RENEWABLE ENERGIES GROUP

Contact details

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Acronym	**GCER**
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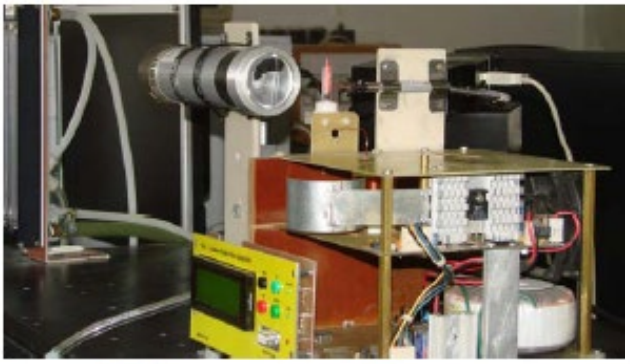

Areas of expertise

Renewable Energy
- Develop new ways to improve energy harvesting and storing for microgrids.

Switched Mode Power Supplies (SMPS) and Power Electronics
- Study and develop new topologies in the field of SMPS.

Digital Control
- Study and develop new algorithms that can be used in the field of power supplies/grid tied inverters.

System Modelling and Simulations
- Develop models for the switched mode power converters in order to improve simulation times.

Embedded Systems
- Develop systems with microcontrollers in C/C++ and assembly for different types of applications: low cost, time constrained, wireless, industrial and sensing.

Team

Prof. Dorin Petreuș PhD, Assoc. Prof. Niculaie Palaghiță PhD, Assoc. Prof. Cristian Fărcaș PhD, Lecturer Toma Pătărău PhD, Lecturer Radu Etz PhD, Lecturer Ionuț Ciocan PhD, Lecturer Lazar Eniko PhD, Izsak Ferencz PhD, Gherman Tudor PhD, Anamaria Petri PhD, PhD student Nicolae Alexandru Sârbu, PhD student Mirela Olteanu, PhD student Andreea Giurgiu.

Representative projects

HELIoS - "Hybrid Renewable Energy Microgrid with Low Operation Cost, Integrating Energy Management Methods Based on Solar Predictions", PED706/2022, PN-III-P2—2.1-PED-2021-0544, http://helios-energy.utcluj.ro 2022 – 2024.

MULTIPASS - "Simultaneous elemental microanalytical method for environment and food control using passive sampling coupled with miniaturized instrumentation based on plasma microtorch optical emission spectrometry", PED733/2022, PN-III-P2—2.1-PED-2021-0151, https://icia.ro/multipass/ 2022 – 2024**.**

MVDC-ERS - "Flexible medium voltage DC electric railway systems", H2020-S2RJU-OC-2018, (2018-2021)

MICROINV – "Microinverters with high power density and high efficiency for renewable energies" POC-A1-A1.2.3-G-2-15.

REMSIS, "Renewable energy management system used for small isolated communities", http://remsis.utcluj.ro/, (2013-2016)

MICROCCP, **"Miniaturized Equipment with Capacitively Coupled Plasma Microtorch and Analytical Technologies for Simultaneous Elemental Determination used in Environment and Foods control"**, http://www.chem.ubbcluj.ro/~edarvasi/Proiect/index.html (2012-2015)

INNOWECS, **"Innovative wind energy conversion micro-system with direct-driven electric generator for residential uses"**, http://innowecs.utcluj.ro/ (2012-2015)

FLUOROSPEC, **"Optoelectronic Equipment and Innovative Method of High Precision and Sensitivity Based on**

Non-conventional Fluorescence Spectrometry for Testing and Control of Some Environmental Agents", PNCDII, (2008-2010) **TRANS-SUPERCAP**, **"Energy Optimized Electrical Systems for Land Transport using Batteries and Supercapacitors"**, PNII-P4, (2007-2009)

Significant results

The most representative publications of the past 5 years:

