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- Anatomy of a controversy: nuclear power in Portugal, Ana Delicado (ICS, University of Lisbon, Portugal), Tiago Santos Pereira & Stefania Barca (Centre for Social Studies, University of Coimbra, Portugal)
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- CO2 storage knowledge infrastructures: seismic monitoring in the Sleipner project, Benjamin Evar (University of Edinburgh, UK)
- Energy in nineteenth century Europe, Mariana Valente (University of Évora, Portugal)
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6. Rural Landscapes

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- Conflicting (?) perspectives on rural wind power plants in South East Finland, Sari Janhunen & Maija Hujala (South Karelian Institute, Lappeenranta University of Technology, Finland)
- Wood Energy produced on Contaminated Land – How Distinct Practices can be Recombined Mutually Beneficial?, Alena Bleicher (Helmholtz Centre for Environmental Research – UFZ, Germany)
- Walking the field, recomposing a visual landscape: Planning wind power in the Eure-et-Loir (France), Alain Nadaï (CIRED-CNRS, France)

7. Media and Discourses on Energy I

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- Energy resilience as the social control of technology, Audley Genus (Kingston University, UK)
Which future for adolescent renewables? Metaphors and Framing in the German Energiewende, Katherina Grashof (Freie Universität Berlin, Germany)

Solar energy in the news: national and local media coverage of a solar power plant in Alentejo, Luís Junqueira, Ana Horta, Ana Delicado & Mónica Truninger (ICS, University of Lisbon, Portugal)

8. Innovation, Markets and Policy I
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The Social Construction of Energy in Contemporary Organisational Management, Murray Goulden (University of Nottingham, UK)

The Role of Qualification in Shaping Demand and Innovation: The case of low temperature laundry, Jo Mylan (Institute of Innovation Research & Sustainable Consumption Institute, University of Manchester, UK)

Technological niches in energy transitions: the case of wave energy, Margarida Fontes, Cristina Sousa & João Ferreira (LNEG - Laboratório Nacional de Energia e Geologia, DINAMICA-CET, Portugal)

New technology-intensive firms as conveyors of new energy technologies, Isabel Salavisa & Cristina Sousa (DINÂMIA’CET-IUL and ISCTE-IUL, Portugal)

9. Media and Discourses on Energy II
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(Re)-framing nuclear power in British parliamentary debates: the use of science in justification discourses, Lucie De Carvalho (Université la Sorbonne Nouvelle-Paris 3, France)

The end of the nuclear renaissance in Europe? Post-Fukushima media debates in Finland, France and the UK, Markku Lehtonen (Ifris, Université Paris-Est Marne-la-Vallée, France & SPRU, University of Sussex, UK)

Nuclear power in parliamentary debates in Portugal: Promise or risk?, Tiago Santos Pereira, António Carvalho & Paulo Fonseca (Centre for Social Studies, University of Coimbra, Portugal)

Between hope and fear: twofold analysis of media coverage of fusion and fission energy, Ana Horta, Luísa Schmidt & Sérgio Pereira (ICS, University of Lisbon, Portugal)

10. Innovation, Markets and Policy II
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A Social Study of Electric Mobility Projects: Innovation, Consumption and Market, Frédéric Vidal (CRIA, Portugal) & Luísa Veloso (CIES-ISCTE, Portugal)

The construction of a collective energy-system, Jens Petter Johansen & Jens Røyrvik (NTNU, Norway)


Lessons from the adoption of wind energy in Portugal: formation of local absorptive capacity and legitimacy, Nuno Bento & Margarida Fontes (DINÂMIA’CET, ISCTE-IUL, Portugal)
• From promise to problem. Making Photovoltaic Happen in France, Béatrice Cointe (Centre International de Recherche sur l'Environnement et le Développement, France)

11. Users, Practices and Technologies

November 5, 14.00-16.00, Room Polivalente, Moderator: Mónica Truninger

• The social construction of heating and cooling practices, Susana Fonseca (ISCTE, Portugal)
• Governing the practices of energy use? The Norwegian policy debate on smart electricity meters, Tomas Moe Skjølsvold (Norwegian University of Science and Technology, Norway)
• A multi-level approach to energy options across EU: The role of supra-national governance, values and trust, Carla Mouro, Paula Castro, Nicole Kronberger & Patrícia Duarte (CIS-ISCTE, Portugal)
• The enrolment of consumers in smart grids, Greg Wallenborn (Université Libre de Bruxelles, Belgium)
• Key socio-economic elements to energy poverty in the ‘developed’ world: the case of Spain, Iván Lopez (University Carlos III of Madrid, Spain) & Javier García Breva (Fundación Renovables, Spain)
1. Exploring Energy through STS

• New perspectives on understanding ‘nuclear societies’, Susan Molyneux-Hodgson, Matthew Cotton, Stephen Connelly & Matt Watson (University of Sheffield, UK)

Energy security is increasing as a matter of concern for government and policy makers. There are equally challenging ‘technical’ concerns underpinning some of the proposed ways forward. The need for academic research to engage across stakeholders, to inform and shape debates, and generate ideas to inform potential futures, is clear. The nuclear sector, in particular, confronts social researchers with socio-technical problems that are multi-layered as well as multi-disciplinary. In the UK, The Nuclear Fission Technology Roadmap (2012) identified the need for a long-term research strategy. Whether considering extensions to current reactor lifespans, replacement reactor options, or expansionist policies for the nuclear programme, for example, the need for social science work in this arena is pressing, but currently limited.

Funding bodies in the UK have expressed a desire to build social science capacity to generate new thinking about the nuclear sector and we have recently received funding to develop a programme of STS work alongside a group of academic nuclear engineers who interact closely with industry. In our paper, we propose to discuss the character of the cross-disciplinary engagement we are establishing and open up our proposed set of projects to scrutiny from STS researchers. The implications for environmental movements, cultures of decommissioning across nation states, and the politics of scale are all areas we will address collaboratively with engineers in the coming years. Thus, in our paper we will outline some of our conceptual thinking on socio-technical concerns (e.g. adapting actor-network approaches; the ‘fuel-cycle’ as metaphor; and theories of temporality) and will describe our plans to bring STS perspectives to past, current and emerging nuclear matters.

• STS Approaches to Energy Systems and Their Boundaries. Exchanges Between ANT, Assemblage Theory and Zero Energy Building Design, Thomas Berker (Norwegian University of Science and Technology, Norway)

In a recent special issue of the journal Building, Research and Information on “The future of building and energy research” (40/4, 2012) several contributions describe research on individual energy efficient buildings as soon to be superseded by analyses of buildings and their (not only) environmental performance as part of larger systems on various scales - potentially reaching from the neighbourhood scale to a future (trans)continental super-grid. Such an extension of the system boundary redefines the zero energy building into a small part of a larger system, where it fulfils functions for the larger whole. At the same time, on the other end of the spectrum, the individual, extremely energy efficient zero energy building is still dominating large fractions of the engineering and architectural approaches to energy efficient buildings. Seen from STS these emerging controversies between a focus on optimizing the individual building on the one hand and a systemic view on the other are strangely familiar from debates around the structure-agency dualism. In this paper two approaches that claim to have developed original solutions to this (and other) dualism(s) are applied to the question of buildings’ energy consumption and their context: actor-network theory (a la Latour) and assemblage theory (a la DeLanda). The empirical material this paper is based on consists of analyses of traces left by controversies about sustainable building design strategies that have emerged in and around the Norwegian Research Centre on Zero Emission Buildings (ZEB). More specifically, we have analysed an email exchange between more than 100 building design professionals and reports and working papers documenting the Norwegian definition of “Net-zero emission building”. This is complemented by an analysis of the Norwegian media coverage of energy and emissions in the built environment from 2009 until 2012. The main goal of these analyses is to develop and demonstrate the theories’ potential to enrich these controversies, but also to shed new light on the theories through an analysis of the innovative solutions
developed in sustainable building design. Moreover, I claim that the specific controversy between proponents of either optimizing building or energy system allows us to discuss issues that are relevant for the more general question of how to define the boundaries and structures of any kind of sustainable energy innovation.

