 (including use of public grid) – national level Decree Law 24/2021 – regional level 2km range	Definition first introduced in the Royal Decree-Law 23/2020	First mentioned in the Royal Decree-Law 23/2020 No CEC framework available
The Netherlands	Allowed in a regulatory sandbox Postcode approach	Transposed as 'energy community' in Energy Law 2022	

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Policy recommendations

Spain

Energy performance	• The upcoming implementation of zero-emission building standards of the revised 2023 EPBD should increase the ambition for new constructions and renovations, also considering the embodied carbon. • Support schemes are necessary to encourage additional investments in positive energy buildings, beyond minimum requirements.
Renewable energy and energy communities	• A coherent and stable framework for energy sharing has to be set to allow predictability for SPEN investments. • REC should be further defined, detailing which legal entities are allowed; a supervising authority should be assigned for consumer protection purposes. • CSC should not be limited to electricity, it should include renewable heating and cooling. • Regulatory sandboxes are necessary to experiment with ways of sharing renewable energy through a local grid. • Update the technical regulation on the low-voltage electrical installation with less conservative simultaneity coefficients to avoid costs due to oversizing.
Digital technologies and demand-side flexibility	• Further elaborate frameworks for REC and CEC for regulating the role of new market players such as aggregators or SPENs with energy communities. • Remove the administrative and financial barriers, create new business models to encourage distribution system operators to collaborate with SPENs, and allow smaller actors on the market.

Norway

Energy performance	• After the implementation of NZEB standards, the upcoming implementation of zero-emission building standards should further increase the ambition for new constructions and renovations, considering the embodied carbon. • Support schemes are necessary to encourage additional investments in positive energy buildings, beyond minimum requirements.
Renewable energy and energy communities	• Need for a predictable regulatory framework for SPENs, especially regarding local and collective production and sharing of energy. Developers need clear and predictable rules for significant investments like SPENs. • CSC must be extended beyond the boundary of one property, similar to the implementation of CSC in other countries such as Spain or France, within a range of 2km or within a low-voltage grid. CSC does not require a legal entity like REC and provides a good framework for sharing energy within a SPEN. • Sharing energy within a SPEN requires the existing CSC framework to be adapted because it does not currently include renewable heating, being limited to electricity. • A regulatory framework for REC and CEC is needed to allow smaller market players such as SPENs to enter the electricity market and sell excess energy beyond the neighbourhood. • The new legislation on CSC was developed in collaboration with private stakeholders who are frontrunners in developing SPENs and were granted exceptions. The participatory process must accelerate progress in overcoming existing regulatory barriers.
Digital technologies and demand-side flexibility	• Develop and implement frameworks for REC and CEC for regulating the role of new market players such as aggregators or SPENs within energy communities. • Net metering should be gradually phased out to be replaced by the 15-minutes imbalance settlement period with the objective of encouraging DSF.

Policy recommendations

The Netherlands

Energy performance	• After the implementation of NZEB standards, the upcoming implementation of zero-emission building standards of the revised 2023 EPBD should further increase the ambition for new constructions and renovations by lowering the whole life carbon limit values of buildings. • Support schemes are necessary to encourage additional investments in positive energy buildings, beyond minimum requirements.
Renewable energy and energy communities	• The existing postcode approach should be further improved to further encourage DSF. The existing administrative boundaries could be replaced with the approach used in Austria, based on grid delimitations, to further incentivise using energy within low and medium-voltage grid segments. • The existing CSC framework should be extended beyond electricity sharing, to also include renewable heating. • The existing energy community framework should be further improved, making a distinction between RECs, which allow both heating and electricity, and CECs, which only regard the electricity market. • A supervising authority should be assigned for the energy communities.
Digital technologies and demand-side flexibility	• REC and CEC frameworks should be further elaborated for regulating the role of new market players such as aggregators, energy managers or SPENs within energy communities. • Financial incentives should promote DSF, such as the development of dynamic, time-of-use tariffs and the removal of double taxation of storage. • The planned phase-out of yearly net metering in favour of 15-minute imbalance settlement should be implemented. • The limited grid capacity should be addressed with new business models and incentives for DSF.

