



Funded by
the European Union

Power Flow Optimization and Distributed Electric Vehicle Charging Control in Smart Microgrids

Prof. Jordan Radosavljević
Faculty of technical sciences
Kosovska Mitrovica

Name of Event/ Date

"Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them."

**Partnership for Promotion and Popularization of Electrical Mobility through
Transformation and Modernization of WB HEIs Study Programs/PELMOB**

Call: ERASMUS-EDU-2022-CBHE-STRAND-2

Project Number: 101082860



Introduction

- Growing use of Electric Vehicles (EVs)
- Importance of smart microgrids
- Challenges of integrating EVs into the power system
- Goal of the presentatio

What are Smart Microgrids?

- Definition
- Components: DER (Distributed Energy Resources), ESS (Energy Storage Systems), controllers, sensors
- Advantages: flexibility, reliability, energy efficiency



Challenges in EV Charging

- Peak loads
- Voltage disturbances
- Limited capacity of the distribution network
- Imbalance in consumption



Concept of Power Flow Optimization

- DC and AC Optimal Power Flow (OPF)
- Objective: minimize losses, maximize efficiency
- Constraints: voltage, current, capacity



Program: ERASMUS-EDU-2022-CBHE-STRAND-2
Project number: 101082860



Role of Distributed Control

- Decentralized approaches
- Agent-based systems and local decision-making
- Communication networks and cybersecurity

Algorithms and Methods

- Optimization methods:
 - Linear/Nonlinear programming
 - Stochastic optimization
 - Machine learning (RL, Neural Networks)
- Examples of charging control strategies: V2G (Vehicle-to-Grid), TOU (Time-of-Use)



Challenges and Future Work

- Real-world implementation issues: regulation, interoperability
- Need for standards and further research
- Role of users and incentive mechanisms

Conclusion

- EVs as a key component of future energy systems
- Integration requires advanced management and optimization
- Potential of smart microgrids for a sustainable energy future