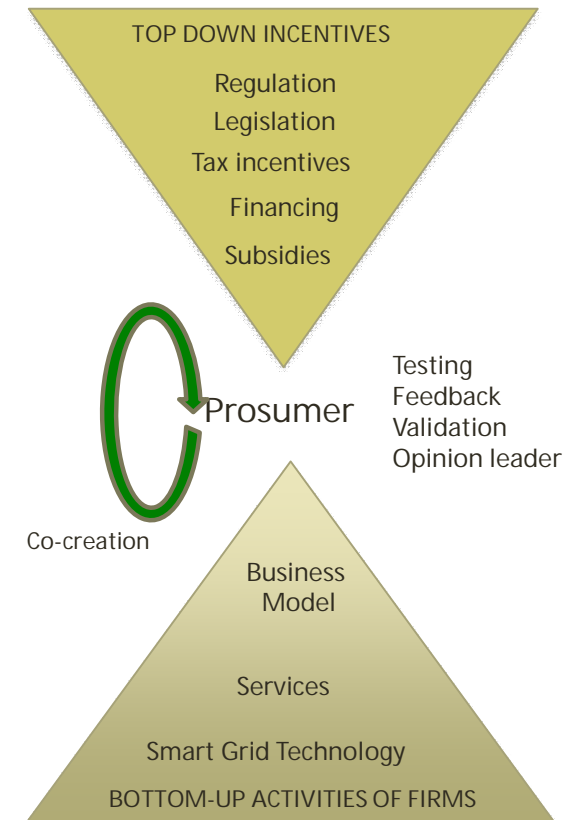


Changes in energy business environment

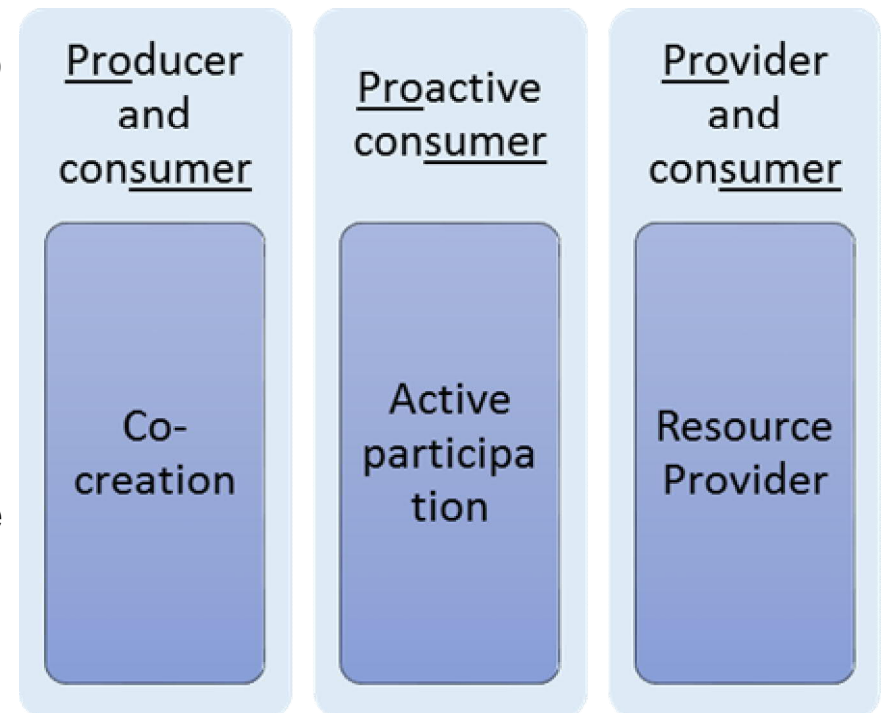
- **Challenges of climate change and actions to mitigate it**
- **Changes in electrical energy system**
 - Weather-dependent intermittent renewable energy production
 - Demand response and energy storages
 - Electric transportation
 - Increasing dependence of the whole society on uninterrupted electricity supply
- **Digitalization**
 - Internet of Things (IoT)
- **End-user and information oriented new ecosystems**
 - e.g. Uber, AirBnB, ...
- **Consumer / Provider / Producer → Prosumer (= active customer)**



