



UNIVERSITIES IN THE SET-PLAN

MOBILISING THE RESEARCH, INNOVATION AND EDUCATIONAL CAPACITIES OF EUROPE'S UNIVERSITIES IN THE SET-PLAN

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Politecnico di Torino, 27 September 2016

The European University Association (EUA) in energy research and education

- EUA is an independent stakeholder for European universities, a non-governmental membership organisation.
- EUA membership represents 34 European Rectors' Conferences and over 850 individual research based higher education institutions across 46 countries.
- EUA convened a first meeting with representatives designated by the EUA National Rectors Conferences – March 2009: The European Platform of Universities Engaged in Energy (EPUE) was created.
- 2010: Inviting universities to enrol through a survey – 170 responded – 1400 groups with 20000 persons involved reported, 900 energy related master programs
- 2012: EPUE Inaugural Meeting in Delft, the Netherlands.



UNI-SET project

- ✓ **ACRONYM:** UNIversities in the SET-Plan
Strategic Energy Technology (SET) Plan
- ✓ **AIM/ OBJECTIVES:** Provide a platform and information for
Mobilising the research, innovation and educational capacities of Europe's universities in the **SET-Plan**

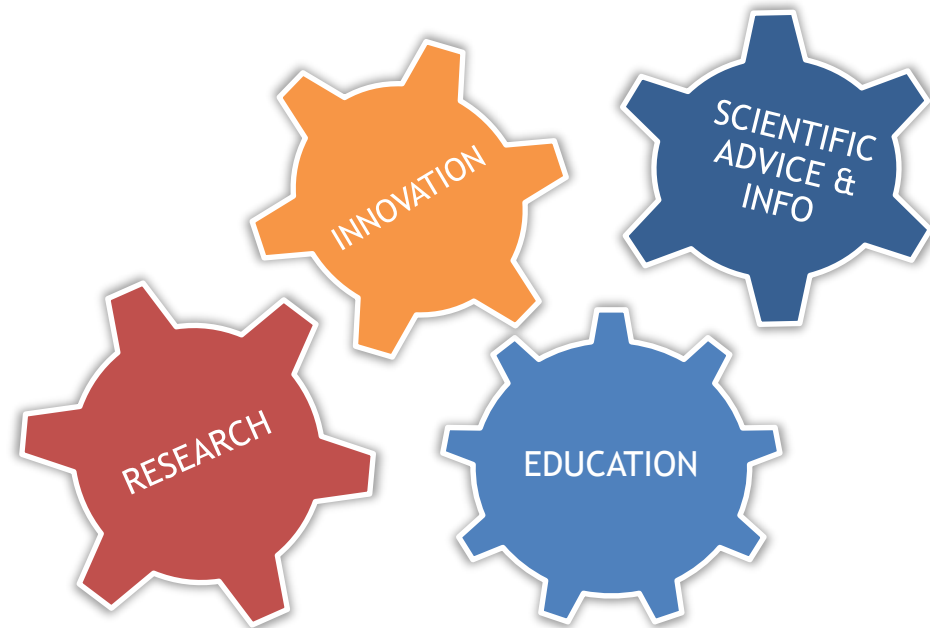
RESEARCH

EDUCATION

INNOVATION

The motivation for UNI-SET and the European Platform of Universities in Energy Research & Education (EUA-EPUE)

The role of universities



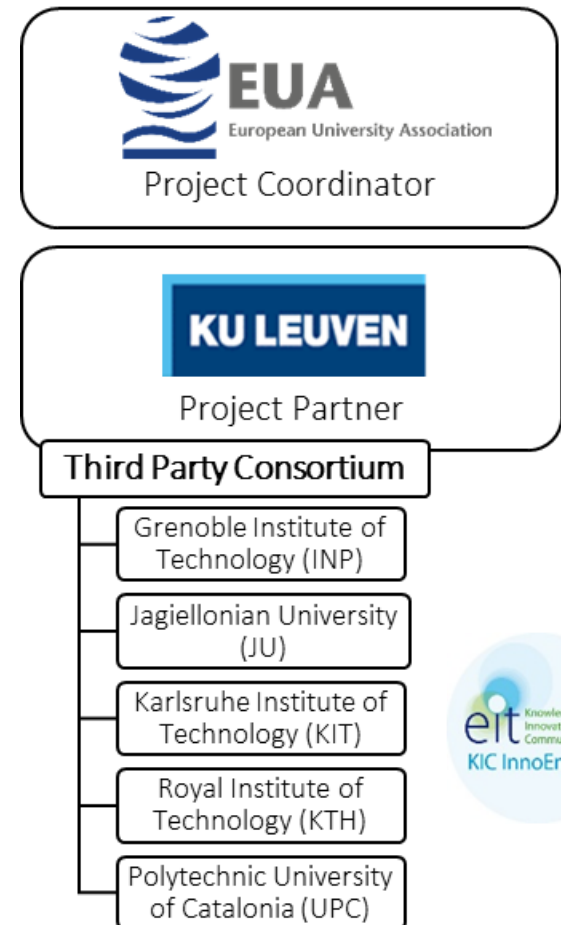
- Unique combination of roles of universities in the transition to a sustainable energy system
- Skilled people will be key to enable the transition
- Education in a vibrant research environment including:
 - ✓ innovative applied research
 - ✓ industry involvement
 - ✓ used-inspired basic research
- Only universities can offer this combination

The UNI-SET project

- **Duration:** Sept. 2014 - Aug. 2017
- **Consortium:**
 - ✓ **European University Association**, main beneficiary/coordinator (80 % share)
 - ✓ **KU Leuven** (project partner) representing the universities in KIC InnoEnergy (20 % share)

