



RESEARCH GROUPS CATALOGUE

DEPARTMENT OF POWER ENGINEERING

Split, 2026

CONTENTS

GROUP FOR ELECTRICAL MEASUREMENTS AND SIGNAL PROCESSING	3
GROUP FOR PLANNING AND OPERATION OF POWER SYSTEMS WITH HIGH SHARES OF RENEWABLE ENERGY SOURCES	5
GROUP FOR MODELLING AND SIMULATION OF ELECTROMAGNETIC PHENOMENA IN POWER SYSTEMS	8
GROUP FOR POWER SYSTEM PLANNING	10
GROUP FOR AUTOMATION AND ELECTRIC DRIVES	12
GROUP FOR ENERGY ELECTRONICS AND AUTOMATION	14

GROUP FOR ELECTRICAL MEASUREMENTS AND SIGNAL PROCESSING (GELM)

Head of the Group:

Prof. Tonko Garma, PhD

<https://www.croris.hr/osobe/profil/30146?lang=en>

Scientific Fields:

Engineering / Electrical Engineering

Brief Description of the Research Group:

The research group specializes in the measurement, modeling, and diagnostics of power systems, with a particular focus on the development of advanced metrological and testing methods. Its core research activities include the development and application of power system disturbance simulators, as well as the calibration of non-sinusoidal voltages and currents to ensure measurement accuracy and the reliability of diagnostic procedures.

The group also develops metrological infrastructure to support smart grids, enabling accurate monitoring, analysis, and control of power systems in the context of digital transformation and the energy transition.

In addition, the group conducts research on advanced nanomaterials for applications in energy conversion and storage. This includes the development of novel materials and concepts for converting electrical energy into chemical energy carriers, as well as experimental investigations of electromechanical coupling in ferroelectric and defect-engineered metal oxides, with a particular emphasis on the role of defects and ionic dynamics in energy conversion and storage processes.

1. RESEARCH TEAM

Faculty members in teaching and research positions:

- Prof. Goran Petrović, PhD
- Prof. Tomislav Kilić, PhD

2. EXPERTISE AND KNOW-HOW

- Measurement, modeling, and diagnostics of power systems
- Power system disturbance simulators and calibration of non-sinusoidal voltages and currents
- Metrological infrastructure for smart grids
- Cleanroom techniques (lithography, thin-film deposition, electrical transport measurements, and electron microscopy)

3. RESEARCH INFRASTRUCTURE

Laboratories

- Laboratory A244 - Laboratory for electrical measurements
- Laboratory A249

Equipment

- Calibrator: CALMET 300B
- STER synchrophasor measurement unit (PMU)
- Power quality meter: ION7650
- NI CompactRIO cRIO-9035 real-time controller
- LCR meter: HP 4284A
- Dynamic signal analyzer: HP 35665A
- Digital multimeter: HP 3458A
- High-voltage voltage transformer (VT): NMT 110/0.1/0.1 kV/kV/kV and high-voltage current transformer (CT): SMT 300(600)/1/1/1/1 A/A/A/A
- Generation and measurement of voltages up to 110 kV AC and 100 kV DC, and currents up to 2000 A AC and 200 A DC
- Measurement of very low electrical resistances (10 A and 200 A micro-ohmmeters) and very high electrical resistances (tera-ohmmeters with 5 kV and 110 kV test voltages)
- 10/0.4 kV, 630 kVA distribution transformer with a 10 kV oil circuit breaker integrated with a Siemens overcurrent protection system
- Inductive and acoustic partial discharge measurement system
- Thermal imaging camera with 320 × 240 pixel resolution and a measurement range from –20 °C to +600 °C
- Diagnostic system for testing power transformers, voltage transformers, and current transformers
- 48 V lithium-ion and lead-acid battery packs, equipment for capacity measurements, and diagnostic instruments for determining State of Health (SOH) and State of Charge (SOC)
- Electromagnetic field strength spectrum analyzers for extremely low-frequency (ELF) fields and mobile communication networks
- Equipment for testing grounding (earthing) systems and determining the electrical properties of soil
- Process measurement instrumentation, including Class 1 sound level meter, illuminance meters, temperature and relative humidity sensors, anemometers, pressure gauges, and analyzers for the electrical properties of liquids.