Social Energy – Prosumer Centric Energy Ecosystem (ProCem)

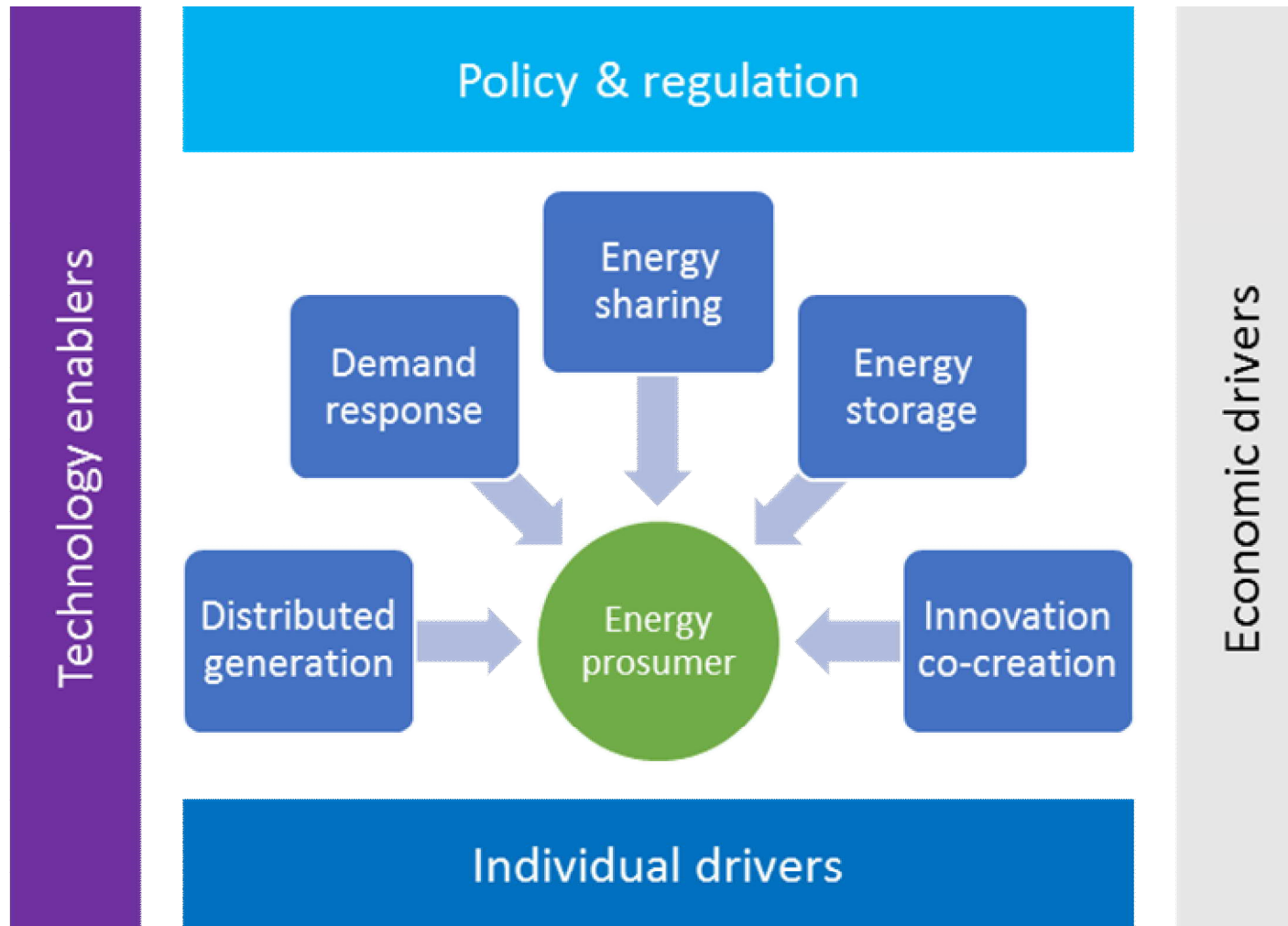
General prosumer definitions

- EU definition for an Active Consumer
 - a customer or a group of jointly acting customers who consume, store or sell electricity generated on their premises, including through aggregators, or participate in demand response or energy efficiency schemes provided that these activities do not constitute their primary commercial or professional activity
- Greenpeace definition for Energy Citizen
 - a change agent in the sustainability transition
- Energy prosumer embraces the dual nature of the role as a consumer who also produces, sells, trades, or stores energy (Ford R. et. al. 2016)
- Prosumers can produce electricity by the means of PV panels, store electricity in a battery storage or in the battery of an electric car, sell their extra electricity to the power grid or to other consumers within an energy community, or participate by means of flexible consumption in various electricity markets (Fingrid 2018)



Social Energy – Prosumer Centric Energy Ecosystem (ProCem)