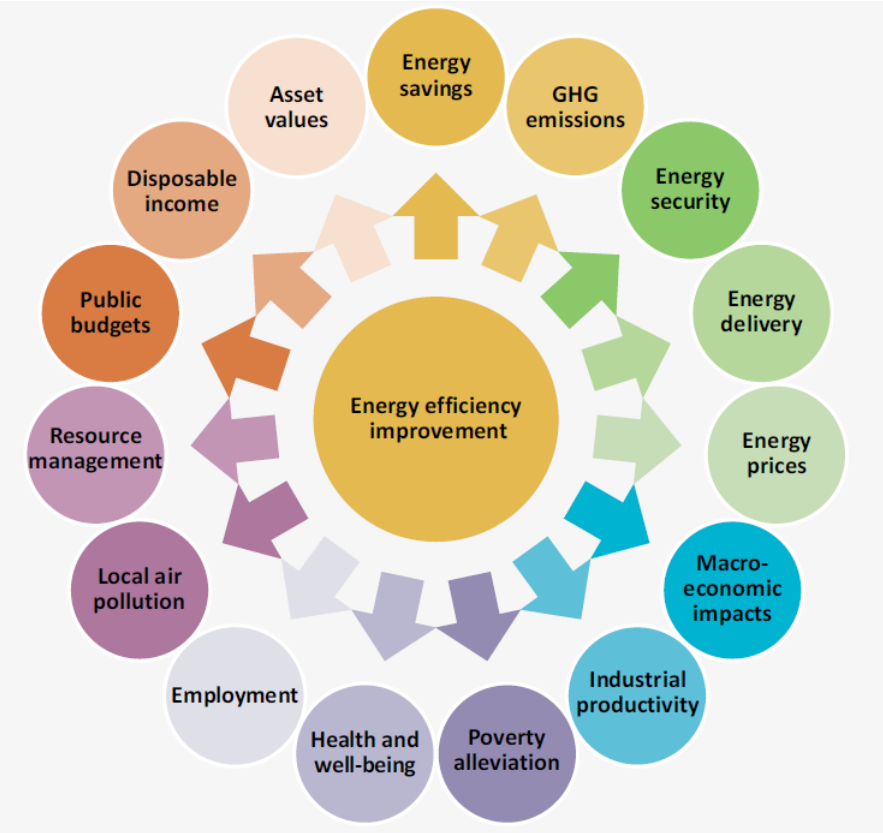
Austria

Energy performance	• After the implementation of NZEB standards, the upcoming implementation of zero-emission building standards of the revised EPBD should further increase the ambition for new constructions and renovations, considering the embodied carbon. • Support schemes are necessary to encourage additional investments in positive energy buildings, beyond minimum requirements. • Incentives and financing schemes should gradually evolve to require lifecycle carbon assessment and reductions.
Renewable energy and energy communities	• The CSC framework should be further improved. Currently, CSC is limited to electricity, while sharing energy within a SPEN requires a framework that includes renewable heating and cooling. • CSC must be extended beyond the building, similar to the implementation of CSC in other Member States such as France and Spain, which implemented CSC within a range of 2km. CSC does not require a legal entity like RECs, and it provides a good framework for sharing energy within a SPEN. • The establishment of one-stop shops to support RECs could be combined with one-stop-shops promoting energy renovation. This would be a good opportunity to promote the concept of SPENs.
Digital technologies and demand-side flexibility	• Within RECs, the 15-minute imbalance settlement has to be set by default to encourage DSF. • Provide easy entry to companies offering additional services to SPENs in terms of DSF, such as aggregators or energy managers in the market and their engagement with residential consumers. • In testing and implementing the SRI, the current building level method should be adapted for the neighbourhood level for certifying SPENs.

Multiple benefits tool

Assist policymakers and investors in decision making

Innovation – possibility to quantify the multiple benefits of SPEN



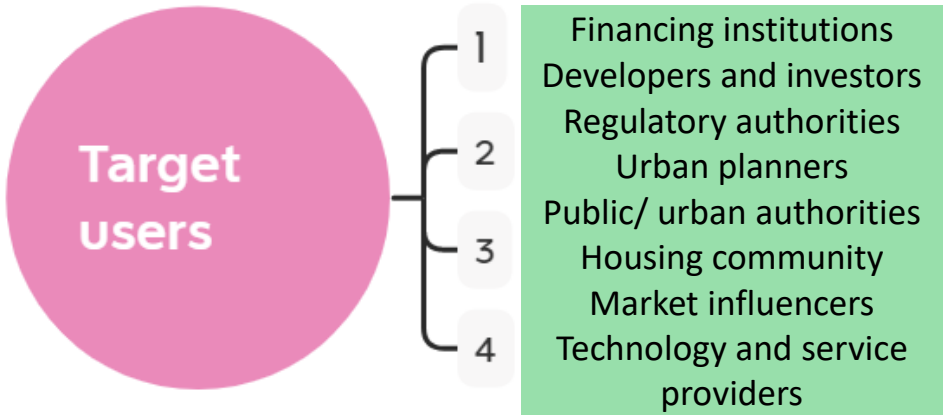


Image source: IEA (2014) *Capturing the Multiple Benefits of Energy Efficiency*

Thank you!

