

Helmholtz Association of German Research Centres - Research Field Energy

Recommendations for an Integrated Research, Innovation & Competitiveness Strategy for the Energy Union

The energy research centers of the Helmholtz association of German research centres appreciate the effort to foster research and innovation via an integrated strategy within the Energy Union.

Recommendations concerning energy research in Europe

We recommend building up a **Europe wide group of excellence** which should work closely with the existing Horizon 2020 Advisory Groups on the future of the European energy system based on existing research results than can be used by business and politics. Therefore an initial EC coordination and funding would accelerate the process of paving a European energy transition.

The Integrated Research, Innovation and Competitiveness Strategy for the Energy Union shall ensure that renewable energy is mainstreamed and fully integrated into a fully sustainable, secure and cost-efficient energy system which needs new solutions to increase sustainability and to become less dependent on energy imports.

To replace fossil fuels and nuclear fission with sustainable climate-neutral energy sources a common new vision of the European energy system is needed which could be build up through the Energy Union research, innovation and competitiveness strategy.

We suggest to explore all possible pathways in a system oriented approach by including renewable energies, energy efficiency, storage and grid technologies as well as fusion as long term option and economical and societal issues. A special focus on research in batteries, materials for the transition and energy system integration would be recommended.

To ensure excellent research results which can boost the European economy the funding for research and development & investments should be increased.

The most suitable approach for effective technological research & development in Europe is collaborative research. Therefore **collaborative research projects** should remain the main tool to achieve European climate and energy targets. The approach of the Horizon 2020 Advisory Group on Energy to develop a consistent and overarching picture of energy scenarios and pathways to promote the energy system transition in Europe should be taken in consideration.

As **basic research** is closely interlinked with innovation it should not exclusively be funded via the European Research Council. It is of vital importance to include basic research in other parts of the Societal Challenges in Horizon 2020. Beside innovation-driven funding activities as in the EIT lower **Technology Readiness Levels (TRL 2-5)** are crucial.

More and more of European funding for R&D is channeled to the beneficiaries via various Public Private Partnerships between the Commission and industrial groupings. They propose their own research agenda and award funding for projects either directly or via the EC calls. Whereas roadmap-driven research is to a certain extent quite an effective measure to reach certain goals, care should be taken to also accommodate research proposals brought forward by academic partners seeing further than in 3-5 years. Furthermore **medium and long term R&D** should be properly taken in account when establishing the respective research agendas.

We are convinced that EU research funding should remain attractive by **reducing oversubscriptions and low success rates**. Clear definitions regarding the thematic scope of calls, the related expected impact and other conditions of the participation in the calls are needed.

Relevance of an Integrated Research, Innovation & Competitiveness Strategy for the Energy Union

One of the European priorities is to build up a European energy strategy to reduce greenhouse gas emissions and to contribute to the climate goals from the UN Climate conference in Paris 2015. Therefore the European Commission published on 25 February 2015 the Energy Union packet.

The European energy supply has to be restructured because the current energy system is not sustainable enough and Europe should take a leading role in renewable energies which is addressed in pillar 4 of the Energy Union.

The Energy Union comprises five pillars:

1. Energy security, solidarity and trust;
2. A fully-integrated internal energy market;
3. Energy efficiency as a contribution to the moderation of energy demand;
4. Decarbonisation of the economy;
5. An Energy Union for Research, Innovation and Competitiveness

A new framework referring to climate, energy and technology issues should foster the development of a comprehensive research, innovation and competitiveness strategy as Fifth Column of the Energy Union and should combine the different existing strategies like the Integrated Strategic Energy Technology Plan (SET-Plan), the idea for a Strategic Transport Research and Innovation Agenda (STRIA) and an overall Integrated Energy Union Research, Innovation and Competitiveness Strategy.

One of the greatest societal challenges for the present and the future is to replace fossil fuels and nuclear fission with sustainable climate-neutral energy sources. Therefore a common new vision of the European energy system is needed which could be framed through the Energy Union research, innovation & competitiveness strategy.

Research and Innovation Challenges for a new sustainable energy system

The decarbonisation of our energy system and especially the **transition to a sustainable energy system** is one of the greatest challenges of the present and the future. Energy research on fields supporting this transition in a system oriented approach would include **renewable energy, energy efficiency, storage, grid technologies, fusion as long term option as well as related issues in economy and society**.

Due to the continuously evolving knowledge on climate change and the highly dynamic research activities support to research and innovation at EU-Level needs to **address all technological approaches** exploring all possible pathways of solutions and their optimal synchronization within the energy system. Reduction of greenhouse gas emissions within all sectors, not only in the electricity sector should be the goal with the highest priority in the research agenda - this includes research in greenhouse gas reduction over the whole life cycle of all kind of products. Publically funded Research and development should concentrate on solving fundamental

questions aiming at the efficient use of energy and the development and search for new forms of primary energy sources. The tendency to anticipate the technical solutions can prevent the optimum solution.