1. Eniko Szilagyi, **Dorin Petreus**, Marius Paulescu, Toma Patarau, Sergiu-Mihai Hategan, Nicolae Alexandru Sarbu, Cost-effective energy management of an islanded microgrid, Energy Reports, Volume 10, 2023, Pages 4516-4537, ISSN 2352-4847.
2. **Petreus, D.;** Patarau, T.; Szilagyi, E.; Cirstea, M. Electrical Vehicle Battery Charger Based on Smart Microgrid. Energies 2023, 16, 3853. https://doi.org/10.3390/en16093853
3. Ana-Maria Petri, **Dorin Petreus,** Adaptive Cruise Control in Electric Vehicles with Field-Oriented Control Appl. Sci. 12, 7094. https: //doi.org/ 10.3390/ app12147094, 2022.
4. Sharifi Sina, Ferencz Izsák, Kamel Tamer, **Petreus Dorin**, Tricoli Pietro. Medium-voltage DC electric railway systems: A review on feeding arrangements and power converter topologies, 2022 IET Electrical Systems in Transportation. 12. 10.1049/ els2.12054, 2022.
5. Ferencz, I., & **Petreus, D**. (2021). A power electronic traction transformer model for a new medium voltage DC electric railway. Advances in Electrical and Computer Engineering, 21(3), 99-108. doi:http://dx.doi.org/10.4316/AECE.2021.03012. ISSN 1582-7445, 2021
6. Ignat-balaci Andreea, Szilagyi Eniko, **Petreus Dorin**. Advances in Electrical and Computer Engineering; Suceava Vol. 21, Iss. 4, pg. 89-98. DOI:10.4316/ AECE.2021. 04010, 2021.
7. Gherman, T; **Petreus, D**; Cirstea, MN, A Real Time Simulator of a Phase Shifted Converter for High Frequency Applications, ADVANCES IN ELECTRICAL AND COMPUTER ENGINEERING, Vol. 20, Issue: 3, pp. 11-22, ISSN: 1582-7445, DOI: 10.4316/AECE.2020.03002, 2020,.
8. **Dorin Petreus**, R. Etz, T. Patarau, I. Ciocan, Comprehensive Analysis of a High-Power Density Phase-Shift Full Bridge Converter Highlighting the Effects of the Parasitic Capacitances, Energies, vol. 13, issue 6, eISSN: 1996-1073, DOI: 10.3390/en13061439, 2020.
9. **Petreus, D**.; Etz, R.; Patarau, T.; et al., An islanded microgrid energy management controller validated by using hardware-in-the-loop emulators INTERNATIONAL JOURNAL OF ELECTRICAL POWER & ENERGY SYSTEMS Volume: 106 Pages: 346-357 Published: MAR 2019

Significant solutions:

Power supplies with power factor correction, grid tied inverters, UPS, low/high power battery chargers from photovoltaic panels, maximum power point tracking algorithms, power optimizers for improving energy harvesting, bidirectional converters, battery equalizers, digital control applied in switched mode power supplies (DSPs, FPGA), class E amplifier for plasma generator, hybrid storage system using supercapacitors and battery packs, battery inverters, low power induction generators, energy management algorithms used in renewable energy microgirds, algorithms for sizing microgrids with renewable energies.

Products and technologies:

1. Design and implementation of switched mode power supplies/inverters; **2**. Embedded programming for DSPs (dsPIC and TMS328F28/F24) and microcontrollers (Microchip, TI, Atmega, 8051) with industrial applications; **3**. Design and implementation of systems for energy harvesting (photovoltaics, wind energy, geothermal and biomass); **4**. Power optimizers (Distributed maximum power point tracking systems)/microinverters for energy harvesting; **5**. Design and implementation of battery/supercapacitor chargers; **6**. Implementation of analog/digital control; **7**. Implementation of electronic systems to be used for chemical/medical experiments (plasma generator, magneto therapy, electrotherapy).

Patents: International

D. Petreus, M. Neag, B. Morley – "Improved MPPT-Control for PWM-based DC-DC converters with average current control", international no. WO 2012/010613 A1, January 26, 2012.

Patents: National

1. T. Frentiu, M. Ponta, E. Darvasi, A. Mihaltan, A. Mathe, S. Cadar, M. Senila, M. Frentiu, **D. Petreus**, R. Etz, F. Puskas, D. Sulea, Analizor miniatural de mercur utilizand spectrometria de emisie optica, OSIM Bucuresti, nr. 130186, 2014, RO130186 B1, 2020.
2. T. Frentiu, M. Ponta, E. Darvasi, S. Butaciu, S. Cadar, M. Senila, A. Mathe, M. Frentiu, **D. Petreus**, R. Etz, F. Puskas, D. Sulea, Analizor miniaturizat pentru determinarea simultana a elementelor din microprobe lichide prin spectrometrie de emisie optica, OSIM Bucuresti, nr. 131066, 2014, RO131066 B1, 2020
3. BIPOLAR CURRENT PULSE AMPLIFIER IN HYBRID BRIDGE WITH SYMMETRICAL CONTROL, Patent(s) no. RO128681-A2; RO128681-B1, 2018
4. Low power plasma generator at low atmospheric pressure - OSIM Bucharest: Patent no. 128077/2016

The offer addressed to the economic environment

Research & development	Supporting local industry to be more competitively on the market by using applied research.
Consulting	Consultancy and applied research for the industrial or academic environment, according to the skills of the laboratory members: high efficient power supplies, digital control, embedded programming, system modeling and simulation and renewable energy.
Training	Specialized courses according to the skills of the laboratory members: high efficient power supplies, digital control, embedded programming, system modeling and simulation and renewable energy.

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