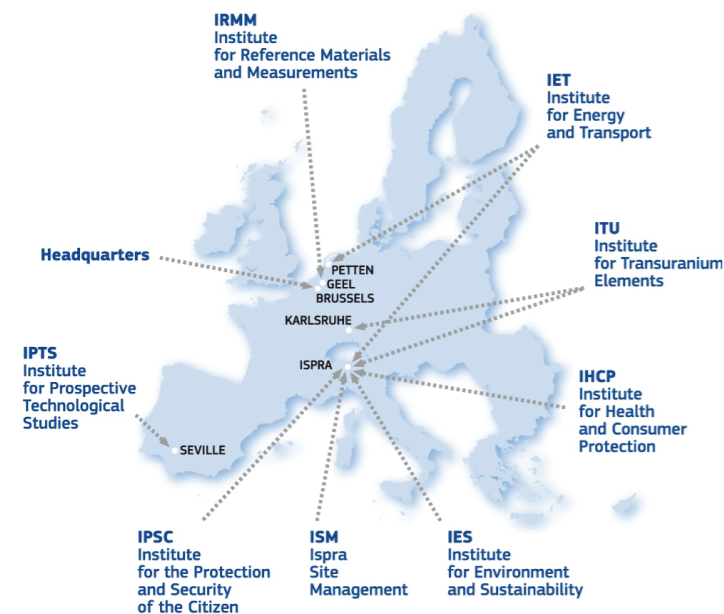


The JRC – The European Commission's in-house science service

As the Commission's in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new methods, tools and standards, and sharing its know-how with the Member States, the scientific community and international partners.



JRC Sites

Facts & figures about the JRC

- Established 1957
- 2 828 scientific and technical personnel
- 7 scientific institutes
- 1 433 publications in 2012

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 the JRC's scientific work is carried out in the JRC 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.

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Serving society
Stimulating innovation
Supporting legislation



E-mobility and smart grids at the JRC

Electromobility or, e-mobility for short, – meaning clean and environmental-friendly transport using electric vehicles – is based on an innovative, climate friendly technology with big growth potential. Standards and interoperability are becoming increasingly important as they provide a predictable framework for innovators to bring their products to market.

The automotive industry, electricity suppliers and legislators are all pushing for standardisation in the field of e-mobility. It is a particularly urgent matter as investment decisions must be made to support the production of, for example, plug-in hybrid vehicles for the next model years. In parallel, utilities and network operators, heavily investing in the development of 'intelligent' electricity distribution systems – smart grids – need to future-proof their infrastructure investments to meet the needs of a step-by-step electrification of road transport, and to adapt to the specificities of different renewable energy production methods.

The European Commission plays an important role in promoting global harmonised and product safety standards, as well as interoperability, both at European and global level. The Joint Research Centre (JRC), the Commission's in-house science service, provides evidence based advice for EU policy makers, assists in establishing standards and works closely together with EU bodies, external partners, industry and international standards organisations. With focused research efforts, the JRC aims to play a key role in the shaping of standards and policy in the e-mobility sector.

FOSTERING CLOSER EU-US COLLABORATION

The JRC hosts one of the two EU-US Electric Vehicle and Smart Grid Interoperability centres, set up following the signing of a Letter of Intent for closer cooperation on e-mobility and smart grids between the JRC and the US Department of Energy. The centres are located at the JRC facilities in Ispra (Italy) and Petten (the Netherlands) for the EU and at the Argonne National Laboratories for the US.

The objective of the twin centres is to promote a common approach between the EU and the US with regards to testing relevant electric vehicle and smart grid equipment, and the fostering of global standards. They also focus on the interoperability issues between e-vehicles, smart grids and recharging systems. In addition, the centres provide testing facilities for electric vehicles, batteries and the related supply equipment, and undertake inter-laboratory comparisons. Finally, they aim to promote a link between the EU and the US vehicle industries on electric vehicle interoperability.

