**Edito**

**Happy summer 2019 !**

EnSO is fully on its last year now, working hard on prototyping the numerous use cases that will integrate new AMES generation. EnSO has organized 2 workshops at EMRS Spring Meeting 2019 and JNRSE 2019 (see p.4), that brought insightful results and discussion. Finally, you’ll have the chance to understand more the work done on prototyping at EnSO, with the interview of Jean Marc Gambin, WP6 leader (p.5).

We look forward to seeing you at the next events (see p.2), in the meantime, enjoy the reading !

*Raphaël SALOT, EnSO Project Coordinator*

**EnSO and CEA Leti recognized at IDTechEx with “The Most Significant Innovation Award”**

IDTechEx hosted their annual technology show in Berlin, April 2019, and the award ceremony where company development and success are recognized is one of the most relevant events ! **We are proud that CEA Tech Leti are the winner of the Best Technical Development Within Energy Storage Award with EnSO project on ‘Microbatteries’**.

Martin Gallezot, Business Developer, CEA-Leti picked up the award and commented: “CEA-Leti's 100% solid state Lithium ion micro-batteries are manufactured using conventional MEMS production equipment. We are now working with industrial partners to ramp-up the volume production. Applications range from medical devices, smart textiles or autonomous sensors for industrial applications.” One of the judges, Dr Tazdin Amietszajew from Coventry University gave his reason for choosing this winner: “CEA Tech Leti have developed micro-batteries that can be used in medical applications or wearable electronics with impressive miniaturisation, while preserving good performance.”

©https://www.advancedbatteriesresearch.com/articles/16989/best-technical-development-within-energy-storage-award
2019 Highlights

- New use case: autonomous sensor and actuators air vent system

Enerbee will develop an energy harvesting solution embedding micro power management, which could power the storage, the monitoring, the sensors and connectivity systems.
Specific developments and tests are necessary:

- Designing & developing an Air Flow Distribution Control, powered by Enerbee generator,
- Develop a robust energy harvesting solution answering the specific harsh environment (temperature, humidity, dust,...)

3rd Review passed!

Last 20th and 21st of March, EnSO consortium passed its 3rd annual review, in presence of 40 members of the consortium, our new Project Officer, Eric FRIBOURG-BLANC, and our two well-known reviewers, Luc JEANNEROT and Romano HOOFMAN.

During this review, the consortium had the chance to present the main project achievements:

- Autonomous Micro Energy Source (AMES) offer has been enlarged: a new generation of Non Form Factor (Generation 3) and two Free Form Factor (one large and one small). First two ones have been delivered and will be tested in 2019. The small Free Form Factor appeared to be very challenging for the NFC recharge aspect since allocated surface for the antenna becomes small.
- New battery offer gave the opportunity to make a new analysis of all the use cases energy requirements and define a new strategy to meet them.

- Regarding harvesting, repeatability regarding manufacturing of flexible non resonant mechanical energy harvesters was proved thanks to new batch results. Scale up of ZnO nanowires manufacturing was investigated through extensive studies of deposition parameters. Several resonant generators based on PVDF, piezoelectric ink or AlN have been developed. Some of them have been integrated in a demonstrator to prove the autonomous operation of a wireless sensor node. Characterization of a combination of power management and thermoelectric generator was realized. First steps on the downscaling of motion-based energy harvester were completed.
- Regarding use cases, significant progresses have been made mainly around: refinement of autonomous smart objects embedded energy requirements, development, validation and integration of functionalities as well as hardware or software, tests on performance improvement of functionalities, extend operating lifetime.