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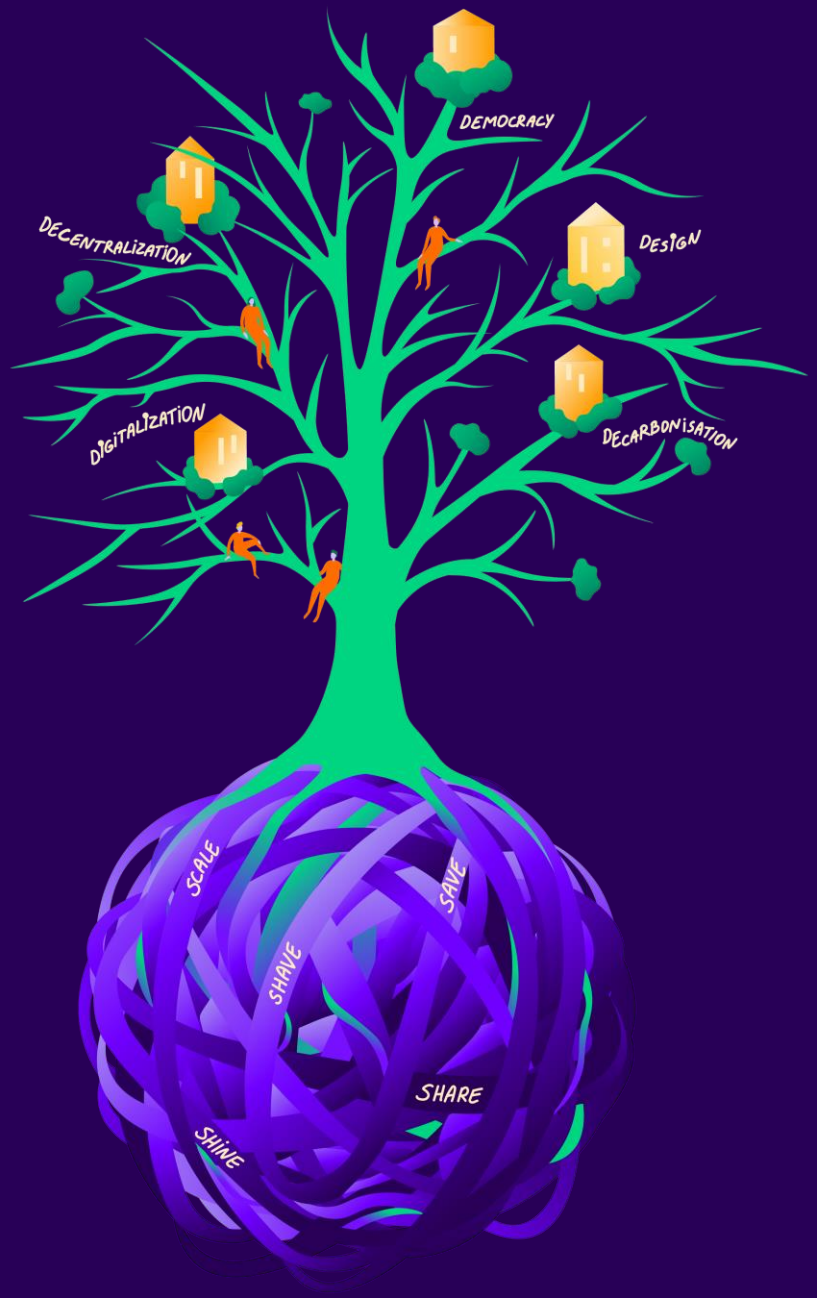

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BPIE

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Norwegian University of Science and Technology

