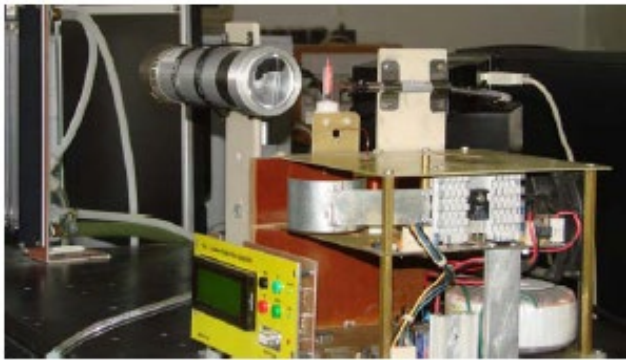




## RENEWABLE ENERGIES GROUP

### Contact details

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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 of new topologies in the field of SMPS.

#### Digital Control

- Study and develop of 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 Petreuş PhD**, Assoc. Prof. Niculaie Palaghită PhD, Assoc. Prof. Cristian Fărcaş PhD, Assoc. Prof. Toma Pătăraş PhD, Lecturer Radu Etz PhD, Lecturer Ionuţ Ciocan PhD, Lecturer Lazar Eniko PhD, Gherman Tudor PhD, PhD student Nicolae Alexandru Sârbu, PhD student Mirela Olteanu, Ing. Lucas Manciu, Ing. Daniel Bulugheana

### 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.

## Significant results

### The most representative publications of the past 5 years:

1. Augustin Catalin Mot, Adrian-loan Dudu, Tiberiu Frentiu, **Dorin Petreus**, Erika-Andrea Levei, Zamfira Stupar, Maria Frentiu and Eniko Covaci, Cost-effective oxygen flask combustion and electrothermal vaporization capacitively coupled plasma microtorch optical emission spectrometry as a green and white method for multielemental determination in food, *J. Anal. At. Spectrom.*, **2026**, 41, 308
2. **D. Petreus** and T. Patarau, "Detailed Analysis of a Regenerative Active Clamping Snubber for a Phase-Shifted Converter," in *IEEE Access*, vol. 13, pp. 7223-7233, **2025**, <https://doi.org/10.1109/ACCESS.2025.3526210>.
3. Nicolae Alexandru Sarbu, **Dorin Petreus**, Eniko Szilagyi, Practical solutions for microgrid energy management: Integrating solar forecasting and correction algorithms, *Energy Reports*, Volume 12, **2024**, Pages 4160-4174, ISSN 2352-4847, <https://doi.org/10.1016/j.egyr.2024.10.005>.
4. J. Sora, I. Serban and **D. Petreus**, "Enhancing Microgrid Operation Through Electric Vehicle Integration: A Survey," in *IEEE Access*, vol. 12, pp. 64897-64912, **2024**, <https://doi.org/10.1109/ACCESS.2024.3397587>.
5. Cirstea, M.; Benkrid, K.; Dinu, A.; Ghiriti, R.; **Petreus, D.** Digital Electronic System-on-Chip Design: Methodologies, Tools, Evolution, and Trends. *Micromachines* **2024**, *15*, 247. <https://doi.org/10.3390/mi15020247>
6. 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.
7. **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>
8. 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**.
9. 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**.
10. 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. <http://dx.doi.org/10.4316/AECE.2021.03012>. ISSN 1582-7445, 2021
11. 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**.

### 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 microgrids, 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 XMC4200) 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.** Implementing electronic systems 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. Petreus Dorin, Pătărău Toma, Szilagyi Eniko, Paulescu Marius, Stroia Nicoleta „Metodă de management a energiei a microrețelelor inteligente bazată pe algoritmi de predicție, de optimizare și de corecție”, A/10011/2023
2. 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.
3. 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
4. Bipolar current pulse amplifier in hybrid bridge with symmetrical control, Patent RO128681-A2; RO128681-B1, 2018
5. 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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