



SENIX

SENIX Conference

The Role of Social Sciences in a Low-Carbon Energy Mix

Stockholm, June 13-15, 2016

BOOK OF ABSTRACTS

DRAFT

Introduction

The SENIX Conferences help bridging the gap between present day conditions and full recognition of the necessity to bring in the social issues up-front in energy policies, programmes and projects. The programme in 2016 included a mix of invited key note presentations and presentations based on abstracts submitted by the conference participants. This book of abstracts includes abstracts submitted given in the order of place in the conference programme.

Kjell Andersson

Karita Research , conference organizer

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Opening Session

SENIX now and in the future and social platforms

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Developing the future energy system will meet huge social and political challenges on all levels (global, regional and local). For this reason, the participation of not only engineers and natural scientists but also social sciences and humanities (SSH), policy makers and other stakeholders should contribute to address energy issues in a broad manner.

It has been the ambition from the beginning that that SENIX conferences should become a point of departure for future initiatives in this direction including the establishment of a Social Platform for a sustainable energy system and now I feel confident that the SENIX concept is well enough grounded so that the first steps can be taken.

I think there is no lack of motivation for the creation of such a Platform as our world faces huge social and political challenges during the rest of this century. Global warming and the drive for lower carbon economies is in itself a huge challenge on a global scale with social and socioeconomic implications. The transition of the energy system has also regional and local implications, for example when it comes to the siting and installation of infrastructure and individual facilities for wind power, hydropower dams, solar power, nuclear reactors, nuclear waste repositories, facilities for carbon capture and storage (CCS), etc. In many cases this leads to local opposition and controversies which leads to uncertainties about governance structures and methods.

The establishment of the *SENIX Platform* needs to be done step by step having a broad perspective and ambiguous goals from the beginning. When the proposal gets attention, momentum will be created for increasing involvement of both policy makers and academia. The first step is to form a *Working Group* for advancing the idea from just an idea to proposing statutes for an association with the aims to:

- promote SSH studies related to decision making in energy matters of importance for governments, regional and local authorities, industry, NGOs and other relevant stakeholders
- give guidance for future research
- provide an effective link between natural and social sciences
- boost education, training and information initiatives

The idea is that the SENIX Platform should be *problem driven* by needs appearing from current programmes and future challenges. The initial topical work areas should be proposed

by the Working Group carefully selected due to relevance for the transfer to a low-carbon society, feasibility in making progress and interests of sponsors.

It has been proven that the SENIX Conferences address a new niche in the energy area and has the capacity to attract SSH researchers and policy makers. A Working Group will be established at SENIX 2016 for developing the Platform until SENIX 2017 all the way until the formulation of Statutes for a new entity including registered office, purpose and activities, members with categories and admission, rights and obligations, financial issues, subscription and fees, general assembly, executive committee, secretariat, other organizational aspects, etc. The *SENIX Academic Platform* should come into operation at SENIX 2017 and should have financial resources secured for the first three years of existence, later a viable Platform should find multiple sources for funding.

Current experiences with the involvement of local communities in an early phase of site selection for a deep geological repository for nuclear waste

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SURAO's mission as a state organisation is to ensure the safe disposal of all radioactive waste in the Czech Republic. There have been 3 repositories of Low and Intermediate Level Waste (LILW) in operation for several decades and an ongoing Deep Geological Repository (DGR) siting process from the 1990's.

The candidate sites have been designated for possible geological investigation based on its geological characterisation – granitic rock - and the surrounding villages are therefore obliged to become involved. The beginning of geological works lead to severe opposition of the local people. Petitions against repository were signed, happenings organised, but mainly local referenda were carried out, resulting always in clear rejection of the repository and all activities related with the potential construction of the repository. Geological works at preselected sites were soon interrupted by governmental moratorium. Lack of trust for, and confidence in the Czech state is general societal challenge. Experience here was similar to what has been seen in some other countries: a lack of trust in levels of government; increased public distrust resulting from perceived attempts or from earlier attempts to impose a facility. Such factors counteract efforts to build the mutual trust and cooperation that are so important in a siting process.

SURAO is aiming for a fair, transparent and open siting process, in which the role of municipalities and all other stakeholders is meaningful and strengthened and which would bring added value for the communities involved from the beginning of geological works. Thanks to the international projects there was initiated the establishment of the Working Group for Dialogue on Deep Geological Repository - national stakeholders group - which is a kind of advisory group of the Governmental Council for Energy Strategy and Raw Materials. The main aim is to strengthen the role of the local players in the siting process and to increase the transparency of the siting process

Challenges for a low carbon society

The greener evil? Chinese hydropower sector goes international and its global implications.

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Hydropower dams have been in the spotlight due to opportunities for low carbon energy generation and possible contributions to mitigating climate change. At the forefront of the renaissance of large hydropower dams are the Chinese as the world's largest dam builder, opening up opportunities for low and middle income countries in Africa and Asia to attract large investments, build up energy and water management infrastructure which in turn can contribute to national development goals and economic growth. However, large hydropower dams, despite their possible developmental and carbon reduction contributions, are accompanied by huge economic cost, profound negative environmental changes and social issues. Using fieldwork data from four hydropower projects in Ghana, Nigeria, Cambodia and Malaysia, this paper assesses the modalities and deconstructs the Chinese hydropower sector, the different actors involved, and the wider environmental and governance implications of these Chinese dams on the local, national and international contexts of governance. The paper concludes that hydropower dams are the inevitable greener evil in the future to cope with energy deficiency of the world hence the planning and building needs to be done in a more sustainable way that takes into account national development priorities, the needs of local people and the impacts on natural habitats.

Stakeholder engagement with carbon capture and storage (CCS) – experiences and challenges

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Carbon capture and storage (CCS) has a vital role to play in a portfolio of low-carbon technologies to tackle climate change at least-cost to the world economy. The Intergovernmental Panel on Climate Change (IPCC), Fifth Assessment Synthesis Report (2014) found that it would cost 138% more to achieve a 2°C scenario without CCS. The International Energy Agency (IEA, 2012) has noted that the exclusion of CCS as a technology option in the electricity sector alone could increase mitigation costs by around US\$2 trillion by 2050. Organisations like the UK's Committee on Climate Change (2015) have found that CCS could almost half the cost of meeting the UK's 2050 CO₂ emission reduction targets.

CCS technology and infrastructure is a vital component of our low-carbon future, yet, public understanding of this process of capturing, transporting and storing CO₂ is low, and there is a history of misperception and (in some cases) negative public reactions to the possibility of a CCS development.

Over time there has been a comprehensive body of international work to understand and

investigate the social factors that influence CCS project deployment and continually emerging project experiences that have helped to shape and refine our ideas of the key challenges for engaging with CCS and the best practice solutions being trialed internationally. This presentation will attempt to synthesize these key findings from both research and experience of delivering public engagement/ education and outreach programmes internationally, and explore some of the creative solutions being piloted in different international CCS projects.

There is an expectation that many of the challenges identified by the CCS community are common across the suite of low-carbon technologies and for those trying to engage on more general issues of energy, sustainability and climate change. This provides an opportunity for cross-sector knowledge sharing and collaboration – an opportunity that is becoming particularly important for CCS engagement in Europe. During the presentation we will briefly consider the recent changes in style and focus of CCS engagement in Europe, and consider what this means for future research and CCS deployment support projects.

Energy system efficiency

Smart Energy Region Zurich 2050 – formative and intuitive Scenarios

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The Swiss energy transition (“Energiewende”) is a challenge at regional level. To handle this, scenarios are a possible tool for policymakers to lead the development in a desirable direction. Therefore scenarios with the target of a low carbon, zero nuclear power future and smart energy region in 2050 were developed for the Zurich region.

The scenario-development is based on workshops with experts from energy utilities, the district administration, representing the departments energy, environment and local promotion as well as universities with their expertise in technology, economy and energy efficiency (Spiess, 2016).

On the one hand the scenario process was performed based on the formative scenario analysis method by Scholz & Tietje (2002). This included a system analysis and a consistency evaluation stage. On the other hand an intuitive method was used. This method is based on the creativity and the intuition of the experts. In total six scenarios were developed, three by each method. The impact variables for the scenario process cover several technological and socio-economic aspects, such as synergies of operational systems, decentralization of renewable energy production, grid conversion, maintaining energy security, contribution to economic prosperity and quality of life (Gohl & Styger, 2015).

The result of the intuitive method offers a wider range of variety for the different scenarios, whereas the result of the formative scenario has a better performance in terms of consistency (Spiess, 2016).

In this paper the outcomes of the relevant energy scenarios for the Zurich region 2050, with focus electricity and the validation stage, will be presented. By undertaking a ‘whole systems’ sustainability appraisal (Foxon, 2012), possible pathways will be explored and interrogated in relation to their technical feasibility and their social acceptance.

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Energy policy in discourse - the power grid expansion between politics and public opinion in Germany

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Background:

In the context of the ‘Energiewende’ (‘energy transition’) of the development of renewable energy in Germany is accelerated. The switch from a central power supply is provided by coal and nuclear power to a decentralized energy supply. This means that the power supply has to adapt to this change. Not only the decentralization is a challenge, but also that wind power especially in the north of Germany is generated while the power consumption is carried out in particular in the south. Existing networks will be upgraded and new long-distance north-south power-lines built. In this context, wide geographical, scenic and societal impacts can be observed. This partly led to conflict and resistance in Germany.

Question and methods:

The project started with the aim to examine from a discourse theoretical perspective. It was focused on the question, how power grid extensions and possible health-related consequences are constructed communicatively. Another question was what interpretation patterns dominate the discussion at the various levels. By using methods based on the discourse theory of Ernesto Laclau and Chantal Mouffe, dominant interpretation patterns in the discussion were identified and analysed. Print media, campaigns especially from NGO and talk shows in

public television relating to the topic power lines were investigated. Also narrative interviews with stakeholders were carried out.

Main results:

To put it into a nutshell: the underlying demand for grid extension on the one hand, and - in varying degrees - issues of the technology involved, health, local economy, nature protection, landscape and participation in the process of decision-making were the main fields of conflict. Especially the social aspect of the conflict can be understood as very important: different social systems and their specific logics are of crucial importance for the assessment of the current power grid extension. Changes within everyday life, especially concerning changes of the local familiar landscape (which is constructed as 'Heimat') are often rejected very strongly. The electric and magnetic fields of the power lines are only one aspect of the conflict between others. The interpretation patterns against the network expansion are regionally differentiated. In particular, in Bavaria there is a fundamental resistance while they are specified in northern Germany instead of overhead lines underground cables.

Conclusion:

Risk communication about health risks as well as landscape changes has to be sensitive, careful and adapted to the importance for the concerned people. If such communication is not performed, there is a considerable resistance.

Cost Minimization of Generation, Storage, and New Loads in a Regional Electric System

LANCE NOEL

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To understand the economics of potentially large-scale changes in the electric system, we generate 86 million different combinations of new electricity generation including wind and solar, new storage, and a shift from fuels to electricity for both light-vehicles and building heat. All electric systems are constrained to meet load every hour over four years. The total cost of each energy system was calculated, both with and without external costs, to find the least cost energy systems. As might be expected, the cost optimum systems included more renewable generation as more externality costs were included in minimizing the costs of energy system.

We find that, using today's cost of renewable electricity and external costs, it is most cost effective to implement 240 GW of renewable electricity that meets 50% of total electric load, and this system runs reliability without needed either new generation or purpose-built storage. This system operates without the need to construct new thermal power plants (local needs were not considered).

