

Energy positive district: a Finnish perspective

**German-Finnish Smart Heating
Conference- Urban Heat Shift**

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Helsinki, 4th June 2019

19/06/2019 VTT – beyond the obvious

Climate Change

- 2015 Paris Agreement (COP 21) & COP 24



- **European Climate Change Programme:**
developing a sustainable, competitive, secure and **decarbonised energy system by 2050.**

Building stock, responsible for 36 % of all CO₂ emissions in the EU



World's urban areas accounted for about 64% of global primary energy use and produced 70% of the planet's carbon dioxide emissions in 2013



City role

- **GOAL 11 SUSTAINABLE CITIES AND COMMUNITIES**

supporting the transition towards low-carbon and inclusive cities to substantially increase the number of cities implementing highly sustainable and integrated solutions and making cities and human settlements inclusive, safe, resilient and sustainable



- **Cities lead the way on clean and decentralized energy solutions** [Energy Technology Perspectives 2017 IEA](#)
- **Establish a multi multisector sandbox** for the urban energy infrastructure represent transition towards free carbon community



IEA, JPI & H2020 interests on PEDs

- **Current Strategic Plan of EBC includes „Communities“** as a priority <http://www.iea-ebc.org/strategy> and the next strategic plan will focus on communities too.



- **JPI Urban Europe coordinates the “PED Programme”**, a transnational, intergovernmental initiative for large-scale implementation of Positive Energy Districts for sustainable urbanization <https://jpi-urbaneurope.eu/ped-pen/>



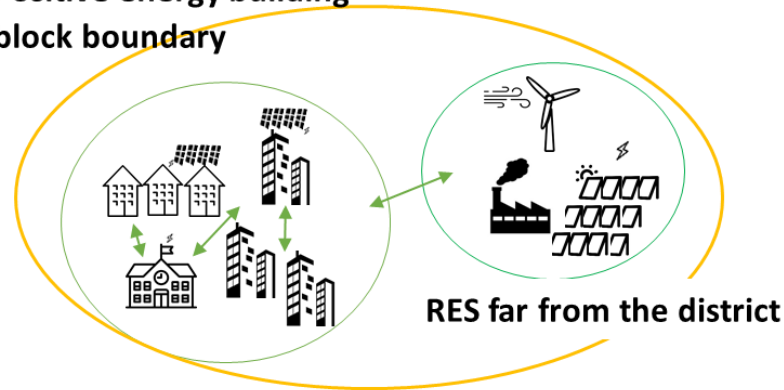
EU research community



Definition of +eDistrict : boundaries

- Positive Energy Districts have an **annual positive energy balance**
- **+eDistrict** manages its energy consumption and the energy flow **between buildings in the district and the wider energy system**
- **Healthy lifestyle & attractive place to live**