- **New scripts for old buildings: conserving both identity and energy**, Tineke van der Schoor (Utrecht University, Netherlands)

Historical buildings are an important source of local identity and form a connection to our past. It is a EU policy objective to conserve and redesign heritage buildings like prisons, military barracks, factories, stations, and schools. Such redesign should also ensure reduction of energy use without compromising historical identity. In this paper we conceptually and empirically investigate how the two conflicting aspirations unfold. Our starting point is Actor-Network Theory, which considers technological artefacts as networks of heterogeneous actors. In particular we elaborate the obduracy and scripts of buildings, to clarify how they resist change and invite a specific use. We analyse the tensions between identity and energy conservation in four cases of restoration in The Netherlands: military barracks in Nieuweschans, an energy neutral villa in Driebergen, a public library in Franeker and a stable in Eerde. These buildings have recently undergone a restoration, with energy efficiency as one of the main goals. Scripts and networks are traced by a combination of methods, such as studying layout, materials and building history, and qualitative interviews with restoration-architects and users. We found three generic strategies to conserve identity and energy. First, the compartmentalised nature of original layouts helps to prevent energy loss and promote energy efficient use of the building, for example the original layout of the military barracks was reinstalled to prevent energy loss. Secondly, recent annexe or other parts with low historical value are often redesigned completely in a modern energy efficient way, such as the (interior) garage in Nieuweschans and the rebuilt annex in the villa in Driebergen. Thirdly, when the original scripts are very different from new uses, energy efficiency has been carefully ‘inscripted’ in the new design. For example in Franeker and Eerde, where the new script invites users to day lit workspaces.

- **From regimes to assemblages? Transitions in the British energy sector**, Marton Fabok (University of Liverpool, University of Manchester, UK)

There has been a novel scholarly attention on the transformation of energy sector in various European countries, due to concerns over climate change and security of supply, changing patterns of energy production, liberalisation and Europeanisation. The bourgeoning literature on sociotechnical transitions (Verbong and Loorbach 2012), and especially the Multi-Level Perspective (MLP, see Geels 2004, Geels and Schot 2010), highlights that these transitions involve much more complex processes than simple changes of energy sources and production technologies. Recently, however, the core concept of sociotechnical regime, denoting meso-level semi-coherent patterns, has been criticised for the under-theorisation of agencies, the implied nested hierarchies, the ambiguities of empirical operationalisation and the ignorance of diverse geographies (Smith et al. 2010). This paper aims to provide an alternative conceptualisation based on assemblage theory, and to mobilise post-ANT insights from STS and human geography (Law and Mol 2002, Anderson and McFarlane 2011). The case study focuses on the British energy sector, primarily on the electricity supply. The sector is shaped by processes of widespread liberalisation, the dash for North Sea gas, and the low-carbon strategies leading to an ambitious nuclear new build project. These changes are intertwined with emergence of new governance networks, rise of diverse managerial knowledges, formation of multinational utilities, development of interconnectors, not to mention complex patterns of deindustrialisation and changing household practices. These processes highlight the relational entanglements of material, social and imaginary aspects and cross-cuttings of micro-, meso- and macro-scales in the context.
of heterogeneous glocalisation processes (Swyngedouw 1999). Through the empirical example, the paper aims to reconceptualise regimes, as well as agency, as sociotechnical assemblages in transitions.
2. Controversies and Catastrophes

- *Imagined Disasters in India’s Anti-Nuclear Landscape*, Monamie Bhadra (Arizona State University, USA)

I contribute to STS studies of energy controversies by illustrating the concept of “disaster scripting” through an ethnographic exploration of India’s heterogeneous anti-nuclear movement using participant observation of meetings and protests, interviews with activists, and document analyses. Disasters like Hurricane Katrina, the BP Oil Spill and Fukushima are typically characterized by the public’s sudden exposure to a rapidly unraveling sociotechnical order. In contrast, the India is currently marked by vociferous pre-emptive outcry against the Indian government’s aggressive pursuit of nuclear energy, from fisher-folk, farmers and uranium miners all affected by nuclear infrastructure siting decisions, as well as India’s urban anti-nuclear activists. These groups view nuclear energy as catalyzing a disaster-in-the-making, propagated along ecological, political, economic, cultural and gendered fault-lines. As such, I argue that when there is intensive and sustained public mobilization in expectation of future calamity, the intervening time leading up to another disaster that may or may not occur is a phase when numerous scripts in anticipation of the next disaster are being drafted, negotiated and circulated by different communities, often through the language of shared identity. Dominant disaster scripts create meaning, frame problems and possible solutions, choose victims and villains, and hash out the political contours of appropriate response long before the disaster ever takes place. Should disasters unfold, the scripts will invariably be improvised, and possibly thrown out. Yet the cultural and political work being done prior to disasters provides a heuristic for contextualizing the narratives that unfold following a catastrophe. Thus, disaster scriptings supplement existing work in "sociotechnical imaginaries" by providing a lens that captures the dystopic disaster imaginaries of developing-world communities living in violent environments related to energy development, their capacity for democratic reinvention through agonistic politics, and the creation of new collective identities to bridge existing cleavages along gender, caste and religion.

- *Fatigue and resigned acceptance— The Norwegian ENGOs approach to carbon Capture and Storage (CCS)*, Eirik Swensen (NTNU, Norway)

Carbon Capture and Storage (CCS) has for years been a priority area for Norway in mitigating climate change, with a lot of money and prestige involved. Prime Minister Jens Stoltenberg’s reference to the development of CCS as “Norway’s moon landing” is a good illustration of the high stakes attached to this technology. Actually, CCS plays a strategic role in upholding consensus in Norway’s climate and energy policy. However, the actual development has been much slower than promised, and CCS is still little more than a technological promise in the Norwegian context. Although the development of CCS in Norway is taking place on shaky ground, there is a lack of stronger criticism in the wider society. Part of the explanation has to do with the environmental NGOs’ stand on the technology. The two leading actors, Bellona and ZERO - which also differ from the others by being foundations and not based on membership - have operated more as knowledge producers and lobbyists, than critics outside the field. This situation has created a unique dynamic where the actors struggle to find their position. In this paper I analyze the debate on CCS taking the Norwegian ENGOs as my point of departure. In a knowledge intensive and technologically complex debate, these more member based organizations express something I label “technological fatigue” and “resigned acceptance” confronted with CCS. Technological fatigue describes the process in which the issue at stake has been so complex and developments so slow that the actors limit their involvement and engagement in the debate. The result of this technological fatigue in the case of CCS is resigned acceptance, which also reflects a political context where CCS acts as a kind of strategic glue with respect to climate mitigation efforts. Resigned acceptance describes a situation where the actors do not actively support, but neither actively challenge, the technological development – to the effect that the actors may be interpreted as silent supporters.
Transitions in biofuel systems: an assessment of social impacts using the Delphi method, Barbara Esteves Ribeiro (Centre for Applied Bioethics, University of Nottingham, UK)

Alternative sources to fossil fuels are a priority in worldwide energy policy, an attractive option for markets, and often a target of public scrutiny. Biofuels are not necessarily a novel source of energy, but the brisk development of a global socio-technical system of liquid biofuels in the last decade has called the attention to what became one of the most controversial alternatives to oil so far. Fostered by political and economic support worldwide, biofuels technologies have been changing in a fast pace to address issues of efficiency and sustainability. However, while technological development is responsible for societal benefits, it also brings along detrimental consequences, affecting especially more vulnerable groups. In this work, ethanol is taken as a case-study to assess potential social impacts of a transition between first and second-generation technologies through an expert consultation using the Delphi method. Twenty-four experts from seven different countries analysed main issues that are likely to play a part in the social sustainability of second-generation ethanol, also called cellulosic ethanol, in the future. Potential impacts were assessed using criteria of probability, reversibility and monitorability of technical and social change. While mitigation of major biofuel-related threats such as food insecurity may be regarded as an advantage due to the use of certain types of non-edible crops or residues as feedstock in the production of cellulosic ethanol, other potential benefits of a transition between ethanol generations are less clear. The study also discusses the challenges and limitations of social appraisal in technology assessment of biofuels.

