



CONNECT: Innovative smart components, modules and appliances for a truly connected, efficient and secure smart grid

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During the second half of the second year of the CONNECT project, the consortium continued to demonstrate significant progress in all the three innovation areas: power conversion, smart energy management systems, and smart-grid communication infrastructure.

CONNECT investigates new concepts and technologies for power conversion targeting bi-directional power exchange with the grid and extended integration of local storage and renewables. During this period, CONNECT's work on power conversion is focused on three main pillars: i) **high power AC-DC grid interfacing power converters**, by experimentally demonstrating the voltage quality enhancement capability without load current measurements in a 2kVA three-phase four-wire power converter, while the prototyping of the 3-phase 4-wire 20kVA power converter is in its final stage of implementation, ii) **close to zero standby power switch-mode AC-DC power converters**, where a discrete design of the ultra-low power AC-DC converter has been implemented, while the AC/DC converter solution for highly integrated sensor nodes with power demand below 0.5 W is in the measurement phase, and, iii) **highly efficient DC-DC converters**, where a prototype of the DC-DC converter with an integrated TMR sensor has been developed, while design of DC-DC converter with flat efficiency has been complemented with the design of 3-kW three-channel interleaved PFC able to maintain

this flat efficiency.

In parallel, during the same period, the CONNECT's work on energy management systems is focused on four main areas: i) **smart metering tools**, by developing a smart metering platform, ii) **energy consumption monitoring via autonomous wireless sensor networks**, by developing a) a novel hardware concept for the gateway and nodes of the wireless sensor network, including state-of-the-art embedded security and the connection board for the new magnetoresistance current sensor, b) a wireless monitoring module using sensor nodes integrated directly with the wall outlet in a household or office building, c) a fast prototyping solution for low power smart sensor node addressing zero stand-by has been provided, using humidity and temperature and pressure sensors, d) micropower DC-DC converters for energy-autonomous wireless sensors' networks, and, e) a power management module based on micropower energy harvesting, iii) **energy management and control architectures for DC micro-grids**, by developing a) a cloud-based smart algorithms for real-time management of the DC microgrid, while a simulation platform has been developed to test the developed algorithms, b) a distributed day-ahead scheduling of a local group of microgrids, c) a lab-scale DC microgrid to be used for the validation of the proposed methods, and, d) an optimal stochastic plan and provision of reserve for the operation of the DC microgrid, and, iv) **energy management system at the district level based on**

cooperation algorithms, by developing novel cooperative energy management schemes for the optimization of the energy generated, stored and consumed at microgrids.

Finally, during the same period CONNECT also provides noteworthy contributions on the communication infrastructure of the smart grid, by focusing on: i) **smart home systems for network-connected devices**, by providing the top-level layout of the multi-band multi-standard low power wireless transceiver chip, ii) **advanced current sensors based on Hall effect or magneto-resistance**, by developing a) the first variant of the TMR current sensor, b) the broadband current sensor SoC, a simulator for the newly proposed X-Hall sensor DC bias architecture, iii) **high data-rate powerline communication**, by developing a crosslink powerline prototype adapter for communication to the access area and to in-house appliances, as well as, forward and backward communication techniques across the galvanic isolation by means of a low-frequency prototype implementing a 1 Mbit/s communication channel, and, iv) **network security solutions for smart homes and smart grids**, by developing a security element embedded in the gateway and nodes of the wireless sensor network, and designing and started developing the hardware platform for the communication

CONNECT Meetings



The CONNECT 4th General Assembly was successfully held at the NXP premises in Hamburg, Germany. During the meeting, the good progress of the project was recognized, while the first prototypes and demos were presented!

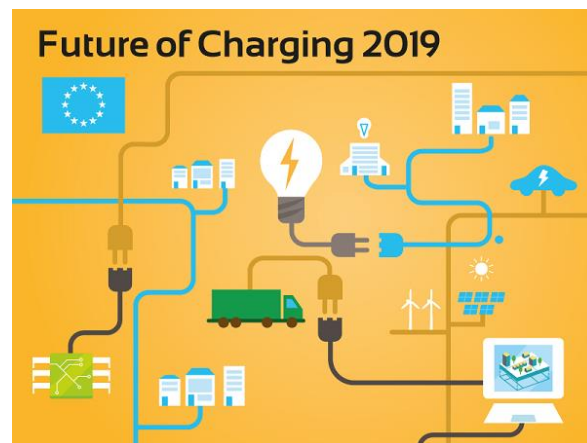
CONNECT Dissemination Activities

VDV ElekBu



CONNECT was represented by HELIOX at the VDV ElekBu Conference 2019 in Berlin, Germany during 5 and 6 February 2019

Future of Charging 2019



Future of Charging 2019

CONNECT was also represented by HELIOX at the Future of Charging Symposium at TU Eindhoven during 19 and 20 February 2019

CONNECT was present at the ECSEL JU Symposium, which took place in the palace of parliament in Bucharest on June 17/18 2019. During the Symposium, the CONNECT partner Mixed Mode had the chance to present the CONNECT secure wireless sensor network demonstrator to the ECSEL program officer Georgi Kuzmanov.



ECSEL JU Symposium 2019

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Publications

Journals

1. I. Zengin, J. S. Vardakas, J. Abadal, C. Echave, M. M. Güell and C. Verikoukis, "[Optimal Power Equipment Sizing and Management for Cooperative Buildings in Microgrids](#)," in IEEE Transactions on Industrial Informatics, vol. 15, no. 1, pp. 158-172, **Jan. 2019**.
2. G. Liu, T. Caldognetto, P. Mattavelli and P. Magnone, "[Suppression of Second-Order Harmonic Current for Droop-Controlled Distributed Energy Resource Converters in DC Microgrids](#)," in IEEE Transactions on Industrial Electronics, **vol. 108 pp. 10-18, Febr. 2019**.
3. Aluisio, B.; Dicorato, M.; Ferrini, I.; Forte, G.; Sbrizzai, R.; Trovato, M. "[Optimal Sizing Procedure for Electric Vehicle Supply Infrastructure Based on DC Microgrid with Station Commitment](#)", *Energies* **2019**, *12*, 1901.
4. Lukas Nagy, Viera Stopjakova, Daniel Arbet, Miroslav Potocny, Martin Kovac, "[An Ultra Low-Voltage Rail-to-Rail Comparator for On-Chip Energy Harvesters](#)," *AEU - International Journal of Electronics and Communications*, **May 2019**
5. Ondrej Kachman, Marcel Balaz, and Peter Malik, "[Universal framework for remote firmware updates of low-power devices](#)", *Computer Communications*, vol. 139, pp. 91-102, **May 2019**.

Conferences

1. L. Nagy, D. Arbet, M. Kovac, M. Potocny and V. Stopjakova, "[Ultra Low-Voltage Rail-to-Rail Comparator Design in 130 nm CMOS Technology](#)," *2019 IEEE 22nd International Symposium on Design and Diagnostics of Electronic Circuits & Systems (DDECS)*, Cluj-Napoca, Romania, **24-26 April 2019**.
2. L. Nagy, A. Chvala, J. Marek, M. Potocny and V. Stopjakova, "[Performance Analysis of ESD Structures in 130 nm CMOS Technology for Low-Power Applications](#)," *2019 29th International Conference Radioelektronika (RADIOELEKTRONIKA)*, Pardubice, Czech Republic, **April 2019**.

CONNECT in social media



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to keep up to date with the project progress!