



JRC—the European Commission's in-house science service

The mission of the Joint Research Centre (JRC) is to provide customer-driven, scientific and technical support for the conception, development, implementation and monitoring of EU policies. As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Union. Close to the policymaking process, it serves the common interest of the Member States, while being independent of special interests, whether private or national.

JRC's structure

The JRC's headquarters are in Brussels, in close proximity to many of its most important stakeholders. These include the policy-making Directorates-General of the European Commission and other institutions, in particular, the European Parliament.

Most of JRC's scientific work is carried out in JRC's institutes, located on specialist sites in five countries. The main site is in Ispra, Italy, which hosts the European electric vehicle and smart grids interoperability centre.

Facts & figures about the JRC

- Established in 1957.
- Seven institutes in five countries: Belgium, Italy, Germany, the Netherlands and Spain.
- Research fields include: energy, environment, transport, climate change, competitiveness, metrology, safety of food and consumer products, security, crisis management, nuclear safety and security.
- 2 845 permanent and temporary staff in 2010.
- 1398 scientific publications in 2010.
- Budget: €418 million annually, of which €62 million is earned income.
- 125 instances of support to the EU policy-maker annually.

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E-mobility and smart grids at the JRC



E-mobility – clean and environmentally friendly transport using electric vehicles – is based on an innovative, climate friendly technology with big growth potential. For this dynamic sector, standards and interoperability are becoming increasingly important as they provide a predictable framework that gives innovators confidence to bring their products to market.

The automotive industry, electricity suppliers and legislators are all pushing for standardisation in the field of e-mobility. For global automotive manufacturers and suppliers, this is particularly urgent as they must make investment decisions to support production of e.g., plug-in hybrid vehicles for the next model years. In parallel, utilities and network operators, who are investing heavily in the development of 'intelligent' electricity distribution systems – smart grids – need to future-proof their infrastructure investments to meet the needs of a step-wise electrification of road transport as well as the specificities of different renewable energy production methods. The European Commission plays an important role in the standardisation process at European and global level in promoting global harmonised standards and enhancing product safety standards as well as interoperability.

The Joint Research Centre (JRC), the European Commission's in-house science service, provides evidence based advice for EU policy makers and assists in establishing standards in many different areas. It works closely with EU bodies, external partners, industry and international standards organisations to develop and verify standards. With focused research efforts, the JRC aims to play a key role in the shaping of standards and policy in the e-mobility sector as well as assist the EU's energy efficiency targets for 2020.

*Serving society
 Stimulating innovation
 Supporting legislation*



LETTER OF INTENT

On the occasion of the Transatlantic Economic Council meeting, on 29 November 2011, the JRC has signed a *Letter of Intent* for closer cooperation with the US Department of Energy on e-mobility and smart grids.

The *Letter of Intent* creates the basis for the establishment of two Electric Vehicle and Smart Grid Interoperability centres, one at Argonne National Laboratories, in the US, and one at the JRC facilities in Ispra, Italy.

The twin centres will play an active role in standardisation, promoting a common approach between the US and EU to testing of relevant electric vehicle and smart grid equipment, and the fostering of global standards. They will address the interoperability issues between e-vehicles, smart grids and recharging systems.

The centres will also provide testing facilities for electric vehicles and the related supply equipment, and participate in each others' inter-laboratory comparisons. Finally, they will promote a link between the US and EU vehicle industries on electric vehicle interoperability.



Moving towards a low carbon society: electric vehicles, smart grids and renewables

The move towards a low carbon society will require progress in parallel areas: renewable energy production and e-mobility both require smart grids to achieve their potential. Development of clean road transport is important as the transport sector has seen its green house gas emissions grow consistently. The success rate of e-mobility is intrinsically linked to smart grid development as the charging infrastructure is a precondition for large scale adoption of electric vehicles. Of course, the dependency goes both ways: large scale adoption of e-mobility is crucial for the large scale infrastructure investments to be profitable.

Smart grids will form the backbone of this future power system of the EU, enhancing energy efficiency and security. These upgraded electricity networks with intelligent metering and monitoring capacities as well as a two-way digital communication between supplier and consumer should predict and intelligently respond to the behaviour and actions of all users connected to them, resulting in the efficient delivery of reliable, economic, and sustainable electricity services.

