Webinar: Emerging Business Models for Energy Communities

Financial viability of Microgrids: an overview from the PEGASUS project

October 31st, 2019
The PEGASUS project

PEGASUS general objective is to contribute to an increased, efficient and effective use of RES in local territories making use of microgrids technologies.

What is a microgrid

A Microgrid is a group of interconnected loads and distributed energy sources within clearly defined electrical boundaries that acts as a single controllable entity respect to the grid. Microgrid can operate both grid connected and in island mode.
Microgrids and the Local Energy Communities

Microgrids are compliant with the new European rules on the Renewable Energy Communities:

“legal entities engaged in electricity generation, distribution and supply, consumption, storage, charging services for electric vehicles and providing other energy services to its shareholders or members”

Ten partners coming from Italy, Belgium, Croatia, Cyprus, France, Greece, Malta, Slovenia and Spain jointly worked to develop viable and sustainable business models to demonstrate the advantages achievable through the microgrids.
The pilots of PEGASUS project

- Municipality of Potenza (Italy)
- Sport Park Area of Ruše (Slovenia)
- University of Cyprus
- Preko island (Croatia)
- Gozo island (Malta)
- Saint Julien-en-Quint (France)
- Mega Evydrio (Greece)
The pilot was aimed at demonstrating the advantages in energy saving, reduced carbon emission and bills by the application of the Italian regulation «Scambio sul posto Altrove».

A heat driven CHP 120 KW\(_t\) / 60 KW\(_e\) is used for water and ambient air heating.

The generated electricity exceeding the local demand is fed into the grid. Electricity is withdrawn from the network when local demand overcomes the available CHP electric power.
The two sites are considered as a single electric user.
Reduced primary energy consumption: 368 MWh/y,
Reduced carbon emission: 80 tonn/y,
Cost saving 73,000 €/y,
Capex, amounting 246,000 €, financed by a bank loan at an interest rate of 3%,
Payback: 3,3 years,
NPV (over 16 years, 3.5% discount rate) : 480663 € ,
IRR : 24.7%.

This figure induced the Municipality to a call for tender for the implementation of what designed in the pilot.
RUŠE Sport Park Area microgrid pilot

- 4 public buildings
- Electricity consumption
  ✓ 478 MWh/y
  ✓ 57133 €/y
- Thermal power demand
  ✓ natural gas
  1204 MWh/y
  ✓ wood biomass
- PV plant: 100 kWp
  99694 kWh/y

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RUŠE Sport Park Area microgrid pilot

- Investments for PV PLANT: 110,000 €
- Bank loan: 126,722 € (15 years, interest rate 1.5%)
- Lower cost for electric service: 11,814 €/y

- Payback = 10.7 years
- NPV 25,645 € (discount rate 1.95%)
- IRR 5%
University of Cyprus microgrid pilot

It includes:
• loads of FOSS premises
• a programmable electric load emulating consumption profiles
• batteries emulating EV charging station
• Energy Storage System
• PV installation
• Energy Management System

Used as testbed for the design of the larger microgrid of University campus, the pilot is able to simulate different operating conditions of the microgrid, including the transients per passage from grid connected to island mode and vice versa.

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University of Cyprus microgrid pilot

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- The required investment is in the range 10,000 - 50,000 €,
- Payback ranges from 5 years to 19 years,
- The configuration more profitable: 15 kWp without storage

It has been evaluated the advantage for DSO due to lower loss distribution grid and peak relieving: about 1 M€ over 20 years can be achieved with a microgrid on whole University campus.
Preko island microgrid pilot

• The pilot site is located on Ugljan island (Croatia).
• The microgrid includes:
  ✓ a 10 kWp PV plant installed on the roof top of an olive oil mill (prosumer)
  ✓ 3 public consumers and 1 private consumer.

• The electricity consumption, equal to 12.145 kWh/y, is lower than the generated electricity equal to 12.546 kwh/y.
• A net metering regulation would significantly reduce the cost of electric service.
• The microgrid would improve the security of supply: following thunderstorms there is high probability of network shutdown.
Gozo island microgrid pilot

- The pilot site is located on Gozo island (Malta) at the Municipality of San Lawrentz
- The community-based microgrid includes:
  - 8 prosumers (public and residential) for a total of 54 kWp PV plant and 76 MWh/y of generated electricity,
  - 6 residential consumers.

Assuming to install further 108 kWp PV plant, the total CAPEX of the microgrid amounts to 150,000 € financed 75% through a grant and 25% through direct funding by the community.
Gozo island microgrid pilot

The most interesting scenario among those investigated:

✓ Microgrid purchases electricity from the grid (143 MWh/y) and prosumers and supplies all the community members at a rate discounted 10% on the current tariffs,
✓ The prosumers are remunerated at a price of 0,10 €/kWh,
✓ The electricity exceeding the total demand is sold at a price of 0,155 €/kWh (in compliance with the current feed-in tariff).

The related financial index:
• Payback: 9 years
• NPV (25 years, 5% discounted rate) : 30216 €
• IRR: 11,4%.
Saint Julien-en-Quint microgrid pilot

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Saint Julien-en-Quint microgrid pilot

- The pilot involves 33 residential consumers.
- A citizen local cooperative, established in June 2018, will bear the investment related to a 36 kWp PV plant (in so assuring 85% of self consumption) and represents the legal entity requested by the collective self-consumption scheme.

The electric demand of each consumer is supplied by the local cooperative and by local DSO, through a repartition scheme based on measured consumption over step time lasting 30 minutes.
Saint Julien-en-Quint microgrid pilot

• The local cooperative must cover the depreciation of his investment and the operating costs through the income from the electricity sale to local consumers.

• The local consumers have to buy electricity at the price lower or equal to the current public tariffs.

• The required investment of 190,000 €, 30% financed by local community and the remaining by bank loan at 2% interest rate, lead to NPV=0 in 15 years when the price of electricity for local consumers is equal to 0,12 €/kWh.

• To achieve a price of electricity equal to the current tariffs (around 0,08 €/kWh) the CAPEX must be covered for 60% by grant.
Mega Evydrio microgrid pilot

- The pilot site is located in the Municipality of Farsala in the area of Mega Evydrio (Thessaly Region, Greece).
- It extends over a very wide area and includes:

  ✓ 300 residential houses, eighty of them equipped with pv installation for a total of 169 kWp,
  ✓ 16 shops and 4 public buildings,
  ✓ 471 public street lights and 2 water pumping station,
  ✓ 5 producers for a total power of 500 kWp.

- The pilot is going to be organized as «local energy community» partecipated by the Municipality of Farsala and the local consumers and prosumers.
Thank you for the attention!!!