Energy in Buildings and Homes - Part I

Inviting people to play new roles in the district heating system

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District heating provides more than half of the homes in Sweden with heating, yet it is rather unknown. To explore this, I investigated how residents in flats understand and make use of district heating in everyday life. The result shows that district heating plays a hidden role, as people are more aware of other means used to get warm, for instance textiles. Those other means have advantages such as providing thermal comfort more rapidly and with added benefits e.g. cosiness. Emphasising the hiddenness, automated regulation of heating makes any interaction with the system needless. It could be said that residents in flats connected to the district heating system are given the role of passive beneficiaries. They do not have satisfactory control over heating, they do not get feedback on the status of the building's heating system nor on the city's district heating system, and they are not deliberately informed about district heating's existence and its role in the home (e.g. through a separate heating bill). Although this passive role can be convenient, at the same time people would like to have more control and be informed about the heating system's status. District heating as a concept and as manifested in the city, in the shape of production plants and pipes, is more concrete for people, compared to a lack of apparent ways of knowing if a particular space is heated with district heating or not.

Design, as a process as well as an end result, has previously been used to create awareness of energy use. Therefore, I explored how new tools for thermal comfort with heat delivered by the district heating system were received. Most of the participants who used the tools with some regularity reported increased awareness, developed new strategies, and/or carried out some kind of action concerning the heating system. This indicates that enabling new ways of interacting with heating can invite people to take a more active role in relation to the district heating system.

Grounding design of smart grid technology in everyday activities

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We present the project “Future Alley - Sustainable Lifestyles”, which is a field study carried out between 2014-2017 in a residential area built during the 70's. The study is carried out in collaboration with a housing company, an energy company and a company producing technology for the smart grid. The purpose is to study how sustainable practices and lifestyles may emerge in retrofitted rental apartments, where technology for smart grids and micro generation of solar power have been installed. There's a need for this kind of studies, since previously the use of smart grid technology has mainly been studied in newly built residential areas, targeting a narrow group of households.

For one and a half years we have followed households in 18 apartments by interviewing them and by attempting to engage them with design interventions and workshops. We have also interviewed the stakeholders and studied their goals, values and agendas with the smart grid implementation. The study analyses how households and stakeholders relate to the smart grid technology and how everyday practices are formed (or not formed) around the use of this technology. Electricity consumption and solar power production are measured and touch-points between households and the technology are mapped out as a way to highlight the various communication channels as well as potential points of conflict.

In discussing households' relationship to the technology implemented in their homes we emphasize the importance of considering the everyday activities when designing smart energy technology. Results from our interviews indicate how technology was *neglected*, *misunderstood* and *personalized*. We conclude that without considering contexts and social settings, we risk losing sight of the dynamic practices in which consumption takes place. Energy consumption takes place in a social and physical context.

Cool young things: youth research peer experiences of energy inefficient homes

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Fuel poverty, more recently termed energy inequality or energy vulnerability, describes the situation where households are unable to achieve adequate household energy services, including maintaining indoor temperatures to healthy levels. Combined causes include building and appliance inefficiency, cost of energy, income, and occupancy.

A growing body of research has focused on the health effects of inadequate indoor environments, with more recent social research to describe the lived experience of energy vulnerability. Children and young people are at greater risk due to increased exposure to home environments as well as physiological factors making them more susceptible to the ill-health effects of inappropriate temperatures. Despite this, little research has specifically focused on children or included youth voices in the research process.

Cool? Exploring the experiences and insights of New Zealand youth living in cold housing specifically aimed to include young people as collaborators on the research team to investigate the effects of cold home temperatures on youth. Classroom workshops provided a forum for young researchers to develop a nationwide online survey of youth, analyse and discuss the results, participate in a small e-interview study, and give a public presentation on their experiences of the research process and initial findings of the project.

This mixed methods participatory research found that young people perceive cold home temperatures as a widespread problem affecting their health, schooling, relationships, and daily activities. Young people showed a strong interest in government intervention to address the multifaceted problem of fuel poverty in New Zealand.

How flexible is household in their energy consumption? An analysis of the rhythm of everyday life and its consequences for peak shaving

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Energy is an important part of the everyday life and to support improved energy efficiency in household, it is necessary to start with understanding this rhythm of people's everyday life in terms of timing, duration and sequence of the activities performed by the household members. The smart grid has become a generally recognized and well accepted concept within the energy sphere. With the smart grid follow a vision where the grid can deliver low carbon electricity more efficiently and reliably, at same time as it enables consumers to manage and reduce energy use and minimize costs to the benefit of all.

Part of the smart grid discourse is the idea that the smart grid can assist energy companies and households in peak shaving i.e. in moving the consumption to outside peak hours. We will take this smart grid vision and relate it to peoples' activity patterns in daily life and show how the electricity consumption is a result of their activity pattern. We will use a time-geographic visualization together with interview data to deepen the discussions of the consequences of everyday household doings for energy consumption and the smart grid. From household members' time diaries, we will analyze and learn about where, when, and for how long time periods which energy-related activities occur in the activity sequences of the household members, including who among the household members are engaged in what activities and in what wider social context the activities are performed. We will e.g. discuss how flexible or inflexible different activities are in terms of altering the order in the activity sequence and analyze which implication moveable or unmovable activities have for e.g. peak shaving.

Challenges ahead - The need for interdisciplinary research

Energy studies and the case for interdisciplinary collaboration

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A series of biases continue to handicap the energy studies field. Researchers often promote technological solutions to energy problems while ignoring the social processes that determine their acceptance and use, shape the risks they can present, and offer opportunities for achieving energy policy goals with existing technology. Moreover, the reliability of energy models is often low because they are overly sensitive to cost assumptions and ignore other major drivers of energy policy and behavior such as social equity, politics, and unforeseen technological advances. Further, national and local energy institutions in many countries lack significant social science expertise outside economics, and although they may assert that they understand what social science offers, they often act as if expertise in other fields is superior to, or obviates the need for social science. This presentation therefore reflects on the state of the energy studies field, and it proposes recommendations for better integrating social science into energy research. Its fundamental argument is that realizing a future energy system that is

low-carbon, safe, and reliable will require fuller and more meaningful collaboration between the physical and social sciences.

The social and political challenges of a low carbon future in the 21st century.

MICHAEL JEFFERSON.

ESCP Europe Business School, London campus, UK. "Energy Policy" journal editor [this paper expresses his personal views.

Our world faces huge social and political challenges during the rest of this century. World population is projected to increase by at least 4 billion people by 2100. Pressures for population movement are likely to increase, as is the likelihood of powerful opposition to inward migration. Most of the population growth and pressure to migrate is likely to occur in sub-Saharan Africa and parts of Asia, where access to modern energy services is already poor or non-existent.

Ageing populations in an increasing number of developed and middle income economies are likely to place increasing pressure on energy services in the home, where the number of those suffering from fuel poverty is likely to increase, with consequential implications for hypothermia and health complications among those living in higher latitudes. Younger people, such as women with young children, may well also suffer added exposure to these problems. A backlash against widening income and wealth distribution is probable.

The drive for lower carbon economies is likely to exacerbate these challenges. The paper reviews the many constraints on achieving the needed availability of "new" renewable forms of energy, of CCS (carbon capture and sequestration), and nuclear power. The implications for access to modern energy services are also covered.

The inadequacies of academic theorising in the process of policy-formulation and assessment are summarised (as set out long ago by Jacob Viner); as are the shortcomings of energy policy, measures and many investments. The lack of realism, especially as to timing, of many international and national targets for sustainable development in general, and the availability of energy and its services more particularly, is also summarised.

The overall conclusion of the paper/presentation is that our World in the 21st century faces huge social and political turbulence.

Special session - Community of inquiry of the concept of development

Community of inquiry (CI) is an examination of a concept in a group. The purpose is to build on each other's ideas, to challenge them and our own assumptions in order to widen and deepen our understanding of the concept in focus. This workshop will examine the concept of "development", a concept central to SENIX. All development seems to rest on the extraction of what works and the elimination of what does not, but how do you gain this knowledge? CI's are ways of practicing stretching of one's own thinking and hence a useful skill when it comes to any development. We will investigate questions like How do you know that there has been development? Is all development positive? Can development be moving backwards?

Can we avoid development? What is the relation between development and power? The assumption is that if we are promoting development per se, knowing what we mean by development as well as problematizing the concept is vital.

This session is organized by Tulsa Jansson, PhD student, Applied Ethics at Linköping University, Founder of Swedish Society for Philosophical Practice

Making difference at the interface of the energy transition

Challenges in Transition: the legal system's role in a sustainable energy future

MELINA MALAFRY

Faculty of Law, Uppsala University

This presentation will address the role that the legal system has in the transition of the energy system to become more sustainable. The transition of the energy system can take different forms, but the focus in this presentation is on the introduction of more renewable energy installations and necessary grid infrastructure. Renewable energy activities often require a legal permit prior to a new installation, both regarding production and distribution projects. Thus, the legal system can both hinder and enable renewable energy production. One of the identified obstacles to the development of renewable energy is the very lengthy and complex legal processes often associated with wind power development. A reason behind this *time problem* is that renewable energy activities can come into conflict with other environmental/economic interests. Another reason why the legal system hinders this transition is that the legal implications of energy system activities are assessed separately, without much consideration for the specific activity's role in the energy system. Hence, the legal system is in this regard hindering a swift transition of the energy system to become more sustainable.

My hypothesis is that one of the reasons behind the very long and uncoordinated legal procedures is due to the fragmented nature of the legal system. The presentation focuses on two aspects of fragmentation; the fragmented nature of the material environmental law and the fragmented nature of legal assessments. First, environmental law is a subfield of law which is rather complex, fragmented and interdisciplinary by nature. In addition to being a field that is fragmented, environmental law provides a complex cluster of norms deriving from international, EU and national levels, and involves problems that are often of a cross-border nature. Due to the fragmented nature of the material environmental law, different environmental goals are often considered in conflict with each other. A common conflict is the one between the protection of biodiversity and the promotion of renewable energy (climate goals). This is an important relationship to assess in light of the vision of a transition of the energy system to be carbon neutral, as well as, ecologically sustainable. It will here serve as the main example. Second; the fragmented nature of legal assessments of energy system activities may give rise to uncoordinated development of the energy system, and thus an inefficient transformation of the energy system. The relationship between the legal assessments of wind power installations and new transmission lines will here serve as an illuminating example.

While there are some openings in the current material law to bridge these problems of fragmentation, both on the EU- and Swedish level, I suggest that a more holistic and systematic approach could better handle this complexity and lead to a more rapid and secure transition of the energy system.

A Tale of Two Communities: Negotiation and Experience at the Interface of the Energy Transition

B. LENNON AND N. DUNPHY

Cleaner Production Promotion Unit, School of Engineering, University College Cork, Ireland

This paper is a result of research that situates itself within European discourses on the identification of sustainable energy transition frameworks that will best facilitate the move to a low-carbon society. How local communities negotiate the many power dynamics associated with engaging in the energy system is explored from the perspective of two very different communities. One is situated in a predominantly rural area, while the other is in a largely urban setting. The communities face quite different challenges as they proceed with their energy-transition pathways. Success in meeting the challenges posed from finding a sustainable energy transition has been rather mixed to date, with an emphasis on top-down, technocratic solutions. This paper shifts the focus back to the human dimension of the energy transition and examines how individuals negotiate their way through the many (and sometimes hidden) competing landscapes of social and economic power that exist at the local level. Local people have generally been portrayed as passive consumers in this transition. This paper will demonstrate that, in fact, the reality can quite often be the opposite with local people occupying (re)active, participatory spaces for specific periods of time that can ultimately influence the success or failure of a given (supra)national policy. A number of scholars, especially Devine-Wright, have indicated that narratives at the local level are often informed by ideas of place attachment, which in turn can determine the intensity of place-protective actions to a perceived threat. However, there is no reason why these narratives cannot be informed by the opportunities that are also a result of the greater enmeshments of place and mobility in contemporary societies across the European Union. This paper will present the findings to date from research conducted as part of ENTRUST, an interdisciplinary H2020 research project exploring the human factor in the energy system.