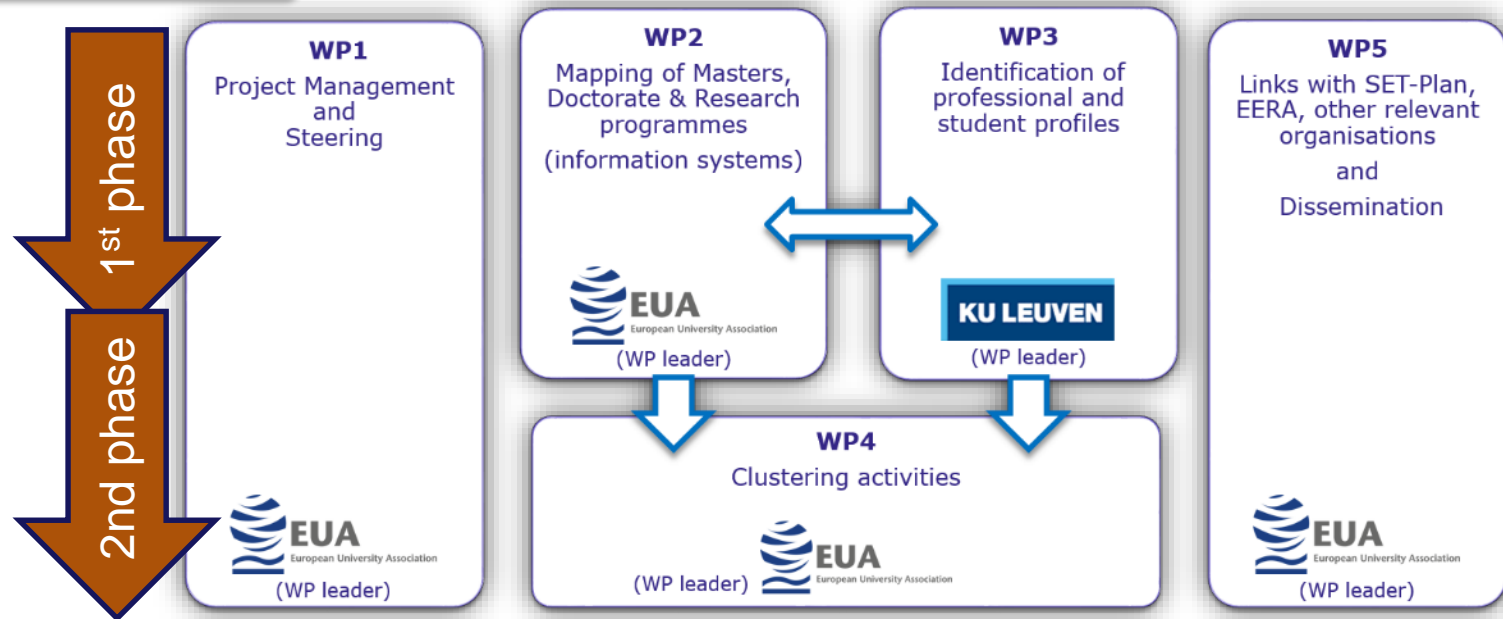


- **Funding:** European Union, as an **FP7** Coordination and Support Action

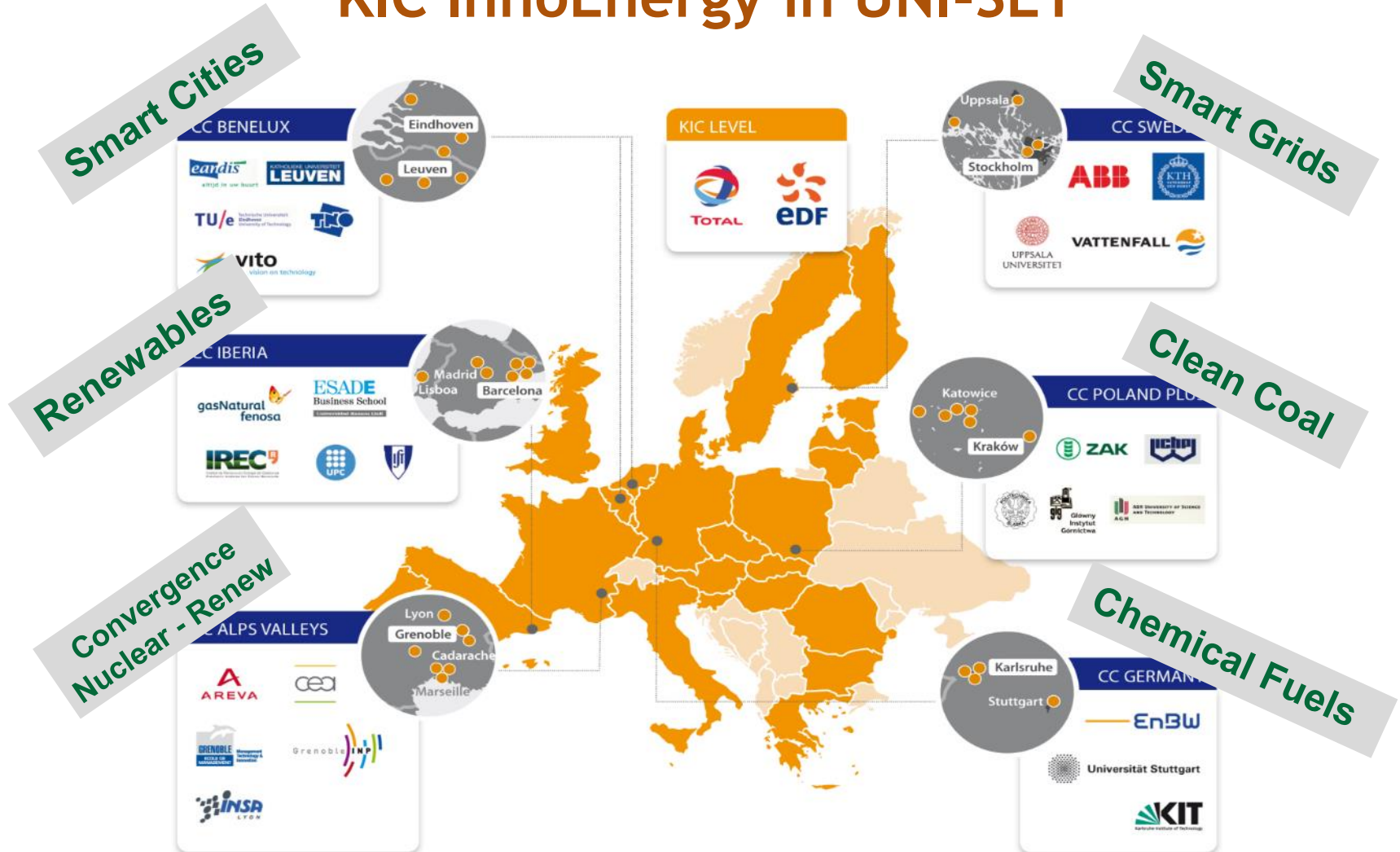


UNI-SET: Work programme

Total of 36 months
09/2014 - 08/2017

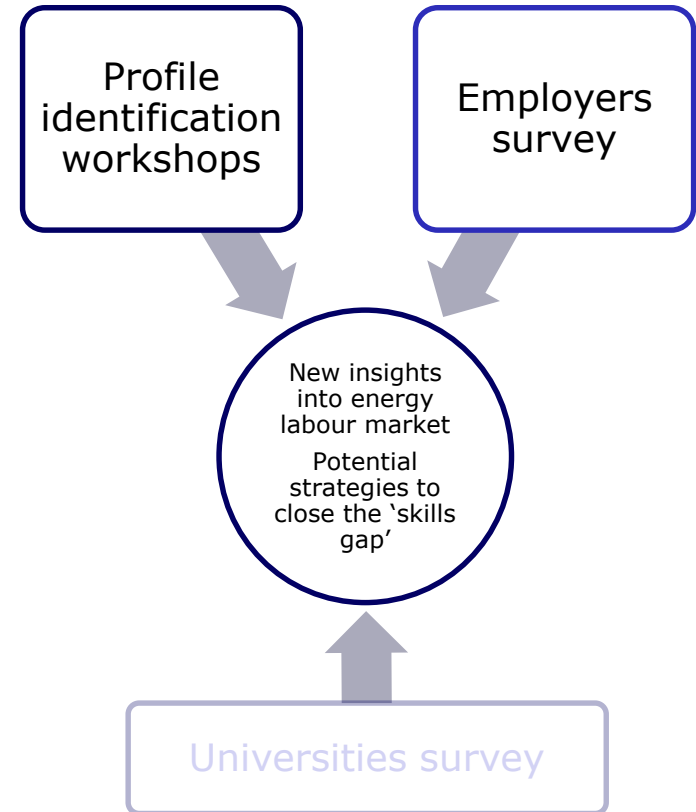


KIC InnoEnergy in UNI-SET



KIC InnoEnergy in UNI-SET

- Strong in university-business links and collaboration
- Contribution: identify skills and professional profiles in the energy field in six different thematic fields
- Taken together with the university mapping, UNI-SET will provide unique insights into current labour market requirements and education offered at universities





