PROGRESSUS

ECSEL Joint Undertaking
Electronic Components and Systems for European Leadership

PROGRESSUS: Highly efficient and trustworthy electronics, components and systems for the next generation energy supply infrastructure

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PROGRESSUS is a European Union project funded under the **H2020-ECSEL-2019-2-RIA** work programme, launched on April 2020. During the last 12 months, significant progress has been made by all partners in order to fulfill the PROGRESSUS objectives. Specifically:

1. for the **development of efficient and intelligent high-power converters for EV charging applications**, PROGRESSUS has focused on a multi-stage solution of DC/DC converter for the power conversion circuits for power stations, analysed the performance of a charger module based on GaN, as well as the design case study of a charger module simulated with GaN FETs and benchmarked against Si power MOSFETs, and considered a 30-kVA dynamic voltage restorer (DVR) that will be used as a protective interface.

2. for the **provision of bidirectional and modular EV charging solutions connected to facility grids**, PROGRESSUS has focused on a bidirectional power converter with a 95% efficiency and power density of 1.5 kW/l for each power conversion stage, on the design and evaluation of the targeted battery system, and on a modular 7kW AC/DC power converter, which have been already evaluated through extensive simulations.

3. for the improvement of **a DC microgrid management for efficient energy and service provision**, PROGRESSUS has developed a coordinated day-ahead and intra-day approach for the scheduling of the resources in a local energy community; the evaluation of this approach confirmed the forecasted reduction of the costs associated with the direct exchanges with the external grid larger than 10%.

4. for the **promotion of cooperation in self-organised grids**, PROGRESSUS works on the development of a Machine-Learning-based algorithm for the real-time management of a smart building, incorporating multiple energy sources, as well as multiple controllable devices, overcoming the limitations of existing approaches in terms of efficiency and accuracy.

5. for the **mass-introduction of charging stations**, progress has been achieved on the development of smart-charging algorithms, mainly in terms of phase-optimisation algorithms that have been deployed on small scale and tested in real life. These algorithms are based on machine-learning approaches in order to automatically detect how the different phases are connected to the different charging stations.

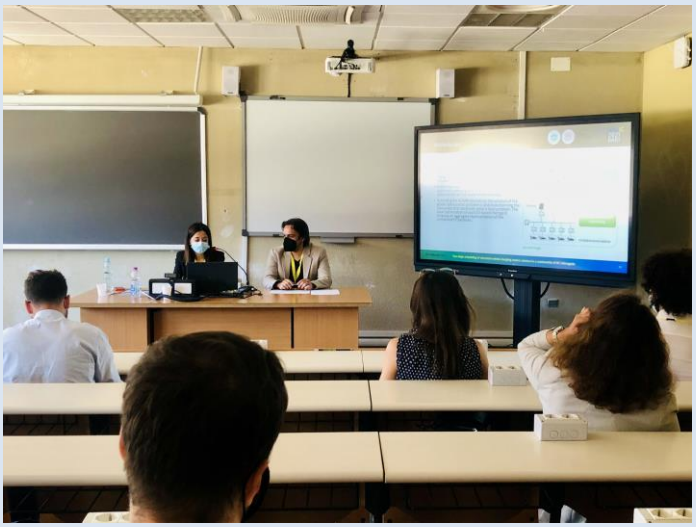
6. for the **enhancement of sensing technologies and methodologies**, significant progress has been achieved through the implementation of a Hall sensor with a bandwidth of at least 10 MHz, which is 10 times better than the state-of-the-art Hall sensors, through the enhancement of a TMR sensor, in order to allow current measurement on straight current paths for easier system integration, and through the design of an AC/DC converter for sensing applications targeting to achieve conversion efficiency by at least 20% compared to the state of the art solutions.

7. for the **incorporation of security modules for self-organised grids**, PROGRESSUS introduces advanced security measures for plug-and-play components in self-organized networks based on state-of-the-art secure elements and blockchain technologies, targeting to develop intelligent sensor network software solutions for measuring physical parameters and controlling grid-connected devices.

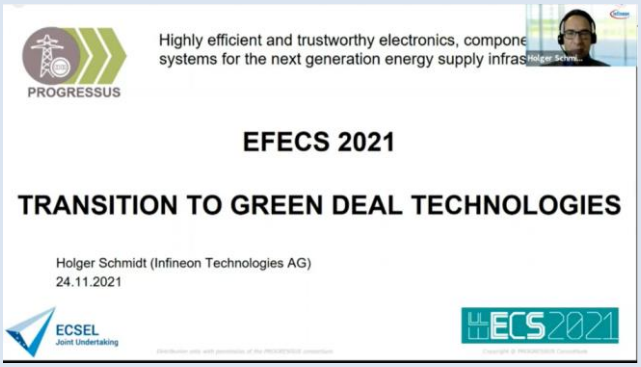
8. for the **development of platforms for accelerated scheduling and predictive monitoring**, PROGRESSUS focuses on the development of a predictive maintenance-monitoring platform, that targets to achieve increased service availability and optimized maintenance costs resulting in reduced ownership costs by at least 15% and resource utilization reduction on the sensor side by at least 20% resulting in optimized consumption figures.