How to de-carbonise the electric energy system? A comparison of Nordic 2030 policies

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In this article, we compare the policies of the Nordic states Denmark, Finland, Norway and Sweden to de-carbonise their electric energy systems up to 2030. The four Nordic states are committed to the global level CO₂ emissions reduction targets and are important for the European Union to meet its 2030 target of 27% share of renewable energy. Their joint electricity market Nord Pool relies largely on decarbonised generation, while they also cooperate in R&D and have innovative national policies to augment the de-carbonising

transition. At the same time, they each have wider economic, political and societal interests which are not fully congruent with each other and which as such influence their de-carbonisation policies. We compare the interests of the four Nordic states and examine how these interests shape their policies across the whole energy system from production through networks to consumption. On this basis, we assess how Nordic cooperation can facilitate the de-carbonising transition and what vested interests stand on the way.

Social Sciences and humanities in nuclear energy and radiation protection – Part I

Social Sciences and Humanities in Context of Nuclear Energy in Slovakia: Outcast? Ignoramuses? Or? Insights gathered within the PLATENSO project

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The core activity of PLATENSO project in Slovakia was preparation of draft National Strategy for research of Social, Societal and Governance issues related to nuclear energy sector development. Preparation of the document included identification of strategic issues for involvement of social sciences and humanities in the arena of nuclear energy. The analysis of national-specific conditions illuminated some historical, cultural and legal context. However, due to limited capacities in the PLATENSO project, these findings could not be sufficiently explained in the PLATENSO project Deliverables. Therefore, objective of this presentation is, applying a post-structuralist approach, to contribute to the dissemination of knowledge gathered in the PLATENSO project by putting more light on the difficulties of introducing, implementing, and sustaining interdisciplinary approaches and thus bridging the gap between present day conditions and full recognition of the necessity to bring in the social issues up-front in energy policies, programmes and projects. The presentation focuses on: (a) recognition of interdisciplinary research in the Slovak Accreditation procedures, (b) recognition of interdisciplinary research in research granting system. The difficulties and obstacles are reflected mainly against the diversity of social-theories and values approaches to technology. The presentation will also briefly cover the other key findings of the PLATENSO project activities in Slovakia (note: remaining issues will be presented at the RICOMET Conference on June 1-3, 2016 in Bucharest).

Some Ethical Aspects of the Nuclear Waste Issue

JESSICA LINDÉN

The Swedish Environmental Movement's Nuclear Waste Secretariat

My name is Jessica Lindén and I am 21 years old. For most of my life I have lived only about eight km from the Forsmark nuclear power station in the Municipality of Östhammar. Until two years ago in my last year of high school, I hadn't given much thought to it except that it

would be really bad if there was an accident. In my last year of high school I was introduced to the nuclear waste issue through a special class project, and since then I have learned a lot. One of the most important things I learned is that there are a many dimensions to the nuclear waste issue, including technological and social science aspects, as well as one of the most important things of all: ethics.

I will talk about why young people in the Municipality of Östhammar do not actively discuss the ethics of nuclear waste, the tools they get from the industry, and the information they get. Another interesting aspect is the information they don't get and why. It is important for young people to discuss the ethical aspects of nuclear waste not only because there is a lot of waste to deal with but also because more waste is continually being produced. The industry takes the position that the generation that created the nuclear waste should be the generation responsible for taking care of it so that the problem doesn't fall in the laps of the future generations. I will point out problems and ethical issues connected to that way of thinking.

The political parties in the majority in the Municipality in Östhammar have said that they want to have a non-binding referendum in 2017 or 2018 on whether or not to have a spent fuel repository at Forsmark. The voters will presumably get two alternatives and one question, for example: should a spent fuel repository be permitted at Forsmark, yes or no? I will point out what is wrong with those alternatives and why they have different pre-conditions. Finally, I will explore ethical dimensions of the question: What will happen if a spent fuel repository is not built at Forsmark?

Building a platform for enhanced societal research related to nuclear energy within New Member States (NMS) in Central and Eastern Europe

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General objective of the project is to enhance the capabilities of research institutions in Central and Eastern European countries to take part in EU research with respect to governance, social and societal aspects of nuclear energy.

Through a series of seminar talks and a group discussion, the project (2013-2016) has aimed to organize a research network mostly within New Member States (NMS) countries and share analysis and results, integrating as well international researchers and also different fields and disciplines addressing nuclear and society (within social sciences and humanities). The primary purpose of PLATENSO is to provide a proposal towards establishing a legal entity for a European Platform on Socio-Economic matters linked to nuclear technology and to develop recommendations for research strategies in PLATENSO countries. In the poster presentation we summarize the view of social scientists on the role of their disciplines on energy infrastructural development (based mostly on project workshops). In addition to creating a network of research institutions in each of the participating countries (Bulgaria,

Czech Republic, Hungary, Lithuania, Poland, Romania, Slovakia and Slovenia) mission is also preparing a strategy to enable and use of social research and public management in the area of nuclear energy development in NMS.

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Energy in Buildings and Homes - Part II

Barriers and enablers for expansion of district cooling – perspective of the property owners

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District cooling is an expanding system in Sweden. In an ongoing project we study how property owners, real estate organizations and tenants of premises perceive opportunities and obstacles to install and use district cooling. How is these actors looking upon the need for cooling in their premises today and in the future? How do they perceive to connect to a large technical system like district cooling compared to having a local cooling equipment? How do they look upon a need for environmental friendly cooling in the future? These are questions that will be discussed. We have done a survey to property owners and also conducted in-depth interviews with property owners, tenants of premises and energy companies. The results from these will be presented.

Making numbers count - negotiations in the use of building energy models

MARIA EIDENSKOG

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The aim to become a sustainable city has been an important vision in the planning of the new city district Vallastaden in Linköping, Sweden. In this project I have followed the construction process of two dwellings with rental apartments in Vallastaden built by the municipality owned housing company. Due to the sustainability focus in Vallastaden, high demands are put on the energy performance of the new buildings. To be able to meet these demands the building company hires consultants firms to simulate the energy use of each building. However, the professionals are face with problems when the simulation programs shows different results and when they need to negotiate on which input data that are the most accurate. Through observations and interviews I have studied the process of how the professionals handle, negotiate and solve issues in relation to insecurities in building energy simulations. This provides new insights in the practical work with energy simulation as well as the valuation of energy in relation to other factors in the construction process.

Collaboration in urban renewal: A pathway to more sustainable housing transformation?

PAULA FEMINIAS,

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Sweden has a large stock of post-war multi-residential housing in need of technical upgrading and improved energy efficiency. Pilot projects have proven the technical possibilities to reach substantial energy savings, however, this is related to large renovation interventions, relocation of tenants and high costs. These costs are to some extent transferred onto the residents, which make the situation especially difficult in areas with low-income residents. Unfortunately, areas with the lowest income correspond to stock with the largest need for renovation and the highest reported energy use.

There are no general solutions to solve the renovation dilemma in low-income areas, something that often coincides with other social problems such as unemployment, stigmatisation and segregation. At present, municipalities and public as well as private property owners explore new ways for housing renewal searching for new business models for property management, increased collaboration and a wider focus on urban renewal. Many property owners explore step-wise or partial renovation strategies as an alternative to deep-renovation with less social impact and lower investment costs

In this project we follow and document a renovation process of a larger property with large and urgent technical needs for renovation and a very low capability among residents to pay for increased rents. In order to tackle these challenges, the public (municipally owned) property owner has initiated a broader municipal collaboration than is normally done. Collaboration is also established with a national research centre for Sustainable Integrated Renovation (SIRen) that has provided input for an improved renovation process. The increased collaboration between different stakeholders to solve problems with renovation and modernization of housing has been proposed by Swedish researchers since the 1980s, but so far few projects of that kind are known or have been studied and documented.

The collaboration process can be compared with a ‘partnering’ collaboration between different municipal agencies – the property owner, the urban planning office and the traffic planning office. The renovation process is thus run in parallel to a planning process which handles the plans for a larger urban renewal and development of the area where the property is located. The larger urban development includes complementary housing, new infrastructure, services and job opportunities. The renovation could potentially benefit from this development through improved attractiveness, increased rent income from new complementary housing but also income through sale of building plots to other property developers.

The study is descriptive aiming for an understanding of processes, actors, roles and responsibilities in a renovation project and how varied goals regarding energy efficiency, affordability, business models and social issues are understood, defined and followed-up through the process. The presentation will report on the first phase of the recently initiated research project which is to document the renovation process through participant observations of meetings and interviews with key actors.

Some questions for the research are:

- In what way are different goals for sustainable housing transformation addressed, defined and understood?
- What documents, objectives and tools are guiding the project? In what way do they reflect different goals/ambitions for the project?
- When, how and by who are decisions taken with an impact on different goals/ambitions?
- In what way does the increased collaboration seem to alter the ‘normal’ procedures of the renovation process?
- Can we find indications of reaching an improved renovation process with respect to fulfilling differing and sometimes conflicting goals for more sustainable renovation through the collaboration?

Expected results are description of a renovation process and an analysis of roles, processes and responsibilities. A focus is on understanding on how the increased collaboration will alter and possibly improve the process in relation to goals. A definite analytic framework for the empirical material will be defined at a later stage.

On a more general knowledge level the study will contribute with detailed insights of a renovation process, an area lacking of qualitative empirical material. Expected practical implications are feed-back to project owners as well as transferred experiences to the rest of the building sector of increased collaboration throughout a renovation project.

The role of energy efficiency in renovation processes - How building professional integrate energy in building renovations

KATHARINA REINDL
Linköping University

How do built-environment professionals integrate energy efficiency into the renovations of multi-family dwellings? Energy use in buildings in Sweden and EU represents 40% of the total energy use. A major challenge is thereby the existing building stock since the new building rate is relatively low. Thus, renovation plays a crucial role for reduced energy consumption.

How, when and why some energy efficient measures are included in a renovation project is decided by professionals during the renovation process. These decision making processes in the planning and design phase are in focus for my research.

I have followed three renovation projects of a municipality-owned housing company in a middle-sized Swedish town. This company has the goal to reduce the amount of purchased energy by 25% to 2025 (compared with 2011 figures).

I conducted 25 participant observations of planning and design meetings, further I interviewed all involved building professionals (members of the housing company and external consultants such as architects, HVAC, El consultants). The renovation objects come from the post-war period (1950's and 1960's).

Conclusions are that the planning process is structured with pre-defined agendas that makes

the process efficient but not flexible. Innovations and alternative ways of thinking have a difficulty to access the process. The building professionals usually selected measures that they have used before. Energy calculations and statistics attracted little interest and had little impact. Experience and tacit knowledge is valued more important. All this leads to a renovation process where energy doesn't get into the process.

Economic and socio-economic aspects of the low-carbon technology transition

Electricity Markets as an Environment for Low-Carbon Technology Transition: the development of competitive markets in the United States and a search for potential lessons

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For decades electricity policy in the United States has been characterized by transition from vertically integrated utilities towards a competitive, or “deregulated” market characterized by the unbundling of the production, transmission, and sale of electricity. More recently the European Union has seen planners push for a similarly competitive and integrated model shared among member states.

