

Roadmap for Universities in Energy

1 Preamble

Universities are core stakeholders in Europe's energy transition towards a low carbon society, most notably due to their work in research, innovation, education and training, all with regional, national and global reach.

Universities in Europe have strong and well-established capacities in research and education in the field of energy, which was highlighted by a recent survey conducted by the European University Association (EUA) in the framework of the FP7 UNI-SET project.¹ At the time of writing, more than 120 universities from 31 European countries have stated that "energy" is a focus area of their institutional strategic orientation and they expect their energy-related research budgets and student numbers to increase in the coming years.² Universities are unique in combining and clustering expertise from different disciplines in research and education and thus provide a unique environment for exploring and testing new ideas and solutions. The "energy challenge" is cross-disciplinary by nature and will require cross-disciplinary solutions, integrating various energy technologies, different energy systems, energy economics and markets, regulatory environments, consumer behaviour and societal aspects.

However, the crucial contribution of universities to the energy system transformation needs to be enhanced through active policy measures from universities themselves, and from political authorities both at the national and European level. The present focus of the SET-Plan is the implementation of close-to-market technologies to reach the short- to medium-term objectives of the Energy Union³ and the 2030 Energy Strategy.⁴ This will not be sufficient to remain competitive and innovative in the field of low-carbon technology and to realise the long-term objective of a low-carbon society. New technologies and improved technologies coming from fundamental research breakthroughs will be required. The full mobilisation of the capacity of the universities requires:

- performing research at low Technology Readiness Levels (TRL), to provide new solutions and new low-carbon technologies with long-term prospects;
- contributing to research at medium-level TRLs together with Research and Technology Organisations (RTOs) and industry to facilitate the deployment and integration of low-carbon technologies;
- performing research and generating cross-disciplinary knowledge on the fundamental societal changes needed to realise a low-carbon society;
- renewing and adapting study programmes for students through all three cycles (Bachelor, Master and Doctorate), embedded in new knowledge generated by research activity;
- providing continuing education on new energy technologies and knowledge to the existing work force;

¹ UNI-SET - 'Universities in the SET-Plan' - is a project funded by the European Commission as an FP7 Coordination and Support Action (no 609838) aiming to the 'Mobilisation of the research, innovation and educational capacities of Europe's universities' (2014-2017).

² UNI-SET Survey, 2016

³ COM/2015/080 final

⁴ <https://ec.europa.eu/energy/en/topics/energy-strategy/2030-energy-strategy>

- strong engagement in providing policy advice and public debate, reaching out to their communities.

Policies that facilitate these measures should be designed as soon as possible in order to maximise the contribution from universities. This is the responsibility of university leaders as well as of political leaders and policy makers at local, regional, national and European levels.

The European Platform of Universities in Energy Research & Education (EUA-EPUE) has already been engaging in several initiatives at the European level aiming to support and inform political decision-making in the domain of energy (research) policy, including:

- The SET-Plan Education and Training Roadmap (2013)⁵ and the SET-Plan Integrated Roadmap and Action Plan (2014)⁶
- The consultation process on the Energy Union Research & Innovation priorities and SET-Plan Key Actions (2015-ongoing)⁷
- The Public Consultation on the Development of an integrated Energy Union Research, Innovation and Competitiveness Strategy (2016)⁸

With this Roadmap, the European university community seeks to deepen its engagement and to lay out its vision for a strategic agenda for universities and stakeholders in order to maximise the impact of university-based research, innovation, education, and training and outreach activities in the field of energy. The Roadmap is intended to spell out the mission and fields of activities for universities in Europe and will be coordinated by the EUA-EPUE in the coming years.

Through the UNI-SET Energy Clustering Events, EUA-EPUE will also engage the university community to develop detailed, thematic roadmaps addressing the challenges and opportunities for all ten priority areas of the SET-Plan from the perspective of the university community.

The Roadmap has been developed in the context of the UNI-SET project, a joint effort by the EUA through its EUA-EPUE platform and KU Leuven, which represents the universities in KIC InnoEnergy. Through the project activities, more than 300 university leaders have contributed to the vision, objectives and actions outlined in this document.

2 Vision

European universities envisage an energy research, innovation and education system that is integrated, mutually reinforcing and embedded in a political framework that facilitates the uptake of innovative solutions for the energy challenge.⁹ The big societal “energy challenge” is addressed as a global issue, and activities aim at moving towards a low-carbon society, but even more, towards a “negative-carbon” society, thus providing solutions to effectively de-carbonise the environment. University-based research contributes to the development of a sustainable and affordable energy system for the benefit of all European citizens. Mutually beneficial cooperation between stakeholders brings innovative technologies and non-technological innovations swiftly to the market and to society.

⁵ <https://setis.ec.europa.eu/setis-output/education-training-roadmap>

⁶ <https://setis.ec.europa.eu/set-plan-process/integrated-roadmap-and-action-plan>

⁷ <https://setis.ec.europa.eu/towards-an-integrated-SET-Plan>

⁸ <http://uni-set.eu/images/uniset/Documents/EuaEpueEurics.pdf>

⁹ EUA-EPUE welcomes the Energy Union Research, Innovation and Competitiveness Strategy as an integrated approach aiming to provide a coherent research and competitiveness agenda under the umbrella of the Energy Union.