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UNI-SET Main Outcomes (September 2014-September 2016)

UNI-SET Universities Survey



- URL: <http://universities.uni-set.eu>
- Covering the entire spectrum of disciplines: from Mathematics, Engineering and Technology to Economy, Social Sciences and Humanities and Arts
- First findings from two data collection phases between April and December 2015

2015 UNI-SET Universities Survey (Phase II*)

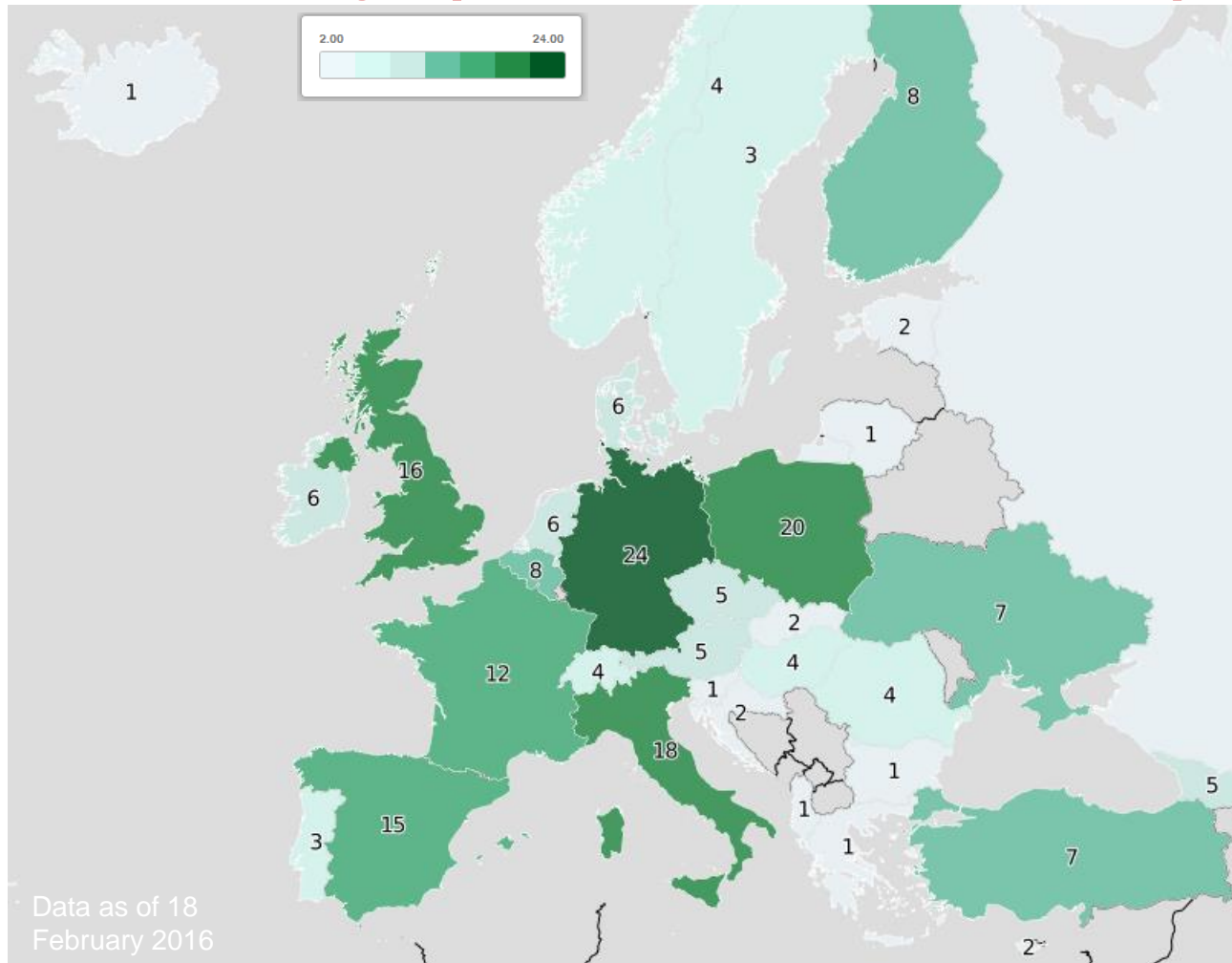
- ✓ 202 universities
- ✓ 864 research topics
- ✓ 451 Doctoral schemes
- ✓ 579 Master programmes
- ✓ *Active in energy research*
 - ✓ Research staff 9,833.3 (FTE)
 - ✓ Doctoral candidates 6,286.6 (FTE)
 - ✓ 36,903 Master-level students

2010 EUA-EPUE Survey

- 171 universities
- 1551 research topics
- 20678 Research staff (including PhD students) in persons
- 607 Doctoral programmes
- 904 Master programmes

*End of Phase II: 15 December 2015

Geographical distribution of participants

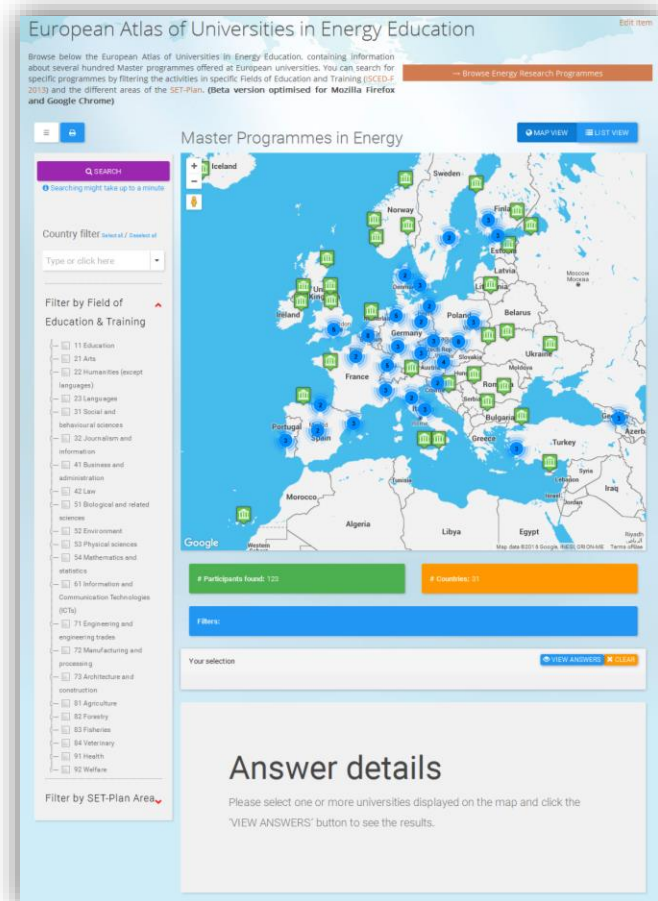


| Country | Institutions |
|----------------|--------------|
| Albania | 1 |
| Austria | 5 |
| Belgium | 8 |
| Bosnia | 1 |
| Bulgaria | 1 |
| Croatia | 2 |
| Cyprus | 2 |
| Czech Republic | 5 |
| Denmark | 6 |
| Estonia | 2 |
| Finland | 8 |
| France | 12 |
| Georgia | 5 |
| Germany | 24 |
| Greece | 1 |
| Hungary | 4 |
| Iceland | 1 |
| Ireland | 6 |
| Italy | 18 |
| Lithuania | 1 |
| Netherlands | 6 |
| Norway | 4 |
| Poland | 20 |
| Portugal | 3 |
| Romania | 4 |
| Russia | 1 |
| Slovakia | 2 |
| Slovenia | 1 |
| Spain | 15 |
| Sweden | 3 |
| Switzerland | 4 |
| Turkey | 7 |
| Ukraine | 7 |
| United Kingdom | 16 |