4. KEY PROJECTS AND REFERENCES

- Power engineering measurements, modeling and diagnostics
- Power system disturbance simulator and non-sinusoidal voltages and currents calibrator
- Metrology infrastructure for support of the intelligent power grid

5. COLLABORATION OPPORTUNITIES

- Measurement and diagnostics of power systems
- Power quality measurement
- Determination of the geoelectrical and geothermal properties of soil

6. CONTACT

Head of Research Group: garma@fesb.hr

General Contact: projekti@fesb.hr

GROUP FOR PLANNING AND OPERATION OF POWER SYSTEMS WITH HIGH SHARES OF RENEWABLE ENERGY SOURCES (ENERGYgrid)

Head of the Group:

Prof. Damir Jakus, PhD

<https://www.croris.hr/osobe/profil/26729?lang=en>

<https://damir-jakus.from.hr/>

Scientific Fields:

Engineering – Electrical Engineering

Brief Description of the Research Group:

The research group develops advanced solutions for the analysis, optimization, and operation of modern power systems with high shares of renewable energy sources (RES). Its core expertise includes transmission and distribution network planning studies, grid integration analyses for new generation and demand, protection system coordination, techno-economic assessment of energy projects, electricity market analysis, optimal sizing of energy systems, and the application of advanced optimization and machine learning techniques through the development of specialized software tools.

The group's research aims to enhance the reliability, flexibility, and efficiency of future power systems while maintaining a strong focus on technology transfer and close collaboration with industry partners.

1. RESEARCH TEAM

Faculty members in teaching and research positions:

- Assoc. Prof. Josip Vasilj, PhD
- Prof. Ranko Goić, PhD

Other faculty researchers:

- Joško Novaković, MEng

2. EXPERTISE AND KNOW-HOW

- Optimization of transmission and distribution system operation with high penetration of renewable energy sources (RES) and electric vehicles (EVs)
- Development of specialized software tools and simulation models for the power industry
- Application of machine learning and deep learning methods for power system diagnostics and forecasting
- Transmission and distribution network development studies (long-term planning, congestion analysis, network development scenarios, etc.)
- Grid impact assessments for the integration of new generation units, energy storage systems, and electric vehicle charging infrastructure
- Verification of grid connection compliance with technical requirements, grid codes, and regulatory standards

- Protection system coordination and settings for transmission and distribution networks, including challenges associated with inverter-based resources
- Techno-economic assessment of energy projects and investments (LCOE, LCOH, feasibility studies, technology comparison, etc.)
- Optimal sizing of energy systems, including generation units, battery energy storage systems, EV charging infrastructure, and microgrids
- Electricity market analysis and optimization of market participation strategies for generation and consumption portfolios
- Application of advanced optimization techniques in power system planning and operation
- Machine learning and deep learning methods for forecasting and diagnostics of key power system parameters

3. RESEARCH INFRASTRUCTURE

Laboratories

- Laboratory for Power System Simulation and Real-Time Analysis
- Laboratory for Microgrids and Renewable Energy Systems
- Experimental Smart Grid Electric Vehicle Charging Laboratory

Equipment

- OPAL-RT real-time simulation platform for power systems and power electronics, including RT-LAB, ePHASORsim, and eHS software packages
- Engineering software: MATLAB/Simulink, PLECS, PowerFactory, NEPLAN, RT-LAB, ePHASORsim, eHS, GridLAB-D, OpenDSS, PowerCAD, WinDIS, EMTP-RV, EMTP-ATP, and others
- Microgrid laboratory testbed for implementing and validating control algorithms for photovoltaic systems and battery energy storage
- Photovoltaic modules based on different technologies and battery testing systems
- Meteorological station
- Electric vehicle charging infrastructure consisting of a 2×11 kW EVBox Elvi charging station, a 22 kW go-e mobile charger, and a backend management platform for charger monitoring and control
- Measurement equipment including oscilloscopes, electrical and non-electrical sensors, torque meters, and rotational speed measurement devices
- Optimization software and solvers: GAMS, GUROBI, and CPLEX