This study compares the process of electricity market restructuring in the US and the EU. In particular, it asks whether and how such restructured markets create an environment conducive to a regional low-carbon technology transition.

Recent studies on technology transition theory in the context of low-carbon transition have focused on the resistance to fundamental change as posed by incumbent regime actors. Borrowing this perspective, this paper looks to the history of US electricity markets and the nested interests they represent. Regulators opened markets pursuant to their mandate to provide for the stability of established (usually high-carbon) economic and technical regimes, and the entrance of new technologies has depended less on management of electricity markets themselves, and more on an ongoing tension between local and Federal jurisdiction and on the gradual exploitation of niches by “outsider” technologies and the regulations designed to support such transition. In the EU, meanwhile, the process appears to occur in reverse: a plan for regional market restructuring and increased interconnection must embrace established regulations designed to encourage the uptake of low-carbon technologies. While direct comparison of governance in the EU and the US is difficult, the US experience (where climate policy has so far been enacted widely only at a surprisingly localized level) may cast light on particular obstacles faced in the development of the EU's internal market.

Renewable energy deployment and financial performance: Insights from the electric utility industry

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The recent Paris Agreement on greenhouse gases emissions may pave the way for a major transformation of the energy system to renewable energy. Electric utilities play a fundamental role in this process of transformation because they represent the backbone of the present supply infrastructure. However, while the adoption of renewable energy can improve their environmental performance (EP) a fundamental question is if it also pays in economic terms. The extant literature focusing on the question “does it pay to be green?” has extensively discussed the link between firms’ EP and financial performance (FP) but surprisingly has devoted little attention to the electric utility sector despite its high contribution to global CO₂ emissions. Moreover, only few studies have addressed the “when”, i.e. under which company’s characteristics and context conditions it may pay to be green. In this article we fill these two gaps by carrying out a regression analysis of panel data from 2005 to 2014 applying both a fixed and random effects estimator for 66 large electric utilities to investigate whether the production of renewable energy in absolute and relative terms is linked to better short-term and long-term FP. Our results do not show any statistical evidence of a link between the increase in renewable energy generation both in absolute and relative terms and short-term FP. However, we find that the relative increase of renewable energy is associated with an increase in product innovation. Secondly we have found that the country’s level of renewable power penetration has a double effect on firms’ FP. On the one hand, it is linked to positive increases in short-term FP which may be due to subsidies. On the other, it is associated with a significant reduction of long-term FP which might be imputable to the combined effect of overcapacity and low power demand in developed economies.

Socio-Economic Aspects of the Nuclear Power Development in NMS Countries

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New Member States (NMS) were integrated into Europe Union (EU) in three steps (2005, 2007, and 2014) and represents 21% in population of EU, 25% in territorial area, 8% in GDP, 14% in the total electricity of the EU (2013). The mix of electricity is different from country to country characterized by the dominance of: coal in Poland, natural gas in Lithuania and Latvia, nuclear in Slovakia, solid fuels in Estonia, Czech Republic, and Bulgaria, hydro in Croatia. Nuclear power is present in most of the NMS or intended to be implemented in the next decade like in Poland.

The paper discuss some of the peculiarities of communist development (rapid increase of electricity networks, coal as the basic option, large dams in hydro, nuclear alternative) and also the transition to market economy (restructuring of the industry, privatization, increase of the electricity consumption for population and municipalities, pressures of EU’s policies). On the other hand some considerations in relation with the existing resources, geopolitics and national priorities completed the landscape of the factors influencing the energy mix decision.

In this context, the role of nuclear power in the development of NMS is discussed. Based on the concept of sustainable development the nuclear option is analyzed in term of social benefits, drawbacks, opportunities, and difficulties. The competition with renewable energies in the context of future green economy is treated including the discussion of some

peculiarities of the evolution of nuclear, wind, and photovoltaic on the regional market. Nuclear option is also discussed from the perspective of a rapid development of smart grids and smart cities.

Related to the medium term nuclear development some NMS are deeply involved in the decision to support Generation IV development: Hungary, Czech Republic, Slovakia, and Poland for the development of ALLEGRO; Romania, Italy, and Czech Republic to implement ALFRED. On the other hand Poland is in a decision process to select the appropriate nuclear system. The paper introduce a set of considerations in relation with the capacity of the society to support in a due time the resources (funds, institutions, and human resources) for such developments and also the capacity of such projects to survive in the strong competition with other national priorities.

Social Sciences and humanities in nuclear energy and radiation protection – Part II

Radioactive Waste Management in the Czech Republic – stakeholders' engagement

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SURAO, Radioactive Waste Repository Authority

SURAO's mission as a state organisation is to ensure the safe disposal of radioactive waste in the Czech Republic. There have been 3 repositories of LILW in operation for several decades and ongoing DGR siting process from 1990's.

The candidate sites have been designated for possible geological investigation based on its geological characterisation – granitic rock - and the surrounding villages are therefore obliged to become involved. The beginning of geological works lead to severe opposition of the local people. Petitions against repository were signed, happenings organised, but mainly local referenda were carried out, resulting always in clear rejection of the repository and all activities related with the potential construction of the repository. Geological works at preselected sites were soon interrupted by governmental moratorium. Lack of trust for, and confidence in the Czech state is general societal challenge. Experience here was similar to what has been seen in some other countries: a lack of trust in levels of government; increased public distrust resulting from perceived attempts or from earlier attempts to impose a facility. Such factors counteract efforts to build the mutual trust and cooperation that are so important in a siting process.

A new start for dialogue in the last years - SURAO is aiming for the start of a new fair, transparent and open siting process, in which the role of municipalities and all other stakeholders is meaningful and strengthened and which would bring added value for the communities involved from the beginning of geological works. Thanks to the international projects there was initiated the establishment of the Working Group for Dialogue on Deep Geological Repository - national stakeholders group - which is a kind of advisory group of the Governmental Council for Energy Strategy and Raw Materials. The main aim is to

strengthen the role of the local players in the siting process and to increase the transparency of the siting process.

Seismic hazard assessment: a challenge for science and geoethics

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When science itself cannot solve a problem, it is necessary to combine available data with philosophy and geoethics. Storage of high-level nuclear waste calls for an absolute isolation of the waste from the biosphere of at least 100,000 years. To make meaningful seismic hazard assessments over such an immense time period is very hard, if at all possible. Seismology only covers a century. Paleoseismology in Sweden covers 13,000 years (with some additional records from around 30,000 BP). In this situation, we must restrict ourselves from making too optimistic assessments. It is here geoethics, philosophy and common sense becomes vital for a balanced evaluation. As some sort of seismic hazard assessment, one may multiply the recorded paleoseismic hazard over the past 13 000 yr by ten (Pattern Recognition in Physics, vol. 1, p. 75-89, 2013). The absence of a clear scientific methodology of assessing the true seismic hazard over this long time-period must not be used to present careless statements. We must also evaluate who says what, and in what interest. The principles of geoethics call for a strict application of scientific facts, observational evidence and physical laws.

The principles of geoethics (according to ICG): (1) Keep to science always being ready for new findings and concepts, (2) Always anchor your ideas in observational facts from nature and firm experiments, (3) Beware of advocacy and lobbying by or on behalf of special interest groups, and (4) Never let your opinion be influenced by money, promotion, or easy publication.

Where are the stakeholders? Towards a social platform for energy challenges

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In the early days of the *Atoms for Peace* programme proposed by President Eisenhower, high-level nuclear waste was a non-issue. It would take more than a decade before it was finally realised that the highly radioactive and long-lived waste from nuclear power plants embodied huge social and political challenges.

If we have today the scientific and technological capacity to isolate, in a definitive and sustainable way from man and its near environment, the most toxic and long-lived waste that man has ever created, why are we still beginning the first steps to manage the social- and political consequences of the existing and continuously growing stock of spent nuclear fuel and high-level nuclear waste in Europe and elsewhere. This is the “Legacy of Fermi”, a legacy that we do not want to pass to the children of our children.

In this paper, we propose a solution to one very specific challenge- how to avoid stigmatising a community as a “waste dump community”. Our proposal addresses the municipality of Östhammar, in the event that SKB is allowed to build its KBS-3 repository at Forsmark, but it could as well, be applied to any other host community for nuclear waste. The solution passes

through voluntary collective engagement and decision-making and co-founding (symbolic, or not) of a museum that addresses the science and technology of waste repositories at Forsmark and the nuclear facilities of CLAB/CLINK at Oskarshamn, as well as an adjacent monument (marker) where the visitor can leave his/her footprint for posterity.

Comparison of print media attention to final disposal of spent nuclear fuel in Finland and Sweden

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Media has an important role in dialogue concerning nuclear waste management. Media plays a role in the formation of risk sensibilities and risk perceptions, but also in the formation of political agendas, decision-making contexts and public understanding of scientific facts. In decision-making processes the media functions in many ways. It is a forum for debate, a channel for political appeals and disputes between different parties, an active promoter of specific views on risk and sometimes a booster of societal pressure towards or against certain policies.

The focus of the study is on national level discussion on nuclear waste issue and similarities and differences between the Finnish and Swedish nuclear waste regimes. Media coverage of nuclear waste issue has been studied previously in both countries but a comparative aspect is missing. Although the final disposal projects are executed in somewhat differing institutional and regulatory frameworks the comparison is interesting as both countries have adopted the similar technical final disposal concept.

We state that analysis of media debate on final disposal of spent nuclear fuel reveals some important differences between the Finnish and Swedish nuclear waste regimes and activity of the main actor groups (such as industry, authorities, experts, politicians and NGOs).

Our research questions are as follows: (1) How frequently different actor groups of the nuclear waste regime were given voice in the news items related to issue and how actively these groups participated by writing letters to editor and (2) what were the main thematic categories which were addressed in the items?

Data consists of items published in two Finnish and two Swedish major national subscription-based morning newspapers, namely Helsingin Sanomat and Aamulehti, and Dagens Nyheter and Svenska Dagbladet. The sample covers the time period from the 1st of January 2008 to 31st of December 2015.

Energy in Buildings and Homes - Part III

Effects of IMD on household water use routines – experiences from two Swedish cases

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In Sweden, on average, residents in flats use more water than residents in private houses. Longer piping is thought to be one cause behind the higher usage in flats, another that water cost is included in the rent. Introduction of individual metering and debiting (IMD) is believed to be one remedy against the excessive usage in flats. IMD is based on the idea that individuals are economic rational, and will take action to reduce usage when confronted with actual water cost. There are support in literature that IMD can reduce demand with 15-30%, but also that the impact differs between cases. A compilation of studies on effects of water metering and debiting showed impact variations between +12 and -53% (Sønderlund, Smith et al. 2014). In research, it is difficult to find explanations behind these varying results – why do households seem to respond positively in some cases but not in others? Is it more behind changes in water usage than the ‘simple’ relationship between volumes used and cost? This gap in research is addressed in this study. By the use of time-diaries, interviews and metering data, household reaction to IMD is qualitatively examined in two cases. The findings suggest that introduction of IMD is a delicate process in which implementers need to carefully consider every part of the process since it potentially can influence household response, i.e., placing of meters, messages conveyed by professionals to residents, introduction of new technology in the flats, and invoice design.

Thermal comfort and careful renovation among new Swedes – an interview study

A. HENNING

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During 2016, a feasible concept for energy saving renovation is tested while tenants stay on. In collaboration with a municipal housing company, an interdisciplinary research team at Dalarna University suggest careful ways of updating worn “million-program” housing areas (which were constructed throughout Sweden during the 1960s and 1970s).