DTU
Technical University of Denmark

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ARCA NOVA GRUPP

area

INCASÒL
Institut Català del Sòl

TNO innovation for life

ENFOR

ABUD
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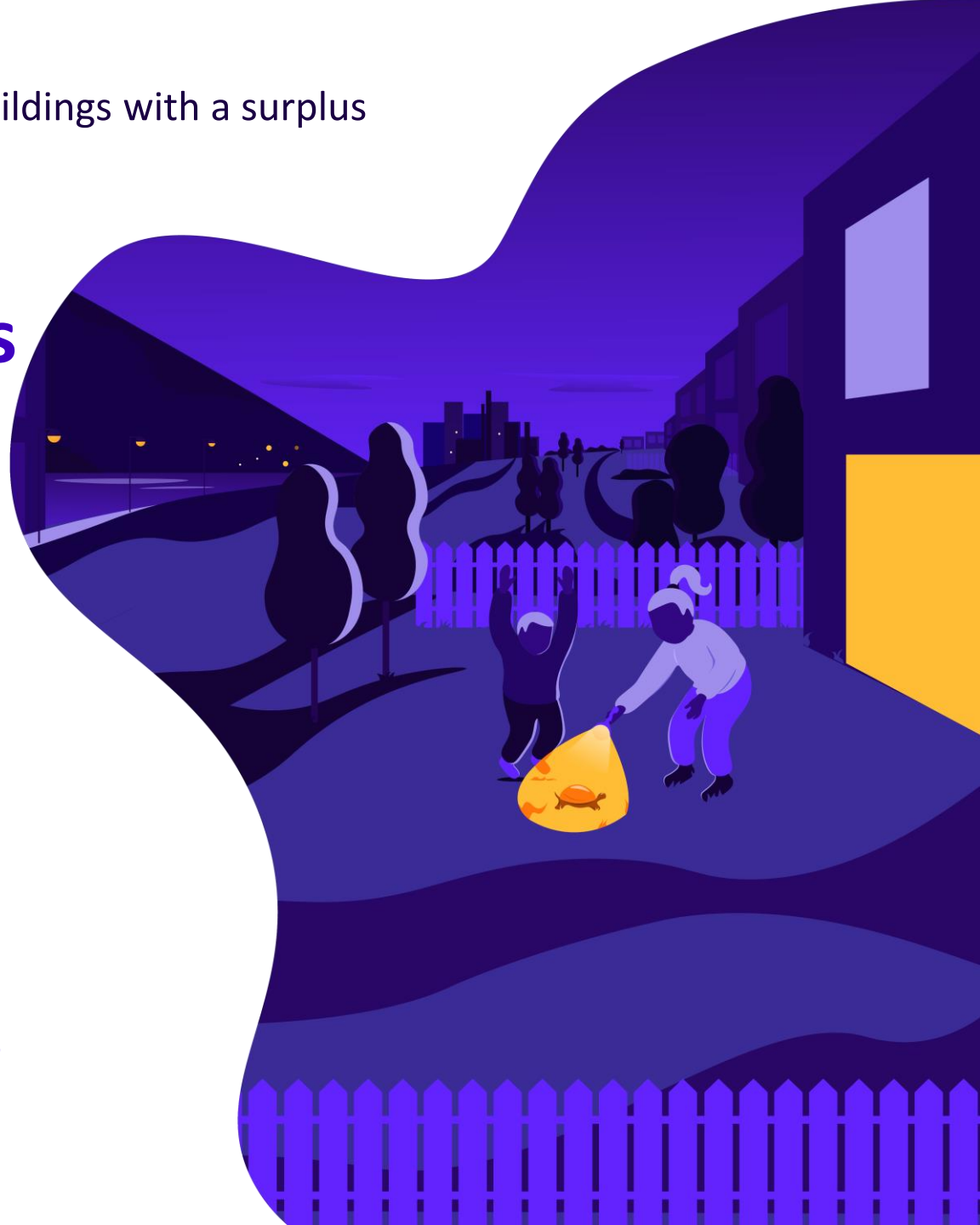
More than a group of connected buildings with a surplus of renewable energy

Positive Energy Neighbourhoods (PEN)



“Positive Energy Districts are **energy-efficient** and **energy-flexible** urban areas or **groups of connected buildings** which produce net zero greenhouse gas emissions and **actively manage an annual local or regional surplus production of renewable energy**. They require integration of different systems and infrastructures and interaction between buildings, the users and the regional **energy, mobility and ICT systems**, while securing the energy supply and a good life for all in line with **social, economic and environmental sustainability**.”

JPI Urban Europe, SET Plan Action 3.2
https://jpi-urbaneurope.eu/ped/

Legal frameworks for production, storage and sharing of energy

REDIII 2023

renewables self-consumers and renewable energy communities

Member States shall ensure that the ***permit-granting procedure for the installation of solar energy equipment with a capacity of 100 kW or less, including for renewables self-consumers and renewable energy communities, shall not exceed one month.*** *The lack of reply by the competent authorities or entities within the established deadline following the submission of a complete application shall result in the permit being considered as granted, provided that the capacity of the solar energy equipment does not exceed the existing capacity of the connection to the distribution grid.*

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Legal frameworks for production, storage and sharing of energy

REDIII 2023

renewables self-consumers and renewable energy communities

Unless there are justified safety concerns, unless further works are needed for grid connections or unless there is technical incompatibility of the system components, Member States shall ensure that connections to the transmission or distribution grid shall be permitted within two weeks of the notification to the relevant entity for:
(a) heat pumps of up to 12 kW electrical capacity; and
(b) heat pumps of up to 50 kW electrical capacity installed by renewables self-consumers, provided that the electrical capacity of a renewables self-consumer's renewable electricity generation installation amounts to at least 60 % of the electrical capacity of the heat pump.

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