The consortium is fully supported by ECSEL and is committed to maximize project outputs and results during this last year!
IoT Development Kits and Wize Protocol makes easier and faster the implementation of Smart Objects for monitoring applications

Gas Network Monitoring Use Case (NATURGY) has led to development of NFF prototype based on K2 IoT development board recently unveiled by Barcelona-based startup AllWize in his Kickstarter campaign. AllWize was born with an open technology vision applied to the LPWAN and specifically to the brand new Wize protocol, developing its first product, the AllWizeK1, based on Arduino solutions with a market approach of all those makers and product developers who are interested in creating solutions quickly and economically. The K2 is featuring the same Arduino architecture and a Wize radio interface for sending data over long distances, but also integrates the microcontroller to reduce cost and size and increase simplicity. Layout packs 8x digital I/O header, 12x PWM pins, 7x analog inputs, and 1X analog output and recently the launch of a low cost gateway to facilitate the creation of own Wize networks. According to AllWize, you can use the K2 for remote IoT applications, such as monitoring air quality, soil moisture, or even as a way to keep track of open parking spaces.
The Wize protocol allows you to connect objects with very low energy consumption in a large area. The Suez Group and Gaz Réseau Distribution France (GrDF) currently use it to connect more than 4.5 million of water and gas meters. In 2017, the Wize Alliance was created to promote the use of the protocol in applications beyond remote meter reading. In essence, the protocol is a low-power wide-area network that employs the EU-only 169MHz license-free frequency and has a range of just over 12 miles (line of sight), along with low-power consumption (up to 20 years of battery life sending 1 message per day).

Gas Network Monitoring (GNM) allows Nedgia as DSO of Naturgy Group to implement the monitoring of operation parameters (flow, pressure,...) at supply points and network stations (ERM) in a simple, fast, autonomous and low-cost way. This system will be deployed in gas distribution assets to improve the operations and will enable a predictive maintenance of the network, while improving performance in the distribution networks and preventing energy fraud.
Moreover the GNM Smart Object is using novel thin-film thermoelectric harvesting technology taking advantage of the thermal gradient between the gas and room temperature. Thermal energy converted into electrical energy allows powering the whole system including sensors and Wize communication and becoming an autonomous IoT device. Finally just highlight that this nice experience of Nedgia using IoT development kits for making easy and faster the implementation of IoT products based on AMES outcome and the synergic collaboration with market active startups as AllWize, are becoming a relevant lesson learnt in EnSO project in order to be replicated as exploitation strategy in the near future.

Update on

www.enso-ecsel.eu
Now available on the website, a section dedicated to EnSO open-access publications.
7 batteries & energy harvesting publications are listed, enjoy the reading!

Thematic school on thermoelectrics - University of Lorraine is organizing a thematic school on thermoelectrics that will be held in La Bresse (France) from Sunday, October 6 to Friday, October 11, 2019. The objectives are to give a set of high-level courses on current “hot” topics, accelerate the dissemination of knowledge and progress in recent years, promote thermoelectricity to industrial partners in search of questioning, and further broaden the community around issues related to energy conversion by thermoelectric effects. The school is built around basic courses and tutorials. They cover several important areas of thermoelectricity: thermoelectric effects, electronic and phononic transport, solid chemistry (synthesis, defects), materials (critical review), metrology, devices and applications. Full information is available at: https://ecolete2019.sciencesconf.org
On May 27 – 31, 2019 in Nice, France, was held the 2019 E-MRS IUMRS ICAM Spring Meeting, with over 2,700 attendees and 33 exciting symposia, tutorials and workshops. Members of EnSO project - CEA-LETI Grenoble (F. Le Cras), CNM-CSIC (Institute of Microelectronics of Barcelona) (G. Murillo), TNO Eindhoven (P. Zalar) – organized the symposium “Advanced materials, components & processes for integrated autonomous micro-power sources”.

This 2.5 day symposium focused on new material developments & material processing related to micropower sources, their design and integration on shapeable substrates. Combinations of energy harvesting and energy storage micro-devices open the way to optimized, possibly ‘perpetual’, energy supply. With 6 oral thematic sessions: triboelectrics, thermoelectrics, piezoelectrics, supercapacitors, batteries, novel materials for low power devices, 7 invited talks, 23 oral presentations and 32 posters, this symposium was a success. Among the many highlights, let us cite the best PhD student paper award and the best poster award. And of course the participation of Prof. Z. L. Wang, from Georgia Institute of Technology. After presenting the fundamental theory of nanogenerators, based on piezoelectric and triboelectric effects for converting tiny mechanical energy into electricity, Prof. Wang gave an overview of the huge number of applications, where energy from human movements, wind, flowing water, or vibrating machines, can be harvested, opening the door to self-powered wireless sensors.