Qualitative interviews are made with tenants before and after renovation. The first round of interviews were made in November 2015, the second will take place during winter 2016/2017. The presentation reflects on the methodological approach and preliminary results from interviews among tenants with Somali and Kurdish backgrounds.

Ten households have been visited in their apartments, and all adults were encouraged to participate in the interview. House-touring, comparisons and memories were used to facilitate conversation on every-day practices and emotional experiences of indoor comfort. Questions were asked on how various household members experience temperature and air quality in their apartment, and how they handle chilliness in terms of clothing, activity or other means. The next interview round will also include changes in terms of thermal practices and experiences, as well as opinions on, and experiences of, the renovation process itself.

The presentation reflects on how interviews among new Swedes may differ from previous research, and raises questions on how the methodological approach in similar cases might be improved. Furthermore, air management at home is discussed, as well as other practices which seem to counteract energy saving, such as a connection between thin clothing, bare feet and a homely feeling, or the praxis of using Venetian blinds during the sunny part of the day.

Re-renovation of pre-1946 housing stock: Combining historical, social and technical knowledge in strategies for energy efficiency and modernization

LIANE THUVANDER AND PAULA FEMINIAS

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The transformation of the existing building stock is a challenge for meeting climate and energy efficiency targets. Retrofitting of multi-family buildings is one focus for the energy saving debate, as it was in the 1970s and 1980s. The debate today mainly concentrates on energy savings and barriers for implementation. There are studies that discuss the social consequences of larger renovations, but more or less no studies investigate the long-term consequences for heritage values. During the period 1975-2002, a large part of the housing stock was renovated, often with special subsidies for energy saving measures. Generally, there is little empirical knowledge about renovation cycles and the dynamics of existing building stocks. In order to get a better understanding of renovation activities, it is of interest to map data and compile knowledge about previous renovations. It is also important to identify the needs for new measures in non-renovated and already renovated multi-family building stocks.

The project deals with up-coming needs for renovation of already renovated multi-residential housing stock built before 1946 in Göteborg, Sweden. The long-term aim is to develop strategies for improving energy efficiency at the same time as heritage values are safeguarded or even restored and social issues related to residents regarding 'at-homeness', belonging, participation and affordability are respected and indoor climate and thermal comfort are improved.

In the first steps of the project, the inter-disciplinary research group will map the current condition of stock as well as earlier renovation interventions with focus on energy efficiency measurements and the effect of these on technical, environmental and cultural qualities of the buildings. A GIS based building stock model developed at Chalmers will be used to get an overview of the characteristics of stock with respect to: location, building typology, age, ownership, tenure, demographics of residents and earlier renovation dates. Specific case studies will be conducted in order to verify the information produced by the building stock model and provide additional information regarding type of renovation interventions made, earlier and present architecture and heritage values, conditions for maintenance and residents experiences.

Our presentation will revolve around the meeting between aggregated data with certain delimitations retrieved from the stock model and detailed, situational and more qualitative data represented by the specific cases. Questions to discuss are: In what way can or could the building stock model be used to predict re-renovation needs and define suitable renovation 'packages'? In what way can the model be developed in order to predict the effect of different renovation strategies applied on technical, social and heritage values?

Social and political challenges on a global scale

Zero Emissions, Zero Conflict: How to make interdisciplinary research on energy successful

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Interdisciplinarity has become an essential prerequisite for successful research project applications. In energy research, this movement is increasingly necessary, since previous energy projects have suffered from a “tunnel vision in engineering”¹ that did not take into account the social context that determine the use of new energy technologies. Engineers and natural scientists have learned from these failures and started involving social scientists from early on in their projects. Thus, social scientists take the role of the missing link between technology developers and target communities. However, interdisciplinarity requires thinking creatively with participants speaking different professional languages. It can be very challenging and thus does not necessarily succeed. It quite often requires taking one step back to establish a common language among the project members.

This paper investigates the challenges of interdisciplinary energy research and practices to overcome them, based on data obtained through semi-structured interviews with project members of an interdisciplinary energy project called Capture+. The project aims to develop sustainable biochar systems for Norway as climate mitigation tool. The project was initiated after the first Idea Lab arranged by the Norwegian Research Council 2014 with the theme “Towards a Zero-Emissions society.” The overall aim of Idea Lab was to bring together researchers from different disciplines to work in a holistic way on finding solutions for a zero emission society. Capture+ presents one of the four teams that received funding after the Idea Lab, combining among others, researchers with a background in soil science, chemistry, biology, economics and social sciences. The aim of the article is to provide a clear guidance as to what key principles and specific activities should be incorporated to make interdisciplinary work on energy a success.

Socio-economic impacts – case studies

Women socio-economic activities and attitudes towards decarbonisation in Poland – the case study of Upper Silesia region (Poland)

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Coal is a major energy source in Poland, including electricity generation sector, but many coal burning power plants have been operated for over 30 years, thus they soon will have to be modernized or decommissioned. Upper Silesia is one of the most intensively mined areas in

¹ Pacey, A., 1983. *The culture of technology*, MIT Press, Cambridge.

Europe and burning coal dumps have created serious problems since several decades. The majority of Poland's coal mining industry, held in the four largest capital groups, is owned by the state and have been posting losses over the past years. Nevertheless, one of the basic indicators of socio-cultural identity of the Upper Silesia inhabitants was an extremely intense (as of mid-nineteenth century) industrialization, the development of specific industrial monoculture (mining and metallurgy), and a strong work ethic.

In the paper I will present the results of the qualitative analysis of socio-economic activities and strategies of women, with particular emphasis on strategies in the context of changes in civilization (the idea of sustainable development) and transformation (decarbonisation). The subjects of the research are women, residents of Upper Silesia, who both have family and work responsibilities. Moreover they are also active participants in the life of their local communities. Women create and reproduce "small community" (even just in family) and the traditions of the local community.

We are dealing within the framework of sustainable development analysis focused on quality of life (social pillar), professional and civic strategies (economic) and attitudes towards environment and different sources of energy. Within this frame we present the case study of Silesian women who adapt to the changing situation on the labor market (as a result of restructuring and blanking mines) and implement different strategies to meet the needs of their own, their families and the social environment (in the local community).

Community acceptance of Hydro balancing: Insights from the case of Tyin, Norway

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Goals of a climate friendly energy system with a large share of intermittent sources such as wind and solar increases the need for flexibility. One opportunity for increased flexibility is storage of energy in large scale, (pumped) hydro reservoirs. Hydrobalance services and related infrastructure have in many cases proven to be controversial at the local level in Norway and elsewhere. We undertook a *descriptive case study* in the vicinity of the reservoir Tyin, Norway, as a case to study community acceptance. Tyin has a *large balance power potential* and *a wide variety of other user interests*. Focus group interviews with representatives from interest groups, such as landowners, cabin owners, tourist entrepreneurs, local authorities and local NGOs provided us with qualitative data to study acceptance. As a qualitative, descriptive case, findings from this study are not generalizable. Still, findings can provide insights with transferability to similar case studies. The first key finding, in line with international research on other renewable energy technology projects (e.g., Cowell 2010; Pidgeon & Demski 2012; Wüstenhagen et al. 2007; Aas et al 2014, Knudsen et al 2015) was that local and regional stakeholders in Tyin were critical of carrying the local impacts of moving towards more renewable energy globally. Secondly, we found that the local resistance amongst Tyin informants could not be reduced to selfish NIMBYism, but rather to concerns for the local environment and biodiversity, negative impacts on business, recreation and transportation in the area, and to safety issues related to rapidly fluctuating water levels. Thirdly, in line with recommendations from studies of pumped hydro-storage projects specifically (Cohen et al. 2014; Steffen 2012) and renewable energy technology projects more

generally (Gross, 2007; Zoellner et al., 2008; Wolsink), early involvement of local stakeholders and procedural justice is of vital importance to ensure community acceptance.

Explaining local variations in the diffusion of solar photovoltaics in Sweden

ALVAR PALM

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This research deals with local variations in the rate of diffusion (number of users) of residential solar photovoltaic (PV) systems in Sweden. Despite apparently homogenous preconditions for PV diffusion in Sweden, there are large geographical variations in the number of PV systems per capita throughout the country. Institutional factors such as subsidies and permits are very homogenous throughout the country, and neither can the differences be explained solely by factors such as housing type, mean income or solar influx. Using survey questionnaires (sent to PV adopters), interviews (with PV adopters and other actors) and comprehensive Internet search queries, these differences were explored.

First, municipalities with high PV diffusion rates were compared to low-diffusion municipalities. It was found that local electric utilities supporting PV were likely the most important factor behind the high diffusion of some municipalities. Local utilities have successfully stimulated PV diffusion through themselves marketing and selling turnkey PV systems and arranging local information seminars.

Second, peer effects (social influence between peers) in the decision making in PV adoption were studied on the zip code level. Peer effects in PV diffusion have previously been quantified in other settings than the Swedish, but little has been known about their inner workings. The present research found that the main function of the peer effects was a confirmation that the technology worked as intended and without hassle (rather than the transmission of more advanced knowledge or the procreation of a “eureka moment”), and that peer effects had mainly taken place through existing and rather close social relations (rather than between neighbours that did not already know each other). The results indicate that the role of *passive* peer effects (seeing PV) was of minor importance compared to that of *active* (direct interpersonal contact) ones.

Energyscope – A pragmatic tool to assess the socio-economic impacts of energy transitions

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Switzerland like many countries plans to undertake an energy transition and the government proposes different pathways for 2035 and 2050 to achieve it. However, policy and other decision makers lack pragmatic tools to assess in real-time the overall impacts of policy decisions regarding the energy transition. The calculator Energyscope has been developed

with the aim to bridge this gap. Energyscope is an energy calculator that enables the user to generate his own scenarios to 2035 and 2050 regarding the future energy system of Switzerland and directly visualise the impacts of these scenarios in the form of 6 indicators: primary energy consumption, energy independence, CO2 emissions, environmental impact, cost and employment (see Figure). This tool proves user-friendly without compromising on scientific rigour, while all the underlying assumptions are made fully transparent in an associated wiki.

Energy transitions are often considered too risky by many decision makers, who tend to favour business as usual or slow incremental changes. Energyscope provides an objective comparison between scenarios and shows under which socio-economic conditions (oil prices, technology improvement, population growth, etc.) given scenarios can be most favourable, helping the policy makers take informed decisions. In particular, the calculator has shown that, for the case of Switzerland, the cost of the future energy system is relatively insensitive to the scenario chosen (typically fossil vs nuclear vs renewables), while the difference in terms of energy independence, CO2 and jobs can vary significantly between scenarios.