Prosumer enablers/drivers and key activities

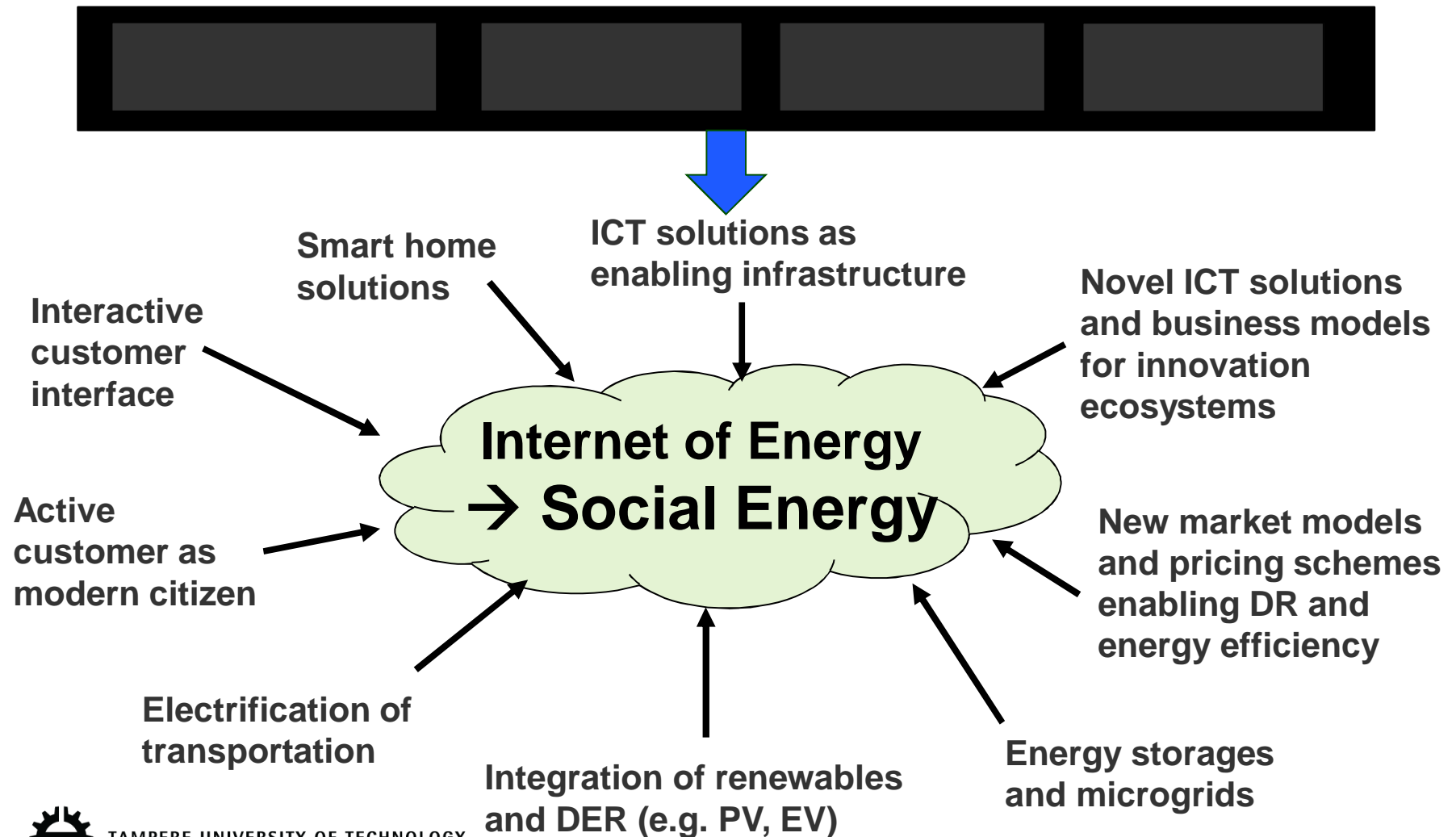


Social Energy – Prosumer Centric Energy Ecosystem (ProCem)

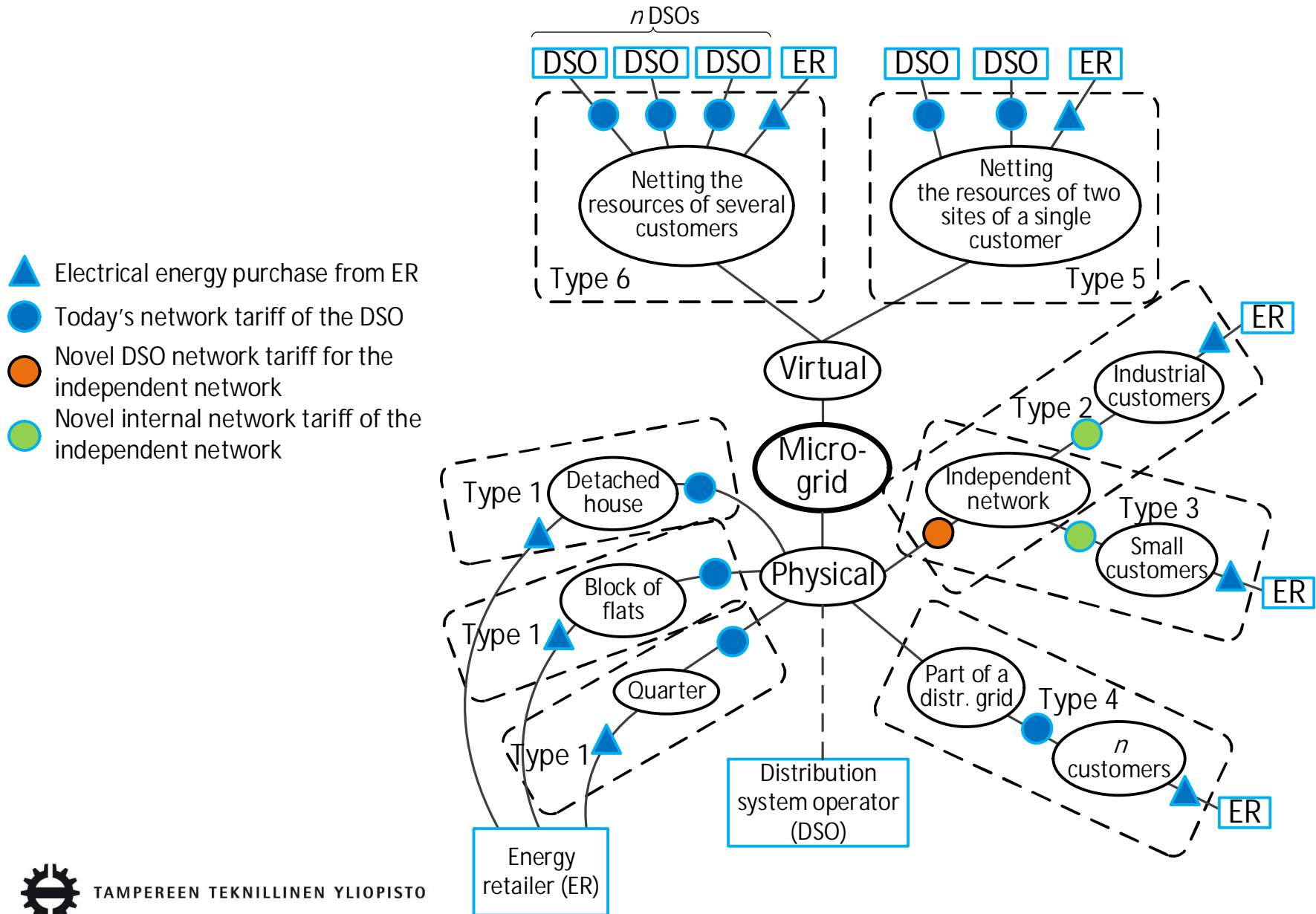
- The main aim of the project is to study the role of prosumers and integration of various kind of distributed energy resources in the electrical energy system.
- IoT-based technology platform has been developed and demonstrated in the Kampusareena at Tampere University of Technology (TUT).
- The technology platform enables to study roles, behaviour, needs and requirements of prosumers and new kind of business models and ecosystems in a new operational environment.
- Two main pilots are:
 - Kampusareena (University Campus Building)
 - Industrial level microgrid under development in Marjamäki, Lempäälä
- Realization of the research project calls for interdisciplinary approach and it is carried out in collaboration of research groups of four laboratories at TUT (i.e. Electrical Energy Engineering, Pervasive Computing, Automation Science and Engineering, and Industrial and Information Management).
 - The research project is carried out 1.8.2016 – 30.9.2018



