



Framework Definition for Positive Energy Districts and Neighbourhoods

Final draft

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1 Background and Motivation

In our globalised world, cities are the hubs of communication, commerce and culture. They consume more than two-thirds of the world's energy and account for more than 70% of global CO₂ emissions. **Urban areas are among the main originators of climate change**, as urban activities are major sources of greenhouse gas emissions.

What our cities do individually and in union can therefore set the agenda for a sustainable future. Being on the frontlines of global climate change in this way, cities are also well-positioned to play a leadership role in **driving global action** to address it.

The Implementation Working Group on Smart Cities¹ of the Strategic Energy Technology Plan for Europe (SET Plan)² was established in October 2018 with the mission to bring about 100 urban districts or neighbourhoods in Europe by 2025³ with a clear commitment to sustainability, liveability and going beyond carbon neutrality by becoming energy positive. Such “**Positive Energy Districts/Neighbourhoods**” (PED/PENs) could be new developments, but should also implement ambitious solutions for urban district renewal. About 20 European countries are currently participating in this initiative, which also involves problem owners, as well as key stakeholders from industry.

2 Framework Definition of PED/PENs and their functions in the regional energy system

2.1 Functions of PEDs/PENs in the regional energy system

In honouring the economic, cultural and climate-related diversity of European countries and cities, a definition for such PED/PENs should not be just an algorithm for calculating the input and output of energy, but rather a framework, which outlines the three most important **functions of urban areas in the context of their urban and regional energy system**. The first obvious requirement is that PEDs should ultimately **rely on renewable energy only (energy production function)**, which is one of the main contributions towards climate neutrality. Secondly, they should make energy efficiency as one of their priorities in order to best **utilise the renewable energies available (energy efficiency function)**. Thirdly, the awareness that urban areas are bound to be among the largest consumers of energy, and therefore need to make sure that they act in a way which is **optimally beneficial for the energy system (energy flexibility function)** (see *Figure 1*).

Based on such a basic framework, cities should be able to **optimise the different functions and guiding principles against one another**, in order to find a balance, which can best represent the renewable energy resources available in their respective climate zone, together with their specific ambitions and needs.

¹ <https://jpi-urbaneurope.eu/ped/>

² <https://setis.ec.europa.eu/>

³ https://setis.ec.europa.eu/system/files/setplan_smartcities_implementationplan.pdf

PED Framework: Functions of PED/PENs in the regional energy system

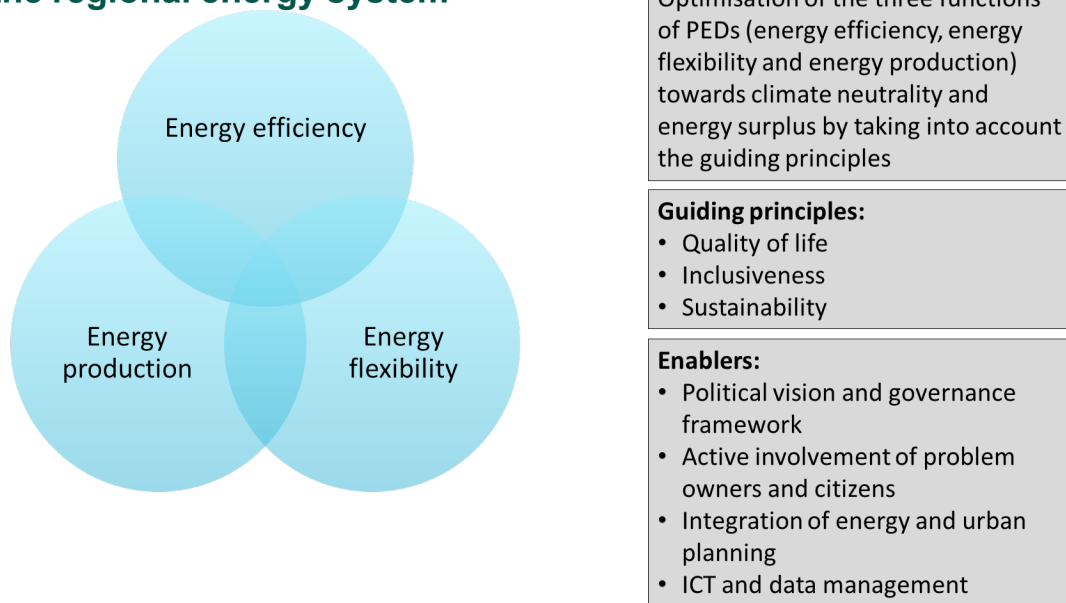


Figure 1: Functions of PED/PENs in the regional energy system

2.2 Framework Definition of PED/PENs

Therefore, a framework for PED/PENs could be defined as follows:

“Positive Energy Districts are energy-efficient and energy-flexible urban areas 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 optimising the liveability of the urban environment in line with social, economic and environmental sustainability.”