Advanced Computing Resources

- High-performance workstations for power system optimization using GAMS, PYOMO, JuMP, GUROBI, CPLEX, and related tools, as well as for machine learning and deep learning applications in power system diagnostics and forecasting

4. KEY PROJECTS AND REFERENCES

- **2025–2029** –FLEXsys: Implementation of Flexibility Resources and Advanced Control Algorithms for Modern Power Systems with High Shares of Renewable Energy Sources
- **2024–2026** – LUMINIH2: Laboratory Model and Prototype of a Control and Monitoring System for Microgrids with Renewable Energy Sources and Hydrogen Technologies
- **2021–2023** – MsEVP: Research and Development of a Smart Grid Electric Vehicle Charging Station Integrated into a Rotary Parking Structure
- **2021–2023** – GridS: System for Establishing a Stable Electricity Distribution Network
- **2020–2025** – ADVANCE-RES: Application of Advanced Optimization and Machine Learning Methods in Planning and Operation of Power Systems with High Shares of Renewable Energy Sources

5. COLLABORATION OPPORTUNITIES

The research group welcomes collaboration with universities and research institutions, power utilities, transmission and distribution system operators (TSOs and DSOs), equipment manufacturers, engineering and consulting companies, and industrial partners in the planning, analysis, and optimization of power systems with high shares of renewable energy sources. Its particular expertise includes transmission and distribution network development studies, grid integration studies for new generation units, energy storage systems, and electricity consumers, verification of compliance with grid connection requirements, and the design and coordination of protection systems in networks with a high penetration of inverter-based resources. The group also offers extensive expertise in techno-economic assessment of energy projects and investments, optimal sizing of energy systems—including generation units, battery energy storage systems, electric vehicle charging infrastructure, and microgrids—as well as electricity market analysis and the development of market participation strategies. A key strength of the group is the development of specialized software tools and simulation models tailored to the specific needs of industrial partners, combined with the application of advanced machine learning and deep learning techniques for power system diagnostics and forecasting. Collaboration opportunities include joint research and innovation projects (including Horizon Europe, Interreg, and national HRZZ and NPOO funding programmes), technical and feasibility studies, expert reports and consulting services, development of specialized software tools, validation of control, protection, and optimization algorithms, technical support, professional training and continuing education, as well as access to the group's laboratory facilities and research infrastructure.

6. CONTACT

Head of Research Group: damir.jakus@fesb.hr

General Contact: projekti@fesb.hr

GROUP FOR MODELLING AND SIMULATION OF ELECTROMAGNETIC PHENOMENA IN POWER SYSTEMS (MOSEPES)

Head of the Group:

Assoc. Prof. Dino Lovrić, PhD

<https://www.croris.hr/osobe/profil/27637?lang=en>

Scientific Fields:

Engineering Sciences – Electrical Engineering

Brief Description of the Research Group:

The research group's areas of expertise include power system transient stability analysis, transient analysis and surge protection of wind farms, transient analysis and insulation coordination in power systems, the application of machine learning to power system transient stability, power system protection, analysis of electromagnetic interference in power systems, interpretation of geoelectrical soil survey results and geoelectrical soil surveying, lightning risk assessment, and analysis of grounding systems in power systems.

1. RESEARCH TEAM

Faculty members in teaching and research positions:

- Prof. Petar Sarajčev, PhD
- Prof. Ivica Jurić-Grgić, PhD
- Assist. Prof. Ivan Krolo, PhD

2. EXPERTISE AND KNOW-HOW

- Transient analysis and surge protection of wind farms
- Transient analysis and insulation coordination in power systems
- Machine learning applications in power system transient stability
- Power system protection
- Analysis of electromagnetic interference in power systems
- Interpretation of geoelectrical soil characteristics
- Analysis of power system grounding systems and surge protection
- Lightning risk assessment
- Power system transient stability

3. RESEARCH INFRASTRUCTURE

Laboratories

- Electrical Installations Testing Laboratory
- Electromagnetic Compatibility (EMC) Laboratory
- Research Laboratory

Equipment

- Instruments for measuring low-frequency electric and magnetic field strength
- Dielectric strength testing equipment
- Thermal imaging camera

