Session E3

Societal Implications of the Energy System

Chair: Linda Nierling (Institute of Technology Assessment and Systems Analysis)

The transition towards a sustainable energy system relies strongly on the development and implementation of technological innovations. However, of no less importance are the social challenges that will arise from the implementation of these technologies in social spheres. This counts for the implementation and development of energy-related technologies in industrial settings but also for the introduction of technical innovation into everyday life. Thus, as decisions by policy makers, organizations or firms are taken for measures to reduce Greenhouse gases, energy, or pass to renewable forms of energy, the urgency to acknowledge, assess and mitigate how these technologies are taken up by social actors as companies or civil society are crucial to analyse.

The purpose of this session is to address these societal implications of energy-related technologies and develop further measures to address them appropriately. Based on the two presentations topics for future TA research as well as future political strategies directed towards a diverse field of actors from industry or civil society will be discussed.

Cyber-Physical Systems and Climate-Change Agenda: Issues and Linkages for Consideration

Author: Jiri Dusik (Integra Consulting Ltd.)

The presentation will outline the basic concern about the impacts of gradual deployment of automation on the total life-cycle demands for energy and materials that will be required for the production, operation and maintenance of various elements of cyber-physical systems. It will also outline two potential options for promotion of energy/material-saving (rather than labour-saving) innovations in cyber-physical systems.

First option is to encourage those who are developing or deploying cyber-physical systems to consider and eventually publicly demonstrate the total implications of these systems on material and energy flows through sufficiently robust analyses based on e.g. life-cycle assessments or energy/environmental management accounting systems. Such analyses will be needed in future debates on impacts of automation on the energy use and their contribution (if any) to a concept of circular economy.

Second avenue could explore opportunities for a greater use of carbon taxes (or other environmental fiscal tools) that encourage energy saving and decarbonisation while generating revenues that could be (partly or wholly) used for social support programmes (as done e.g. in Ireland, Finland, etc.). We are at interesting point in time in debates about taxation of future production systems – both in current debates on cyber-physical systems as well as in climate change debates that are increasingly pre-occupied with the future role of fiscal tools such carbon taxes or carbon trading. Given this interest in taxation, it may be interesting to explore implication of e.g. various scenarios of carbon tax on energy demands of cyber-physical systems, their economic competitiveness and tax revenue generation. Insights obtained through such research could gain policy-making attention, especially if the adverse impacts of automation and climate change scenarios begin to tangibly affect human livelihoods.

Societal Acceptance of Emerging Energy Technologies in the Context of the Energy Transition

Authors: Marcel Weil, Manuel Baumann, Jens F. Peters, Martina Haase, Christine Rösch, Jens Buchgeister (Karlsruhe Institute of Technology), Christina Wulf, Petra Zapp (Research Center Jülich), Tobias Junne, Tobias Naegler (German Aerospace Center), Philip Emmerich (Technical University Berlin)

The "Energy System 2050" initiative of the Helmholtz Association aims to develop tangible and usable system-technology findings, including the identification of technological solutions for the future energy transformation, to analyze them in a holistic manner and make the results available to politics and industry.

Decarbonization and increased sustainability are the major targets of the energy and mobility transformation. Both transformations rely on new and emerging technologies, which allow on the one side the intensive use of renewable energy sources, and ensures on the other side a stable and uninterrupted provision of energy to industry and whole society. The new and emerging technologies have an economic and ecological impact, which has to be assessed in a systemic perspective. But also the social impacts need to be analyzed in a holistic manner, and beyond social LCA with all the related limitations. A Sustainability Indicator System (SIS), which was developed for the assessment of the German energy system and its transition (EnergyTrans project), was proven within the ongoing project “Energy System 2050” regarding applicability on energy technology level. In this respect and regarding the social impacts, the “acceptance of technology” is considered of great importance as an indicator.

Therefore, a quantitative and qualitative acceptance survey is conducted for three independent technologies. It is considered: Hydrogen filling station, biofuel production plant and large scale stationary battery storage facility. Within the first emission, a total of 211 data sets (answered questionnaires) were generated via the platform of sosci-survey, approximately one-third for each technology. At the beginning of each questionnaire, the respective technology was introduced with a short description. The preliminary results exhibit that the considered energy technologies were largely unknown to the questioned persons, which is of great importance regarding future activities and communication with stakeholders. In addition the most frequently mentioned concerns for hydrogen filling stations and stationary battery storage systems are explosion and fire hazards, in the case of biofuel production plants, these are odor and noise pollution; also if such effects like explosion, fire hazards and odor would not occur in a controlled operation.