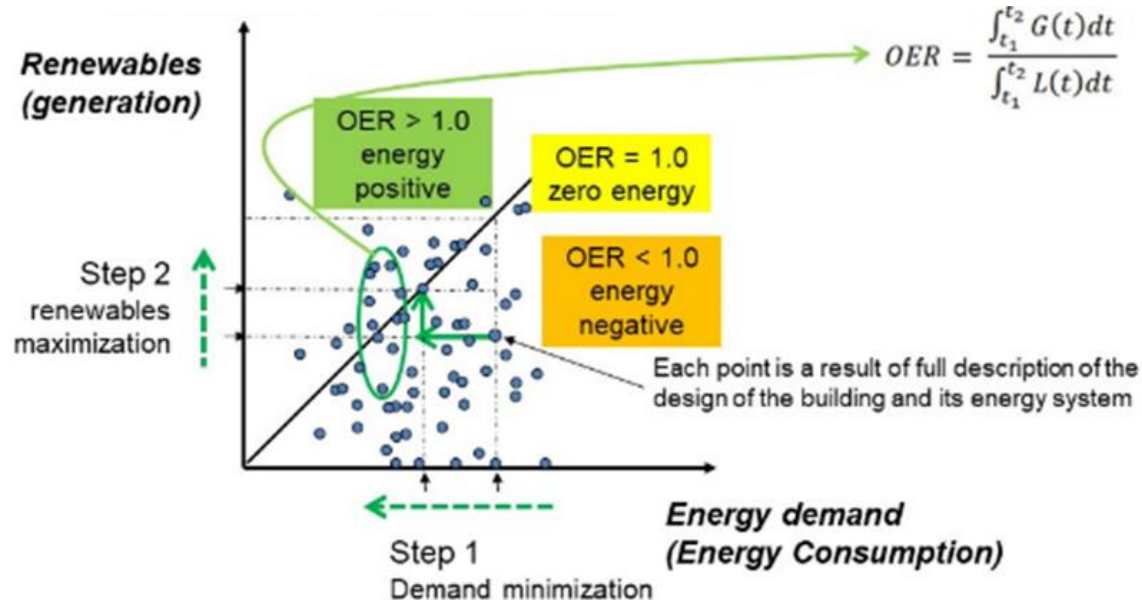
Positive energy building
block boundary



Physical boundaries

Exchange energy between buildings and grid – no pollutant in the area!

Definition of +eDistrict : KPIs

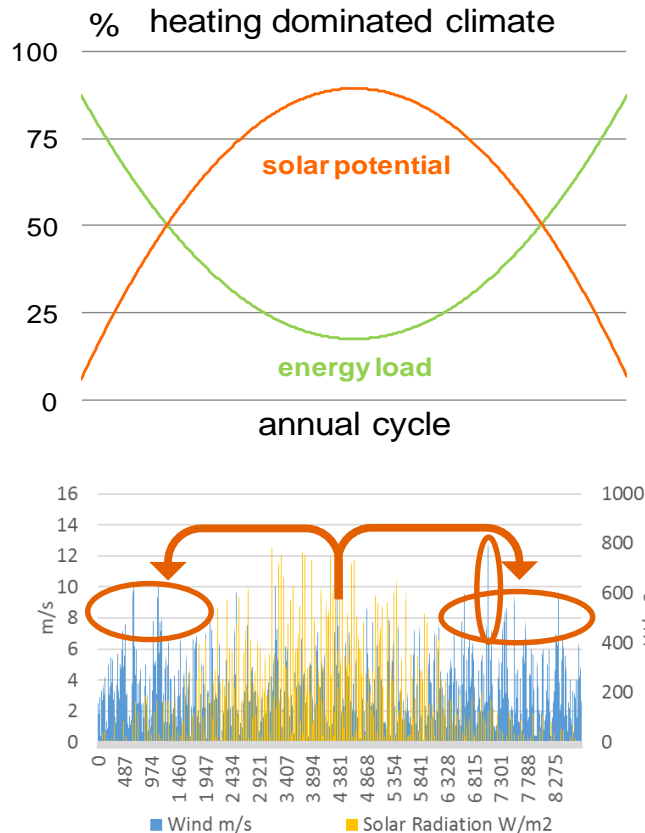


Key challenges

- Cities are a complex mechanism in equilibrium
- Many actors are involved for ensuring the conventional services to citizens
- Transformation of the “*status quo*” require even more players to involve
- **Mapping stakeholders, their needs and roles for enabling PEDs**