4. KEY PROJECTS AND REFERENCES

- Convergent OT–IT Energy Management System (EMS) for the Transition of Port Communities into Smart Low-Carbon Energy Hubs (SPIN Project)
- Vujević, S.; Modrić, T.; Lovrić, D. Testing the Geoelectrical Characteristics of the Soil at the Location of the Future 35/20 (10) kV Vrlika Substation. Commissioned by HEP ODS Ltd., Elektrodalmacija Split Distribution Area, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture (FESB), University of Split, 2019.
- Sarajčev, P. Selection of the Generator Grounding Resistor for Kosinj Hydropower Plant. Commissioned by Projektni biro Split Ltd., Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture (FESB), University of Split, 2021.
- Vujević, S.; Modrić, T.; Lovrić, D.; Krolo, I. Design of the Grounding System for the 35/20 (10) kV Vrlika Substation and Calculation of Transferred Potentials in the Grounding System. Commissioned by HEP ODS Ltd., Elektrodalmacija Split Distribution Area, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture (FESB), University of Split, 2019.
- Sarajčev, P. Analysis of Electromagnetic Interference Between Adjacent Triplets of Shielded Generator Bus Ducts in Zakućac Hydropower Plant. Commissioned by Projektni biro Split Ltd., Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture (FESB), University of Split, 2011.

5. COLLABORATION OPPORTUNITIES

The research group welcomes collaboration in areas including power system transient stability analysis, transient analysis and surge protection of wind farms, transient analysis and insulation coordination in power systems, machine learning applications for power system transient stability, power system protection, analysis of electromagnetic interference in power systems, geoelectrical soil surveying and interpretation of geoelectrical survey results, lightning risk assessment, and analysis of grounding systems in power systems.

6. CONTACT

Head of Research Group: dlovric@fesb.hr

General Contact: projekti@fesb.hr

GROUP FOR POWER SYSTEM PLANNING

Head of the Group:

Prof. Elis Sutlović, PhD

<https://www.croris.hr/osobe/profil/15117?lang=en>

Scientific Fields:

Engineering / Electrical Engineering

Brief Description of the Research Group:

The research group focuses on the planning, analysis, operation, and control of power systems in the context of the energy transition and the development of sustainable energy solutions. Its expertise includes strategic energy planning, the development and application of methods for power system analysis and expansion planning, and the optimization of power system operation and control. The group's research aims to enhance the security of supply, reliability, efficiency, and flexibility of power systems while supporting the integration of emerging technologies and renewable energy sources.

1. RESEARCH TEAM

Faculty members in teaching and research positions:

- Prof. Tonći Modrić, PhD
- Prof. Nikša Kovač, PhD

Other faculty researchers:

- Marin Mandić

2. EXPERTISE AND KNOW-HOW

- Energy sector planning
- Power system planning and analysis
- Power system operation and control

3. RESEARCH INFRASTRUCTURE

Laboratories

The research group conducts its project-related research activities in Laboratories A247 and A325.

Equipment

- Typhoon HIL 606 real-time digital simulator (RTDS) with the integrated Typhoon HIL Control Center software suite.

4. KEY PROJECTS AND REFERENCES

Members of the research group have participated in the following research projects:

- Converged IT–OT Energy Management System (EMS) for the Transition of Port Communities into Smart Low-Carbon Energy Hubs (SPIN), 2024–2027
- Power System Disturbance Simulator and Non-Sinusoidal Voltage and Current Calibrator, Croatian Science Foundation, Project IP-2019-04-7292, 2020–2024
- Development and Operation of Power Systems with a High Penetration of Wind Power, Ministry of Science and Technology of the Republic of Croatia, Project No. 023-0361590-1654, 2007–2011
- Optimization of Planning and Operation of Hydropower Systems, Ministry of Science and Technology of the Republic of Croatia, Project No. 0023026, 2002–2006

5. COLLABORATION OPPORTUNITIES

The research group specializes in the planning, analysis, operation, and control of power systems, with particular emphasis on the challenges and opportunities arising from the energy transition, renewable energy integration, and the development of sustainable energy solutions.

