



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 Special Session entitled “Components and systems for the development and integration of next generation energy infrastructure” under the framework of the EEEIC 2021 Conference!



SEPTEMBER 10TH
NOON SESSION N4-T56
11:15-13:30
ROOM 11

SS - COMPONENTS AND SYSTEMS FOR THE DEVELOPMENT AND INTEGRATION OF NEXT GENERATION ENERGY INFRASTRUCTURE
 Session Chairs: Giuseppe Forte, Pasquale Montepagher

N4-T56 186 THERMAL SIMULATION OF A 7KW INTERLEAVED MODULE FOR FAST AUTOMOTIVE CHARGER
 Lavinia Andruzzi (University of Messina & ST Microelectronics - Catania); Alessandro Cotta (ST Microelectronics - Catania); Enza Fazio (University of Messina); Michele Galateria (ST Microelectronics - Catania); Antonio Leonetto (ST Microelectronics - Catania); Angelo Messina (ST Microelectronics - Catania & CNR IMM Catania); Mario Di Guardo (ST Microelectronics - Catania); Salvatore S. Fatone (University of Messina)

N4-T56 225 A BROADBAND CURRENT MODE X-HALL SENSOR FOR SMART POWER AND METERING APPLICATIONS
 Syeda Sara Fatima (University of Bologna); Marco Crescentini (University of Bologna); Roberto Caraglio (STMicroelectronics); Aldo Romani (University of Bologna)

N4-T56 260 A DECENTRALIZED POWER REGULATION APPROACH FOR DC MICROGRIDS
 Pasquale Montepagher (Politecnico di Bari); Giuseppe Jaccari (Politecnico di Bari, Italy); Maria Dicozzio (Politecnico di Bari); Giuseppe Forte (Politecnico di Bari); Francesco Marascuolo (Politecnico di Bari)

N4-T56 274 PROTECTION INTERFACE CONCEPT FOR IV GRIDS WITH AN EFFICIENT DYNAMIC VOLTAGE RESTORER
 Lorenzo Cecchiarelli (Eindhoven University of Technology); Gabriel Tamas (E.ON Energy Research Center); Jiajia Xu (Eindhoven University of Technology); Jorge Duarte (Eindhoven University of Technology)


N4-T56 306 A TWO-STAGE ISOLATED RESONANT DC-DC CONVERTER FOR WIDE VOLTAGE RANGE OPERATION
 Nicola Zanatta (University of Padova); Tommaso Di Calabognato (University of Padova); Giorgio Spiazzi (University of Padova); Paolo Mattavelli (University of Padova)

N4-T56 326 TWO-STAGE SCHEDULING OF ELECTRICAL VEHICLE CHARGING STATION CLUSTERS IN A COMMUNITY OF DC MICROGRIDS
 Francesca Marascuolo (Politecnico di Bari); Camilo Ceppas (University of Bologna); Maria Dicozzio (Politecnico di Bari); Alberto Borghetti (please add your institution); Giuseppe Forte (Politecnico di Bari)



PROGRESSUS was at the EF ECS 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.



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PROGRESSUS

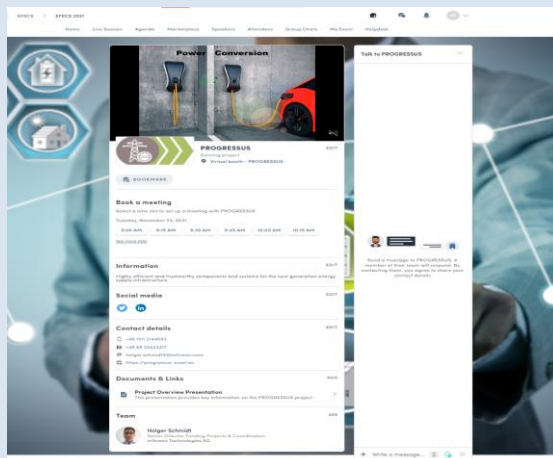
EF ECS 2021

TRANSITION TO GREEN DEAL TECHNOLOGIES

Holger Schmidt (Infineon Technologies AG)
 24.11.2021

ECSEL Joint Undertaking

EF ECS 2021



Home Live Stream Agenda Microgrids Systems Alternative Energy Other My Event Helpdesk

Power Conversion

PROGRESSUS
 @progressus_eeic

Book a meeting
 Meeting with meeting with PROGRESSUS
 Tuesday, November 23, 2021
 9:00 AM - 9:30 AM, 10:00 AM - 10:30 AM, 10:45 AM - 11:00 AM, 11:30 AM - 12:00 PM

Information
 This meeting is a mandatory one-to-one meeting for the next generation energy infrastructure.

Social media
 Facebook
 LinkedIn

Contact details
 Email: info@progressus.eu
 Phone: +39 051 203217
 Website: https://www.progressus.eu
 LinkedIn: https://www.linkedin.com/company/progressus-eeic

Documents & Links
 Project Overview Presentation
 Project Overview Presentation for EEEIC 2021 (PDF)

Team
 Holger Schmidt
 Pasquale Montepagher



PROGRESSUS

ECSEL Joint Undertaking

European Commission | Horizon 2020 European Union Funding for Research & Innovation

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PROGRESSUS Coordinator

**Holger Schmidt**

Infineon Technologies AG

Email:

Holger.Schmidt2@infineon.com**Grant Agreement:**

737434

Project Duration:

01.04.2020 – 31.03.2023

Website<https://progressus-ecsel.eu/>**Twitter**[@progressus20](https://twitter.com/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, Lukáš, 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

1. Kohútka, Lukáš, Lukáš Nagy, and Viera Stopjaková. "RED-based Scheduler on Chip for Mixed-Criticality Real-Time Systems", **in Proc. 9th MECO**, 8-11 June 2020.
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 Σ - 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.
7. Zhang, Y., Xu, X., Duarte, J. L., & Fei, W. "Plug-In Voltage Dip Compensation Using Mainstream Shunt Grid-Connected Converters", **in Proc. IEEE 9th IEEE IPEMCC**, 29 November 2021.
8. L. Nagyt, D. Arbet, M. Kovac, M. Potocny, M. Sovecik and V. Stopjakova, "EKV MOS Transistor Model For Ultra Low-Voltage Bulk-Driven IC Design," **in Proc. DDECS 2021**, 7-9 April 2021.
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. Zengin, 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.
15. L. Nagy, D. Arbet, M. Kovac, M. Potocny, R. Ondica and V. Stopjakova, "EKV Model for Bulk-Driven Circuit Design Using gmb/ID Method," **in Proc. IEEE AFRICON**, 13-17 Sept. 2021.
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!