Designing university programmes to support the European Green Deal and the Sustainable Development Goals

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EUA Webinar "Making a difference through partnerships"
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Motivation – Universities and Global Challenges

"…requires new cross-disciplinary approaches, integrating different energy technologies, energy systems, energy economies and markets, and importantly, embracing new regulatory frameworks, and understanding consumer behaviour and societal and cultural dimensions." (Action Agenda)

Effective solutions must address:

- the **whole energy system**
- the **interface** with an **informed society, citizens, policy**
- and **use of resources**.

  - **Interdisciplinary** working – reflecting complexity
  - **Challenge-based** approaches
  - **Collaborative Cross sector** working
  - **Sustainable** solutions

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The UNI-SET Project

- **Collaboration**: mobilising universities to address the skills gap: Building a community of experts through the UNI-SET FP7 project **2014-2017** https://www.energy.eua.eu/

4 conferences addressing Research & Education for SET-Plan Priorities

2 conferences on universities engaged for a clean energy future

7 Professional Profile Identification Workshops

- **500+ Participants**
- **130+ Universities**
- **100+ Organisations, NGOs, etc.**
- **40+ Companies**
- **40+ Countries**

➢ **Solid foundation for success**

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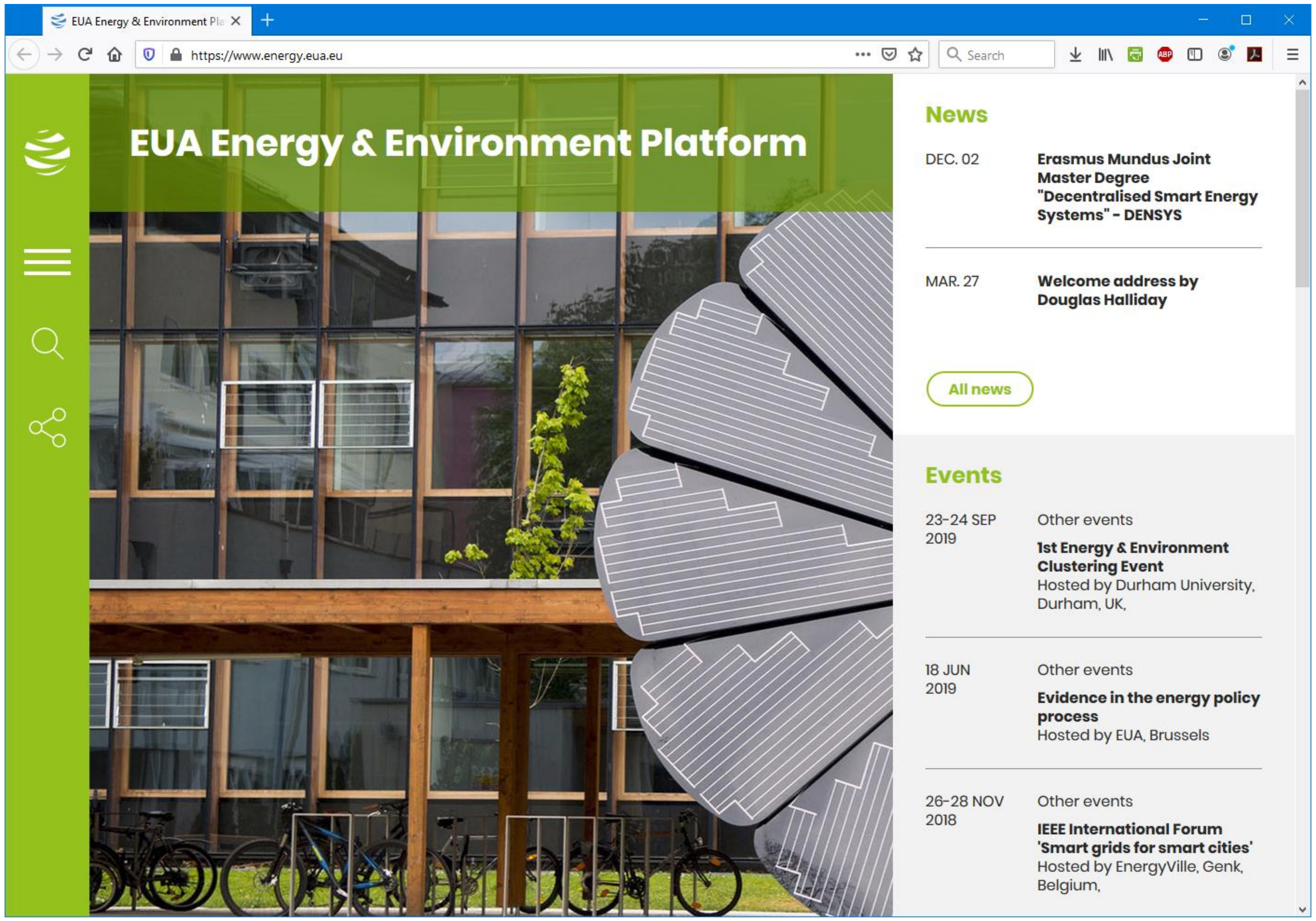
More details available…