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





Testing a heavy-duty truck in JRC's Vehicle Emissions Laboratory (VELA) in Ispra, Italy.

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

The move towards a low-carbon society will require progress in renewable energy production and in e-mobility. Both require smart grids and electric energy storage technologies to achieve their full potential. Development of clean road transport is important as greenhouse gas emissions have grown consistently. The e-mobility success rate can be linked to smart grid development, because intelligent charging infrastructures will help the large scale adoption of electric vehicles. This dependency works both ways of course: large scale adoption of e-mobility helps large scale infrastructure investments to be profitable. The efforts on interoperability are flanked by the JRC's pre-normative work on vehicle/battery performance, safety and cost.

Smart grids will be the backbone of the EU's future electric power system, enhancing energy efficiency and security. These upgraded electricity networks with intelligent metering and monitoring capacities, and a two-way digital communication between supplier and consumer should predict and intelligently respond to the behaviour and actions of all users connected.

An important challenge today is that certain energy sources, e.g. wind and solar power, are dependent on the weather, resulting in uneven energy generation patterns, for which smart grids are designed to compensate. Electric vehicles and other energy-storing appliances can be used to compensate for peaks and dips in the supply and demand of electricity, thus helping to optimise grid management.

VELA: the European Electric Vehicle and Smart Grid Interoperability Centre

The 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 extending its VELA installations and it set up a new laboratory focusing on the testing of electric vehicles and smart grids, and in particular on the communication between them. Current areas of research include safety and vehicle performance with respect to driving range, energy efficiency and operational usability of the vehicle under various climatic conditions. In parallel,

complementary research will address performance and safety of vehicle batteries as described further in this fact sheet.

In addition to this, JRC scientists are developing test procedures and assessment tools for hybrid/electric vehicles, to support EU legislation. The creation of the JRC's new laboratory will support the development of standards regarding vehicle-grid interconnections, recharging 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 interoperability issues between electric vehicles, smart grids and recharging systems.

Engaging with Industry

The JRC's commitment to technology innovation is epitomised by a new co-operation with the Transatlantic Business Council (TBC). An important element is industry's input to JRC activities in three main topics: e-vehicles, batteries and smart grids, and where the JRC can provide the appropriate testing facilities. JRC facilities will offer a cost-saving opportunity for industry to allow the JRC to test emerging technologies for accelerated development of relevant standards.

JRC's work on batteries

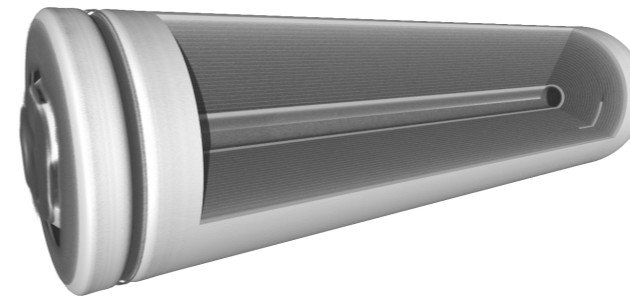


A battery electric vehicle being tested at Vehicle Emissions Laboratory (VELA) in Ispra, Italy.

The safety and performance of traction batteries have a critical impact on the cost, efficiency, safety and mass market uptake of electric vehicles. To facilitate a smooth transition to transport electrification, harmonised testing methods must be developed to ensure the safety, performance and environmental sustainability of electric vehicles and their components.

The JRC is establishing an experimental complex in Petten for testing electric vehicle energy storage components (e.g. batteries, supercapacitors). Pre-normative performance and abuse tests will be carried out, using state-of-the-art facilities, to highlight safety and performance issues which could have implications for electric vehicle users. The identification of potential hazards and shortcomings, by exhaustive testing under controlled environmental conditions, will provide regulators and industry with independent and scientifically

robust evidence on how the safety and performance of energy storage devices can be improved before commercialisation. By working in close collaboration with European battery industry representatives, the JRC ensures the relevance of its battery testing activities in supporting technology innovation. By developing harmonised international standards the competitiveness of European industry is stimulated by reducing technical barriers to trade.