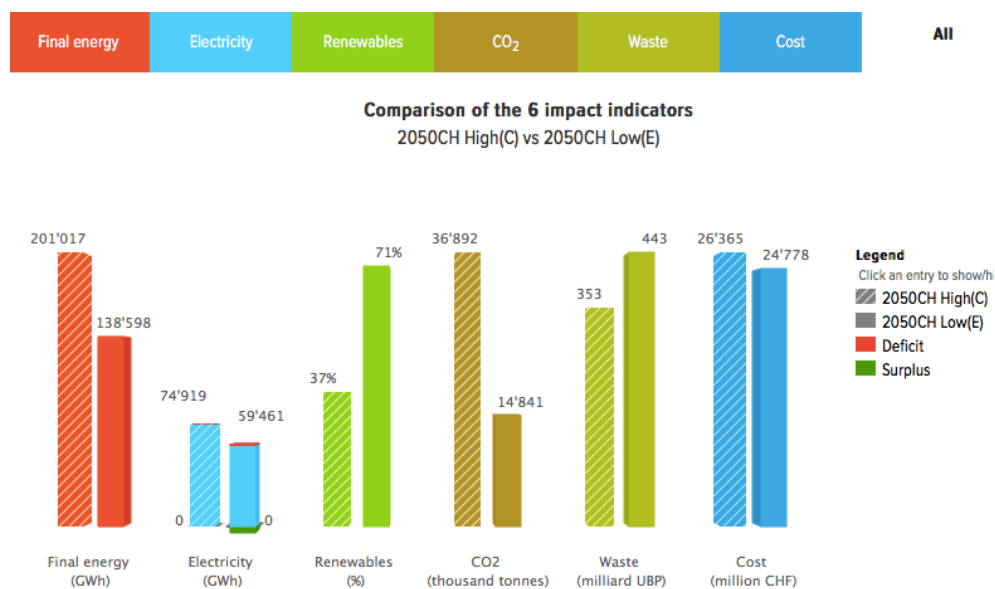


Figure: Screen capture of the Energyscope tool, which compares two scenarios for the 6 indicators. Note: The “employment” indicator is currently under development.

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Social Sciences and humanities in nuclear energy and radiation protection – Part III

The challenge of risk communications in radiation protection for the IAEA

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A principal objective of the International Atomic Energy Agency (IAEA) is to enlarge the contribution of atomic energy to peace, health and prosperity throughout the world. The IAEA is authorized to establish safety standards for protection of health and minimization of danger to life and property, and to provide for the application of these standards within a Member State's activities in the field of atomic energy.

The safety standards represent international consensus on what constitutes adequate protection and safety, and which has led to the widespread use of the IAEA standards throughout the world. But the Standards are only effective if they are properly applied in practice. Following the accident at the Fukushima Daiichi NPP, the safety standards were reviewed and determined to be generally fit for purpose, but implementation efforts needed to be further progressed, including for radiation protection.

Radiation protection systems are rooted in research by international organizations on the health effects of radiation exposure, and the protection of people and the environment from harmful effects of ionizing radiation. As scientific considerations are only part of the basis for making decisions on protection and safety, the standards also address the use of value judgements in the management of risks for planned, emergency, and existing exposure situations. However, these value judgements, and the fear of radiation, can result in sub-

optimal approaches to decision-making, such as; the reluctance of patients to have diagnostic or therapeutic procedures, and impacts on decision-making processes following emergencies. An essential role of the Agency is to work with the international community to place ionizing radiation risks and benefits within a proper context, and with appropriate communications to facilitate sound decision-making by both persons and institutions. Approaches to the communication of radiation protection by the IAEA will be discussed.

Social challenges of nuclear human resources scarcity for the energy market. EHRO-N analysis and methodology.

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Since the Chernobyl accident in 1986, which turned public opinion against nuclear energy exploitation, EU member states interest in nuclear energy slowly faded. After Fukushima accident in 2011, an expanding negative perception of nuclear energy production and the economic crisis brought a drastic reduction in personnel recruitment expectations. Younger generations' interest in nuclear studies decreased dramatically and nuclear education was abandoned by many engineering faculties. In October 2008 the European Human Resources Observatory for the Nuclear Energy Sector (EHRO-N) was set-up to permanently observe and monitor the nuclear human resources in the European Union. To analyse the composition of nuclear workforce EHRO-N developed the "pyramid of skills", in which nuclear experts represent the 16% of the total workforce, while "Nuclearized" experts are the 74%. Two main surveys and several analyses were conducted which pointed out that, taking into account the large scale retirements in the near future, the supply of nuclear engineering students covers only 70% of the demand for nuclear experts by the EU nuclear energy sector.

This unfulfilled demand poses a challenge with keeping a steady and secure energy production, as 1/3 of energy production in Europe derives from nuclear sources. Meanwhile the first generation of senior nuclear experts started to retire, causing a loss of knowledge and competence that, since now, has not been replaced or adequately transferred among younger experts.

Recommendations for social, societal and governance research in nuclear energy in Central and Eastern Europe

NADJA ZELEZNIK

REC Slovenia

The new member states as often the countries in Central and Eastern Europe(CEE) are called have majority certain nuclear history which is due to their specific geo-political position in the time of nuclear programs development in 50-ties to 70-ties linked to ex-soviet union nuclear programs (VVER and RBMK). There are also some exceptions – like Westinghouse PWR in Slovenia and Canadian PHWR (Candu) reactors in Romania. In Poland there have been just research nuclear program without commercial reactors in operation. Until 90-ties in all these countries, but also in the rest of the world, nuclear programmes were perceived as something positive and advances, very technically competent and as sign of scientific expertise. Only

after the collapse of previous systems in 90-ties all CEE countries were challenges with social, societal and governance (SSG) issues related to nuclear programs development. Most of the time they were not connected to nuclear power plants, but more to support programs, like radioactive waste management development or decommissioning of nuclear installation activities. In some of case the changes were required due to accession to European Union after 2004 in which some NPPs (e.g. Lithuania, Bulgaria, Slovakia) were shut down due to safety concerns. The approaches to solve SSG issues were based on individual solutions in which the problem was addressed with the aim to minimize the negative impacts.

In PLATENSO project the investigation of SSG issues related to nuclear programmes was performed systematically including Bulgaria, Czech Republic, Hungary, Lithuania, Poland, Slovenia, Slovakia and Romania. Different possible scenarios of nuclear programme development were assessed and topics for a longer term research with respect to SSG proposed. The paper will discuss the main findings of the investigations in 8 CEE countries from national strategies, will compare similarities and differences, and propose the most important SSG topics and issues of common interest to be addressed in the future EU research activities

Energy transition - social acceptance and energy justice

Why Did Better Place Fail?: A Post-Mortem Examination of Electric Vehicle Promotion in Denmark and Israel

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With almost \$1 billion in funding, Better Place was poised to become one of the most innovative companies in the electric mobility market. The system Better Place proposed had two novel prongs; first, to reduce the cost of batteries, and second, to reduce range anxiety, public infrastructure concerns, and long charging times. Yet, despite this seemingly strong combination, Better Place failed to make any progress in Denmark and Israel, the first two markets it operated in, and subsequently declared bankruptcy, selling off its collective assets for less than \$500,000. This paper posits several reasons to explain the failure of Better Place, including that Denmark is not as “green” as it seems nor is the Israeli market as attractive as believed, and that Better Place’s solution to charging time resolved a psychological, not a functional, barrier of the general public to adopt electric vehicles. Before investigating these two reasons, the paper presents a short history of Better Place and explores the contours of its operations in Denmark and Israel. It then discusses why Better Place “failed” across both countries before concluding with implications for energy planning, policy, and analysis.

The social acceptance of Hydrogen Fuel Cell applications in Europe: results from a seven country study

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There is increasing realisation amongst policy makers and industry that ‘social acceptance’ is a key issue in the deployment low carbon energy technologies and infrastructures in Europe. The development of hydrogen fuel cell technologies (HFCs) involves small-scale applications as well as large-scale infrastructures, the socio-technical embedment of which will be influenced by the public and stakeholders in various roles. Previous research on social acceptance has investigated public perceptions of HFCs in specific countries. Here we present survey data on a multi-country scale, using a multivariate, socio-psychological approach. The data come from the EC HYACINTH project (Hydrogen Acceptance in the Transition phase), which surveys seven European countries. We particularly focus on cross-country and other group differences in self-reported awareness and familiarity, global attitude and support in relation to mobile and static HFC applications. We show how attitudes to HFCs vary with demography, identity and lifestyles. We consider the implications of these differences for the social acceptance of HFCs.

Energy Justice in Theory and in Practice: Insights from the Hinkley Point and Sellafield Nuclear Complexes

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Energy is moving up the global political agenda, with poverty, climate change and energy security bringing new awareness of the links between energy and social justice. Amidst these challenges, the concept of energy justice has developed with an aim to provide all individuals, across all areas, with safe, affordable and sustainable energy. However, this paper argues that the full extent and diversity of justice implications within the energy system is currently neglected. It does so using empirical evidence of how energy justice is being articulated within two contrasting UK case studies; energy production at Hinkley Point in Somerset and nuclear waste management at Sellafield in Cumbria. Using results from 40 semi-structured interviews with policy, industry and NGO actors, this paper presents findings that demonstrate that justice claims vary extensively between location, actor and engagement mechanism as the result of differing priorities, desires, understandings, and formations of justice within each group and sector. In this regard, it provides real-world insights into ethical perspectives on nuclear energy from across the fuel cycle. As a result of the discourses gathered, the paper argues that the current framework for energy justice is insufficient to explain justice manifestations and proposes a refined ‘energy “systems” justice’ framework in its place. Further, it advances a ‘what, who, and how’ approach to tackling energy injustice on the understanding that you must (a) identify the concern – distributional justice, (b) identify who it affects – recognition justice, and only then (c) identify strategies for remediation – procedural justice. These results contribute to the theoretical concept of energy justice as well

as informing justice in practice; presenting knowledge that is essential for an understanding of the ways in which energy justice is constructed, understood, and tackled across a range of scales.

Challenges for a successful transition to a low-carbon energy system

Seminar summary - Ethical Perspectives on the Nuclear Fuel Cycle

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Chinese overseas hydropower dams: Analysing the nexus of Corporate Social Responsibility, Social Policy and Corporate Welfare

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China has become the world's largest financier and builder of hydropower dams around the world, with most of its dams being built in Southeast Asia and Africa. Some Chinese dam-building firms have made an effort in recent years to reduce their social and environmental impacts and follow global standards, while other firms do not even have social and environmental policies in place. This paper argues that first, these cases present the limits of Corporate Social Responsibility (CSR) in relation to implementing global standards and secondly, this must be understood as a social-lock in where lax implementation of social and environmental regulations could be understood as corporate welfare (reduced economic, environmental and social responsibility of a firm) to support large infrastructure investments on the back of social and environmental protection for local people. This paper draws on the analysis of firm strategy documents and CSR documents and gains additional insights from key informant interviews and focus groups conducted in China, Malaysia, Cambodia and Ghana. The paper concludes that national governments need to apply stricter rules and monitoring for dam-builders on one side and on the other side a binding global regulation to prevent corporate welfare on the backs of the poorest is required.

Linking Society, Industry and Government in Electricity Supply

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Has the Holocene era ended and a new earth age begun? Have we entered the Anthropocene (new man) Age? If so it began in the 19th century with the industrial revolution. There is no doubt that human activity has damaged the oceans, land and air. By 2050 it is estimated that there will be more tons of plastic in the oceans than tons of fish and climate change, due to air pollution is having major economic and social consequences.

The industrial revolution brought about massive energy production and consumption. Communities were connected to national or regional grids, providing power to households. Very recently we have seen the emergence of renewable energy systems that can be used by homeowners to produce their own power. The availability of renewable energy has dramatically increased, making individuals and communities eager to produce energy that is clean but regional and national providers of baseload power are aggressively resistant. As residents continue to demand more opportunity to produce their own power while being environmentally responsible, utilities and independent power providers must work within the communities they serve to develop business models that will allow for distributed generation.

