

## Project profile

# E2SG

## Energy to smart grid



Electricity distribution has changed radically over the last few years, due to different forms of generation and the introduction of domestic renewable sources such as solar and wind that feed surplus energy into the national grids. There is therefore a growing need for a greater degree of automated control of supply and demand within electricity grids both at national and local levels – a so-called smart grid. The ENIAC JU project E2SG is addressing this requirement by developing methods for detecting and controlling energy flows in the grid with information transmitted over the grid itself.

### Sub Programme

- Nanoelectronics for energy efficiency

The electric power grid infrastructure is facing considerable challenges as a result of significant shifts in generation and consumption caused by an increasing reliance on renewable energy. Control and measurement techniques for the generation and consumption of electricity have improved, providing better knowledge of flows within national grids. However, progress has slowed over recent years while renewable sources have grown in popularity. Surplus energy from solar and wind sources is increasingly being routed to the grid, adding further complication to the already complex monitoring processes.

### **Technological convergence**

Smart grids are seen as the answer to controlling these changing infrastructure demands. The smart grid concept relies on the convergence of competences in power technology and in information and communication technology (ICT).

The US National Institute for the

Standardisation of Technology recently established a reference model for the definition of smart grid concepts and challenges. This model places particular emphasis on networking and interoperability issues as well on the role of ICT as a provider of both key enabling devices and of far-reaching paradigms that encourage the development of complex interconnected and information-driven systems.

The ENIAC JU project E2SG has set out to meet the challenges posed by the concept of the smart grid and to develop the required control and management technologies to the level needed by industrial players and society over the coming decades.

E2SG will develop and demonstrate key enabling technologies including:

- *Node-grid interfaces* – between generating nodes and the grid;
- *Grid-sensing/metering* – to collect management and control information;
- *Over-the-grid communications* – to convey sensing and control information;

- *Grid topology and control* – to understand and design connection-induced behaviours for improved reliability and to control local energy production and distribution by exploiting advanced storage policies; and
- *Energy routing* – to develop flexible and efficient mechanisms to transmit energy between nodes.

### Setting efficiency targets

The efficiency of power-conversion equipment is now a significant topic. Many authorities and governments have approved regulations to guarantee minimum efficiency requirements and have started funding projects to obtain the necessary expertise to attain performance targets. Power conversion for sustainable energy production and distribution is one of the most active areas in this context, as efficient power conversion is required at every level of the energy supply chain. The demand for energy-efficient and reliable power conversion is further strengthened by the current trend towards intelligent energy networks, which facilitate the integration and deployment of renewable energy sources.

Applications in this field include photovoltaic converters, grid-tied inverters and bidirectional DC-to-DC converters for battery and large capacitor – so-called supercap – applications for both grid support and electric vehicles. At European Union level, a 20-20-20 target has been set to improve the efficiency and performance of the global energy system and supply chain. The objective is to achieve a 20% increase in energy ef-

iciency, 20% use of renewables and a 20% decrease in CO<sub>2</sub> emissions by 2020.

### Meeting European needs

E2SG will follow a top down approach, starting with socio-economic challenges and particularly the pan-European need to increase the use of renewable energy and raise overall energy efficiency. The project is focusing on the complex set of hardware and communications needs that will be required in future smart power grids.

Project objectives will be approached by a combined strategy, from existing microelectronics technology, selection of the most promising communications medium, monitoring existing and future regulation and standardisation aspects, to the development of missing links for a common platform of networked power nodes. In the final stage, the complete added value chain will be demonstrated.

The main innovations expected are:

- Optimisation of energy consumption by use of relevant environment and grid information;
- Demonstration of new intelligent interface solutions for connection of consumers to smart grids;
- Introduction of energy-efficient high voltage technologies; and
- Sustainable solutions by intelligent, stable and robust driver circuits.

The final results are expected to increase and maintain manufacturing capabilities in Europe and will position European industry partners in a leading position for the construction and supply of efficient energy grids and interfaces worldwide.

## Energy efficiency

### Partners:

- Austriamicrosystems
- Centre Tecnològic de Telecomunicacions de Catalunya
- Centro Ricerche FIAT
- EFPEGI
- Encesys
- Fraunhofer IISB
- HELIOX
- HERA
- Infineon Technologies
- Insta Elektro
- Instituto de Telecomunicações
- IQE Silicon
- IQADRAT
- Italian Universities NanoElectronicsTeam (IUNET)
- LEITAT
- METATRON
- NXP Germany
- NXP Semiconductors
- On Semiconductor
- POLIMODEL
- Politecnico di Torino
- R-DAS
- RWTH Aachen University
- Silvaco
- Slovak University of Technology
- STMicroelectronics Italy
- Telefunken Semiconductors
- TP Vision Netherlands
- University of Bologna
- University of Calabria
- University of Catania
- University of Sheffield

### Project co-ordinator:

- Wolfgang Dettmann, Infineon Technologies

### Key project dates:

- Start: April 2012
- Finish: March 2015

### Countries involved:

- Austria
- Belgium
- Germany
- Italy
- The Netherlands
- Portugal
- Slovakia
- Spain
- United Kingdom

### Total budget:

- €33.5 million



The ENIAC Joint Undertaking, set up in February 2008, co-ordinates European nanoelectronics research activities through competitive calls for proposals. It takes public-private partnerships to the next level, bringing together the ENIAC member states, the European Commission and AENEAS, the association of R&D actors in this field, to foster growth and reinforce sustainable European competitiveness.

Details correct at time of print but subject to possible change. Updates will be included in the project summary at the end of the project.

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