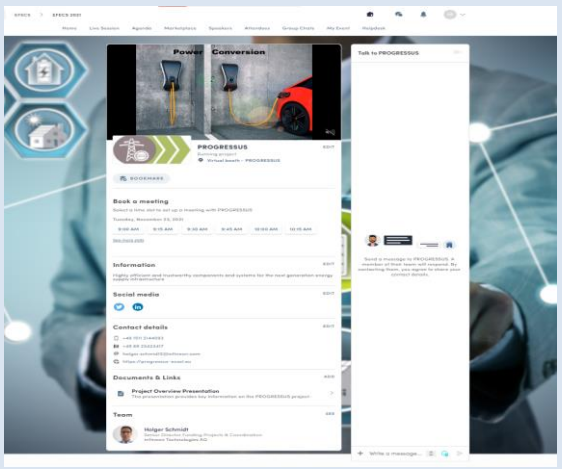
PROGRESSUS Dissemination Activities

PROGRESSUS partner POLIBA organised a Speciall Session entitled “Components and systems for the development and integration of next generation energy infrastructure” under the framework of the EEEIC 2021 Conference!



PROGRESSUS was at the EFECS 2021, where the project’s coordinator Mr. Holger Schmidt was in charge of the PROGRESSUS booth!





PROGRESSUS first video is available on the project’s website and the social media! This video provides key information on motivations and goals of our project.

PROGRESSUS Coordinator

Holger Schmidt
Infineon Technologies AG
Email:
Holger.Schmidt2@infineon.com

Grant Agreement:
737434

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01.04.2020 – 31.03.2023

Website
https://progressus-ecsel.eu/

Twitter
@progressus20

LinkedIn
https://www.linkedin.com/in/progressus-project/

Publications

Journals

1. Stopjakova, Viera, Martin Kovac, and Miroslav Potocny. "On-Chip Energy Harvesting for Implantable Medical Devices." **Radioengineering** 29.2, 269, June 2020.
2. Kohútka, Lukás, and Viera Stopjaková. "Novel efficient on-chip task scheduler for multi-core hard real-time systems." **Microprocessors and Microsystems**, 76, 103083, July 2020.
3. L. Wang, Z. Qin, T. Slangen, P. Bauer and T. van Wijk, "Grid Impact of Electric Vehicle Fast Charging Stations: Trends, Standards, Issues and Mitigation Measures - An Overview," **IEEE Open Journal of Power Electronics**, vol. 2, pp. 56-74, January 2021.

Conferences

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2. L. Kohútka and V. Stopjaková, "ASIC Architecture and Implementation of RED Scheduler for Mixed-Criticality Real-Time Systems," **in Proc. 27th MIXDES**, 25-27 June 2020.
3. Ondica, R., Arbet, D., Kováč, M., & Stopjaková, V. "Feasibility study towards increasing efficiency of fully on-chip DC-DC boost converter", **in Proc. ICAE**, 8-9 September 2020.
4. Maljar, David, Daniel Arbet, and Viera Stopjaková. "130 nm CMOS Fully Differential SC Filter for Ultra-Low Voltage∑-Δ Converter." **in Proc. ICAE**, 8-9 September 2020.
5. Ravasz, R., Kovac, M., & Stopjakova, V. "Experimental Verification of a Ultra-Low Voltage Charge Pump", **in Proc. ICAE**, 8-9 September 2020.
6. Hudec, A., Nagy, L., Kovac, M., Kohutka, L., & Stopjakova, V. "Maximum Power Point Tracking Circuit for an Energy Harvester in 130 nm CMOS Technology", **in Proc. ICAE**, 8-9 September 2020.
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9. D. Maljar, M. Šovčík, D. Arbet and V. Stopjaková, "Enhanced Reliability of Fully Differential Difference Amplifier Through On-chip Digital Calibration," **in Proc. DDECS 2021**, 7-9 April 2021.
10. R. Ondica, D. Arbet, M. Kováč and V. Stopjaková, "Investigation of Inductor-based Fully On-chip Boost Converter," **in Proc. MIXDES 2021**, 24-26 June 2021.
11. I. Zenginis, J. Vardakas, K. Ramantas, C. Verikoukis, "Real-time energy management of a smart home based on deep deterministic policy gradient," **in Proc. IEEE EEEIC / I&CPS Europe**, 7-10 Sept. 2021.
12. F. Marasciuolo, C. Orozco, M. Dicorato, A. Borghetti and G. Forte, "Two-stage Scheduling of Electrical Vehicle Charging Station Clusters in a Community of DC Microgrids," **in Proc. IEEE EEEIC / I&CPS Europe**, 7-10 Sept. 2021.
13. L. Anoldo et al., "Thermal simulation of a 7kW interleaved module for fast automotive charger," **in Proc. IEEE EEEIC / I&CPS Europe**, 7-10 Sept. 2021.
14. L. Ceccarelli, G. Tibola, X. Xu and J. L. Duarte, "Protection Interface Concept for LV Grids with an Efficient Dynamic Voltage Restorer," **in Proc. IEEE EEEIC / I&CPS Europe**, 7-10 Sept. 2021.
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16. D. Arbet, M. Potočný, M. Kováč, L. Nagy and V. Stopjaková, "Fully On-Chip Low-Drop Regulator for

PROGRESSUS on the web!

PROGRESSUS is present in:

So please check out our project website and follow us on our social media accounts to keep up to date with the project progress!