Collaboration opportunities include joint research and development projects, the development and validation of novel methods and algorithms, modelling and simulation, laboratory and Hardware-in-the-Loop (HIL) testing, demonstration projects, technical studies and analyses, as well as the preparation and implementation of national and international research projects. Potential areas of collaboration include:

- Power system planning and development – transmission and distribution network expansion planning and power system development scenario analysis
- Renewable energy integration – analysis of technical and operational challenges associated with integrating large-scale and distributed renewable energy sources
- Power system flexibility and energy storage – optimization of energy storage systems, management of flexible resources, and development of new approaches to improving power system flexibility
- Modelling, simulation, and validation – development of mathematical models and computational tools for power system analysis, including real-time simulation and Hardware-in-the-Loop (HIL) techniques for testing control systems, protection schemes, and energy equipment
- Microgrids and local energy systems – design, modelling, and optimization of microgrids, energy communities, and local energy systems with a high share of renewable energy sources and energy storage

6. CONTACT

Head of Research Group: Elis.Sutlovic@fesb.hr

General Contact: projekti@fesb.hr

GROUP FOR AUTOMATION AND ELECTRIC DRIVES

Head of the Group:

Prof. Božo Terzić, PhD

<https://www.croris.hr/osobe/profil/13848?lang=en>

Scientific Fields:

Engineering / Electrical Engineering

Brief Description of the Research Group:

The research group focuses on the development and application of advanced technologies in the fields of electrical machines, power electronic converters, and automated systems. Its expertise covers AC electrical machines and electric drives, power electronic converters, industrial automation, and advanced control systems. Particular emphasis is placed on electrical energy storage systems and their role in enhancing the flexibility, stability, and reliability of power grids. The group's research contributes to the development of energy-efficient, digitalized, and sustainable industrial and energy systems.

1. RESEARCH TEAM

Faculty members in teaching and research positions:

- Prof. Marin Despalatović, PhD
- Assoc. Prof. Ozren Bego, PhD
- Assoc. Prof. Danijel Jolevski, PhD
- Assist. Prof. Goran Majić, PhD

2. EXPERTISE AND KNOW-HOW

- AC electrical machines and electric drives
- Power electronic converters
- Industrial automation
- Advanced control systems
- Electrical energy storage systems and power grid stabilization

3. RESEARCH INFRASTRUCTURE

Laboratories

- Electric Drives Laboratory (up to 50 kW)
- Electric Drives Laboratory (up to 350 kW)
- Automation and Control Systems Laboratory
- Containerized Electrical Energy Storage and Power Grid Stabilization System (300 kW / 150 kWh)

Equipment

- Electrical machines of various types and ratings (100 W to 350 kW)
- State-of-the-art power electronic converters up to 350 kW
- Programmable Logic Controllers (PLCs)
- Measurement equipment (electrical instruments, oscilloscopes, thermal imaging camera, impulse voltage generator, electrical and non-electrical sensors, torque and rotational speed measurement systems)
- Microprocessor-based systems
- Components for power electronic converters (IGBT modules, inductors, capacitors, electronic control boards, busbars)

4. KEY PROJECTS AND REFERENCES

- Development of Electric Drives for Crane Systems, ABB Sweden – FESB, Project Leader, international R&D project, 2009–2013.
- Development of Electric Drives for Crane Systems, CEC Germany – FESB, Project Leader, international R&D project, 2017–2025.
- Safer and More Efficient Cogeneration/Trigeneration Plants, Partners: FESB Split – Banko Ltd., Project Leader, EU-funded project, 2015–2016.
- Active Electrical Energy Storage System for Power Grid Stabilization, Partners: FESB Split – Sintaksa Ltd., EU-funded project, 2018–2021.