Multidisciplinary approaches in research and education support the integration of all dimensions of the energy system, technological and non-technological. Basic and applied research and innovation enjoy sustained funding support and the integration of research and education are the norm. Universities have increased the impact of research and education activities in society and reach out more to society. University researchers are seen as key providers of in-depth knowledge and understanding for policy development and science-based decision making. Universities inform and engage with local communities, stakeholders and civil society at large.

3 Objectives

EUA-EPUE seeks to contribute to the achievement of this vision in the next six years by providing a stable platform where universities can share their knowledge and make their voice heard at the European level and to support universities in their outreach to society. This major goal includes the following specific objectives:

- Foster structured dialogue with other university networks and other stakeholder networks of the SET-Plan and the Energy Union.
- Coordinate input from the university sector in energy policy development at the EU level (European Parliament, European Commission), including: SET-Plan, Framework Programme, Structural Funds, other EU programmes, infrastructures (ESFRI, e-IRG), and other policy instruments.
- Provide support for up-to-date, high-quality higher education programmes, skills upgrading and life-long learning activities fit for an evolving energy sector.
- Support and facilitate
 - the creation of flexible university structures for multi-disciplinary and collaborative research and education in the field of energy, in particular for the support of energy system integration and other technologies enabling the energy system transformation.
 - the adoption of policies in the digital area that facilitate the sharing and dissemination of knowledge (e.g. copyright exceptions for teaching materials and research outcomes; open access to research publications; text and data mining).
 - the creation of partnerships between universities, university networks, and between universities and other research and innovation organisations.
- Promote
 - long-term support for fundamental research, including use-inspired basic research, for next-generation and breakthrough knowledge to decarbonise the economy and society.
 - sustained support for the training of researchers and professionals to understand the systemic challenges of energy generation, transmission, distribution, conversion and consumption and the impact on nature and climate change.
 - excellent, research-based innovation to create the technological solutions for the realisation of the Energy Union.
 - multidisciplinary education and research (science engineering and technology; bio and life sciences; economics social sciences and humanities) for the benefit of society.

- Encourage universities to engage in their social environment, at different levels from local to national and international.
- Create an international forum of dialogue to unite efforts with other universities and university associations in the world, for example in the context of the Paris Agreement and 'Mission Innovation'.¹⁰

4 Actions

EUA-EPUE and KU Leuven, which represents the universities in KIC InnoEnergy, have started to work towards these objectives with a view to assume a main role as coordinators of the mobilisation of the university community.

For this purpose, EUA-EPUE will develop a series of detailed, thematic roadmaps addressing the challenges and opportunities for all ten priority areas of the SET-Plan from the perspective of the university community in addition to this main document.

The following concrete and equally important actions, to be implemented in the next four years (2017-2020), are structured in three main areas, namely research and education, collaboration and outreach to society:

Research and education

1. Map the education and research infrastructures in universities in the field of energy. This is to be added to the collection of maps in the European Atlas of Universities in Energy Research & Education. Update other maps in the Atlas, including those of Master, Research and Doctorate programmes.
2. Build a repository of teaching and learning materials and other learning materials (e.g. data, lab simulations).
3. Consolidate the Energy Clustering Events as the European forum where university leaders from all over Europe discuss education, research energy programmes in relation to the needs of society.¹¹
4. Establish a platform for high-level dialogue between universities and between universities and policy makers, as part of the university platform.
5. Issue guidelines on multidisciplinary approaches in higher education and research programmes (particularly in Master, Doctorate and Research Programmes).
6. Issue statements on major trends and propose ways forward for the university sector, including trends in specific areas of energy.

¹⁰ <http://mission-innovation.net/>

¹¹ The UNI-SET Energy Clustering Events (ECE) aim at addressing from a university perspective the challenges in research and education relative to the ten Key Actions of the European Strategic Energy Technology Plan (SET-Plan), in line with the objectives of the Energy Union and other major European policy developments to foster the transition towards a low-carbon society in the energy field.

Collaboration

7. Coordinate dialogue between university networks in research and education to maximise the opportunities to upgrade educational programmes. These would include, for example, dialogue with CESAER, EERA, KIC InnoEnergy, Climate KIC, ETIPs at Energy Clustering Events.
8. Foster university-business cooperation with the private sector to inform the development of new or updated curricula and educational contents on the development of an integrated and sustainable energy system and the deployment of renewable energy on a larger scale, through structured surveys and interviews.
9. Foster cooperation between organisations in different sectors through platforms of dialogue, including higher education institutions, research and technology organisations, industry and enterprises, and public authorities, to bring technological and non-technological innovation to the market and to society.
10. Develop an international agenda to unite efforts with other universities and university associations in the world.

Outreach to society

11. Increase interaction with society in order to encourage citizens to play a role in the future energy system (e.g. consumer, prosumer, supplier and system manager) and to shift to a low-carbon society. Informed, educated and critical citizens, a core mission of higher education in Europe, are key in achieving this.
12. Support the role of universities in their local, regional or national contexts in education, training and research.
13. Support the involvement of universities in solutions to energy challenges, such as in advising policy and industry or engaging with local communities and other stakeholders.

5 Calendar of implementation

During 2016-2017, activities in the framework of the UNI-SET consortium can achieve good outcomes in actions 1 to 5, as signs of success are already apparent (the European Atlas of Energy Research and Education, the first Energy Clustering Events, the in-depth university expert input to the ten Key Actions of the SET-Plan). Some advancement in actions 6 to 12 is possible in the framework of the six Energy Clustering Events of UNI-SET. Further advancement on these actions, in particular the development of an international agenda for universities in energy, needs special effort to be implemented from 2017 onwards.

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