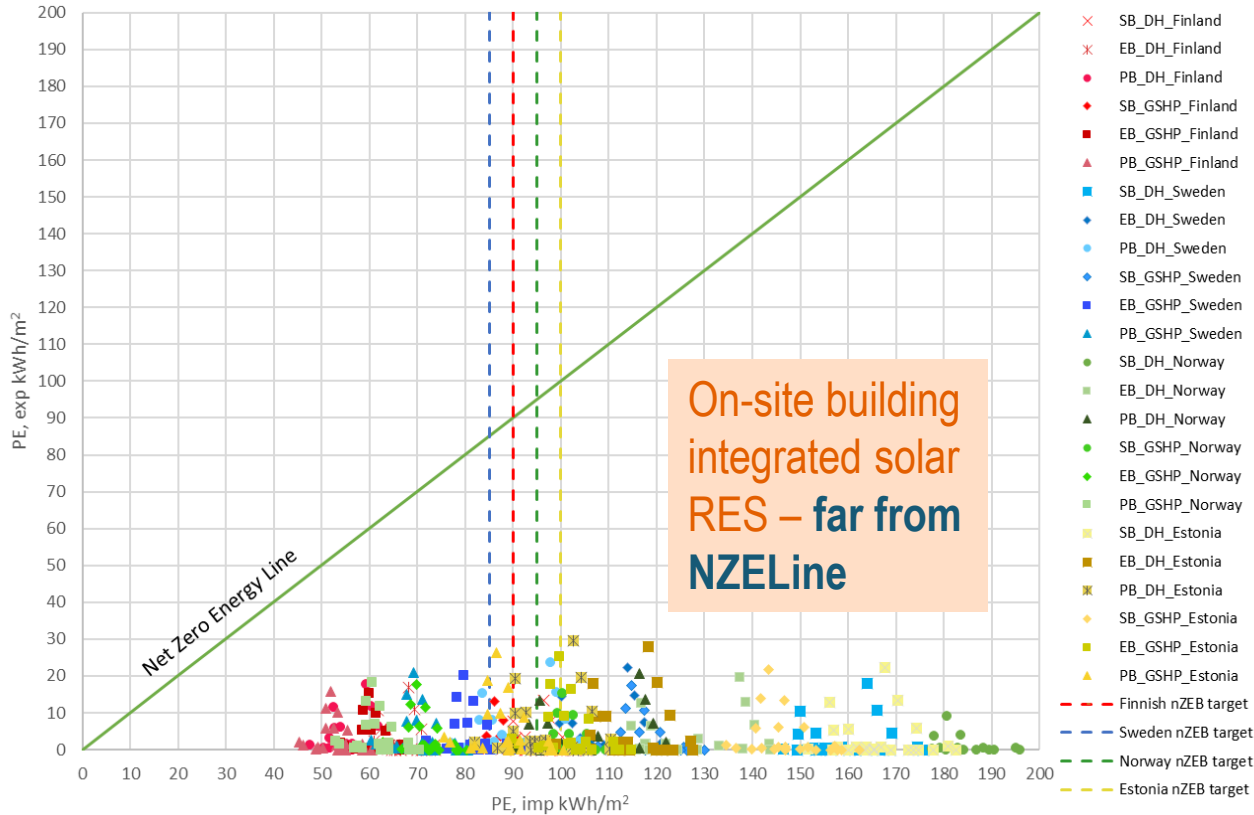


Key challenges and design principles



- **RES Mismatch:**
solar-seasonal, wind-daily
- **Optimization of yearly demand and supply**
- Lack of space in the Built environment
- Energy networks integration (electricity, district heat and district cooling) – **Smart Urban Grid**
- Energy efficiency reduces mismatch