Main Outputs

1. **Roadmap**
2. **Action Agenda**
3. **Atlas of Energy Education**

4. **Employers' Survey**
5. **14 inputs to SET-Plan consultations**

https://energy.eua.eu/ **@EUA_Energy**

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Universities ⟷ Global Challenges

Durham University

Anthropology
Archaeology
Biosciences
Business School
Chemistry
Classics and Ancient History
Combined Honours in Social Sciences
Computer Science
Earth Sciences
Education
Engineering
English Language Centre
English Studies
Foundation Programme
Geography
Government & International Affairs
History
Law School
Liberal Arts
Mathematical Sciences
Modern Languages & Cultures, School of
Music
Natural Sciences
Philosophy
Physics
Psychology
Sociology
Sport and Exercise Sciences
Theology & Religion

- Role of universities, place in society
  - Source of new knowledge, understanding
  - Place of education and training
  - Advocates for societal development

- Aligning aims with global challenges
  - New Structures
  - New Approaches
  - Working across boundaries

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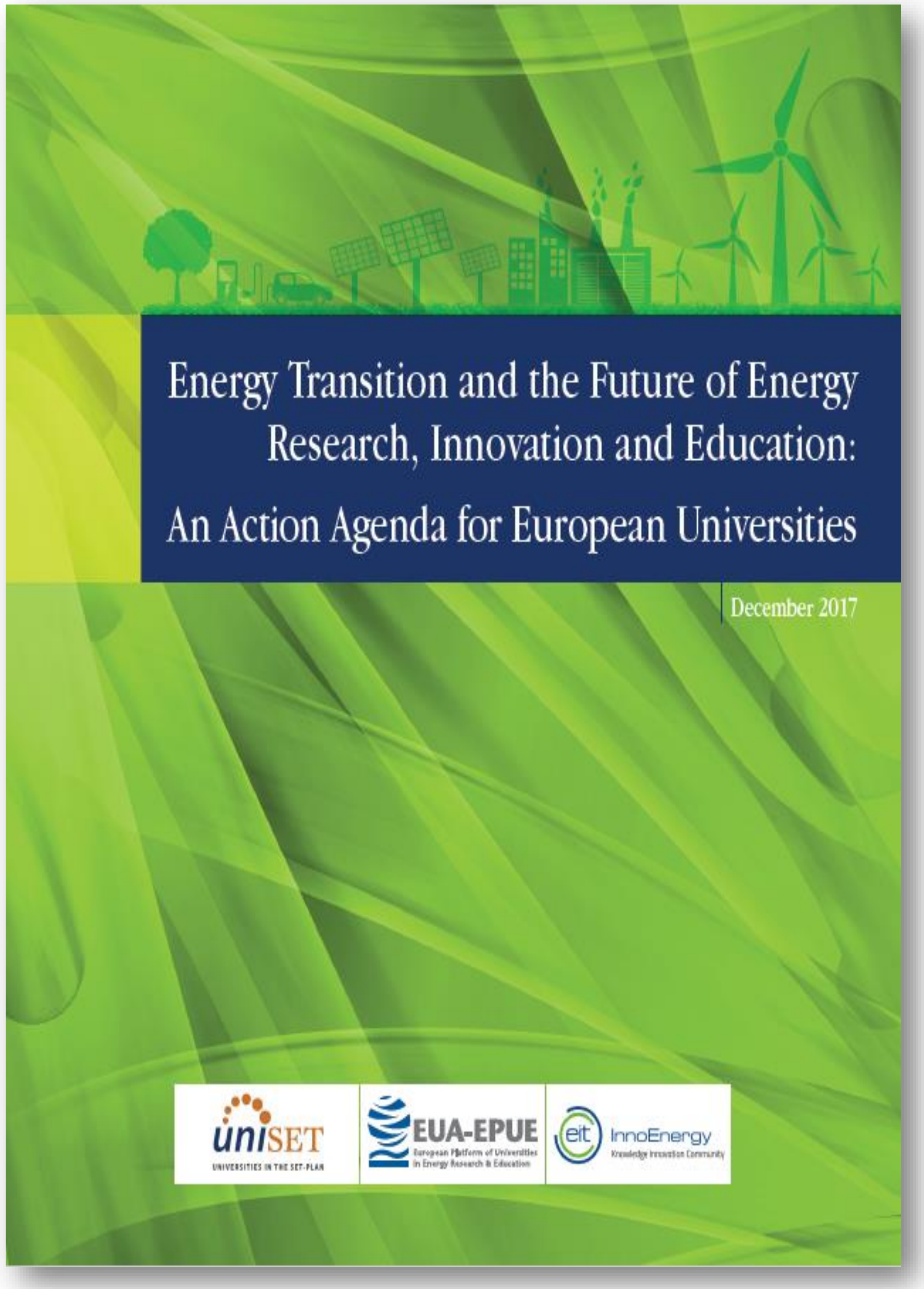
An "Action Agenda" for European Universities

