

Metrology Section (MLI)
INVITED LECTURE:

“Advancing Energy Digitalization through Digital Twins and Living Labs”

Živko Kokolanski

Ss Cyril and Methodius University in Skopje,
Faculty of Electrical Engineering and Information Technologies,
Skopje, Republic of North Macedonia
kokolanski@feit.ukim.edu.mk

Abstract: The transition toward sustainable and resilient energy systems is a key priority under initiatives such as REPOWER EU, the European Green Deal, and EUSAIR. Energy digitalization plays a crucial role in achieving these goals by enabling efficient management, real-time monitoring, and advanced forecasting of renewable energy sources. Digital twins and living laboratories emerge as key enabling technologies in this transformation, offering a platform for innovation, experimentation, and optimization of energy systems.

Living labs provide real-world environments for testing and validating new energy technologies before large-scale deployment. The INNOFEIT Living Lab in Skopje exemplifies this approach, integrating a solar power plant, battery storage, an electric vehicle charger, a geothermal heat pump, a weather station, and infrastructure automation. This setup allows researchers, industry stakeholders, and policymakers to assess the impact of various energy solutions under real operating conditions.

Beyond physical experimentation, the integration of digital twins enhances the capabilities of living labs. Digital twins are virtual replicas of physical systems that enable remote monitoring and control, simulation of energy scenarios, and real-time testing of optimization algorithms. Moreover, the application of machine learning and artificial intelligence facilitates advanced energy forecasting, demand-side management, and predictive maintenance. These efforts align with the IPA INTERREG ADRION Project GOTOTWIN, which focuses on the development of a digital twin platform for renewable energy sources across the Adriatic-Ionian region.

The primary objective of this talk is to showcase how the synergy between digital twins and living labs can drive the digitalization of energy systems, accelerating the transition toward more efficient, resilient, and sustainable energy infrastructures. By showcasing real-world experimentation in the living lab environment, and advanced digital modeling, stakeholders can optimize energy systems through data-driven insights, and align with the European energy policies.

Short biography:



Prof. Dr. Živko Kokolanski is a full professor at the Faculty of Electrical Engineering and Information Technologies (FEIT) in Skopje and serves as Vice-Dean for Finance and Industry Cooperation. With over two decades of experience, he continually integrates scientific research, applied innovation, and strategic collaboration to advance regional development. An esteemed expert in electrical measurements, virtual instrumentation, and telemetry, he has authored more than 100 scientific papers and international patents. Prof. Kokolanski has been a key contributor to many international research projects, promoting cooperation and excellence among institutions. As the project manager of the GoToTWIN project under the INTERREG ADRION program, he promotes sustainable regional growth and stakeholder engagement across the Adriatic-Ionian region. Through his active involvement in INNOFEIT’s European Digital Innovation Hub, and INNOFEIT Living Lab he thrives towards digital transformation and institutional collaboration.