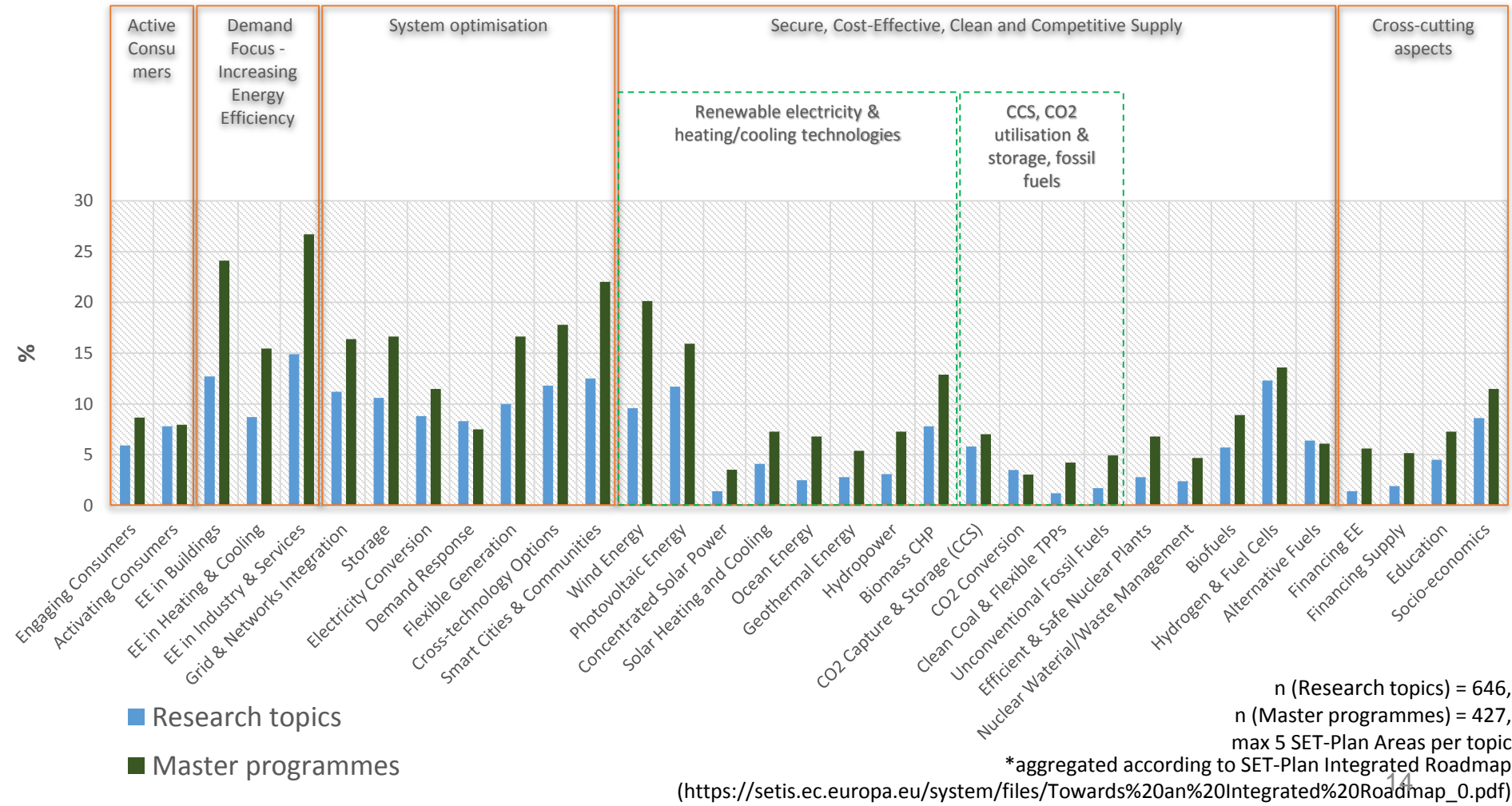


EUROPEAN **ATLAS** OF UNIVERSITIES IN **ENERGY** RESEARCH & EDUCATION

- 127 Universities share information online
- <http://atlas.uni-set.eu>
- Participation through the UNI-SET Universities Survey
- <http://universities.uni-set.eu/>



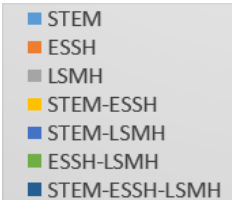
SET-Plan Areas* - Masters and Research topics



Multidisciplinary STEM/ESSH/LSMH

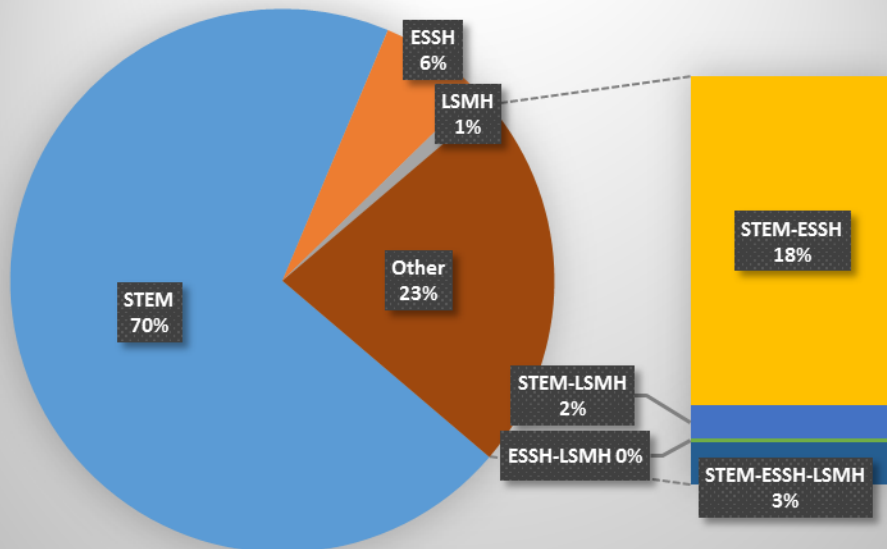
✓ Which **broad fields of knowledge** are covered by the contents of the programme / activities of the research topic?

