

ADVANCED RESEARCH IN POWER SYSTEMS

Contact details

Name	Advanced Research in Power Systems
Acronym	ARePS
Logo	
Site	areps.utcluj.ro
Address	26-28 G. Barițiu Street, 400027, Cluj-Napoca, Romania
Faculty Department	Faculty of Electrical Engineering Power Engineering and Management
Telephone	+40 264 401231
Director	Assoc. Prof. Dr. Eng. Phys. Andrei C. CZIKER
e-mail	andrei.cziker@enm.utcluj.ro

Areas of expertise

Renewable Energy Systems and Energy Storage Technologies

Advanced research and development in wind, hydro, photovoltaic, biomass, geothermal and hydrogen-based energy systems. Design, modelling and integration of battery energy storage systems, hydrogen technologies, fuel cells and supercapacitors for enhanced system flexibility and resilience.

Modelling, Simulation and Analysis of Modern Power Systems

Comprehensive modelling and simulation of transmission and distribution networks, microgrids and distributed generation systems. Grid integration studies for renewable energy sources, power flow optimization, stability assessment and loss minimization.

Energy Efficiency and Power Quality

Energy performance assessment for industrial and residential consumers, advanced power quality monitoring and mitigation solutions, and implementation of SCADA-based supervisory and control architectures.

Artificial Intelligence Applications in Power and Energy Systems

Development and deployment of machine learning algorithms, artificial neural networks, fuzzy logic systems and evolutionary optimization methods for forecasting, diagnostics, optimization and decision support.

Energy Management and Energy Markets

Load and generation forecasting, optimization of energy resources, participation strategies in energy markets and integrated energy management solutions.

Smart Metering and Demand-Side Integration

Design and implementation of intelligent sensing systems, data acquisition and communication infrastructures for advanced metering, demand response and demand-side management.

Smart Cities and Intelligent Buildings

Research and implementation of Building Management and Automation Systems (BMS/BAS), integration of renewable energy in urban infrastructures and development of nearly Zero-Energy Buildings (nZEB).

Team and key skills

Assoc. Prof. Dr. Eng. Phys. Andrei C CZIKER – PhD defended in 2002 at Technical University of Cluj-Napoca (*Unbalance compensation in electrical power systems working in non-sinusoidal condition*). His research activity gathers around 140 scientific publications. Research areas: modeling of modern power systems, energy efficiency in building and industry, energy audits, power systems, power quality in networks, digital signal processing, artificial intelligence in power systems, smart grids, and renewable energy.

Prof. dr. eng. Silviu Ioan DARIE – PhD supervisor since 1989, His research activity gathers around 127 scientific publications. Research areas: power system analysis computer applications; industrial electrical energy distribution design; power quality investigation: site survey, harmonics measurement, harmonics mitigation, harmonics analysis, harmonics filters design, dynamics analysis; transmission pricing in energy deregulated market; embedded generation analysis and design; computer aided power system analysis and design: EDSA / Paladin DesignBase, PSS/E, PSS/U, SKM, ETAP, Easy Power, DigSILENT, NePlan, ASPEN, CYME, PSCAD /EMTDC software experience;

Prof. dr. Eng. Mircea Dorin CHINDRIȘ – PhD defended in 1986 at Technical University of Cluj-Napoca. PhD supervisor since 1994. He published 24 books and over 250 papers in Romania and abroad. Research areas: end use of electricity, energy efficiency, artificial intelligence in power systems, smart grids, renewable energy

Prof. dr. eng. Sorin Gheorghe PAVEL – PhD since 2000 at Technical University of Cluj-Napoca, His research activity gathers around 146 scientific publications (67 in the last 10 years). Research areas: modeling, simulation, and analysis of modern power systems; industrial installations design; power quality investigation; computer aided power system analysis and design: EDSA / Paladin DesignBase software experience.

Prof. dr. eng. Radu TÎRNOVAN - PhD supervisor since 2009. His research activity gathers about 120 scientific publications. Research areas: renewable, fuel cells, modeling of modern power systems, artificial intelligence in power systems, power systems protection and control

Assoc. Prof. Dr. Eng Titus E. CRISAN – Thesis *Theoretical and Experimental Researches on Non-contact 3D Roughness Measurements* – 2004, Technical University of Cluj-Napoca, coauthor/author of 6 books, 50+ scientific publications, teaches courses in Transducers, Applied and Legal Metrology, 3D Measuring Systems; research interests: electrical measurement of non-electrical sizes, daq and measured data transmission, numerical modelling of measuring phenomena, process monitoring

Eng. Daniela NISTE – Degree in Electrical Power Systems in 2021, currently a Master student in Management of Modern Electrical Power Systems. Research areas: modeling, simulation and analysis of modern power systems, computer aided power system analysis and design: EDSA / Paladin DesignBase.

