

Attachment: Syllabus

1. Name of the Teaching Module

Decentralised energy systems. Social aspects of energy production and use.

2. Brief description of the subject matter

We are facing today a significant shift from classical, central and hierarchical systems of energy production and distribution, based primarily on big size power plants powered by conventional energy sources towards distributed local energy systems (DES) based mainly on renewable energy sources and smart grids solutions. The change implies not only implementation of new energy technologies, but also important social, cultural and political transformations in our societies. The goal of the course is to analyse drivers, dynamics and consequences of those complex socio-cultural trends. Focus will be put on the strategic analysis of possible futures scenarios.

3. Complete SSH problems description

A complete SSH problems description. e.g. bullet points, short text, mind map, etc.

4. Prerequisites and context

Here we should indicate what are the prerequisites for the students to be able to take the classes. If the prerequisites are not met, this place should indicate possible ways to meet the prerequisites e.g. read a book chapter or do an online quick course. Example prerequisites: communicable English, required knowledge, required skills, etc.

5. Learning outcomes

a. Knowledge

- About current technological and social solutions and trends in energy production and distribution
- About interconnectedness of technological, social, cultural and political developments
- About main social drivers of technological innovations

b. Skills

- Analysing future trends from broad SSH perspective
- Identifying possible SSH impacts of technological innovations
- Understanding complex socio-technical relations of macro and micro level energy systems

c. Social competencies

- team work
- applying group strategic analysis methods

6. Form of classes

- Lecture, seminars with presentations; group work
- Three stages (3 x 45 min) for up to 20 students.
- At least 70% direct student participation.
- Additional self-study in-between stages

7. Teaching methods

- Concept problem presentation (power point) with brainstorming, discussion.
- Student project with Webquest, case study, analysis
- Workshops
- Scenario analysis

8. General classes plan

Session 1 Innovative technological solutions in energy production and distribution (3x45min)

1. An introductory open-form (with student interaction) lecture on innovative technological solutions of producing and distributing energy
2. Case study analysis
3. Open discussion of possible consequences (technical and non-technical) of implementation of presented technologies: from central to distributed, local energy systems.

MATERIALS: presentation, info materials related to the presented technologies

Self-study in-between: Examples of existing and potential distributed energy systems' solutions, such as:

- prosumption
- energy independent (autonomous) communities
- use of RES in DES

Assignment: students in groups of three prepare a short (5 minutes) presentation of a chosen DES-solution.

Session 2 Decentralised energy systems from SSH perspective (3 x 45min)

1. Presentation of the self-study assignments
2. Lecture on the shift from central to distributed DES – broad perspective, presentation of socio-political trends contributing to it (EU energy policy, green energy, energy democracy, energy as a moral resource);
3. Discussion and analysis of possible future scenarios using strategic analysis methods. (forecasting)
4. To be continued as two kinds of scenario analysis: 'Road map' and 'What if?' (explanation of the procedure and topic)

Session 3 Scenario analysis: 'Road map' and 'What if?' (3 x 45 min)

1. Scenario analysis of the given cases in groups
2. Summary discussion

9. TM assessment methods & criteria

Session 3 includes the final assignment in which the students are asked to conduct the roadmap analysis and the what if analysis. Criteria to be taken into account:

- Proper identification of barriers (cause, effect, solution)
- Proper identification of non-technical barriers
- Forecast based on non-technical factors (economic, social, political, etc.)

The proper evaluation and marks awarded for the assignment and module are subject to applicable rules of the institution hosting the module.

10. Literature and other materials

1. Scheer Herman. 2007. "Energy Autonomy. The economic, social and technological case for renewable energy". London: Earthscan.
2. Morris Craig, Arne Jungjohann. 2016. "Energy Democracy. Germany's Energiewende the Renewables". London: Palgrave Macmillan.
3. Schoor, T., Scholtens, B. "Power to the people: Local community initiatives and the transition to sustainable energy" Renewable and Sustainable Energy Reviews. Vol. 43(2015), pp. 666-675 Online: <https://doi.org/10.1016/j.rser.2014.10.089>
4. Adil, A.M., Ko, Y. "Socio-technical evolution of Decentralized Energy Systems: A critical review and implications for urban planning and policy" Renewable and Sustainable Energy Reviews. Vol. 57(2016), pp. 1025-1037 Online: <https://doi.org/10.1016/j.rser.2015.12.079>
5. Lampropoulos, I.; Vanalme, G.M.A.; Kling, W.L. "A methodology for modeling the behavior of electricity prosumers within the smart grid" Innovative Smart Grid Technologies Conference Europe (ISGT Europe), 2010 IEEE PES, oct. 2010, pp. 1-8. Online: <http://ieeexplore.ieee.org/xpls/icp.jsp?arnumber=5638967>
6. Karnouskos, S. "Demand Side Management via Prosumer Interactions in a Smart City Energy Marketplace" 2011 2nd IEEE PES International Conference and Exhibition on Innovative Smart Grid Technologies Online: <http://ieeexplore.ieee.org/document/6162818/>