The 9th edition of the « National Days on Energy Harvesting and Storage » (« Journées Nationales sur la Récupération et le Stockage d’Energie » - JNRSE) took place on May 23-24, 2019, in Blois, France, jointly organized by GREMAN laboratory and INSA-Centre Val de Loire. The aim of this conference was to bring together researchers working on energy conversion, harvesting and storage, especially at small scale, as well as the design of complete self-powered devices. Young researchers, PhD students and post-doctoral fellows, had the opportunity to present their works through oral presentations or posters. Moreover, invited talks from renowned French and international researchers completed the program of the conference. From EnSO project, Raphaël Salot, Anne Labouret and Henrik Zessin were invited to present the last advances in their respective fields, within EnSO project. With more than 60 participants coming from 6 European countries, the high quality scientific exchanges were highly appreciated by all the audience. Five companies, in the field of mechatronics, robotics, smart materials solutions, smart grids, IoT, electronics and renewable energies, were present. Future collaborations may emerge between academic and industrial participants, working in multidisciplinary fields, as mechanical, solar or thermal energy harvesting, low consumption electronics, wireless energy transfer, or energy storage.

More info at: https://jnrse-2019.sciencesconf.org/
Interview with Jean-Marc Gambin, Thales – Gemalto

Jean-Marc GAMBIN is Program Manager of European Projects at GEMALTO, a THALES company, In EnSO, he is the Leader of WP6, focused on Autonomous Smart Objects prototyping and demonstration (use cases development with AMES integration).

Hello Jean-Marc! Before we go to EnSO Business, can you tell me a bit about yourself, where you live, where you work …?

JM Gambin: I grew up in Saint-Germain-en-Laye, West of the Paris area, where its castle was, for a long time, a residence of the kings of France. That probably explains my passion for history! Today, it has been almost 25 years since I live in the 15th arrondissement of Paris, initially more for practical reasons. It is not very far from Meudon, less than 7 km or 25 minutes because here we think “time”, where I work at Gemalto as European Program Manager.

Back to business, what’s your role in ENSO? I know that you are the WP6 Leader, what is it related to? What do you do?

JMG: As WP6 Leader, I’m responsible for the technical management of the tasks assigned to 16 end-users who develop 17 use cases related to Smart Society, Smart Health, Smart Mobility and Smart Production domains. My main role is to ensure the progress of the work plan and to interact with WP1 for project coordination, WP5 for batteries & AMES topics and WP7 for the dissemination and exploitation activities.

What are the challenges of WP6? What are the main stakes regarding the last year of the project?

JMG: The main objective of WP6 is to demonstrate the competitiveness of EnSO energy solutions for powering the different autonomous Smart Objects developed. I would say that there are several challenges, one of which is the management of energy density, for example in the context of a size limited and sustainable form factor integration. Another challenge is also to reduce the power consumption and have sufficient harvested energy for recharging and optimization of the use cases addressed. For all partners, the most important stake this year is to integrate, characterize and validate EnSO AMES in their different prototypes and for some of them make pilot tests.

Very challenging! What’s your experience with European projects and more particularly with EnSO?

JMG: Since few years, I regularly participate in European projects mainly as a partner. Within EnSO project, I took on a new role as WP Leader, which allowed me to discover and understand new areas that were usually far from my day-to-day concern. Now, regarding feedbacks about interests of EnSO by others companies and particularly thanks to BLUMORPHO market segments’ explorations, it appears that several organizations are interested to have access to an AMES module for evaluation. Perspectives are good.

Gemalto recently changed name to THALES, how will this impact EnSO?

JMG: That’s right! Gemalto is now part of the Thales Group since last April 2nd. For a period of time, not yet determined, Gemalto will still continue to trade as a separate organization. As far as I know, EnSO will not be impacted.

Read the full story on the EnSO website.