Social Energy – Prosumer Centric Energy Ecosystem (ProCem) Innovation domain at TUT for issues of Social Energy

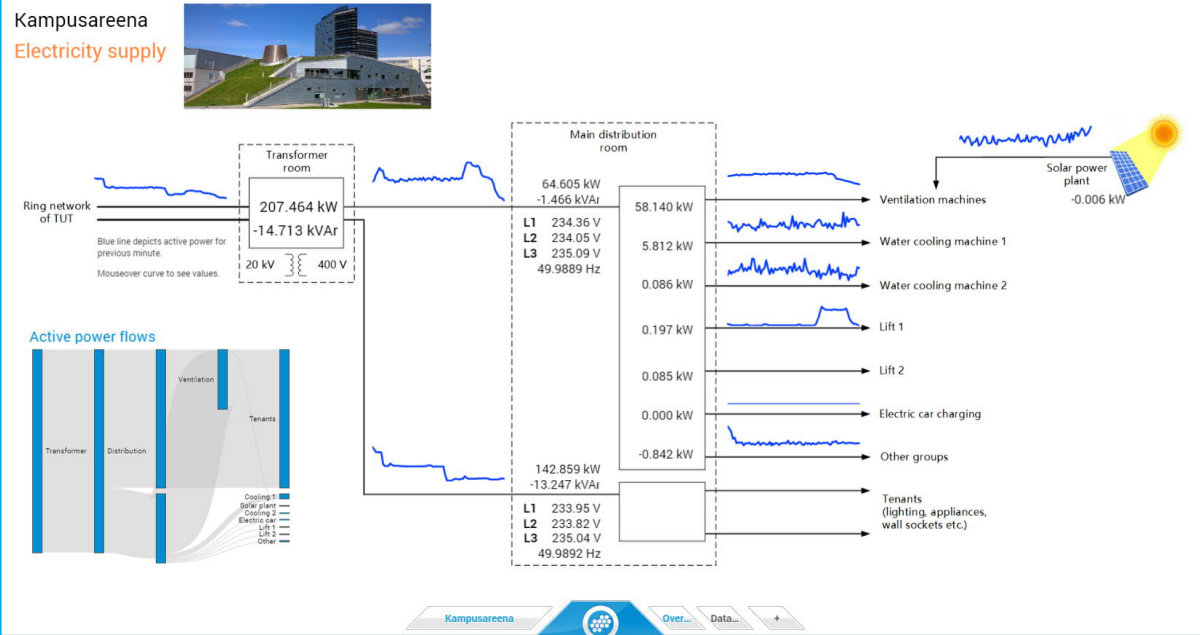


Type of microgrids and prosumers



Kampusareena pilot case

- Kampusareena (<http://www.tut.fi/en/kampusareena/>) is a relatively new building complex combining university library, university services, restaurants and company suites. The building is powered partly by using solar PV and the site offers electric vehicle charging stations to university staff and visitors. Daily energy consumption of the buildings, including its elevators are monitored



Microgrid region of Marjamäki area