5. COLLABORATION OPPORTUNITIES

- Expertise in AC electrical machines and electric drives
- Development of power electronic converters for renewable energy sources and energy storage systems
- Industrial automation systems
- Advanced control methods for renewable energy systems integrated with electrical energy storage and power grid stabilization, including microgrids

6. CONTACT

Head of Research Group: Bozo.Terzic@fesb.hr

General Contact: projekti@fesb.hr

GROUP FOR ENERGY ELECTRONICS AND AUTOMATION

Head of the Group:

Prof. Dinko Vukadinović, PhD

<https://www.croris.hr/osobe/profil/2361?lang=en>

Scientific Field:

Engineering / Electrical Engineering

Brief Description of the Research Group:

The research group focuses on developing advanced solutions in the fields of power electronics, electric drives, and intelligent control systems. Its expertise includes the design and optimization of power electronic converters for renewable energy systems, the development of control systems for induction and switched reluctance machines, and the application of artificial intelligence methods in control and regulation. The group's research aims to improve the efficiency, reliability, and adaptability of power and drive systems while supporting the integration of renewable energy sources and the digital transformation of the energy sector.

1. RESEARCH TEAM

Faculty members in teaching and research positions:

- Prof. Dinko Vukadinović, PhD
- Prof. Mateo Bašić, PhD
- Assist. Prof. Ivan Grgić, PhD

2. EXPERTISE AND KNOW-HOW

- Power electronic converters for renewable energy systems
- Control systems for induction and switched reluctance machines
- Artificial intelligence applications in control systems

3. RESEARCH INFRASTRUCTURE

Laboratories

- Power Electronics Research Laboratory (B310)

Equipment

- dSPACE DS1103 controller board
- dSPACE DS1104 controller boards
- dSPACE MicroLabBox real-time prototyping system
- Fluke Norma 4000 power analyzer
- Rohde & Schwarz HMC8015 power analyzer
- Programmable DC power supplies: Chroma 62050H-600S, Itech IT6006C-800-25, and Magna-Power Electronics SL50-30

- Tektronix MDO3014 oscilloscope
- Siglent SDS5034X oscilloscope
- LEM IT 60-S current sensors
- LEM CV 3-500 voltage sensors
- Fluke 80i-110s and Testec TT-CC 770 current probes
- Siemens four-quadrant power converters (52.5 kW and 6.3 kW)
- Magtrol TMB 308 and Magtrol TM 308 torque transducers
- Itech IT8615 electronic loads
- LARA100 processor system
- Hyundai N700 5.5 kW variable frequency drive

4. KEY PROJECTS AND REFERENCES

- HRZZ Project IP-2016-06-3319: Wind-Solar System for Optimized Residential Electric Generation, Croatian Science Foundation, 2017–2021.
- Energy-Stored Quasi-Z-Source Inverters for MVDC Grids, University of Split, SEA-EU collaboration with the University of Cádiz (Spain), May–November 2021.
- ERIGrid 2.0: Experimental Exploration of Model Predictive Control for Three-Phase Split-Source Inverters, European Research Infrastructure Supporting Smart Grid and Smart Energy Systems Research, Technology Development, Validation and Roll Out – Second Edition, 2024.
- SystE-mobility: Promoting Smart Industrial Development through Innovation in Advanced Electric Vehicle Training Systems. Project coordinator: S+B Systemtechnik Ltd. Co-financed by the European Union through the Integrated Territorial Programme 2021–2027.
- SURFER: Control Systems for Photovoltaic Power Plants. Institutional research project funded under Source 581 – Recovery and Resilience Facility, 2025–2029.

5. COLLABORATION OPPORTUNITIES

The research group welcomes collaboration with universities, research organizations, and industry partners in the fields of power electronics, electric drives, renewable energy, and advanced control systems for electric power applications. Potential areas of collaboration include the design, modeling, simulation, and experimental validation of power electronic converters for photovoltaic, wind, battery, and hybrid energy systems. Particular emphasis is placed on converter topologies that enhance the efficiency, reliability, and flexibility of modern power systems.

The group also collaborates on the development and testing of control systems for electric motor drives and generators, the application of artificial intelligence to optimize the operation of energy conversion and drive systems, and the development of laboratory, educational, and industrial solutions in power electronics. Collaboration may take the form of joint research projects, prototype development, laboratory testing and measurements, technology and knowledge transfer to industry, as well as the preparation of technical studies, expert analyses, and educational materials.

6. CONTACT

Head of Research Group: Dinko.Vukadinovic@fesb.hr

General Contact: projekti@fesb.hr