Eng. Călin PAȘCALĂU - Degree in Electronics & Telecommunications in 1992, Politehnical Institute of Timisoara, currently PhD student from 2021 at UTCluj , PhD supervisor is Pr Dr Eng Silviu I Darie. Interest area Hardware Computers, Software applications: PCB design, Java& Python applications,UAS, CAE software

Infrastructure

Power Quality Analyzer SATEC PM 175; Power Systems Analyzer Mavowatt 45; Power Quality Analyser EP 04XX X MEMOBOX 300 Smart, LEM NORMA GmbH, Austria; Power Quality Analyzer: Fluke 43B; Electronic energy meter (ABB, AEM); Data acquisition systems; NI based DAQ boards. ELVIS platform, Ni Motion Control modeling software (EDSA, ETAP, COMSOLL, EVINCE-Prediktera – image analysis, WINCHILL – reliability, etc.)

Development strategy

The ARePS Center aims to address societal needs by developing innovative solutions that support the transition toward a sustainable and resilient energy future. The center's strategy is built on excellence in scientific research, reflected in high-impact publications, active participation in national and international research projects, and strong involvement of students and young researchers in advanced research activities.

A core strategic objective is to strengthen cooperation with industry and facilitate technology transfer, transforming research outcomes into practical solutions with measurable economic and societal impact. The center actively promotes energy-efficient and sustainable technologies for residential and industrial applications, supporting stakeholders in the implementation of modern energy systems and smart solutions.

The center aims to develop a specialized training and innovation hub in partnership with industry leaders, fostering professional development, knowledge transfer, and the formation of highly qualified experts in the energy field.

Representative projects

Adaptive system for energy quality assurance, by correcting the electrical parameters of low voltage networks that can be integrated into SMART GRID - (SAMGRID) networks, Grant PN-II-PT-PCCA-2013-4-1003

Development strategies for photovoltaic power generation systems - PV development - Contract CNCISIS type A consortium Nr. contract: 167 / 1.08.06, 2006-2007

Continuous voltage microgrids for optimal integration of distributed energy sources, CEEX type project, contract no. 109 / 10.10.2005, 2005-2007

Holistic impact of renewable energy sources on the environment and climate, acronym HORESEC, Contract 31PCCDI / 2018, code PN-III-P1-1.2-PCCDI-2017-0404, period: 2018 – 2021.

IR spectral measurements applied in biometrics and security systems, PN-II 616/2009 2009-2012

Significant results

Papers

- Niste, D.F.; Tîrnovan, R.; Pavel, S.; Beleiu, H.; Andrei, C.; Misaroş, M. Electricity Losses in Focus: Detection and Reduction Strategies—State of the Art. *Appl. Sci.* 2025, *15*, 3517. <https://doi.org/10.3390/app15073517>
- Miron, A.; Cziker, A.C.; Beleiu, H.G. Fuzzy Control Systems for Power Quality Improvement—A Systematic Review Exploring Their Efficacy and Efficiency. *Appl. Sci.* 2024, *14*, 4468. <https://doi.org/10.3390/app14114468>
- Ungureanu, S; Topa, V; Cziker, AC Deep Learning for Short-Term Load Forecasting-Industrial Consumer Case Study. *APPLIED SCIENCES-BASEL*. Volume 11, Issue 21, Article Number 10126, DOI 10.3390/app112110126, Published NOV 2021
- Ungureanu, S; Topa, V; Cziker, AC. Analysis for Non-Residential Short-Term Load Forecasting Using Machine Learning and Statistical Methods with Financial Impact on the Power Market, *ENERGIES*, Volume 14, Issue 21, Article Number 6966, DOI 10.3390/en14216966 Published NOV 2021
- Miron, A., Cziker, A.C., Bogariu, H.C., Knowledge-based system for the analysis of voltage fluctuations and flicker. *Proceedings of 8th International Conference on Modern Power Systems (MPS)*, 2019, WOS: 000612401900024
- M. Chindris, A. Cziker, Anca Miron, UPQC - the best solution to improve power quality in low voltage weak distribution networks, *Proceedings Paper, 7th International Conference on Modern Power Systems (MPS) 2017*, WOS:000428462600002, ISBN:978-1-5090-6565-3
- Darie, S., Dynamics in Distribution Power System. *Rev Energetica*, Nr. 9, 2020
- Darie, S., Harmonics in Power Systems. Part 1: Overview, Harmonics Indices, IEEE & IEC Standards. *Rev Energetica*, Nr. 10, 2020
- Darie, S., Harmonics in Power Systems. Part 2: Computer Aided Harmonics Studies. *Rev Energetica*, Nr. 11, 2020
- Darie, S., Smart Design in Power Systems. Part 1: Low Voltage Circuit Breakers; IEC Standards; Field Data Collection. *Rev Energetica*, Nr. 1, 2021
- Darie, S., Smart Design in Power Systems. Part 2: How to Build a Digital Twin from a Given Power System Simulation. *Rev Energetica*, Nr. 2, 2021
- Darie, S., Understanding Arc Flash Hazard - part 1. *Rev Energetica*, Nr. 6, 2021
- Darie, S., Understanding Arc Flash Hazard - part 2. *Rev Energetica*, Nr. 7, 2021
- H. G. Beleiu, V. Maier, S. G. Pavel, I. Birou and C. Pică, "Synchronous Motor Behavior in Harmonics," 2019 54th International Universities Power Engineering Conference (UPEC), Bucharest, Romania, 2019, pp. 1-6. doi: 10.1109/UPEC.2019.8893511
- V. Maier, S. G. Pavel, H. G. Beleiu and V. Farcas, "Aspects on Harmonics Analytical Identification of a Periodic Non-Sinusoidal Wave," 2019 8th International Conference on Modern Power Systems (MPS), Cluj Napoca, Romania, 2019, pp. 1-6. doi: 10.1109/MPS.2019.8759685
- Pica, C., Munteanu, R., Pavel S.G. and Beleiu, H.G., Modeling of Photovoltaic Panels, *2018 International Conference and Exposition on Electrical and Power Engineering (EPE)*, Iasi, 2018, pp. 0769-0773. doi: 10.1109/ICEPE.2018.8559884
- Ioaneş, Andrei; Tîrnovan, Radu, Power Grid Health Assessment Using Machine Learning Algorithms, 2019 11th International Symposium on Advanced Topics in Electrical Engineering (ATEE), Bucharest, Romania, DOI: 10.1109/ATEE.2019.8724920
- C. Cristea, M. Cristea, R. -A. Tîrnovan, I. Birou, C. E. Stoenoiu and F. Mioara Şerban, "Performance analysis of grid-connected rooftop solar photovoltaic systems using different photovoltaic technologies: a case study in Romania," 2021 International Conference on Electromechanical and Energy Systems (SIELMEN), 2021, pp. 310-314, doi: 10.1109/SIELMEN53755.2021.9600338.
- R. Tîrnovan and M. Cristea, "Advanced techniques for fault detection and classification in electrical power transmission systems: An overview," 2019 8th International Conference on Modern Power Systems (MPS), Cluj-Napoca, Cluj, Romania, 2019, pp. 1-10, doi: 10.1109/MPS.2019.8759695.
- A. Ioaneş and R. Tîrnovan, "Energy Price Prediction on the Romanian Market using Long Short-Term Memory Networks," 2019 54th International Universities Power Engineering Conference (UPEC), Bucharest, Romania, 2019, pp. 1-5, doi: 10.1109/UPEC.2019.8893550.
- Septimiu Crisan, Bogdan Ţebrea, Titus E. Crisan - Multimodal Liveness Detection System for Hand Vein Biometrics,