Science, technology and environmental conflicts in deepwater oil exploration: a sociological contribution, José Eduardo Viglio (Universidade Estadual de Campinas- UNICAMP, Brazil)

In a context of political and institutional strength around environmental issues, unlike what is expected by environmentalist actors, a process of expansion of oil exploration is observed at world level. In Brazil, the discovery of reserves in ultra-deep pre-salt waters is illustrative of this process. The exploitation of these reserves is seen by these actors as highly contradictory regarding the environmental agenda by posing risks and possible worsening of climate change. However, it is observed that science, technology and innovation (STI) have been one of the main pillars of environmental justification and legitimization to exploration of pre-salt. Taking this scenario, the major interest of this investigation, affiliated to the dialogue between environmental sociology and social studies of science and technology, is to understand the role of science and technology in the discussion and decision-making processes which present environmental controversies and uncertainties. In this sense, this research investigates more specifically the mobilization and uses of science and technology by different actors in negotiating, conflicts in decision making related to environmental issues in the pre-salt. The empirical cut around the pre-salt is justified because it is a scientific-technological wrapped in uncertainty, controversy and broad environmental and social impact.
3. Energy Systems and Transitions

- Opening up and closing down energy futures: energy scenarios in Germany and France, Stefan Aykut (LATTS, Université Paris-Est Marne-la-Vallée, France)

Several developments, including the climate crisis, the growing energy hunger of emerging economies, the nuclear catastrophe of Fukushima and the recent shale gas and tight oil boom in the US, have contributed to putting energy policy more than ever at the center of policy attention. Energy scenarios are central nodes in these discussions. They structure debates about the necessary “energy transition(s)” and represent stages in the negotiation, enactment or reaffirmation of global, national and local energy futures. Despite their growing importance as a policy tool, social sciences have not yet given scenarios the attention they deserve. This contribution to the Conference "STS perspectives on energy" therefore concentrates on the role of energy scenarios in current debates and policy decisions in Germany and France, in order to elucidate the ways societies think about energy futures, and under which conditions scenarios can help to successfully prepare sustainable transformations of energy systems. The contribution is based on fieldwork in both countries (interviews with experts, archives) and aims at answering two questions: First, despite increasing integration of energy markets, efforts to collectively manage global environmental risks and other transnational dynamics in the field of energy policies, some countries have rather accentuated their differences. While neighbouring Germany and France have decided to both engage in “energy transitions”, they give very different interpretations to this term: Germany has decided to ban nuclear energy and dramatically expand electricity production from renewable sources (and to a lesser extent natural gas), while France has launched a national debate on its future energy policy, but continues to rely heavily on nuclear energy for its electricity production.

How can we make sense of these developments from a social science point of view? In what way can the analysis of energy scenarios and public debate help to understand the persistence and even increase of differences? Second, scenarios are highly ambivalent tools: on the one hand, they can help to open up discussions by presenting alternatives to current trends and thus politicize energy questions. On the other hand, energy scenario development, generally concentrated in the hands of a few actors, can lead to a delegation of policy questions to experts. Furthermore, scenarios often tend to over-estimate path-dependencies and current trends, thereby de-politicizing the energy debate. Thus, starting from empirical examples, we will see under which conditions energy scenarios encourage discussions about sustainable energy futures, helping alternative scenarios to emerge and to influence energy debates, and when they close such discussions down.

- Path Creation and Path Dependence in the Transition of Energy Infrastructures, Gerhard Fuchs (University of Stuttgart, Germany)

In spite of the fact that there is a lot of talk about energy transitions or most prominently in German the “Energiewende”, the substantive meaning and significance of this concept is unclear. We readily admit that energy transition means more than a change in technologies being used e.g. for the generation of electricity. As the call for papers mentions, we are dealing with “systemic interactions between technology, organization and behaviour at regional, national and supranational level.” An analysis of these interactions in a static manner already requires the combination of insights from various theoretical traditions. In the social sciences e.g. the analysis of technological developments, changes in the organization of work and social practices are largely isolated from one another. Looking at these approaches individually in the light of an attempt to help us understand the overall socio-technical system “electricity generation” they look rather “thin” to us. The analytical and theoretical challenges grows even more daunting when the problem of change or transition has to be addressed and the contribution of the specific factors mentioned above (technology, organization, social practices etc.) in processes of change. Traditional systems of electricity generation can be conceptualized as
“Large Technical Systems” (Hughes/Mayntz 1988). Once being developed they are characterized by a high degree of path dependence and inertia. Energy transitions are contemplated by various governments (like the German), the European Commission and others, but they are obviously hard to come by (see Verbong/Loorbach 2012). This seems to be an empirical as well as an analytical problem. On-going changes and developments are often underestimated by a concentration on the analysis on single technologies or by using a more or less idiosyncratic set of indicators developed by the researchers to judge whether transition takes place. The paper tries to present a generic approach for the study of transition by spelling out, how the analyses of processes of stability and change can be distinguished and what analytical instruments seem best suited to analyze either a period of stability or a period of contention and change. The argument will be illustrated by using cases dealing with the development and implementation of new electricity generating technologies.

- Seeds of destabilization in energy regimes. The Chilean case, Gloria Baigorrotegui (Instituto de Estudios Avanzados, Chile)

The concern that is causing energy policies to take a more sustainanible path has focused attention on the dynamics of governance, and in the destabilizing processes of fossil regimes. Much has been written about the complex nature of the energy transitions in cycles of 30-40 years but less around their subjective aspects, those we propose would enter as intruders in the regimes conforming different geographies in its recent history. For this we present the Chilean coal regime in the context of three general transitions from 1900-2012, highlighting the entry of “seeds of destabilization” favouring the formation of crisis, failures, and obstructions. We describe their influence on policies, legislation and energy policy plans. Finally, we reflect on how these “seeds of destabilization” have resulted in a much less coherent scenario, complicating assumptions about the contexts of governance, and transition in energy regimes in general, and also particularly in the case of Latinamerica. Keywords: Desestabilization of energy regimes, seeds of destabilization, carbon Chilean energy regime.

- Urban energy and socio-technical systems: explorations through time and space, Vanesa Castan Broto (University College London, UK)

Achieving low carbon and socially just cities will require spatial, socio-economic and political transformations. These transformations will depend on our ability to find low carbon development pathways for urban energy systems. Changes in energy systems and urbanisation processes are mutually dependent. Thus, devising sustainable development pathways towards low carbon and socially just cities will require new methods to analyse the shared history and geography of energy systems and cities. This will require an understanding of urban energy through time and space. A socio-technical perspective on urban energy will help understanding the co-construction of energy systems in cities as embedded both in social and technological practices. But, simultaneously, urban energy systems interact with ongoing processes of urbanisation and urban growth. Changes in energy systems are related to broader changes at the peri-urban interface of cities, in between transitory spaces that defy the organisational logics of planners and managers. This also draws attention to the equity issues raised by the production, transmission and consumption of energy in cities. This paper will report the first results from the ESRC project ‘Mapping Urban Energy Landscapes’ (MUEL). The concept of ‘landscape’ represents an attempt to capture the relationship between socio-technical systems and the dwelling practices that develop around them. The project will develop the concept of Urban Energy Landscapes through a comparative analysis of changes in energy systems in different cities, using a combination of analysis of satellite images and in-depth studies of specific locations. Thus, this paper will focus in understanding how to move
from descriptive analysis of the history and distribution of energy in cities, to anticipate specific pathways towards putatively sustainable energy landscapes.