- Action Agenda for European Universities
- Input from 100+ energy experts
- Enable the development of the actions set out in the **Roadmap for European Universities in Energy**
- Adoption of **new innovative approaches to learning, teaching and research**: Novel framework and approach for structuring new energy-related programmes
- Bridging **skills gap** in higher education and business sector
- **Greater interaction** between universities and other energy stakeholders including European and national policy makers, industry and citizens
- **Specific examples** in key areas of energy technology: Energy Efficiency; Smart Grids and Systems, Integration of Renewables



http://bit.ly/action_agenda

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What does this mean for Universities?

- How do providers of Doctoral and Masters education respond to this challenge?

Upgrade & innovate own programmes

Collaborate with society and industry

Update learning & teaching

Break down disciplinary barriers

More flexibility

New interdisciplinary working – new insights

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Main recommendations

- **Skills and knowledge** development need to go hand in hand
- Focus on **new learning approaches**
- **Rethink the role of the educator**
- **Institutional support** for interdisciplinary education and research
- **Combine breadth and depth** in “T-shaped” educational programmes
- Pay attention to **Lifelong Learning**
- Leverage **digital opportunities**

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Strategies to enable change

- **High level support** – institutional commitment to interdisciplinary working
- **European level Coordination and Support** – common approaches to research and education, shared repositories
- **Culture Change** in universities – possibly reflected in evolving institutional structures
- **Support and development opportunities** for staff – need to create a community of practice towards interdisciplinary working
- **Role of different disciplines** – agreed and clearly articulated: must “add value”
- **Overall design** should be a coherent programme not a complex programme

Strategies to enable change 2

- **Variety of learning approaches** in addition to core of learning by research, include professional skills, role of digital and blended learning
- **Case Studies** and **Challenge based** problem solving
- **Cross sector collaboration** – essential. Doctoral candidates must experience: policy, industry, citizens…
- **Life long learning**, needs to be seen as a lifelong challenge, build in culture of continuous CPD
- **Context Matters** – programmes must be designed for local requirements
- **Communication** – clear open communication amongst all parties