2018 IEEE International, Symposium on Medical Measurements and Applications (MeMeA 2018), ISBN 978-1-5386-3393-9

B. Țebrean, S. Crisan, C. Muresan, T. E. Crisan - Coplanar capacitive matrix structures used for monitoring the recovery of burn injuries, 22nd IMEKO TC4 International Symposium and 20th International Workshop on ADC Modelling and Testing 2017: Supporting World Development Through Electrical and Electronic Measurements, Vol. 2017- September 2017, Pag. 385-390, Code 134087

Crisan, T.E., Ardelean, M.I., Tebrean, B., Munteanu, R.A., Hand Movements Monitoring Device for Post Paresis Recovery Process, IFMBE Proceedings, 2022, 88, pp. 45–54

Crisan, T.E., Ardelean, M.I., Tebrean, B., Oltean, T. Low Cost Foot Pressure Measuring Device, Proceedings of 2021 9th International Conference on Modern Power Systems, MPS 2021, 2021, 9492694

Patents

Sacerdoțianu Dumitru, Nicola Marcel, Ciontu Marian, Ivanov Sergiu, Chindris Mircea Dorin, Cziker Andrei Cristinel, Radu Alexandru, Dumitrescu Camil-Sorin, Sistem adaptiv pentru asigurarea calitatii energiei in retelele de joasa tensiune, Nr. 132402

PhD Thesis

Bogdan Iuga, Studies regarding wireless energy transfer, PhD Supervisor: Prof. Eng. Radu-Adrian TÎRNOVAN, PhD, TCUN 2021

Andrei IOANES, Elements of artificial intelligence in the management of modern power systems, PhD Supervisor: Prof. Eng. Radu-Adrian TÎRNOVAN, PhD, TCUN 2022

Maria FĂGĂRĂȘAN, Contributions to management and design of electrical energy storage systems in distributed generation networks, PhD Supervisor: Prof. Eng. Radu-Adrian TÎRNOVAN, PhD, TCUN 2022

The offer is addressed to the economic environment.

Research & development	Power systems modeling and simulation Integration of renewable energy sources into modern power grids Energy efficiency improvement and optimization solutions
Consulting	ARePS provides specialized consultancy services across all its areas of expertise, offering technical support, feasibility studies, system analysis, optimization solutions, and strategic guidance tailored to the needs of industry and public stakeholders.
Applied engineering services	ARePS delivers applied engineering services to the economic and industrial environment, providing advanced technical expertise across all fields of the center. Our services include system design and validation, technical assessments, performance optimization, testing and implementation support tailored to real-world industrial applications.
Training	Members of the ARePS Center are actively involved in organizing and delivering postgraduate professional training programs in Romanian, including: ▪ <i>Industrial Power Systems Auditors</i> ▪ <i>Energy Managers in Industry</i> These programs aim to support professional development and certification of specialists in the energy sector.

Last update on February 2026