• **Visions of a Sustainable Energy System for the Mediterranean Region, Sharlissa Moore (Arizona State University, USA)**

Energy and sociotechnical systems research often focus on the nation-state as the unit of analysis, which is insensitive to rising energy interdependence among nations and overlooks phenomena and inequities that arise at different governance scales. This research project explores how a vision for a sociotechnical energy system is constructed and negotiated at the regional scale through the case study of the Desertec Industrial Initiative (Dii). Dii is a conglomerate of 55 leading energy companies that aims to build large-scale solar power plants in North Africa and high voltage submarine cables along the rugged Mediterranean seabed to provide renewable energy for both continents. This research site offers a window into the early design phase of a sociotechnical system, where crucial decisions are made that have lasting influence on the shape of the system and its implications for energy justice. Using data from interviews conducted in Morocco, Germany, and Spain; event ethnography conducted at Dii meetings in Egypt; and document analysis of news articles, industry literature, and images, I describe the power disparities that arise in the initial construction and negotiation for this massive system. I argue that project developers are using lenses in the project planning and design process that are not sensitive to understanding the social and justice aspects of this complex system. For example, Dii’s framing of the project as a “win-win” for all countries assumes that low carbon energy is a sufficient criterion for assessing sustainability and, therefore, masks capabilities justice issues relating to the energy services the system would provide (e.g. powering resorts in Majorca versus pumping water in Morocco), as well as the capability of citizens across the Mediterranean to imagine the future of energy systems within their country. Methods and processes that illuminate the societal and political dynamics are needed to prevent unjust outcomes.
4. Communities and Citizens

- **Shale gas and local governments: the need for an integral regulatory framework**, Annick de Vries (Rathenau Institut, The Netherlands)

The US energy revolution has also sparked interest in potential shale gas development in the Netherlands, which has an extensive gas history. This has led to a lively societal and political debate. The Rathenau Institut analysed the societal debate through a media analysis, and studied the way the government has governed the debate through desk research and by conducting stakeholder interviews. Several dominant concerns were identified. In response to societal concerns, the government decided to examine the safety and environmental risks of the exploratory drillings. However, local governments and other actors plea for a broader debate about the usefulness and necessity of shale gas. Moreover, they state that more knowledge is needed about how environmental and health risks will apply onto a specific local Dutch context. Next to that, there are concerns that shale gas activities could pose a threat to regional core competencies and local economic activities. Further, local governments complain that current regulations do not adequately deal with the increasing activities in the subsoil (CCS, geothermal energy, shale gas, drinking water). Moreover, as local citizens will face the spatial and environmental impact of shale gas activities, regional and local governments insist on having a larger say in the political decision making process. They plea for a more integral regulatory framework that ensures their involvement in the decision making process and incorporates above- and belowground interests as these are currently not aligned.

- **The unsuccessful experience of "Consensus Conferences around alternative energy" in Castilla y Leon, Spain**, Ana Cuevas, Tamar Groves & Jorgelina Sannazzaro (ECyT, University of Salamanca, Spain)

With this contribution we would like to present the experience of the project "Consensus Conferences around alternative energy" in Castilla y Leon, Spain. We analyzed different alternative solutions to the problem of energy supply and the problems arising from the use of fossil fuels and release CO2 into the atmosphere with the aim of looking for the participation of the Spanish citizenships. We addressed the energies included under what is known as renewable energy and a nonrenewable energy source, but very powerful and highly effective: nuclear energy. Consensus Conferences are a method for the citizenship participation designed to foster a debate and to improve the contact with the public controversies about science and technology. Citizens take on a relevant role, to commit to a series of readings and discussions with experts, culminating in a forum open to the public. The purpose was to understand the different perspectives that citizens of the Castilla y Leon, Spain, have about these issues, and collect suggestions that citizens would like to make. The standard procedure in countries that have already developed this methodology is to select a group of people interested in the matter, being members of a representative sample of society. The chosen citizens have to show their interest in participating, answering to an advertisement placed in newspapers of the chosen community. In our case this method was not successful. The number of citizens who responded to the call was not significant, nor adequate profile to be part of the sample. The Project Committee met and discussed possible reasons for this failure. As a result of these considerations the committee decided to contact the Federation of Neighbourhood Associations of Salamanca and ask them for cooperation, but this initiative neither gave good results. Specifically, we propose in this paper shed light on the difficulties encountered in this project of consensus conferences, and propose other options to attract citizens, and other possible ways of implementation of such methodologies in Spain.

- **Anatomy of a controversy: nuclear power in Portugal**, Ana Delicado (ICS, University of Lisbon, Portugal), Tiago Santos Pereira & Stefania Barca (Centre for Social Studies, University of Coimbra, Portugal)
Nuclear energy is one of the most contentious forms of energy generation. From the risk of accidents to radioactive waste management, from the construction stages to the decommissioning of nuclear power plants, stakes are high when it comes to nuclear energy. Environmental contamination and the public health hazards that come with it are serious, difficult to control, invisible and with potential impacts over future generations. Thus, anti-nuclear protests have been at the root of environmental movements all over Europe and Portugal is no exception. The proposal to build a nuclear power plant in the 1970s in a fishing village north of Lisbon met with strong opposition from the local population, spurred the emergence of environmental non-governmental organisations and kick-started a scientific controversy between researchers against and in favour of nuclear power. Innovative alliances between residents, scientists and activists were forged, that would go on to re-emerge in other environmental crises. This presentations aims to present a chronology of events of this case, as well as an analysis of the positions of the social actors involved. It is based on document and media analysis and interviews with local leaders, environmentalists and scientists. It stems from a research project funded by the Portuguese Foundation for Science and Technology (HC/0063/2009), undertaken at the Institute of Social Sciences of the University of Lisbon, in collaboration with CES University of Coimbra: Nuclear Portugal: Physics, Technology, Medicine and Environment (1910-2010).