Wide-scale implementation of renewable electricity generation is critical to meet EU's energy goals for 2020 which include the aim of having 20% of total energy supply from renewable sources. One important challenge is the fact that certain energy sources, e.g. wind and solar power, are dependent on the weather. This results in uneven energy generation patterns, which the smart grids are designed to compensate. Electric vehicles and other appliances that store energy can be used to compensate for peaks and valleys in the supply of and demand for electricity, and thus help to optimise grid management.

VELA – the European electric vehicle and smart grid interoperability centre

JRC's Vehicle Emissions Laboratory (VELA) has state of the art equipment capable of measuring the emissions and environmental impacts of a range of vehicles from motor-cycles to trucks according to standard test protocols as well as under realistic operating conditions. In addition it carries out energy efficiency and cost-benefit analysis of cleaner transport technology options including electrical, hybrid, hydrogen and fuel cell vehicles.

In 2011, the JRC started the extension of its VELA installations to encompass the testing and development of electric vehicles. It set up a new laboratory that will focus on the testing of electric vehicles and smart grids, and will pay particular attention to the communication between them. The research will cover aspects related to safety and vehicle performance with respect to driving range, energy efficiency and durability of the vehicle. In parallel, complementary research will address vehicle batteries, with particular focus on their durability and charging time as well as their performance in different temperatures and under different driving conditions.

In addition to this, JRC scientists will develop test procedures and assessment tools for hybrid/electric vehicles, to support EU legislation.



The creation of JRC's laboratory will support the development of standards regarding vehicle-grid interconnections, energy distribution and safety measures for the vehicles and their components. The cooperation between the JRC and Argonne National Laboratories in the US will promote global standards and address the interoperability issues between electric vehicles, smart grids and recharging systems.

JRC's work on smart grids

The JRC has expanded its capacity and focus to support further research and development of smart grids. As part of this effort, the JRC has established a European Reference Centre for Energy Security. This provides a technical competence to support the technical development of standards and include a real-time simulation for the assessment of smart grids operation. The JRC is also running an Energy Security Competence Centre, which together with a Smart Grid Simulation Centre will help to explore the stability of networked physical systems.



A recently compiled JRC report on smart grid projects in the EU Member States indicated the size and scope of the issue. The report found that over the last decade, over €5.5 billion had been allocated to some 300 projects all over Europe. To put the investments into context, conservative estimates quantify smart grid investments by 2020 at €56 billion. The JRC continues to keep track of the status of smart grids and provides publicly available up-to-date information about them. This helps identify bottlenecks, potential synergies and gives all actors the information they need to better focus their efforts on smart grid development.

JRC's work on renewable energies

Developments in the renewable energy and low carbon technology sectors will assist both the energy security and efficiency potential of smart grids. As a result the EU has focused much research in this field. For example, the European Strategic Energy Technology Plan (SET-Plan) was set up as a vehicle to accelerate development in low carbon technologies. The aim is to lead to large scale deployment of such technologies in Europe. The JRC has also placed particular emphasis on establishing assessment criteria so as to appropriately monitor low carbon and renewable energy technologies.

One example of this work is JRC's European Solar Test Installation (ESTI); an independent reference laboratory for the verification of the power and energy generation of photovoltaic devices. Through their work, ESTI develops performance verification methods for international standards as well as training and dissemination of best practices. The monitoring and assessment of low carbon technologies undertaken by the JRC also include geothermal, hydro-power, ocean and wind energies and nuclear fission and fusion. Finally, there is focus on policy support for renewable energies and energy

efficiency, with particular attention to technology deployment and market uptake.

Another example is JRC's work on hydrogen and fuel cells. JRC carries out pre-normative research on performance characterisation methodologies to enable assessment of hydrogen and fuel cell technologies in terms of safety, efficiency, emissions, reliability, durability, etc. This research feeds directly into European and international standardisation and regulatory bodies, and is complemented by underpinning scientific research into the physical and chemical mechanisms determining the behaviour and performance of technologies and components.



Conclusion

According to conservative estimates, smart grid investments in the EU will reach €56 billion by 2020, which highlights the importance of setting standards and improving interoperability. As the European Commission's in-house science service, the JRC works with standards organisations in order to facilitate this. This also highlights the key role integrated research between smart grid and electric vehicles will play, ensuring the interoperability between one and the other as investment drives product and service innovation and technological advances.

This European centre will facilitate the establishment of standards and harmonised criteria within the electric vehicle and smart grid sectors, and particularly how they will work together. Such advances will be important to foster innovation in both sectors by setting in place the framework upon which industry and enterprises will be able to invest and develop products and services.