

Towards a Consumer-Driven Energy System

Understanding Human Behaviour



Workshop Summary

12-13 October 2017

Hosted by the Technical University of Denmark

Lyngby, Denmark



Experts' Group on R&D Priority Setting and Evaluation

International Energy Agency

The International Energy Agency (IEA), an autonomous agency, was established in November 1974. Its mandate is two-fold: to promote energy security among its member countries through collective response to physical disruptions in oil supply; and to advise member countries on sound energy policy.

The IEA carries out a comprehensive program of energy co-operation among 28 advanced economies, each of which is obliged to hold oil stocks equivalent to 90 days of its net imports. The Agency aims to:

- Secure member countries' access to reliable and ample supplies of all forms of energy, in particular by maintaining effective emergency response capabilities in case of disruptions to oil supplies.
- Promote sustainable energy policies that spur economic growth and environmental protection globally, particularly by reducing greenhouse gas emissions that contribute to climate change.
- Improve the transparency of international markets through the collection and analysis of energy data.
- Support global collaboration in energy technology to secure future energy supplies and mitigate their environmental impact, including through improved energy efficiency and development and deployment of low-carbon technologies.
- Find solutions to global energy challenges through engagement and dialogue with non-member countries, industry, international organizations and other stakeholders.

IEA Experts' Group on R&D Priority Setting and Evaluation

The research, development and deployment of innovative technologies are crucial to meeting future energy challenges. The capacity of countries to apply sound tools in developing effective national research and development (R&D) strategies and programs is becoming increasingly important. The Experts' Group on R&D Priority Setting and Evaluation (EGRD) was established by the IEA Committee on Energy Research and Technology (CERT) to promote the development and refinement of analytical approaches to energy technology analysis, R&D priority-setting and assessing the benefits of R&D activities.

Senior experts engaged in national and international R&D efforts collaborate on topical issues through international workshops, information exchange, networking and outreach. Nineteen countries and the European Commission are participating in the current program of work. The results and recommendations provide a global perspective on national R&D efforts that aim to support the CERT and feed into the analyses conducted by the IEA Secretariat.

For information specific to this workshop, including the agenda, background information and presentations, see www.iea.org/workshop/name,43381,en.html. For information on further EGRD activities, see www.iea.org/aboutus/standinggroupsandcommittees/egrd/.

Executive Summary

The International Energy Agency's (IEA's) Experts Group on R&D Priority Setting (EGRD) held a workshop entitled "Towards a Consumer-Driven Energy System: Understanding Human Behaviour" to help decision-makers determine RD&D priorities and policy needs in a consumer-driven energy system. The Technical University of Denmark (DTU) hosted the workshop on 12-13 October 2017 in Copenhagen. The aims of the workshop were to explore individual and organisational behaviour and decision-making related to energy use and to identify novel approaches and social science needs, gaps and opportunities that could accelerate innovation and facilitate market uptake and transformation. Participating technology experts from research institutes, academia, government agencies and intergovernmental organisations located in 15 countries offered a wide range of perspectives and insights.

Social science in energy

Energy production, distribution and consumption all have technical and human components, though little research exists on the latter. However, there is an increasing focus beyond technology and economics towards the social aspects of energy technologies. In this regard, methods that capture the role of human behaviour (attitudes, habits and experiences) in energy use and consumption are essential. Individuals and their choices may influence patterns and modes of consumption far more than previously expected. Therefore understanding individual behaviour and decision-making is critical to accelerating the transition to an energy-efficient and low-carbon energy future.

The EGRD first examined the socio-economic aspects of the energy system at its workshop, "The Transition to a Low-carbon Economy: Socio-economic Considerations" (Baden, 2011). Since then there has been considerable progress in understanding the gap between social scientists and energy technologists and planners. This progress was convincingly illustrated in the workshop through the challenge-oriented, cross-disciplinary research programmes, pilot projects including human behaviour, policies considering the role of the individuals and stakeholders in the design and execution of policies, and research communities overcoming historical disciplinary silos (social science, engineering and natural sciences) to work together.

Understanding human behaviour

Despite recent progress in the contribution of the social sciences to energy sector decision-making, and given the essential role of human behaviour in a consumer-driven energy system, much more research in this area is needed. As described by Sovacool, social science research for energy is more than an afterthought and requires further development such as conceptual frameworks, methodologies and reliable and valid data to underpin decision-making. However, while key issues have been identified, researchers are still in the process of understanding human behaviour related to the energy system and its transformation to a more sustainable system.

A better understanding of the effects of human behaviour in energy systems is required at different levels of planning and policy making. Human behaviour underpins decisions made by individuals that are directly linked to the community, the region and to the whole of society. It should also be considered at all stages of planning processes, whether- short-, medium-, or long-term.

Balance between understanding and action

A better understanding of human behaviour enables informed actions. Including it throughout the knowledge value chain as a basic research topic in its own right and integrating it into technology demonstration projects would lead to a fully considered, dynamic, human-centred energy system. The most effective energy solutions are those which combine multiple disciplines in which social science plays an important role at all stages, including testing programmes or policies (e.g. questionnaires, surveys, semi-structured interviews, observations, case studies, scenario-building and foresight, expert judgement) before implementing a new initiative.

Better data and methodologies

While the contribution of social sciences has improved, addressing the challenges of developing complex energy systems requires accessing data sets across social science disciplines and combining qualitative and quantitative methodologies for analysis. These efforts would strengthen the impact of social sciences when considering the technical, resource and other rationally based scientific disciplines. Comparing cases across cultures, regions and countries would provide valuable further insights.

High-quality, valid and reliable data are paramount not only to understand - but also to stimulate – human behaviour. While data on energy costs (including levelised costs of energy) may be relatively straightforward to generate, further methodologies are required in order to capture the effect of individuals' decisions at the time and point of consumption.

Digitalization of the energy system is creating vast amounts of real-time data which could provide valuable insights into behavioural patterns and lead to guidelines for immediate action. Workshop participants touched briefly on the challenges and opportunities of accessing such data. Analysing other research areas such as marketing and artificial intelligence could provide valuable insights in understanding the role of human behaviour in energy choices.

Co-creation and co-design

Effective policies and programmes are those which are co-created by a range of stakeholders through a consultative, participatory process. While this may take more time, stakeholders are more likely to implement the agreed policies and the resulting policy or programme is more representative of the market as a whole. One interesting example of stakeholder consultations in a hospital involved 'story-telling' and visualisation techniques to brainstorm on ways to cope with complex energy-efficiency challenges and problems of the management, medical staff and patients.

Consumers and citizens are at the centre of the energy system. Empowering them to make informed decisions could improve the social acceptance of new technologies, encourage social innovation, and ultimately transform the energy system.

Conclusion and recommendations

Many governmental energy RD&D policies and programmes have made progress in facilitating problem- or challenge-based interdisciplinary research that engages both the producers and users of knowledge. There is an increasing understanding that the transformation of the energy system is inherently linked to the consumer. This requires a deep understanding of individuals' behaviour - and the effect of this behaviour on their communities and society as a whole.

Workshop participants developed two recommendations:

- Decision-makers should design RD&D programmes and projects that are challenge-driven, benefiting from an interdisciplinary approach which fully integrates social science considerations.
- Social science communities should continue to improve their conceptual frameworks, methodologies and data in order to translate insights of human behaviour into evidence for appropriate action.