Wind energy deployment in Mexico: The environmental and social impact, Maria Elena Huesca Perez (TU Berlin, Germany)

This work analyzes Mexico’s wind energy deployment, which has been focused on large-scale wind parks, mainly in the Oaxaca state, one of the most marginalized one in the country. The most relevant issue of the wind power projects in Mexico is the Social Impact regarding the lack of benefits, the lack of participation of the local people, indigenous groups in majority, as well as a conflictive land use change and management. The aim of this document is to have a wider understanding of the significant role of the Social Impact as an inherent part of the Environmental Impact Assessment (EIA) regarding to the wind energy projects, by outlining the current process of the environmental, economic and socio-cultural impacts of the large scale wind parks in Mexico. The evaluation is carried out through indicators in the economic, environmental and social context at the global, national and local level. Finally, some recommendations and suggestions will be made in order to improve the current procedures of the Social Impact Assessment SIA/EIA within the wind parks in the country, which can be considered as a potential tool for increasing the participation of the people and enhance the local acceptance of this technology in current and future projects; this processes can be lead to a a better land and wind resources management in Mexico and other sensitive contexts. Keywords: Wind energy; Mexico; social impact, environmental impact, local impact
5. Knowledge and Infrastructures: Pasts and Futures

- **Tapping Geothermal Energy: Mutable Immobilities and Experimental Virtues of Nonknowledge**, Matthias Groß (Helmholtz Centre for Environmental Research - UFZ, Leipzig, Germany)

Geothermal engineering includes the utilization of naturally occurring heat in water as well as in dry and impermeable rock. The drilling technologies used for tapping geothermal heat are basically half a century old. For shallow geothermal sources the drilling gear is transferred from traditional well drilling, for deeper drillings the technology is taken from gas and oil drilling. This article analyzes the role of such “immutable mobiles” in emerging geothermal energy systems by pointing to the sometimes unexpected mutability inherent in the implementation into changing geological and scientific contexts. The presentation will discuss some of the experimental strategies that engineers and scientists develop such as in situ readjustments while drilling. In order to examine the issue of technological mobility in geothermal energy utilization more closely, the presentation will especially focus on situations of ignorance or nonknowledge in geothermal drilling projects. Framing the strategies for moving forward despite the known existence of nonknowledge can be conceptualized as a form of experimentality that is part of a large scale experiment in energy transition. Thus understood, current attempts at energy transitions in many countries seem to be shifting away from the special to the general or real world experiment, and thereby raising further questions for the role of science and engineering in society.

- **CO2 storage knowledge infrastructures: seismic monitoring in the Sleipner project**, Benjamin Evar (University of Edinburgh, UK)

This paper examines the knowledge production infrastructure of the Sleipner CO2 storage demonstration project in the Norwegian North Sea with a particular focus on the role of 3D seismic observations in establishing a consensus view. I first provide an overview of the Sleipner project and analyse the publication network through a ‘social network analysis’. Second, I draw on literature from the philosophy of science, particularly Nancy Cartwright’s work (1999), to assess the role of seismic observations in supporting understandings amongst geoscientists. Material is drawn from interviews with 27 geoscientists, conference notes, close readings of several research papers, and a few interviews with policy oriented stakeholders. The first part of the paper shows how a few actors have had a pivotal role in developing insights related to storage safety particularly on the back of seismic monitoring and other data acquired through industry partnerships. The second part of the paper continues with a deconstruction of how seismic data has been used to make a case for the safety of CO2 storage, drawing on Cartwright and others (Glymour 1983) to explain how individual findings are ‘bootstrapped’ when conclusions are formulated. I thereby show how a general case about storage safety has emerged on the back of the Sleipner research network and its knowledge production practices, and has helped shape a shared understanding among geoscientists of how to account for uncertainties and arrive at probable explanations.

- **Energy in nineteenth century Europe**, Mariana Valente (University of Évora, Portugal)

Operating within the field of historical studies and guided by pedagogical purposes, the aim of this talk is to look at culture, enabling an understanding of the specificities of the scientific concepts and its roots in the culture of the era, thereby making some aspects of the construction of scientific knowledge explicit: imagination, aesthetic sense, meaning, controversy and power. The word 'energy' enables us to Traverse multiple fields and various eras. The power of steam is a source of joy, of pain, of anguish, of thought in a world in transformation. Manchester, 1842, Joule and Engels were producing different worldviews, in physical world
and in social world. The centre of these constructions is inhabited by something that later would be named energy. The narrative that will be developed, in this talk, puts in the centre the power of steam and with it a map of crossroads between science, technology, culture and society would be designed.

- An anatomy of techno-scientific promise: electric vehicle batteries, Sjoerd Bakker (Faculty of Architecture, Delft University of Technology, Netherlands)

Despite their current limitations and overly high costs, battery electric vehicles are met with great enthusiasm by a wide variety of actors. This enthusiasm seems to be based, among others, on high expectations of further technological progress of traction batteries. In the near future these are expected to store more energy (to increase the range of the vehicles) and to do so at lower costs. Drawing from, and adding to, the so-called sociology of expectations literature, this paper aims to answer the question: how is the promise of further technological progress of batteries constructed and what types of arguments constitute this promise. The various arguments are derived from an analysis of both on- and offline media containing promissory statements from scientists and the automotive and battery industry. The findings show that three major arguments make up the battery promise. First, increasing production volumes should lead to lower unit costs. Second, further engineering on current battery technology (lithium-ion) is supposed to lower costs further and to result in better performing batteries. Third, several newly developed battery chemistries are presented as breakthrough technologies that are supposed to bring step-changes in both costs and performance. The findings furthermore suggest that there is a gap between expert expectations, those found in the media statements, and collective expectations that circulate among the relative outsiders. This finding is line with the ‘certainty through’ as it was coined by McKenzie and it supports the notion that collective expectations are too high and that actual battery developments will fall behind expectations. This in turn points to the hype-like character of current enthusiasm for battery electric vehicles.

- Co-producing socio-technical futures: collaborative trans-disciplinary research on next generation solar energy technology, Anna Krzywoszynska, Matt Watson, Nicky Gregson, Alastair Buckely, Helen Holmes, Prue Chiles & Jose Mawyn (University of Sheffield/Durham University, UK)

Moving energy systems to a sustainable footing requires the assimilation of diverse technologies to the patterns and places of everyday life. Whatever the shape of future energy systems, it seems certain that photovoltaics (solar electric technology) will be part of it. So what does it take to get more photovoltaics (PV), and more effective PV in terms of energy return, into the sunshine? The fundamental insight from STS, that better technologies tend to happen where their future users are involved in their development, can clearly serve as a base for exploring this challenge. So what happens if we seek to involve future users in the development of next generation PV technologies still at the laboratory stage? Solar Energy for Future Societies is a four year project funded by the UK Engineering and Physical Sciences Research Council based at the University of Sheffield and Durham University. The project is a transdisciplinary collaboration which sets out to understand how future photovoltaic technologies can be developed to shape and fit within future socio-technical systems and situations of deployment and use. It is doing so through participatory research with a community near Sheffield, UK. In this paper, we explore both the pitfalls and potential of engaging in the co-production of socio-technical futures, particularly where the focus is upon a technology (next generation PV) which does not exist yet beyond laboratory prototypes, and which is generally seen as benign and uncontroversial.
6. Rural Landscapes

- **Conflicting (?) perspectives on rural wind power plants in South East Finland**, Sari Janhunen & Maija Hujala (South Karelian Institute, Lappeenranta University of Technology, Finland)

At rural areas the perceptions of environment may differ between local people and second home owners. Often reported are the situations where locals are supportive to new rural developments, whereas second home owners are opposing. However, Farstad & Rye 2013 found both the local people and second home owners protective to rural idyll and positive to new developments. Bergmann et al (2008) found different welfare gains in rural and urban households, depending on the type of renewable energy technology and on the scale of project. As an environment means surroundings of being, persons or community - variety of important places, processes and objects - we should always ask “Whose environment” when assessing human-environment relationships (O’Neill, Holland & Light, 2008).

In our paper we explore the differences in tolerance towards environmental impacts of wind energy production at Finnish rural area. We found significant differences between locals and second home owners in opinions about wind energy plans. Why second home owners see risks especially for rural landscapes, more than local people? These differences are interesting, since second home owners spend much less their time at the environment where local people live permanently. Hence, we ask what is protected in environment by the locals and second home owners and how tolerance is connected in this process.

The paper is based on a survey study made in rural municipality Ruokolahti in 2012 in South East Finland. A questionnaire was conducted for the locals and second home owners at the time when wind power project plans were published.