- ✓ STEM (Science, technology, engineering, mathematics)
- ✓ ESSH (Economics, Social sciences and Humanities)
- ✓ LSMH (Life science, medicine, health)



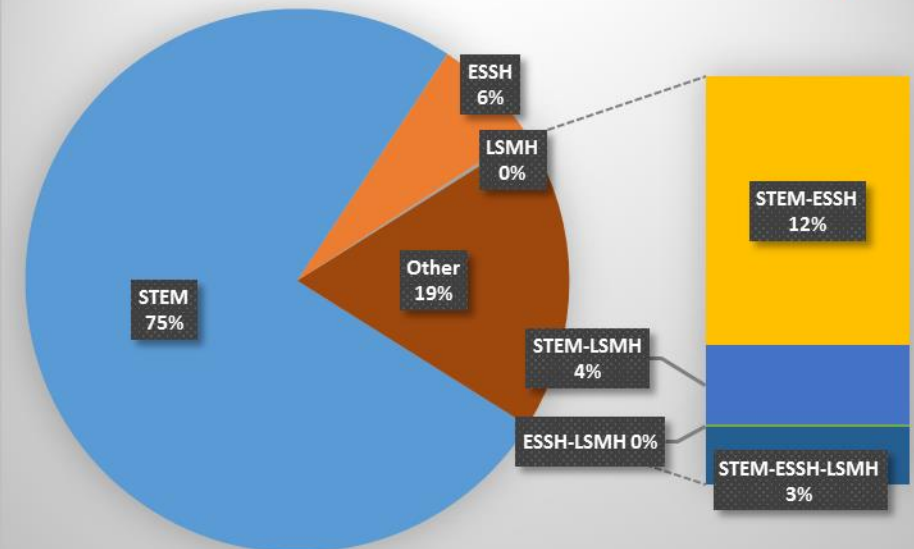
N (Master programmes)=552

Master programmes



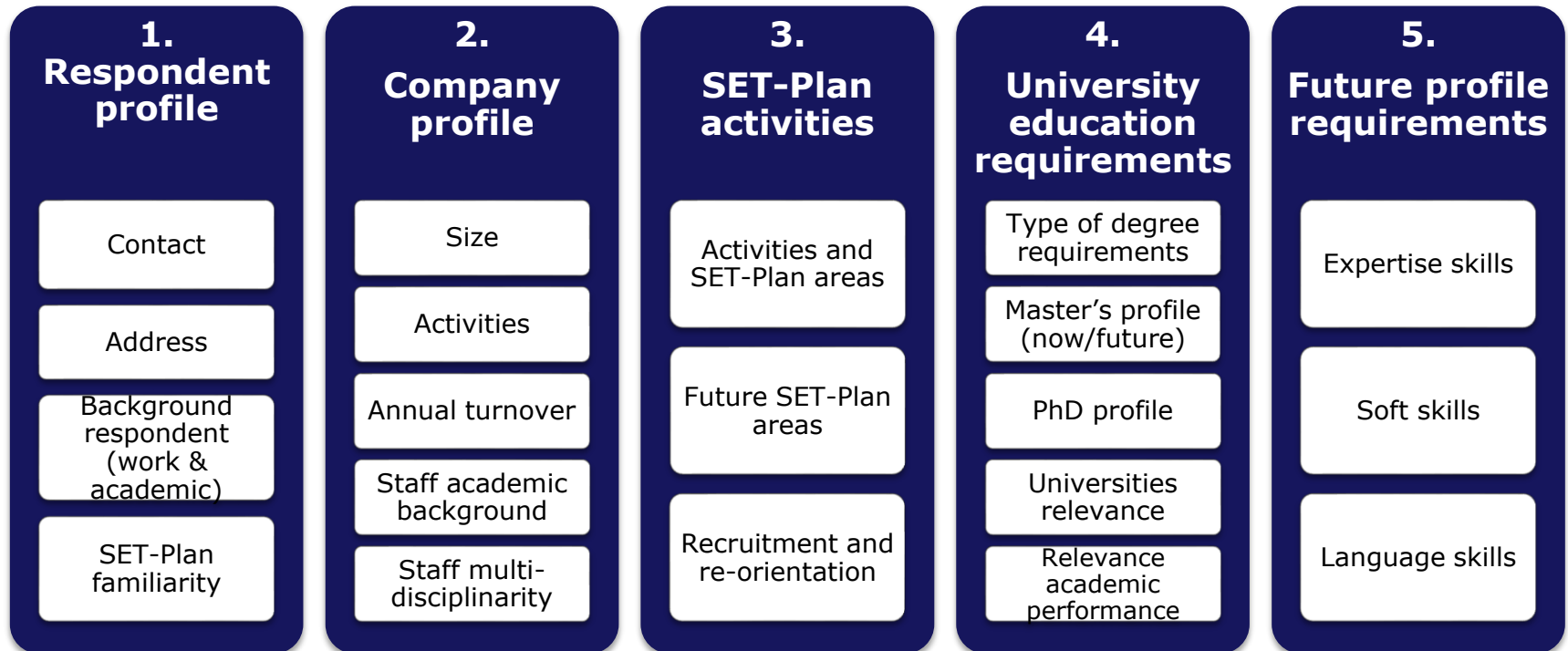
N (research topics)=800

Research topics



The UNI-SET Employers Survey is looking for your contributions!

- URL: <http://employers.uni-set.eu>
- Online survey send to companies by KIC InnoEnergy Universities



- Contact: uni-set@kic-innoenergy.com

UNI-SET Profile Identification Workshops

- A series of 7 Profile Identification Workshops held at different offices of KIC InnoEnergy or back to back with international relevant industry events:
 - ✓ May KU Leuven
 - ✓ June Grenoble Institute of Technology INP
 - ✓ October Universitat Politecnica de Catalunya, Barcelona
 - ✓ October Karlsruhe Institute of Technology
 - ✓ November KU Leuven at the European Utility Week, Vienna
 - ✓ November Jagiellonian University, Krakow
 - ✓ November KTH Royal Institute of Technology, Stockholm



Views and recommendations for Universities from the employers in Nuclear and Renewable convergence

| | |
|--|---|
| <ul style="list-style-type: none"> University Education & fundamental knowledge in Energy <ul style="list-style-type: none"> MSc, PhD | <ul style="list-style-type: none"> + Need for technical and support team experts - need for team managers as well. + Diversity of profiles for working at international, and in satellite companies in Large Enterprises like EDF. + In France, more Engineers recruited than MSC students. +/- PhD is more needed where both global knowledge supervision is required; or in specific R&D. |
| <ul style="list-style-type: none"> Extracurricular activities <ul style="list-style-type: none"> Mobility Industry Involvement | <ul style="list-style-type: none"> + Associative involvement with social activities needed in CV + Life and social science skills needed especially for SMEs. +/- Great diversity in recruitment in SMES, less sectarian than Large enterprises. + Industrial experience not required in 1st employment. |
| <ul style="list-style-type: none"> Languages & Soft Skills | <ul style="list-style-type: none"> + Need for soft skills in priority since technical can be easier to learn. + Fundamental concept is sharing-partnership creation spirit + English required everywhere. |