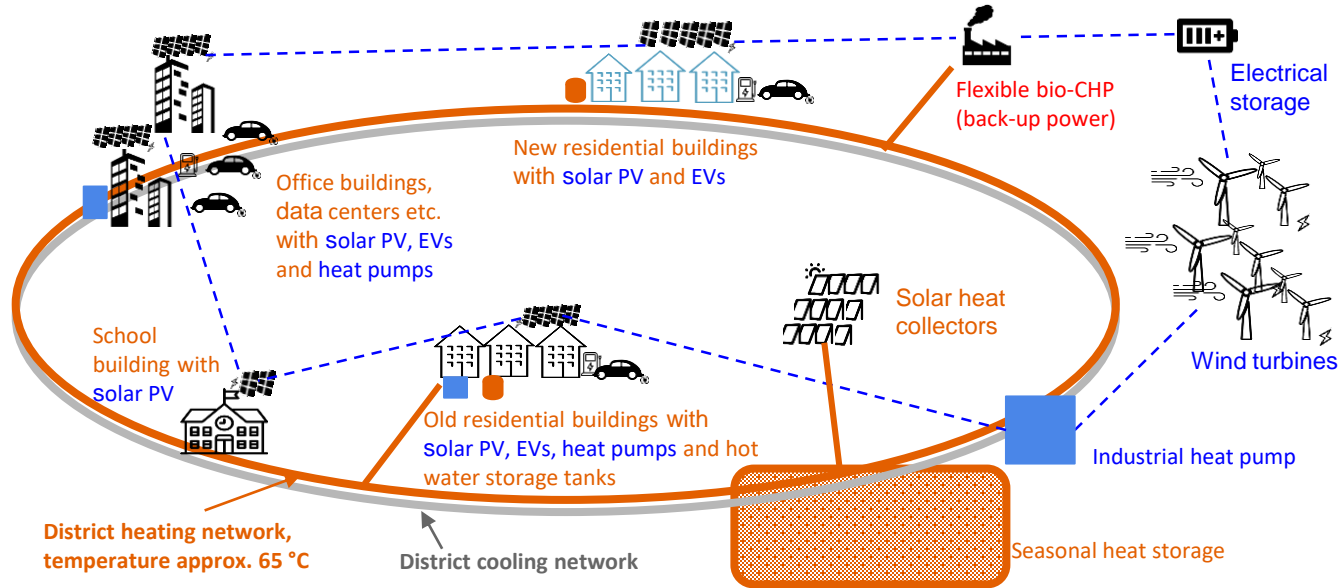
Beyond individual building



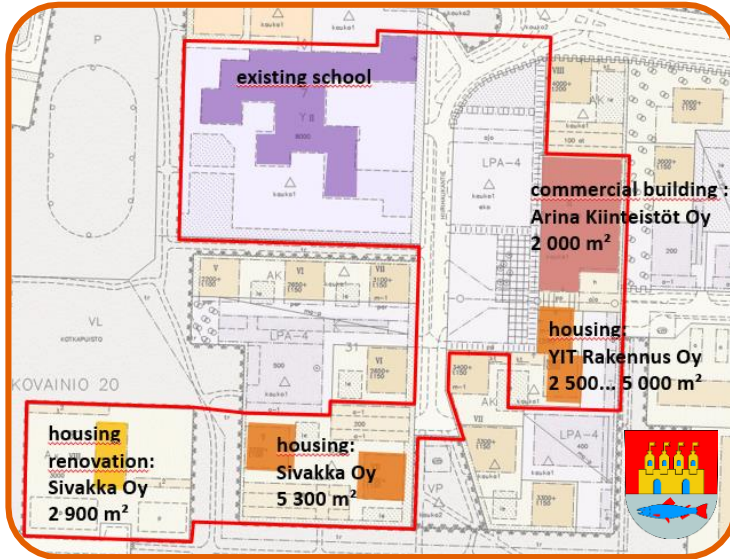
+eDistrict, SET concept

<http://smartenergytransition.fi/>

Carbon-Free district vision 2050

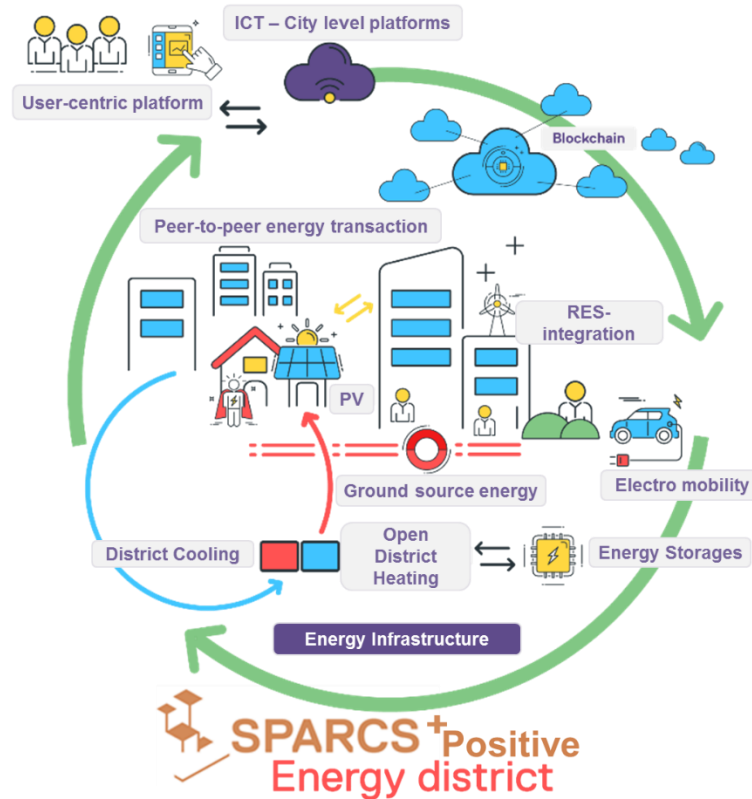


+eDistrict, best practices: Oulu case



- Heat distribution between the buildings on site
- **Solar thermal plant** (70 kW nominal output) on the roof of the school building
- High efficiency - **Heat pump**
- **Retrofitting** old building. Low temperature distribution
- **Decentralized PV**
- **Energy storages** (wells, PCM tank)
- **Heat recovery** from buildings and return pipe main District-heating

+eDistrict, best practices: Espoo & Leipzig



 **SPARCS**

 **SPARCS⁺ Positive Energy district**

Lessons learnt & future perspective

- **Nordic +eDistrict** shares **decentralized RES**, limiting energy migration
- **Synergies between building types** through a district energy infrastructure is **key**
- **Space optimization** in the built-environment
- **Political commitments** towards PositiveEnergyDistrict
- **Local Innovation ecosystem** is fundamental for R&D





Thank you!

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