References

- **Wood Energy produced on Contaminated Land – How Distinct Practices can be Recombined Mutually Beneficial?**, Alena Bleicher (Helmholtz Centre for Environmental Research – UFZ, Germany)

Using wood cultivated on farmers land for heating since centuries is part of agricultural practices. During the past years cultivation of fast growing trees in form of Short Rotation Coppice (SRC) in order to produce energy gained attention in many countries. This rather extensive production of biomass for energy has comparatively few impacts on biodiversity, soil quality and water household. Thus it is seen as a more sustainable form of bioenergy.

Since the 1980’s the use of trees also gained attention in remediation of contaminated land. So called phytoremediation approaches use plants for improving soil quality and removing contaminants. Since some years experts discuss the potential of cultivating SRC on contaminated land mutually beneficial – energy production and cleaning up. However, this discussion so far remained theoretically.

Within this presentation a practice theoretical perspective is taken to explore the potential of linking the agricultural practice of energy wood production and the environmental sanitation practice of cleaning up contaminated land. The challenges of recombining practices routed in distinct cultures will be elicited. Furthermore it will be discussed which modification in existing practices may foster the emergence of a new practice that combines more sustainable energy production and sustainable remediation.
Walking the field, recomposing a visual landscape: Planning wind power in the Eure-et-Loir (France), Alain Nadaï (CIRED-CNRS, France)

In 2003, wind power arrived massively in La Beauce (outskirts of the Parisian basin, 100 kilometres south of Paris). La Beauce has historically confirmed its vocation as a major agricultural area through land consolidations and mechanisation. It is nowadays a place often considered of low landscape quality, especially by non-natives. Industrial cultures have replaced sheep grazing. They shape an open, almost abstract space, punctuated by church steeples and villages, and by small valleys in the west. The northern part is dominated by the imposing and symbolic presence of the Cathedral Notre Dame de Chartres. While the Cathedral had always been the main focus of French heritage protection in the area, the emergence of wind power turned La Beauce into a central issue for the landscape administration. This paper is interested in how wind power made La Beauce emerge as a landscape for the French State. It is about re-inventing a visual landscape. We follow the administration at work and analyse the way in which wind power has forced civil servants to quit a perspective centred on the Cathedral, to experience in situ the presence of wind power and bring it into visual existence in planning through the language of sensation and experience. In doing so, we analyse the processes through which new forms and aesthetic codes emerge in landscape planning. The paper explores these issues by applying concepts drawn from STS to the process and the role of visualisation in planning. While addressing issues which are at the core of wind power planning, the paper is about the role of visualisation in planning and how landscape can be experienced and being made part of planning.
7. Media and Discourses on Energy I

- Energy resilience as the social control of technology, Audley Genus (Kingston University, UK)

Energy resilience is commonly stated to be one of the main goals of national energy policies. However the concept of energy resilience is not to be taken for granted and may be contested. The paper reconsiders the received notion of energy resilience by applying a discourse-institutional perspective to its analysis, rooted in fundamental concerns about the social control of (energy) technology. The paper draws on – and seeks to integrate – insights from the work of Collingridge on the social control of technology, Fairclough on critical discourse analysis, and Scott on neo-institutional theory. The contributions of the paper are to: (a). reconceptualise ‘energy resilience’; (b). identify the role of institutional rules in legitimating certain approaches to and framings of energy resilience and in inhibiting the design and widespread diffusion of flexible energy technologies; and (c). assert the role of language as underpinning such institutionalisation. The paper concludes with some reflections about how to enable better social control over energy technologies, connected with issues linked to the building of new institutions and discourses of energy resilience.

- Which future for adolescent renewables? Metaphors and Framing in the German Energiewende, Katherina Grashof (Freie Universität Berlin, Germany)

After the accident of Fukushima, Germany has intensified the transition to a renewable power system. While in 2011 all parties supported this choice strongly, 2013 sees a different picture. How to promote renewables has become a matter of fierce debate and many plead for a substantial revision of the renewables policy. The aim of a renewable energy system itself officially remains unchallenged among politicians and their policy advisors from academia. However, advocates from both communities argue that now that renewables have become “adult”, they need to “compete against each other” and to be “integrated into the market” to put an end to the present “unfair risk allocation”. The current policy is said to lead to an “uncontrollable growth” of renewables and an “explosion of costs”. George Lakoff, Walter Ötsch and others have shown how powerful framing can be in advancing political aims. And while framing is common in the public political argument, the paper will show how it can also be found in the scientific debate. The paper will analyse the underlying image of the Energiewende that politicians as well as scientists draw when talking about the future renewables policy. Which conceptions of the future energy system and the roles of renewable and conventional energy technologies can be detected? What action does the framing imply as necessary and legitimate, which solutions does it preclude?

- Solar energy in the news: national and local media coverage of a solar power plant in Alentejo, Luís Junqueira, Ana Horta, Ana Delicado & Mónica Truninger (ICS, University of Lisbon, Portugal)

At the time of its planning and construction, the solar photovoltaic power plant in Amareleja (Alentejo, south of Portugal) was the largest in the world. With 46 MW and 2,520 solar trackers, occupying 250ha, in a remote and deprived area of the country, it could not have failed to attract the media’s attention, drawing into the public eye the issue of renewable energies.

In fact, this solar power plant merited over 60 news articles in the main national newspapers and a much larger number in regional and local newspapers. But just as national media attention dwindled over time (with much larger power plants emerging in the US, China, Germany and other European countries), local newspapers maintain a regular coverage of what is still a dominant feature of the landscape and of the economic fabric of the municipality.
This presentation will strive to analyse the media representations of the solar power plant, identifying the relevant actors, the main issues covered, the positive and negative valuations, the points of contention but also of agreement. A comparison between national and local media coverage will also be attempted. This presentation stems from an on-going research project on renewable energies, funded by the Portuguese Foundation for Science and Technology (PTDC/CS-ECS/118877/2010) and carried out at the Institute of Social Sciences of the University of Lisbon, in cooperation with the University of Aveiro and the Centre for Research in Anthropology.
8. Innovation, Markets and Policy I

- The Social Construction of Energy in Contemporary Organisational Management, Murray Goulden (University of Nottingham, UK)

This talk will present early results from Creating the Energy for Change (C-TECH), a five-year EPSRC project to understand and implement energy reduction measures within workplaces. It will draw on ethnography and interviews within several public and private sector organisations, focusing on the management of energy at different levels of the organisational structure. The talk will recount a number of cases of difficulties in the organisational management of energy. In one, a strategy of rationalisation leads to the delocalisation of energy control for both individuals and lower tiers of the organisation, without reconstituting that control at higher levels. In another, those ‘energy actors’ given responsibility for it are excluded from strategic and practical decision making despite the consequences for both energy and the organisation. These actors’ ability to affect change is hampered by indifference by other departments who have distinct, sometimes contradictory goals. The talk will argue that the ‘wickedness’ of energy as a managerial problem stems from both the manner of its social construction, and its physical properties. The former includes conflicting representations of it as a relatively minor expense; an increasingly important environmental and public relations issue; a means to an end of comfort and convenience; but most importantly, as a consequence of planning outcomes rather than a determinant of them. The latter most obviously includes its ethereal nature, but also its potential lethality and the difficulties in transmitting and storing it. This argument will draw upon the design concept of affordances, being the properties of a thing that guides its utilisation, and the mirroring concept of affordance-lessness. The talk will consider how these properties play out in within the divergent rationalities, ambiguous goals, and local knowledge of organisational sub-cultures.