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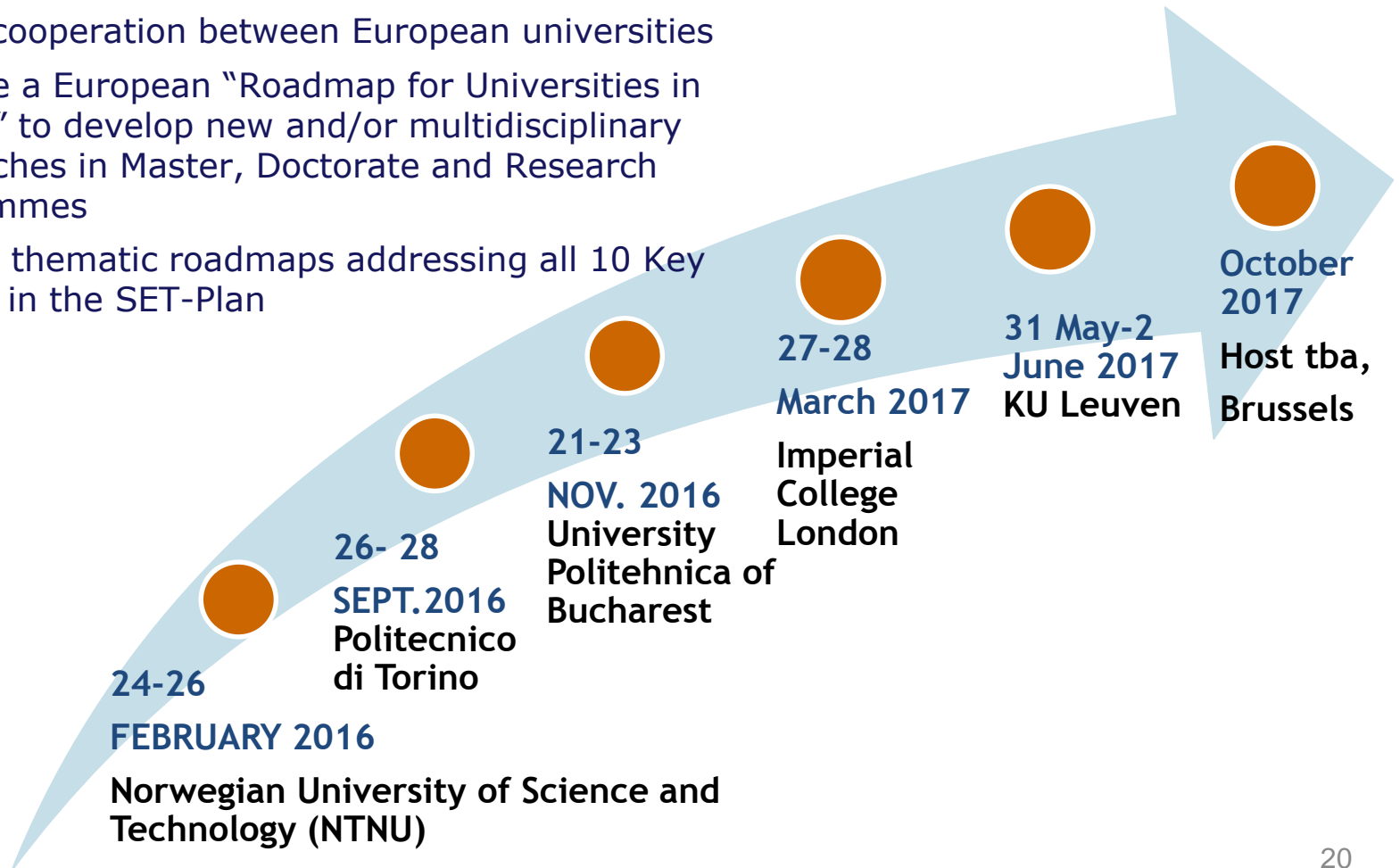
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UNI-SET Energy Clustering Events






UNI-SET Energy Clustering Events: Timeline 2016-2017

OBJECTIVES:

- Foster cooperation between European universities
- Validate a European “Roadmap for Universities in Energy” to develop new and/or multidisciplinary approaches in Master, Doctorate and Research programmes
- Discuss thematic roadmaps addressing all 10 Key Actions in the SET-Plan



Upcoming UNI-SET Energy Clustering Events topics

| |  |  POLITECNICO DI TORINO |  | Imperial College London |  | |
|--------------------------------|--|--|--|---|--|--|
| Host | Norwegian University of Science and Technology | Politecnico di Torino | University Politehnica of Bucharest | Imperial College London | KU Leuven | Brussels |
| Main theme (SET-Plan Priority) | <ul style="list-style-type: none"> • "Human resources and new knowledge to build the future energy system" | <ul style="list-style-type: none"> • Universities in the energy transition: Focus on energy efficient systems and nuclear safety" | <ul style="list-style-type: none"> • "Universities in the energy transition: Focus on smart energy systems and communities" | <ul style="list-style-type: none"> • Energy options for sustainable transport • Carbon capture storage and use deployment | <ul style="list-style-type: none"> • Renewable Energies and their Integration into the EU Energy System | <ul style="list-style-type: none"> • UNI-SET Final Event – Linking University Research & Education with the Energy Union and the SET-Plan |
| Audience | University leadership, industry representatives, researchers, educational leaders, students etc.  | | | | | |
| Date | 24-26 February 2016 | 26-28 September 2016 | 21-23 November 2016 | 27-28 March 2017 | 31 May-2 June 2017 | October 2017 TBA |

Upcoming Energy Clustering Events topics & dimensions

| Host | Date | Main theme (SET-Plan Priority) |
|--|----------------------|--|
| Norwegian University of Science and Technology | 24-26 February 2016 | • "Human resources and new knowledge to build the future energy system" |
| Politecnico di Torino | 26-28 September 2016 | • "Universities in the Energy Transition: Focus on Energy Efficient Systems and Nuclear Safety" |
| University Politehnica of Bucharest | 21-23 November 2016 | • "Universities in the Energy Transition: Focus on Smart Energy Systems and Communities" |
| Imperial College London | 27-28 March 2017 | • Energy options for sustainable transport • Carbon capture storage and use deployment |
| KU Leuven | 31 May - 2 June 2017 | • Renewable Energies and their Integration into the EU Energy System |
| Brussels | October 2017 TBA | • UNI-SET Final Event – Linking University Research & Education with the Energy Union and the SET-Plan |

| Dimensions |
|---|
| Research – Education – Innovation – The knowledge triangle |
| Open Education – Competence profiles and learning material |
| Multidisciplinary perspectives and competencies for the theme |
| Outreach to society – Citizen awareness |
| Cooperation with research organisations, industry and public sector |
| System Integration aspects |
| Regional Innovation and Smart Specialisation |



Open Call for 3rd UNI-SET Energy Clustering Event

- **Title:** “Universities in the Energy Transition: Focus on Smart Energy Systems and Communities”
- **Host:** University Politehnica of Bucharest
- **Call for Contributions:** “good practice examples” and “clustering of knowledge” in Master, Doctorate and Research programmes
 - ✓ Deadline: 24 October
- **Registration:** 21 September - 7 November 2016



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EUA-EPUE contribution to EU policy development