The inside of a cylindrical lithium-ion battery (as seen by X-ray computed tomography).

JRC's work on smart grids

With its European Smart Grid Simulation Centre, the JRC has expanded its capacity to support further research and development of smart grids. It is equipped with hardware components, Information and Communication Technologies (ICTs) and advanced real-time simulators, to study the static and dynamic behaviours of evolving power grids integrating more renewables, electric vehicles, dispersed energy resources, storage, etc. The Centre is cooperating with selected European laboratories in simulating and testing emerging smart and super grids features.

With regards to e-mobility, the Centre looks at the interoperability of e-vehicles and smart grids, for simulating and analysing the interactions at the information and energy levels, the implementation of standards, and the impact of different regulatory and business regimes onto the operations, reliability and stability of the grid.

More information about the European Smart Grid Simulation Centre can be found on <http://ses.jrc.ec.europa.eu>.



JRC's smart-grids interactive communication tool.

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. The JRC has placed particular emphasis on establishing assessment criteria to appropriately monitor low-carbon and renewable energy technologies.

Examples of this are the JRC's European Solar Test Installation (ESTI) and its work on hydrogen and fuel cells.

ESTI is an independent reference laboratory for the verification of the power and energy generation of photovoltaic devices. Through its work, ESTI develops performance verification methods for international standards as well as training and dissemination of best practices. More information on ESTI can be found at <http://re.jrc.ec.europa.eu/esti/>.

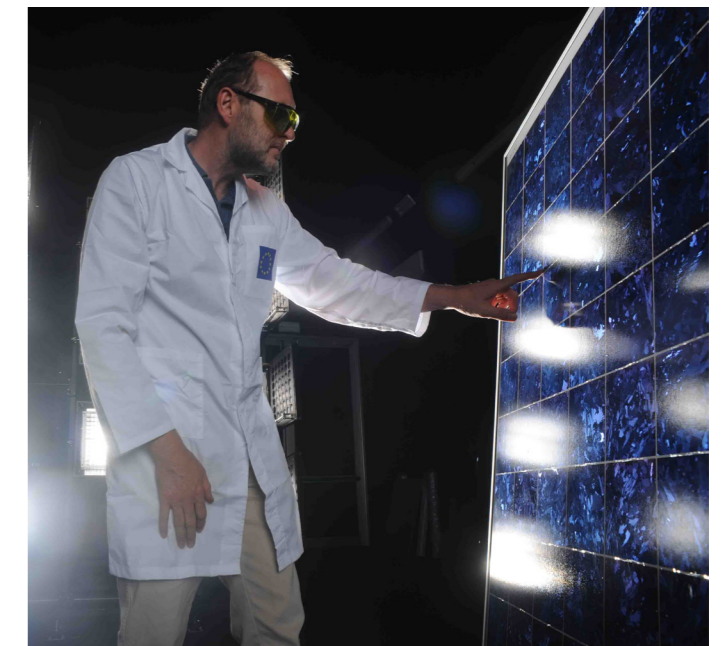
The JRC also carries out pre-normative research on performance characterisation methodologies to assess the safety, efficiency, emissions, reliability, durability, etc. of hydrogen and fuel cell technologies. This research feeds directly into European and international standardisation and regulatory bodies.

In addition, the European Strategic Energy Technology Plan (SET-Plan) was set up as a vehicle to accelerate development in low-carbon technologies. More information on the SET-plan: http://ec.europa.eu/energy/technology/set_plan/set_plan_en.htm

The way forward

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. The JRC works with standards organisations in order to facilitate this. Integrated research between smart grid and electric vehicles will play a key role, ensuring the interoperability between one and the other as investment drives product and service innovation and technological advances.

The European Electric Vehicle & Smart Grid Interoperability 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.



Apollo solar simulator at the European Test Installation ESTI.