- The Role of Qualification in Shaping Demand and Innovation: The case of low temperature laundry, Jo Mylan (Institute of Innovation Research & Sustainable Consumption Institute, University of Manchester, UK)

While upstream energy technologies such as offshore wind, CCS, and nuclear remain important, policymakers increasingly recognise the importance of downstream consumers and households. In the UK, for instance, the Science and Innovation Strategy 2012 of DECC (Department of Energy and Climate Change) highlights that: “Understanding how people and communities might respond to things like the introduction of new energy technologies, electric vehicles or insulation programs is crucial to ensuring that our policies can be successful” (p. 40). This paper addresses this challenge, by examining the diffusion and appropriation of a domestic energy saving innovation of low temperature laundry. The case is particularly interesting because the innovation, initially promoted by detergent manufacturers, relies on changes to consumer practice associated with existing products (rather than uptake of novel products). While existing efforts have met with some success (according to DEFRA (2011) the number of UK consumers reporting low temperature washing rose from 2% in 2002 to 17% in 2007), the paper argues that diffusion is constrained by the meanings embedded in existing laundry practices, particularly links between temperature, cleanliness and hygiene. The paper uses a multi-method approach, drawing on data from interviews with actors across the laundry industry and a large-scale survey of consumer laundry habits. The paper explores the processes underpinning the diffusion and appropriation of low temperature laundry, from the perspective of both producers and consumers. The analysis draws on Callon’s (2002) idea of ‘qualification’ which conceptualizes the dynamic, interactive process through which products are attributed meaning within a market environment. While practice theory privileges consumers as the main actors in the creation of shared meanings, attention to processes of qualification highlights the role of firms in shaping consumer practices.
Technological niches in energy transitions: the case of wave energy, Margarida Fontes, Cristina Sousa & João Ferreira (LNEG - Laboratório Nacional de Energia e Geologia, DINAMICA-CET, Portugal)

This paper investigates the process of construction, development and transformation of the wave energy niche, in Portugal. The wave energy is a technological niche still in the formative stage. Thus, the technology and user specifications are still unstable and the technology-specific structures (actors, networks, and institutions) are still being created and aligned, but these processes are not taking place in isolation from the regime. Rather they involve substantial interaction with regime actors and institutions. Moreover, they also withstand the impacts of other (competing) energy niche innovations. Thus, wave energy offers an interesting setting to address some key questions raised by niche research: how protective spaces are created, maintained (or removed) over time; the dynamics of actors' coalitions formed around future expectations; the nature of the interplay between niche and regime (and also between competing niches), whereby developments taking place at both levels link-up and reinforce or slow down niche evolution, and eventually contribute to reconfigurations in niche (or regime) structures and practices. The paper presents some preliminary results of an on-going case study, where we: a) typify the current configuration of the niche at the light of the theoretical and empirical approaches to niches in the transitions literature; b) trace the process of niche emergence and its evolution over time, with particular emphasis on the nature of actors, the timing and conditions of their involvement and the functions they play; the real-life experiments that take place and resulting learning processes; the structure and evolution of the networks formed; the role of (changing) policies; c) attempt to identify key events and understand their impacts on niche trajectories. The analysis draws on documentary data and interviews with key actors. First results permit to highlight some salient aspects that confirm the non-linearity and interactive nature of niche trajectories.

New technology-intensive firms as conveyors of new energy technologies, Isabel Salavisa & Cristina Sousa (DINÂMIA'CET-IUL and ISCTE-IUL, Portugal)

This paper focuses on the functions played by new technology-intensive firms (NTIFs) in the process of developing research-based renewable energy technologies, and introducing them into the market, as well as on their interactions with other key actors. Our main assumption is that the introduction of new energy technologies is connected with the creation of a variety of small technology-intensive firms that are the conveyors of those technologies (Bergek et al, 2008; Hekkert and Negro, 2009). In fact, the exploitation of disruptive technologies requires new knowledge and entails a high degree of uncertainty, thus creating opportunities for new entrants (Brown et al, 2007). Recent literature on NTIFs stresses their heterogeneity, regarding the nature of knowledge, strategies and business models. The transition literature (Geels, 2004) mentions contrasting firms' strategies: engaging in alliances within the dominant regime; or developing new disruptive products and exploiting them in niches (Smith, 2009). Finally the literature shows that new energy technologies have distinct levels of maturity and market acceptance, implying different levels of opportunity for new firms (Hockerts and Wüstenhagen, 2010). These sources of heterogeneity suggest that we will find a variety of strategies. We adopt a framework that combines macro-level approaches to regime transition, with micro-level approaches. Using a case study method, we addressed the development of new technologies in a
sample of Portuguese NTIFs. Based on the detailed information obtained, the analysis of the cases permitted to identify: 1) the main opportunities and barriers faced by the companies; 2) the existence of distinct behaviour patterns according to several main dimensions: the relations with research organizations; technology strategies; business models, including the exploration of niches and the alliances with other firms; access to external resources, through networking; international relationships; 3) the impact of the recent turn in public policy on NTIFs.
9. Media and Discourses on Energy II

- (Re)-framing nuclear power in British parliamentary debates: the use of science in justification discourses, Lucie De Carvalho (Université la Sorbonne Nouvelle-Paris 3, France)

Since 2006 British political debates over nuclear power have been rekindled within a general context which - in terms of economic, political and geopolitical factors and goals - seems relatively similar to that of the previous British nuclear programme of the 1980s. The two ventures have had different outcomes however, since the previous programme was subsequently abandoned, while the 2013 Energy Bill supporting the current new nuclear-build programme is on the verge of being voted in Parliament. Even though a wide gap often exists between the discursive description of a policy and its actual implementation, it is worth exploring on which grounds such a technological choice is publicly defended and legitimized. If one considers that discursive framing allows for underlying values and assumptions to surface within a set socio-cultural framework (Howarth and Griggs 2012), we argue that a rhetorical shift helps to account for the success of the current nuclear programme. Using a quantitative and qualitative approach based on critical discourse analysis on a corpus of British parliamentary debates over nuclear power between 1980 and 2011, the purpose of this paper will be to show how the way scientific expertise and data are invoked and harnessed, notably changed between the two periods. More specifically, while nuclear power was first enshrined within a rather strong positivist narrative in the 1980s, the use of science enabled recent discourses propounding nuclear power to present this controversial technology as an acceptable and necessary evil by framing it within the wider debate over climate change and sustainable development. We also argue that this shift in values which could be embodied by the notion of ecological turn represents a more significant change in paradigm for British energy policies as a whole, also reflecting how politicians define the societal ideal the British nation should be headed for.

- The end of the nuclear renaissance in Europe? Post-Fukushima media debates in Finland, France and the UK, Markku Lehtonen (Ifris, Université Paris-Est Marne-la-Vallée, France & SPRU, University of Sussex, UK)

This paper examines the repercussions of the Fukushima accident to nuclear policy, industry and public debate in three countries at the forefront of the presumed “nuclear renaissance” prior to Fukushima: Finland, France, and the UK. The post-Fukushima public debates and their interaction with nuclear policies are examined against the context of the historically developed institutions and cultural and political orientations in the three countries. Building on our earlier research (Teräväinen et al. 2010), and drawing on the concepts of techno-political regimes (Hecht 1998), techno-political cultures (Felt & Müller 2011), and ‘state orientations’ (Dryzek et al. 2002), the paper critically examines the continued explanatory power of country-specificities and contributes to comparative inter-cultural analysis on the role of major disasters in provoking rupture and enhancing continuity. The empirical analysis focuses on argumentation and reporting on post-Fukushima nuclear debates in the main national daily newspapers, with emphasis on 1) the varying framings and perceptions of the risks of nuclear power, and 2) the roles of the state, the market, the expert, and the citizens in nuclear policy. The concrete factors explaining the partly contrasting policy and media reactions to Fukushima in the three countries – the “business-as-usual” approach in Finland and the UK, as opposed to the very lively political debate on the future of nuclear in France – include the weight of nuclear industry in the national economy and politics, public trust in state institutions and experts, and the perceived transparency of decision-making. The fluidity and dynamism of the country-specificities is manifest in the trends towards greater emphasis on economics and transparency in France, the gradual decline of “market fundamentalism” in the UK, and the first signs of erosion of trust among Finns in experts, state authorities and the nuclear industry. References
• Nuclear power in parliamentary debates in Portugal: Promise or risk?, Tiago Santos Pereira, António Carvalho & Paulo Fonseca (Centre for Social Studies, University of Coimbra, Portugal)