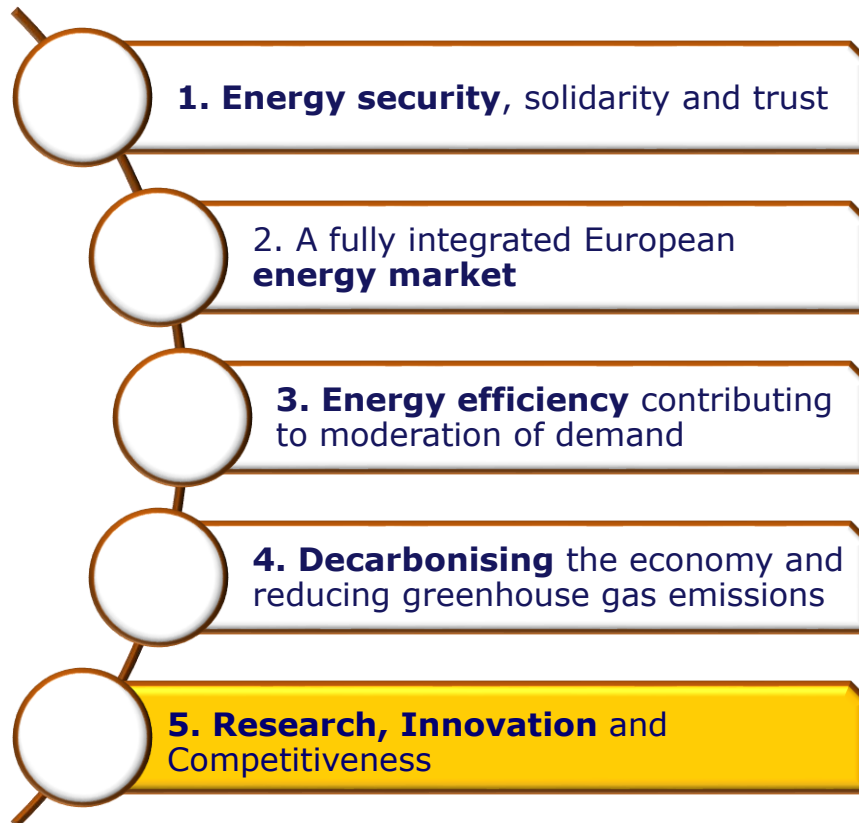

Policy Context

- **2030 Energy Strategy**
- **Energy Union**
- **COP 21:** 2015 United Nations Climate Change Conference
- **Mission Innovation**
- **SET-Plan:** European Strategic Energy Technology Plan *aiming to accelerate the development and deployment of low-carbon technologies*

The challenges to realise the EU energy objectives

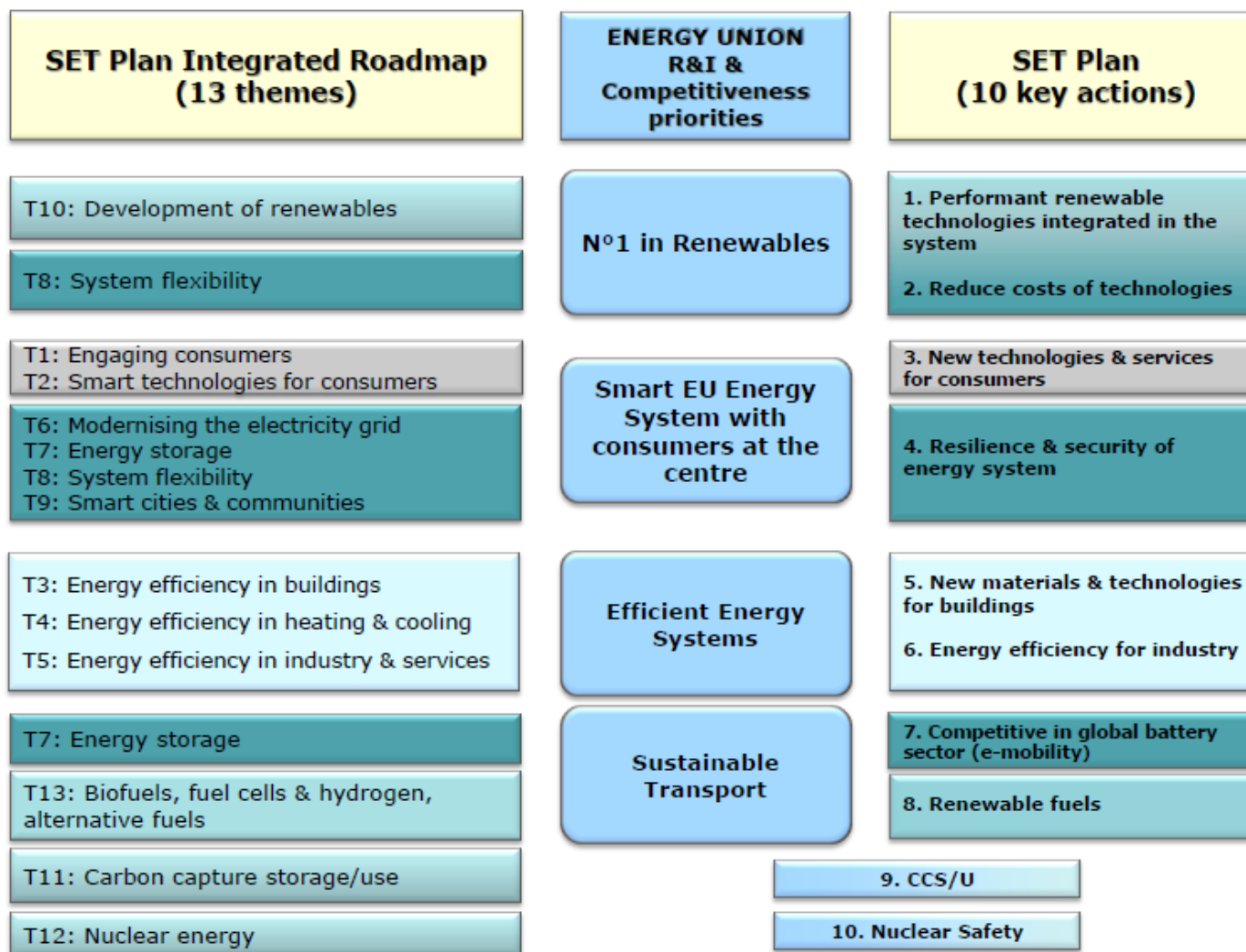
- Research breakthroughs that can
 - I. improve the competitiveness of existing technologies
 - II. become the basis for innovations that offer new solutions
 - III. enable the required societal change
- Upgrade competencies in the existing work force to adopt new technologies for the overall benefit of society
- Develop new human talent that can strengthen the innovation processes
- Create scientific evidence-based policy-making
- Inform and engage civil society

The Energy Union - Research & Innovation

Universities have the competences to address all of these priorities & are willing to contribute

SET-Plan 10 Key Actions



EUA-EPUE Response to EURICS Public Consultation

- UNI-SET has coordinated the EUA-EPUE response to the EURICS Public Consultation on the development of a comprehensive, integrated research, innovation and competitiveness strategy for the Energy Union
 - ✓ The response was submitted on 31 May 2016 and is available at the following [link](#)
- The response highlighted in particular the need for:
 - ✓ long-term thinking and support for university-based research and education in the energy field
 - ✓ integration and support of multi-stakeholder cooperation and openness for scientific advice of the strategy

EUA-EPUE Response to SET-Plan Key Actions (KAs) input papers (1/2)

| KA | Topic | Date |
|-----------|--|-----------------------------|
| 1 & 2 | Photovoltaics | November 2015 |
| 1 & 2 | Solar Thermal Electricity | November 2015 |
| 1 & 2 | Offshore Wind | November 2015 |
| 1 & 2 | Deep Geothermal Energy | June 2016 |
| 1 & 2 | Ocean Energy | June 2016 |
| 3 & 4 | Energy systems | August 2016 |
| 3 & 4 | Smart Cities and Communities | August 2016 |
| 3 & 4 | Smart solutions for energy consumers | August 2016 |
| 5 | <i>Energy efficiency in industry</i> | <i>February 2016</i> |
| 6 | <i>Energy Efficiency in buildings</i> | <i>February 2016</i> |
| 7 | Batteries/e-mobility | May 2016 |
| 8 | Renewable fuels | May 2016 |
| 9 | Carbon Capture Storage and Use | April 2016 |
| 10 | <i>Nuclear safety</i> | <i>April 2016</i> |

EUA-EPUE Response to SET-Plan Key Actions (KAs) input papers (2/2)