Assessing energy security in a low-carbon context

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As part of a growing body of research into potential ways of achieving a secure transition to a low-carbon energy system, this paper assesses the future security of the UK electricity system in a low-carbon context. A novel mixed-method indicator framework for assessing security of both supply and demand has been developed and applied to a set of three transition pathways for the UK electricity system, all of which seek to reduce UK carbon emissions by 80% by 2050. The choice of transition pathways aims to compare and contrast options for market-centric, centrally-controlled and decentralised systems. The framework for analysis is constructed using an interdisciplinary, co-evolutionary approach which explicitly recognises the importance of actors and policies as well as technologies, systems and markets. The paper finds that energy security is often conceptualised as the avoidance of causes of insecurity (such as insecure fuel imports), but that an equally important aspect of security lies in maximising *responses to* insecurity, for example by increasing the flexibility and responsiveness of both supply and demand. The results show that demand reduction is highly beneficial and results in co-benefits across multiple security dimensions. Increasing the penetration of renewable electricity generation is shown to increase the diversity of the generation mix, and to have a positive impact on several aspects of environmental sustainability; however, multiple risks and trade-offs between various security objectives are also identified. Finally, it is found that there may be fundamental challenges in developing generalisable frameworks for assessing energy security in multiple contexts; therefore there is a requirement for a critical look at whether or not comparisons of energy security across multiple contexts give an accurate portrayal of the highly nuanced and context-specific nature of energy security.

Leading by example: The role of energy champions in sustainability transitions

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As the window of opportunity to address climate change narrows, there is a growing consensus that changes to human actions are required as part of a transition to more sustainable means of living and energy consumption. Behaviour, practices and culture constitute a powerful human factor in the energy system; in particular the interactions between technologies, practices and norms that lock individuals in to certain patterns of (often inefficient) energy use are of key importance. An acknowledgement that technological fixes alone are insufficient has resulted in an increasing focus on behaviour change research, particularly on the social contexts in which people live, the routines they shape, and the extent to which people feel empowered to change these contexts.

Energy champions play a substantial role in within local communities and in communities transitioning to more sustainable paradigms. Energy champions play a vital role in encouraging, and empowering, other residents to reduce their energy consumption. This paper presents results from an extensive stakeholder engagement process, including community focus groups and semi-structured interviews with energy champions in the UK. The key role of these individuals within their communities and in sustainability transitions is explored. The paper contends that energy champions contribute substantially to the success of community energy projects; demonstrating the multitude of actions and involvement that residents can take, in awareness raising and momentum generation and maintenance for community initiatives. In so doing, energy champions ground the acceptability of participation in sustainability transitions indicating how sustainable actions can be integrated effectively within everyday living to fit within community norms and expectations.

Does politics matter? Explaining policy swings in renewable energy

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Many theoretical takes on the renewable energy expansion tends to explain development *trajectories* than actual *change*. Economists talk about getting prices right – renewable energy will be expand fast once it is competitive – others talk about resource endowments – countries with unresolved energy problems and/or an abundance of renewable resources will have more ambitious renewable energy policies. But in doing so, the emphasis is on variables outside of the realm of politics, and where the value either rarely changes (such as resource endowments) or develops steadily in one direction (renewable energy costs). But often times changes in the pace of renewable energy installations has been due to policy swings and to policy instability. Such swings are amongst the most obvious indications that politics matters. This paper looks into policy swings in the US, Japan, Denmark, and Germany, in an attempt to 1) explain the swings and 2) how they have affected renewable energy. My explanation focuses on how changes to the political environment (for instance through external shocks) can lead to changes in interest coalitions, changes in the power relationships between different

actors, changes in public opinion, new windows of opportunity. Theoretically, I draw on Joseph Schumpeter and Mancur Olson. Schumpeter's emphasis on structural change is crucial since an energy transformation from fossil fuels to renewable energy transformation is about as big a structural change as we are likely to ever witness. Mancur Olson's contribution is the notion of vested interests rising in the political economy, silting it down and making it ever more rigid, and how without any shakeups (again, for instance through external shocks), vested interests will wrest more control of political decision-making away from elected politicians. It is a framework that allows us to analyze policy stability as well as policy swings.

The way forward - Integrating social sciences and humanities into energy research

Trust, Distrust and Confidence in Energy System Transformation

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Energy systems around the world are in transition. Future energy systems feature especially so called "smart technology". Particularly *in vogue* are ideas of smart technologies (smart grid, smart markets, demand-side-management etc.) in order to implement multiple alternative energy sources and to increase the efficiency of distribution. Proponents of smart grids assume that the public will adapt to the new technological reality once the opportunities become clear. Scientists, politicians and economists call on the ability of potential users to rationally calculate risks and chances. This assumption rests on nothing less than the broad-scale modification of public attitudes toward:

- New technical devices which are "intelligent, self-healing, autonomous machines", into whose operation the majority of the public has no insight.
- Opaque markets in which rules of fairness cannot be enforced for certain, as it is unclear "who reaps the benefits, who bears the risks and burdens".
- The complex of public administration and governmental agencies, which supervise the development of smart infrastructures, and on which the public has to rely on.

With reference to the visions and goals of system transformation we have to expect a major qualitative change of the relationship between the general public and the energy system. The transformation into smart grid energy systems now is likely to cause a shift of modes from *confidence* to (*system*) *trust* among consumers who are supposed to take a more active role as "prosumers" despite intransparent technologies and markets. Therefore, the sociological problem arises in a probable shift of disappointment attribution from external references (e.g. politics) to self-reference (own decision), making smart grids primarily a problem of

increased choice between decision alternatives for the public. This future outlook might entail the paradox experience with technology: A situation of empowered but distrusting users faced with uncertainty and decisional risk.

“Good science for better policy making” – a reflection on the idea of integrating social sciences and humanities into energy research.

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When it comes to evaluating energy technologies, obviously science has a key role to play in generating knowledge to inform that evaluation. Especially in the case of evaluating energy technologies that bring along a risk to human health and a burden to the environment, the responsibility of science as policy advice extends beyond the traditional criteria of objectivity and independence. The reason is that the existence of knowledge-related uncertainties puts fundamental limits to understanding and forecasting technological, biological and social phenomena in the interest of risk assessment. Scientific research to inform policy in a responsible way therefore not only needs to take into account these uncertainties but, given the risk-inherent character of that technology, also the various value judgements related to its (eventual) use. It is now generally accepted that this kind of scientific research cannot solely rely on the natural, engineering and technical sciences alone. ‘Good science for better policy making’ is science that generates policy-supportive knowledge in a ‘holistic’, transdisciplinary and participatory way, synthesising insights from natural, engineering and technical sciences with those from social sciences and humanities on the one hand and with those from citizens and actors from civil society on the other hand. From this perspective, the presentation will (1) analyse the ethical reasons to ‘integrate’ social sciences and humanities into research that traditionally relies on natural, engineering and technical sciences, (2) present a view on practical implementation and (3) draw conclusions for the case of energy governance.

POSTER PRESENTATIONS

Low Carbon Transition for Energy System Sustainability: Considering the Human Factor in the Energy System

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New understandings of energy-related practices and an intersectional approach to the socio-demographic factors in energy are required to enhance stakeholder engagement in Europe's energy transition. The ENTRUST project is an international, multi-partner consortium which investigates the human factor in the energy system. This is achieved through research arranged in three pillars. The role of gender will be illuminated by intersectional analyses of energy-related behaviour and attitudes towards energy technologies, which will assess how multiple identities and social positions, combine to shape practices. Secondly, these analyses will be integrated within a transitions management framework which takes account of the complex meshing of human values and identities with technological systems. The third key pillar informing the research is the concept of energy citizenship, with a key goal of ENTRUST being to enable individuals overcome barriers of gender, age and socio-economic status to become active participants in their own energy transitions. Through these means, the ENTRUST project provides a comprehensive mapping of Europe's energy system (key actors and their intersections, technologies, markets, policies and innovations) and an in-depth understanding of how human behaviour around energy is shaped by both technological systems and socio-demographic factors (in particular gender, age and socio-economic status). New understandings of energy-related practices and an intersectional approach to the socio-demographic factors in energy use will be deployed to enhance stakeholder engagement in Europe's energy transition. Central to the project is an in-depth engagement with selected communities, acting as co-designers of their own energy transition.

Social Enterprise and Low Carbon Transition – An Explorative Analysis

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This project explores the value of utilising social enterprise in community owned energy schemes as a form of social innovation. While there is growing consensus that human behaviours need to change to a more sustainable paradigm, community driven approaches, such as social enterprise, have yet to be explored as serious instruments of sustainability transition. In the UK, social enterprises sit within the third sector of the economy, typically where market or governmental failures exist in the provision of social welfare, and have increasingly become a key driver of social progress. The autonomous nature of social

enterprise legal structures can represent a viable means to reduce state social welfare dependence, and as a proven model for social change. Social enterprises have the capacity to create social and economic value; often considered a 'win-win'. However, there are clear potentials for social enterprise models to be more extensively applied to address contemporary ecological challenges, moving towards 'win-win-win' outcomes across social, economic and ecological domains.

This poster presents the conceptual framework and initial findings from semi-structured interviews with social enterprises based in Liverpool. Outcomes from these interviews provide insight into how energy focused social enterprises currently operate. Common barriers faced are identified. Data will be utilised as a platform to develop a robust methodology for further investigation. Through in-depth exploration of stakeholder perspectives, the potential of social enterprise to act as local level social niches will be investigated. This research provides novel perspectives on the conceptualisation of social enterprise within a socio-technical transitions framework. The potential of social enterprises to act as 'transitions engines', by delivering innovative transformation of the social domain will be evaluated, as will the role of social enterprise in delivering a low-carbon economy.

Renewable energy sources towards social challenges in sustainable development and low carbon economy

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Low carbon economy, sustainable and holistic development is a challenge for all society. The imperative is to alleviate carbon emission, global warming effects and minimize cross-border environmental pollution. Developing countries follow the global policy and protocols by preparing their technically feasible renewable energy potential for investment and world emission trading market. This paper presents the current state of different renewable energy sources in Serbia, as well as opportunities for incorporating the world and European legislation, technology, knowledge, and investments in the energy sector of this Balkan country. Several case studies of initial investments in renewable energy sources are reported.

Extending the national power grid in Germany - Analysis of the public discourse on health impacts of high-voltage power lines: Results and recommendations for radiation protection

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Background:

The composition of the energy supply in Germany is changing. With the phase-out of nuclear power generation and the expansion of renewably sourced energy, changes of the national power grid are necessary. Existing networks will be upgraded and new long-distance north-south power-lines built. In this context, wide geographical, scenic and societal impacts can be

observed which partly lead to conflict and resistance in Germany. The project started with the aim to examine from a discourse theoretical perspective how power grid extensions and possible health-related consequences are constructed communicatively, and what interpretation patterns dominate the discussion at the various levels.

Method:

Using methods based on the discourse theory of Ernesto Laclau and Chantal Mouffe, dominant interpretation patterns in the discussion were identified and analysed. Print media, campaigns and talk shows in public television relating to the topic power lines were investigated and narrative interviews with stakeholders were carried out. In a nutshell, the underlying demand for grid extension on the one hand, and - in varying degrees - issues of the technology involved, health, local economy, nature, landscape and participation in the decision-making process on the other hand form central fields of conflict.

Main results:

The social aspect of the conflict is very important: different social systems and their specific logics are of crucial importance for the assessment of the current power grid extension. Changes within everyday life, especially concerning changes of the local landscape are often rejected very strongly. The electric and magnetic fields of the power lines are only one aspect of the conflict. The concern differs geographically within Germany. In some but not in all regions it is primarily a question of visibility: there is hope that in these regions underground cables will bring social peace.

Conclusion:

Risk communication about health risks has to be sensitive, careful and adapted to the importance for the concerned people.

