

**2nd BALKAN FORUM** in Thessaloniki 26 09 2020

**Session 5.1** Transition towards sustainable energy  
and environmental future practices

**Prof. Dr. Marija Kacarska**



Faculty of Electrical Engineering and Information Technologies  
Ss. Cyril and Methodius University in Skopje, North Macedonia



# Outline



- PV integration challenges
- Balkan-Mediterranean Program  
2014-2020
  - project PV-ESTIA
- Future sustainable energy practices
  - energy communities
- Conclusion



**INTERREG**

# PV integration challenge

**Photovoltaics are evolving as one of the main future Renewable Energy Source!**

Supplies energy for 200,000 households



One of the world's largest PV Parks – Agua Caliente, Arizona, USA (290 MWp)

# PV integration challenge

PVs in buildings – A new bright world .. Under the sun!



But the real advantage of PVs is their capability to integrate in the building environment!

<b>PV systems installed:</b>	<b>553</b>
<b>Total PV capacity:</b>	<b>2,129 kW</b>
<b>Avg. system capacity:</b>	<b>3.85 kW</b>

# PV integration challenge

And even making PV part of it!



# PV integration challenge



Nevertheless there are still many challenges for PVs!

- Cost
- Efficiency/Energy yield
- Reliability
- Grid/Market integration



The PV-ESTIA project is dealing with the last one!

# PV-ESTIA project



- Balkan-Mediterranean programme 2014-2020
  - Priority Axis: Environment
  - Thematic Objective: Preserving and protecting the environment and promoting resource efficiency
  - Investment Priority: Promoting innovative technologies to improve environmental protection and resource efficiency

# PV-ESTIA project



- **Networking** - transnational cooperation of 6+2 partners and 4 countries
  - Aristotle University of Thessaloniki, Department of Electrical & Computer Engineering, Power Systems Laboratory – **Lead partner, Greece**
  - University of Western Macedonia, Kozani, **Greece**
  - University of Cyprus, Foss Research Centre for Sustainable



# PV-ESTIA project (3)



Video with PV-ESTIA project goals and outputs

Video available on the link:

[https://www.youtube.com/watch?v=qqAnn\\_1LsAc](https://www.youtube.com/watch?v=qqAnn_1LsAc)

- Aiming to enhance the penetration of PVs in buildings

- using electric energy storage (to transform

~~buildings into a controllable energy~~

source



- changing the way buildings with PVs

## The PV-ESTIA outputs and results (real and applicable):

1. Innovative Management Scheme of hybrid PV+storage systems to make buildings grid-friendlier
2. User-friendly **online tool** providing profitability estimation of hybrid systems modelling both the thermal and the electrical energy demand (<http://pvestiatool.eu/>)
3. **Advanced tool** to evaluate multiple policy scenarios **to be used by decision- and policy-makers**
4. Set of joint **regulation recommendations** as a roadmap for grid operators and relevant stakeholders/engineers in BalkanMed region
5. Set of joint **policy recommendations** targeting mainly **policy makers and interested stakeholders** in BalkanMed countries

# Future sustainable energy practices

- Move the attention from individual households in PV-ESTIA project to energy community projects to achieve easier transition towards sustainable energy and NZEB. Not only to energy benefits of them, but also an economic and environmental benefits for the citizens in Balkan area
- **Energy communities** enable consumers to jointly pursue their individual and collective economic, environmental and social goals, while simultaneously contributing to the decarbonisation of the energy system
  - Future challenge for promotion of the necessary business and technological networking and collaborations on a Balkan level (energy community projects in non EU Balkan countries as transferred experience from EU Balkan countries)
  - Local wind farms and community solar photovoltaic cooperatives become increasingly prominent

# Future sustainable energy

## practices

- Barriers for energy communities
  - **Technical** (energy efficiency, local balancing of supply and demand, local flexibility and the impact on the energy system)
  - Socio-economic (willingness to pay, energy poverty, economic incentives and high upfront investments)
  - Environmental (emissions, waste, spatial issues) <sup>13</sup>

# Future sustainable energy

## practices

- **Technologies** for energy community projects
  - Shared PV generation (rooftop or collective, with or without individual batteries)
  - Community-owned (shared) storage
  - Hybrid and multi-energy systems
  - District heating and cooling systems
- Optimal design of energy systems for communities

# Future sustainable energy practices

- Indicators used to quantify the impacts of energy communities
  - Economic (energy bill savings; investment; operation and total cost savings; levelized cost of energy; internal rate of return (IRR); payback period; life cycle cost; net-present value)
  - Environmental (GHG; CO<sub>2</sub>; life-cycle emission; refrigerant emission)
  - Technical (self-consumption ratio (SCR); self-sufficiency ratio (SSR); loss-of-load probability (LOLP); load match index (LM); electricity exports; primary energy)

# Conclusion



- **Balkan-Mediterranean Programme 2014-2020**  
pros and contra
  - 👉 Success story! Excellent programme and experience!
  - 👉 PV-ESTIA project is one of the flagship projects in INTERREG BalkanMed programme with a LOT of usable results
  - 👉 The programme gives the opportunity to enhance the collaboration among the partners, moving from local to regional and to global



# Conclusion



- The promotion of sustainable development programmes, partnerships and networks in the Balkans during the programmatic period 2021 – 2027 of the EU funds
  - ✓ Strong **support** to Balkan-Mediterranean programme as a good practice opportunity for<sub>17</sub>

# Thank you for your attention!

## Prof. Dr. Marija Kacarska

[marija.kacarska@gmail.com](mailto:marija.kacarska@gmail.com)



Faculty of Electrical Engineering and Information Technologies  
Ss. Cyril and Methodius University in Skopje, North Macedonia