- Marjamäki microgrid combines large-scale solar PV, energy storage, CHP-plants, and electricity, gas, district heating and cooling networks with industrial processes in a way that has not been trialed before in northern Europe.

Business and industrial premises, both existing and ones under construction.

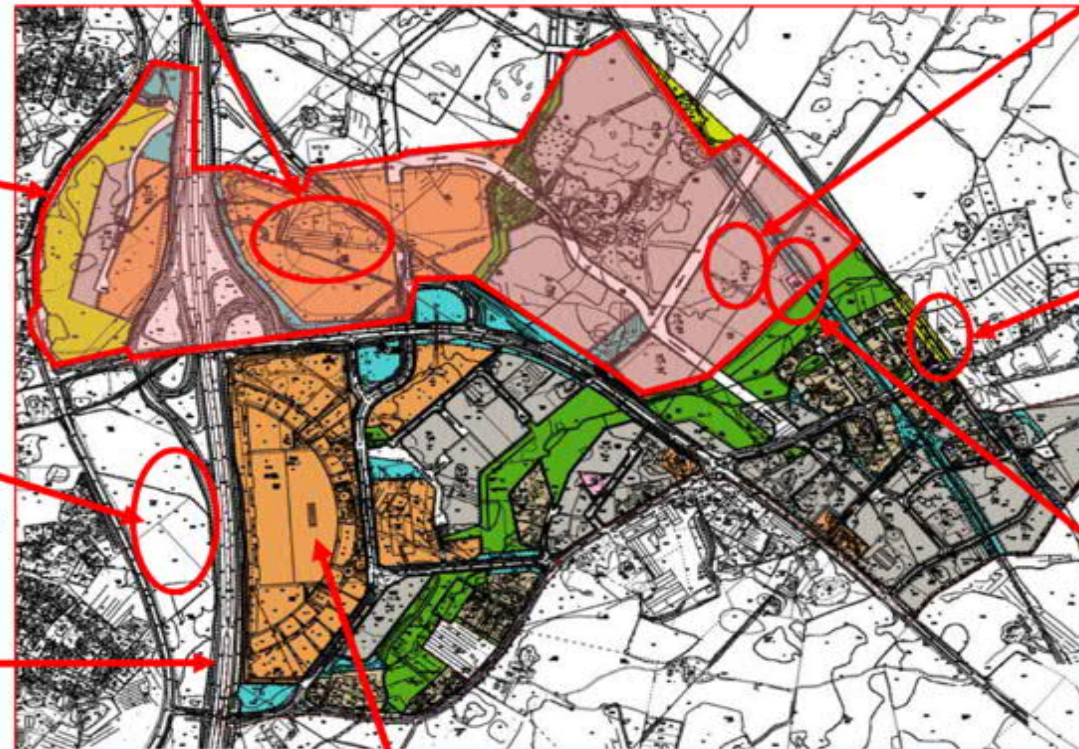
Marjamäki area today:

- Almost 300 companies
- 1700 jobs
- Total area 300 hectares

Industrial park under planning

MW scale solar power park

Tampere-Helsinki highway



Logistics center (large cold storage)

Pressure reducing station of the gas network

110/20 kV primary substation

Shopping center