- 14 EUA-EPUE input papers submitted to EC by September 2016, available at: [UNI-SET](#) and [SETIS](#) website
- 3 EUA-EPUE papers in the field of energy efficiency and nuclear safety (see "[Background documents](#)" in the 2nd ECE event website):
 - ✓ Energy Efficiency in Buildings
 - ✓ Energy Efficiency in Industry
 - ✓ Nuclear Safety
- List of EUA-EPUE contributors can be consulted [here](#)

EUA-EPUE participation in ETIP Smart Networks for Energy Transition

- Advisory environment for research and innovation on smart networks for the energy transition
- Structure of the ETIP:
 - Governing Board (GA) - limited participation
 - Working Groups (WP) - open participation
- EUA-EPUE experts in the GA: Johan Driesen
- *1st meeting: 27 June 2016*
- *2nd meeting: 11 July 2016*
- *3rd meeting: 16 September 2016*

EUA-EPUE and the SET-Plan

Action 6 : Energy Efficiency in Industry

***European Union Steering Group for Strategic Energy
Technologies Meeting***

Centre Borschette, Rue Froissart, Room 5B

Brussels, 15 March 2016 – 9.30 to 14.00

From the input by the EUA-EPUE Expert Group

How universities could contribute to defined objectives – Suggested actions (1/2)

1. A **mapping of all relevant waste and by-product flows** from this sector is necessary.
 - ❖ to tap the potential of the food & beverages sector to reduce bio-resource loss along the bio-value chain from post-harvest to distribution.
 - ❖ Specific targets for increasing the efficiency along this value chain have to be set, in accordance with the targets for energy loss prevention proposed here under the cross cutting technologies section above.
2. **Optimal technology networks** to utilise these resources and transform them to useful products (e.g. bio-fuels) **and energy services must** be generated.
3. Development of **innovative business models along the bio-value chain**.
4. **R&I efforts** are necessary **to improve materials and heat exchanger geometries/configurations to reduce fouling**.
5. **Wider application of small size CHP system**, based on IC engines, turbines or fuel cells, which still have a limited application in industry.

How universities could contribute to defined objectives – Suggested actions (2/2)

6. **Cooperation between major stakeholders** - academia, industry, authorities, research institutions, communities.

❖ Intensive collaboration **between industry and academic researchers.**

❖ **For example:**

- ✓ Fostering collaboration from lab to pilot scale and from pilot scale to industrial demonstration.
- ✓ Development of strong networks of pilot plant installations.
- ✓ improve methodological approaches and implement industrial parks.
- ✓ **Dissemination from academia to industry of proper analysis techniques for industrial energy systems optimisation.**
- ✓ Academic training to improve, disseminate and implement innovative approaches to the design of fluid transport, pneumatic and heat transfer systems within industrial processes.
- ✓ **Improve technologies and analytical methods to optimally integrate technologies such as waste heat, CHP, trigeneration.**
- ✓ Improving value-chain-optimisation methods.
- ✓ Provide progress in the methodological approaches for total site integration and optimisation.

How EUA-EPUE could contribute to the common objectives

- ❖ **Providing a platform:** promoting the perspective of the universities' role in the society
- ❖ **Coordination of universities' voice in policy development**
- ❖ **Network building and knowledge sharing in the field of energy**
- ❖ Discuss the **strategic role of universities** and **facilitate cooperation**

- ✓ **Education role:** universities educating the highly skilled work force of our societies
- ✓ **Research role:** universities constituting a significant part of the research capacity in Europe
- ✓ **Innovation role:** integration of innovative research with education, including industrial partners

- ❖ Statement: We consider that setting up the SET-Plan projects with integration of research with innovative education, including industrial partners, will provide a high pay-off towards achieving the energy transition, as outlined in the SET-Plan and Energy Union.

Data: total sum of research staff (FTI - Four Time Equivalent)

“Data from UNI-SET Universities Survey: 202 universities”

| | Professors, post-docs | PhD candidates | Master-level students |
|------------------------|--------------------------|-------------------|--------------------------|
| EE in Industry | 698 | 431 | 2846 |
| EE in Buildings | 482 | 288 | 4092 |
| EE in Heating | 101 | 81 | 1123 |
| Total | 1280 | 800 | 8061 |



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Discussion on the roadmaps

“Roadmap for Universities in Energy”: Preamble (1/2)

- Universities are core stakeholders in Europe’s energy transition
- Universities are unique in combining and clustering expertise from different disciplines
- The “energy challenge” is cross-disciplinary by nature and will require cross-disciplinary solutions

“Roadmap for Universities in Energy”: Preamble (2/2)

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

“Roadmap for Universities in Energy”: Vision (1/2)

2. Vision

- 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.
- **Multidisciplinary approaches** in research and education support the integration of all dimensions of the energy system, technological and non-technological.

“Roadmap for Universities in Energy”: Vision (2/2)

2. Vision

- 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.

“Roadmap for Universities in Energy”: Objectives (1/4)

3. Objectives

EUA-EPUE seeks to contribute to the achievement of this vision

1. Foster structured dialogue with other university networks and other stakeholder networks of the SET-Plan and the Energy Union.
2. 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.
3. Provide support for up-to-date, high-quality higher education programmes, skills upgrading and life-long learning activities fit for an evolving energy sector.

“Roadmap for Universities in Energy”: Objectives (2/4)

4. Support and facilitate

- I. 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.
- II. 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).
- III. the creation of partnerships between universities, university networks, and between universities and other research and innovation organisations.

“Roadmap for Universities in Energy”: Objectives (3/4)

5. Promote

- I. long-term support for fundamental research, including use-inspired basic research, for next-generation and breakthrough knowledge to decarbonise the economy and society.
- II. 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.
- III. excellent, research-based innovation to create the technological solutions for the realisation of the Energy Union.
- IV. multidisciplinary education and research (science engineering and technology; bio and life sciences; economics social sciences and humanities) for the benefit of society.

“Roadmap for Universities in Energy”: Objectives (4/4)

6. Encourage universities to engage in their social environment, at different levels from local to national and international.
7. 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’.

“Roadmap for Universities in Energy”: Actions (1/3)

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.
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.

“Roadmap for Universities in Energy”: Actions (2/3)

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.

“Roadmap for Universities in Energy”: Actions (3/3)

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.



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.

Template for Reports from Parallel Sessions

| | Energy Efficiency in Buildings | | Energy Efficiency in Industry | | Nuclear Safety | |
|---------------------------------|--------------------------------|----------------------|-------------------------------|----------------------|-------------------|----------------------|
| | <i>Challenges</i> | <i>Opportunities</i> | <i>Challenges</i> | <i>Opportunities</i> | <i>Challenges</i> | <i>Opportunities</i> |
| Research & Education | | | | | | |
| Cooperation | | | | | | |
| Outreach to society | | | | | | |

Template for Reports from Clustering Sessions

| | Energy Efficiency in Buildings | | Energy Efficiency in Industry | | Nuclear Safety | |
|--|--------------------------------|----------------------|-------------------------------|----------------------|-------------------|----------------------|
| | <i>Challenges</i> | <i>Opportunities</i> | <i>Challenges</i> | <i>Opportunities</i> | <i>Challenges</i> | <i>Opportunities</i> |
| Cros-disciplinary in energy education | | | | | | |
| Cross-disciplinary in research | | | | | | |

Thank you for your attention!

For more information go to



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