Effect of capitalization of water resources on development of the regional socio-economic systems

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Abstract. The paper deals with the main branches of the Ukrainian economy being the largest water consumers, and determines their effect on the social and economic development of the regions and regional systems. The authors offer introducing of the system of water resources' assessment based on the differential rent in the economic turnover, which can lead to capitalization of water resources in accordance with the demands of sustainable and balanced development in the conditions of integration changes.

Keywords: water consumption, water use, capitalization of water resources, water resources' assessment, differential rent

Introduction. Despite the existence of studies of the problems concerning the economics of nature management, rational use, protection and recovery of the natural and water resources, development of the regional social and economic systems, conducted by Ukrainian and foreign researchers, the issue of capitalization of water resources in the system of development of the regional socio-economic systems today remains a subject of scientific

discussions. Conditions of implementation of sustainable development of the Ukrainian territories demand from the scientists of Ukraine the development of a mechanism of water resources market functioning in order to capitalize these resources and to provide further preservation and recovery of water resources in Ukraine.

Material and Methods. We use in our study traditional and special methods including: historical and logical method, abstraction and analogy and system analysis methods.

Results and Conclusions. Among the branches of Ukrainian economy, the energy sector, metallurgical, chemical and petrochemical industries are the largest water consumers; at the same time they belong to the main polluting industries in the industrial sector of economy.

Fig. 1–3 show the basic indices of water supply and disposal (according to data of the State Agency of Water Resources of Ukraine, mln. m³).

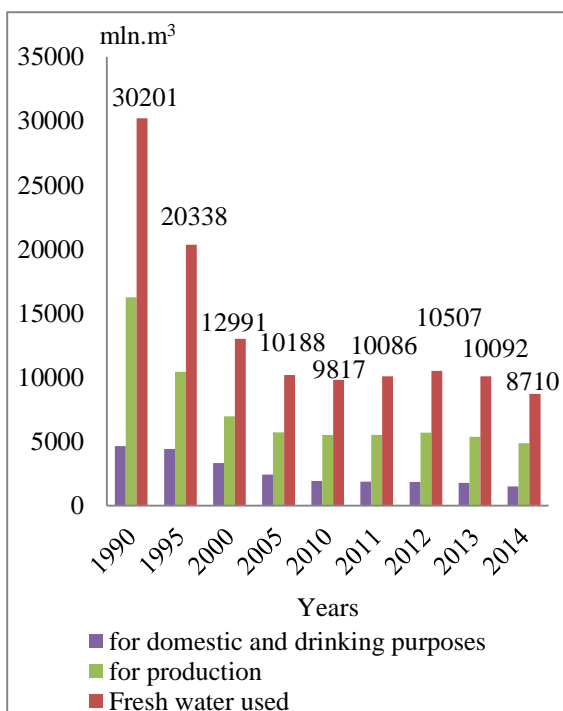


Fig. 1 – Statistics of fresh water use, mln. m³

The most of plants use obsolete equipment and wastewater treatment systems, as well as water-intensive technologies, leading to increase in the volume of water intake, water loss in the production process and discharge of contaminated wastewaters.

Upon declaration of independence of Ukraine (1991) the volumes of water production are gradually reduced (Fig. 1). It is conditioned by several reasons: first of all, reduction of the national production because of re-orientation of production to internal in the crisis period of 1991 – 1996, and secondly, moral and physical ageing of equipment and wastewater treatment facilities over time, which also caused the decline in the national production. Almost 75% of used water

is discharged back into water bodies (Fig. 2).

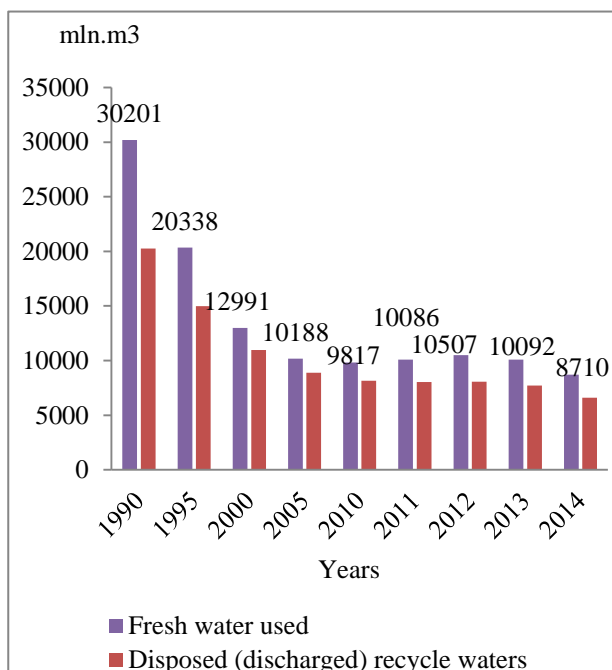


Fig. 2 – Statistics of fresh water use and disposal of recycle waters, mln. m³

Because of disposal of used water resources, physical, chemical and biological properties of water are changing, which makes water unsafe for human health [1].

According to data of the State Agency of Water Resources of Ukraine, five largest water consumers in Ukraine are

Dnipropetrovsk, Zaporizhzhya, Donetsk, Kherson and Kyiv regions (Table 1).

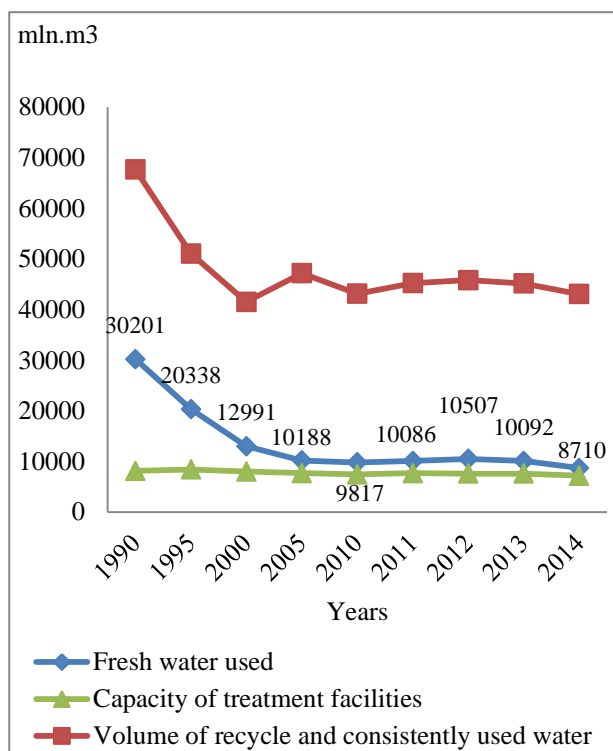


Fig. 3 – Basic indices of water supply and water disposal, mln.m³

Industrial needs of these five regions (of 24 regions of Ukraine and the Autonomous Republic of Crimea) account for nearly 63.3 % of all volume of fresh water use in the regions.

In the opinion of the researchers of the Institute of Industrial Economics of the NAS of Ukraine, according to the conditions of domestic economy and taking into account the share of regions in the mining and processing branches of industry, groups of regions of Ukraine can be classified as follows: 1) over 7% - hypertrophied industrial development of the regions; 2) 2-7 % - normal industrial-agrarian development of the regions; 3) less than 2% - agrarian-industrial development of the regions [2]. According to this classification, Volyn, Zhytomyr, Zakarpattya, Kirovograd, Ternopol, Kherson, Cherkasy and Chernivtsi regions of Ukraine are typically agrarian-industrial regions.

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Table 1 – Use of fresh water by regions, including fresh water and seawater (according to data of the State Agency of Water Resources of Ukraine, mln.m³)

Index	1990	1995	2000	2005	2010	2011	2012	2013	2014
Ukraine	30201	20338	12991	10188	9817	10086	10507	10092	8710
<i>Regions</i>									
Dnipropetrovsk	3599	2752	1756	1579	1361	1407	1429	1349	1359
Donetsk	3419	2548	1751	1508	1467	1479	1445	1354	1135
Zaporizhzhya	4598	2635	1702	1076	1099	944	1186	1237	1146
Kyiv	2131	1496	1132	812	902	925	1028	866	808
Kherson	2161	1131	639	610	770	963	1083	1074	1062

All the others are, to a greater or lesser degree, industrial-agrarian and old industrial regions. The majority of scientists adhere to the opinion that Dnipropetrovsk, Donetsk, Zaporizhzhya, Lugansk, Poltava and Kharkiv regions of Ukraine are typically old industrial regions.

It should be noted that the Dnipro basin comprises diversified economic complex, which includes industry, agriculture, hydraulic power industry, municipal infrastructure, water transport and fishery. Here nearly 43 % of industrial production of Ukraine is concentrated. This economic complex can be considered as the regional socio-economic system characterized by its own laws of development.

The scientists note that old industrial regions of Ukraine occupy the leading positions among the other regions, while their development is characterized by producing the goods of insufficient knowledge content, high depreciation of fixed assets, rather low innovativeness and difficult ecological situation [3].

Comparison of data in Table 1 and the definition of “old industrial region” in Ukraine indicate that the industrial complex is a major consumer of water resources among all branches of the national economy of Ukraine.

Optimization of the system of industrial water use will have a significant impact on development of water use in the country as a whole. Implementation of water resources’ capitalization can be the basis for optimization of the industrial water use system. The process of capitalization, i.e. accumulation of capital through transformation of added value into it, has been analyzed since the mid-19th century. With the transition of Ukrainian economy to market relations, the interest to this process is growing considerably. The basis for inclusion of the nature potential into economic turnover should be adequate assessment of water resources, capable of transforming them into the form of financial capital.

The most objective and novel method is the method of water resources’ assessment based on the concept of differential rent resulted from the use of social labor towards the limited water resources of various quality and location. The rent approach reflects, on the one hand, result-based characteristic when the results of object’s operation exceed the expenses, and, on the other hand, cost-based characteristics, when the costs in the rent, as distinct from actual costs, are socially necessary costs arising in the course of appraisal object writing-off. The rent approach takes into account, first of all, the fact of uniqueness and limitedness of water resources, as well as their quality and involvement into the economic turnover [4].

The main objective of introduction of rental component into the payment for water resources is the provision of real economic benefits to the state (resource owner) from water use in the national economy, establishment of legal principles for deriving additional profit by enterprises at the expense of water resource use, and encouraging the economic entities to use water in the rational way [4].

Absolute (pure) water rent which is received by the owner of a water body under conditions of functioning of the regional water market is the result of inelastic supply of the owner. The emerging market of water resources of Ukraine is still like a monopolistic market, as distinct from the European trends.

The introduction of differential rent will allow to form the adequate assessment of water resources for Ukrainian water users/water consumers thus facilitating the emergence of the competitive market of water resources based on self-sufficiency principles.

Conclusions and further research directions. Therefore, in order to increase the level of water resources' capitalization in Ukraine, it is necessary to create the mechanism of environmentally sustainable water use, based on the renewed institutional environment which would promote the recovery of water resources in the form of the most productive capital. This approach will allow determining the real value and prices of water resources, enhancing their capitalization, eliminating mismanagement syndrome and free-of-charge principle for the resources from the economic turnover, and promoting development of the natural infrastructure. Our study also clearly shows that formation of large markets of water resources is possible in Dnipropetrovsk, Donetsk, Zaporizhzhya, Kyiv and Kherson regions, with the potential of considerable effect from implementation of system measures with regard to capitalization of water resources. Today water industry becomes a huge by volume global market which can be compared with the oil and gas sector and electric power generation industry. Furthermore, the global experts believe that water can be “the future coal”.

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