2.3 Additional description of the PED framework and its functions

The three **main functions, the target, guiding principles and enablers** are described more in detail below.

1. Energy Efficiency Function

The aim is an optimal reduction of energy consumption within the PED/PENs balancing out the needs of the different sectors, building infrastructure, the use of energy, settlement typology, as well as transport and mobility. Due to its relevance, not only new urban development areas but also the existing building stock needs to be addressed. As an example, mixed use settlements could be an effective instrument towards minimizing transportation needs. By adopting a life cycle approach and assessing the energetic and ecological footprint of goods and services, also "grey energy" will be considered.

2. Energy Flexibility Function

The main roles and functions of PEDs regarding energy flexibility are

- to actively contribute to the resilience and balancing of the regional energy system by managing its interactions as one of the main consumers of energy with the optimal benefit for the regional



energy system in mind. Demand side management, sector coupling and storage are among the main instruments to achieve this goal.

- to manage those interactions between the urban district/neighbourhood and the regional energy system in a way that enables carbon neutrality and 100% renewable energy in the local consumption and an additional surplus of renewable energy over the year.

3. Energy Production Function (locally and regionally)

Locally and regionally produced renewable energy will enable an optimal reduction of greenhouse gas emissions and ensure economic viability. Nevertheless, the local production of renewable energy is highly dependent on local and regional conditions and additionally on the transformation paths for the transition of the regional and European energy system.

2.3.1 Target of PED/PENs

Each PED/PEN will have to find its own optimal balance between energy efficiency, energy flexibility and local/regional energy production on its way towards climate neutrality and energy surplus taking into account the guiding principles.

2.3.2 Guiding Principles for PED/PENs

The development of PED/PENs should also follow three guiding principles to make them attractive for cities and citizens:

- Quality of life
- Inclusiveness
- Sustainability

2.3.3 Enablers for PED/PENs

The development of PED/PENs should make use of the following enablers:

- Political vision and governance framework
- Active involvement of problem owners and citizens
- Integration of energy and urban planning
- ICT and data management

3 Outlook towards PED implementation

For the application of the PED Framework, the following three-level approach will be used (*Figure 2*):

1. Development of a PED framework definition by the PED Programme,
2. Refinement and application of the PED Framework in the local and national context and
3. Development of certifications and labels for PEDs by regional, national and European Standardisation/Certification Bodies.



PEDs: Framework, Methods, Certifications and Labels Three-Level Approach

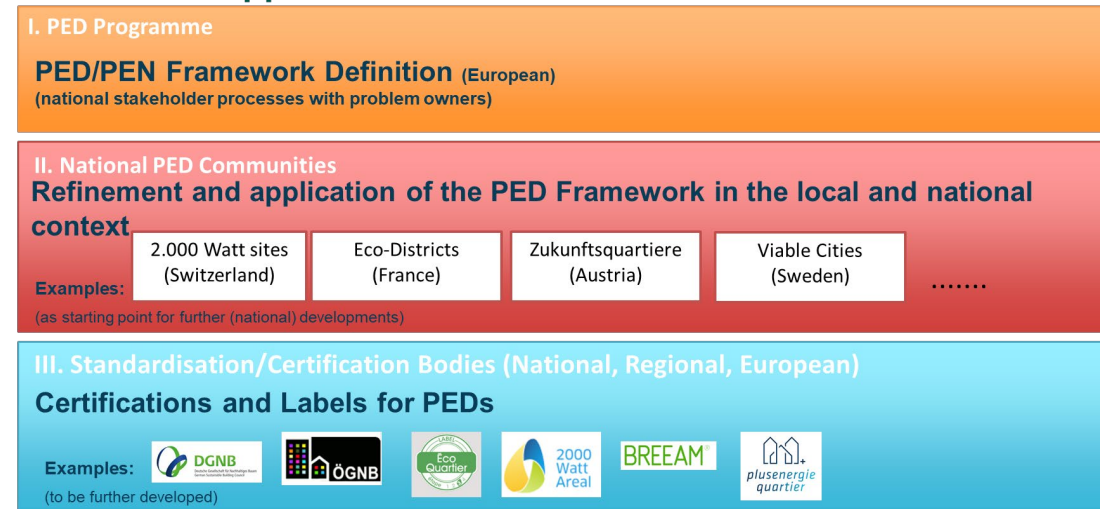


Figure 2: Three-level approach towards the application of the PED Framework