Example from Action Agenda

7. Energy Efficiency			
Topics (for courses)	**Understanding, Background Knowledge, Comprehension, General Appreciation of …**	**Design and Implementation / Deeper (Master level) Appreciation of …**	**Employment Skills**
Technical	The factors that influence systemic energy efficiency, incl. integrating energy along life cycles and within the spatial/ geographic context	The relationship between life cycle and energy efficiency	Propose energy efficiency measures at process level, potentially driven by data gathering
	Collected data analysis and appreciation of the power of such data, accepting its limitations	Simulation results and data gathered from measured consumption to improve energy efficiency	Propose energy cascades and efficiency improvements in whole life cycles
Social	The deployment barriers for efficiency improvements	Social barriers as part of a holistic analysis to improve implementation/integration	Consider social barriers
	The roles of actors in and impact on efficiency improvements	The impact of (new) technical processes in their spatial and social context	Interact with actors along the value chain/in the spatial context to improve systemic energy efficiency
Economical	Life cycle costs analysis of energy use with regards to generation efficiency	Calculate ROI for existing combined with new installations	Propose profitable and sustainable (costing) solutions
	The impact of pricing scheme trends (e.g. pricing based on kW instead of kWh) on management and new installations		Propose innovative business models for increased energy efficiency (uptake)
Political	Environmental regulations on efficiency and requirements	Adequate incentives for citizens and companies to move towards better energy efficiency	Operate in/create a legal framework
	Potential impact of economic incentives for energy efficiency improvements		

Appendix B - Case Studies

Energy Efficiency

Example 1 - Energy Efficient Regional Resource Use

Optimal use of existing, preferably local, resources is the ultimate improved efficiency goal. This requires students to generate holistic resource systems that make optimal use of restricted resources with state-of-the-art planning methods (e.g. Pinch, Exergy Analysis or Process Network Synthesis). When a group of (ideally engineering and urban/spatial planning) students is familiar with these technologies, they can be asked to optimise the resource use of a given region/urban settlement. Whenever possible, representatives from the region should be involved. The students will need to see data about the potential energy sources (bio, wind, hydro, solar) in the region, about demand (energy, subsistence, buildings), demographic development, existing businesses and existing infrastructure.

Each group of 4-5 students plans a method to overcome the existing problem. They propose an optimal resource-technology-demand system, integrating existing sites and infrastructure, and identify the most beneficial investments available. They present their results to the whole group, including tutors and regional representatives, followed by a discussion to analyse the strengths and weaknesses of the different approaches.

Example 2 - Multi Criteria System Optimization

A big chemistry plant produces a given number of tons of waste hydrogen and a given quantity of waste heat at 250°C per year. Students are given the annual electricity and primary energy resource consumption of the plant. CO2 emissions for chemical and own energy production are also provided. An onsite captive fleet is attached to the plant. Energy networks (electricity, gas and potentially heat) are part of the boundary conditions. The plant is located in a mid-rural territory that produces agricultural waste (wood, straw and manure are available). The region is rather windy, so a field of wind-turbines is currently being explored, while the yearly wind profile and installed power capacity are also provided.

Students are asked to:

1) Exploit waste as a resource
2) Create synergies within, and where possible across, plant boundaries
3) Increase the use of decarbonized resources.

Their main goal is to achieve multi-criteria system optimisation.

Groups of 4-5 students research the problem from a variety of perspectives, e.g: CO2 budget, deep decarbonization potential, economic impact/potential, energy efficiency, etc. An initial brainstorming is held to define potential technologies and synergies beyond the plant boundaries. Each group performs part of the modelling and simulation of the various potential technologies and synergies across plant boundaries. Results are discussed in a consensus meeting and presented to a broader panel of experts including people with non-technological backgrounds (geography, psychology, social, regulation, governance).

Towards a successful energy transition in Europe?

- Emergence of new **career trajectories** in sustainable and renewable energy and energy systems
- Need to develop a **dynamic** and **skilled** work force
- Need new approaches to protect Earth's valuable **resources**

"A Clean Planet for All"

- Knowledge and skills gaps
  - ✓ Need for a European-level silo-breaking activity in higher education
  - ✓ Need for new educational pathways
- Universities are **key stakeholders** in the energy transition
- They provide **knowledge, education, research** and **skills development → talent pipeline**

European Green Deal

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Concluding remarks

- Universities responsible for evolving education and training programmes
- Role of university programmes in solving global challenges – A public good?
- Training adds value to education process
- Interdisciplinary approaches can add insights and additional context
- Training develops individuals
- Intersectoral and industry collaboration add value and perspective
- Creating a new generation of problem solvers
- Not just disciplinary experts, able to solve complex energy challenges
- Increasing policy and advocacy role – need for “experts”
- Voice of universities must be heard, respected and acted on in Energy and Climate Debate and all Global Challenges
- Get involved

The place of universities in society?

Thank you for your attention

Questions

Comments

Discussions