The low carbon economy transformation will not be successful without a parallel significant **reduction of raw material and energy use**, especially in the field of manufacturing processes. The availability of raw materials has to be secured to allow further technology development. Further challenges are the affordability & accessibility of innovative and sustainable solutions as well as **better manufacturing processes**. **The development of infrastructure is hereof the most urgent part**. Innovative technologies should address context-specific system **solutions for regions**. Main barriers in achieving **the low carbon economy transformation are costs, especially for materials and the production of technological solutions** as well as safety of supplies and public acceptance. Further challenges are the integration of new technologies and the optimizing of the energy systems.

Furthermore, market dynamics and behavioral patterns should be a research priority to prepare possible changes in the energy system. Efficient energy demand management tools should ease the deployment of innovative and affordable low carbon solutions in the EU. Research on “technology implementation” would be an action to reinforce the exports of EU low carbon solutions.

To foster the energy transition in Europe further efforts are needed in research in batteries, materials for the transition and energy system integration, as well as options like fusion energy and nuclear safety.

Research areas to improve **information and communication technologies, functional material solutions, biotechnology and nanotechnology** should be clearly identified as **key cross-sectoral approaches**.

Therefore multidisciplinary research and innovation activities across sectors for new solutions would be needed.

The way to manage a new energy system requires flexible solutions for volatile feed-in from wind and solar, especially in a transnational or EU context and can be paved by applied and basic research approaches.

Last but not least, the energy transformation is a huge societal challenge in terms of public acceptance and transformation of behavioral patterns.

How to achieve sustainable solutions within the Energy Union

Research and innovation are important to support the development of the EU integrated strategy for Research and Innovation through **long-term visions across different sectors**. A regulatory framework and the availability of research infrastructure are crucial to fulfill this issue. Research (basic and applied research) and Innovation should be directly linked with each other.

The challenge to find new sustainable energy system solutions for Europe requires an enormous effort. For this reason **funding for research and development as well as for investments should be increased**. Investments in infrastructures and sustainable access to resources are crucial to build up a low carbon economy. Increasing private and public funding as well as supporting innovative pilot projects are key elements to support research and development of transferable solutions.

Due to the complexity of the energy system different approaches should be explored to solve the challenge to transform the energy system including social, political and economic aspects.

A huge emphasis lies on energy research supporting the **energy transition in a system oriented approach** by using real data from the research infrastructures. One new initiative could be a research area to develop tangible and usable knowledge based on a systematic and technical approach by 2020 which can then be picked up by

business and politics. The required technology-oriented research for this initiative can be done in the Horizon 2020 research fields and in the different joint programs of the European Energy Research Alliance (EERA). A close interaction with KIC “InnoEnergy” and KIC “RawMatters” would be recommended.

European research organisations are the key element to identify the EU leadership potential and to make the EU the world number one in renewable energy by taking into consideration the whole systematic approach. This systematic research approach does not stop at national borders but leads to an exchange on European level. Therefore the research experience already existing in Europe will play an important role to accelerate the energy transition on a European level and to become Europe world-leader in renewable energies.

European alliances as the European Climate Research Alliance (ECRA) and the European Energy Research Alliance (EERA) offer scientific support by bringing together European research institutions in the field of climate and energy research. EERA and the SET-Plan aim to accelerate the development and deployment of low-carbon technologies. We regard EERA, which is an alliance of 150 European public research centres and universities in energy research, as an important organization for advancing joint activities towards the European energy and climate goals. European research organisations are well interlinked in different joint programs of the European Energy Research Alliance (EERA) and in other European associations such as the EUROfusion Consortium.

Helmholtz Centres in the field of energy: Karlsruhe Institute of Technology (KIT); Forschungszentrum Jülich (FZJ) German Aerospace Center (DLR); Helmholtz-Zentrum Berlin für Materialien und Energie (HZB); Helmholtz-Zentrum Dresden-Rossendorf (HZDR); Helmholtz Centre for Environmental Research (UFZ); Helmholtz-Zentrum Potsdam, Helmholtz Centre Potsdam – German Research Centre for Geosciences (GFZ); Max Planck Institute for Plasma Physics (IPP)

Brief portrait of the Helmholtz Energy research field and the Helmholtz Association

Energy Research in the Helmholtz Association coordinated by the Vice-President for the Research Field Energy Prof. Dr. Holger Hanselka aims to develop solutions to secure an economically, ecologically and socially sustainable supply of energy.

The Helmholtz Energy research field has a budget of about 2 billion euros for a funding period from 2015-2019 and consists of seven research programmes: 1. “Energy Efficiency, Materials and Resources”; 2. Renewable Energies; 3. Storage and Cross-Linked Infrastructures; 4. Future Information Technology; 5. Technology, Innovation and Society; 6. Nuclear Waste Management, Safety and Radiation Research; 7. Nuclear Fusion.

The Helmholtz Association contributes to solving major challenges facing society, science and the economy with top scientific achievements in six research fields: Energy; Earth and Environment; Health; Key Technologies; Matter; and Aeronautics, Space and Transport. With some 38,000 employees in 18 research centres and an annual budget of approximately €4 billion, the Helmholtz Association is Germany’s largest scientific organisation. Its work follows in the tradition of the great natural scientist Hermann von Helmholtz (1821-1894).

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