Public and political reasoning about the use of nuclear energy has been a classic and fertile ground for the study of sociotechnical controversies. Distinct empirical analyses about nuclear technology systems have supported the development of conceptual frameworks relevant to the understanding of the intertwining performances of civic movements, political discourses and government decisions regarding massive technological projects. In the context of a wider project on the coproduction of society and technology through the development of nuclear technologies and knowledge in Portugal, we explore how parliamentary debates reflected political visions on nuclear energy and related controversies in Portuguese society. The analysis extends throughout the dictatorial regime of the New State (from the beginning of the nuclear program in the 1951 until the 1974 revolution) and the democratic period (post-1974). The country, an early exporter of uranium minerals, significantly invested in the development of a national capacity in nuclear research but eventually never developed an endogenous nuclear power infrastructure. Through the analysis of parliamentary debates we intend to contribute to characterize the dynamic evolution of the Portuguese sociotechnical imaginary about nuclear energy and nuclear technology, and its image as a promise of a technological Nation or as a major example of socio-technical risks.

• Between hope and fear: twofold analysis of media coverage of fusion and fission energy, Ana Horta, Luísa Schmidt & Sérgio Pereira (ICS, University of Lisbon, Portugal)

Fusion is a new form of nuclear energy production technology currently being researched. Despite scientific and technical challenges that need to be overcome, it is expected to develop into a sustainable solution to power needs in the future. Contrarily to fission it is considered to be safer and cleaner than traditional nuclear energy.

As nuclear energy (fission) became highly controversial in public opinion around the world due to its environmental, health and military use risks, it is interesting to find out how this new technology, still under development and marked by uncertainties, is being publicly framed, especially after the anxiety reawaken by the recent accidents in the Japanese nuclear reactors of Fukushima.

This paper presents results from a research project funded by the European Fusion Development Agreement (EFDA) and consists in an international comparison of media coverage of fusion and fission energy in three countries (Germany, Spain and Portugal) and in English language newspapers that address transnational elite, from 2008 to 2012. Results show a substantial difference in fusion and fission framing: the first one being generally favourable, presented mostly as scientific research accomplishments towards a new source of clean, safe and unlimited energy. Nuclear energy, instead, and especially after the Fukushima accident (March 2011), is presented negatively and related to accidents, energy policy, risk management and military use. These results suggest, on one side, that support to fusion is influenced by science and technology beliefs towards a
technology in its early stage of development; on the other side, the consolidation of a strong interpretative frame relating nuclear energy to risk and negative impacts.
10. Innovation, Markets and Policy II

- **A Social Study of Electric Mobility Projects: Innovation, Consumption and Market**, Frédéric Vidal (CRIA, Portugal) & Luísa Veloso (CIES-ISCTE, Portugal)

This paper aims at discussing the social construction and reception of a research project on electric mobility in Portugal. Since the early 21st Century, MobiE project has mobilized a wide set of actors: industrial companies, laboratories, universities and public organizations (at local, regional and national levels). This project of industrial policy has aimed to promote solutions of electric mobility, focusing, in particular, in intelligent systems of managing and charging of electric vehicles. It was constituted in 2009, a consortium of companies and an excellence and innovation centre managed by a State-owned company. The pilot project finished in 2011 and a set of other and independent R&D projects were developed by the companies, in other consortia where national and international research centers are partners. Research project in S&T can be an outlook to scrutinize the social dimension of R&D activities (Graber 2011). This approach helps to stress the collective dimension of R&D activities and the diversity of the social actors involved in these activities. Furthermore, electrical car has been a fascinating case study for the social study of S&T (Ivory Genus 2010; Garçon 2003; Schiffer 1994). In fact, key issues for research and innovation in this field are technical characteristics of the vehicle, but also social universe in which the vehicle would function (Callon, 1986). This paper offers content analysis of discourses on electric motility, based on media coverage (popular and technical publication) and interviews of actors involved in MobiE project. It focuses on the social context of production, diffusion and uses of the innovation. It concludes that technological innovation for electrical mobility is somehow restricted according to the actors. Innovation is more connected to the construction of socio-technical networks (access to technology; distribution through urban spaces; mode of consumption) and to the capacity of putting the product in the market.

- **The construction of a collective energy-system**, Jens Petter Johansen & Jens Røyrvik (NTNU, Norway)

Although it is proven that systems for integrating energy flows of different businesses are technically possible, economically profitable and environmentally sound – few such systems are actually realized in Norway. This paper shows that there are other aspects that should be taken in to consideration, and argues that such infrastructures should be understood as sociotechnical, thus what we call collective energy systems. The paper is based on a case study of a regional cluster in Norway; Kviamarka, where the businesses have successfully integrated their energy flows. The surplus heat, cooling-water and CO2 output that are byproducts by some of the companies in the cluster, are utilized by the other ones making the cluster more energy-efficient. This paper discusses how such integration of companies’ energy-flows involves a material and structural bridging of the companies, and focus on the mutual trust and interdependence of the actors in order to establish and maintain a collective energy system. This implicates a need for knowledge sharing, negotiation of new roles and emergence of interdependence. By studying the creation of the energy system, it becomes clear that this sociotechnical system is constructed of more than technological artifacts. Focusing on the construction, in a Latourian sense, the paper shows how political regulations, interpersonal relations, trust, available technology and competence as well as the consequences for integrating companies, must be understood to explain the creation of a collective energy system. A sociotechnical understanding of energy-systems has political implications for what should be the incentives to drive the development for more interconnected energy flows between companies. While the current incentive systems in Norway focuses on economic compensation, we suggest that the issues of interdependence and role negotiations, interpersonal trust and knowledge sharing must be taken into account to facilitate more sustainable industry clusters.

Energy markets, taxation and regulation in Britain are dealt with by the UK Government, with limited powers for the devolved administrations of Wales and Scotland. The UK also has a highly centralised energy system, structured around large scale high-carbon electricity generation and a gas grid. Recent low carbon energy policy has however positioned district heating as one means of reducing greenhouse gas emissions, ensuring security of supply (by reducing primary energy consumption and building in source flexibility), and mitigating volatile and rising energy costs. This established technology has been little used historically in the UK and there are significant obstacles to its development in the present liberalised energy market. Notably, payback periods for district heating investment are long term, requiring commensurately long term commitments of local actors willing to accept modest rates of return. Where district heating is common, particularly in Scandinavia, development has relied on the capacity of local government to mobilise finance and broker agreement among local actors to enter into long-term mutual interdependencies. In the UK, by contrast, local government, which historically has had limited fiscal discretion, has been further weakened by recent neo-liberal reforms. These have dispersed delivery of services and infrastructure across a range of organisations (themselves operating over various spatial scales) and re-oriented local government to an enabling role for other organisations. There is moreover no established market for heat (as opposed to gas) and existing DH provision is unregulated. This paper examines the ways in which some leading English and Scottish local authorities are seeking to devise distinctive socio-technical solutions to these challenges. It focuses particularly on emerging distinctions between heat policy and practices in Scotland and England, and the ambiguous position of heat provision in the UK energy system. The consequences for interactions between local and national government in policy development and resource mobilisation in the two countries are compared. Drawing on in-depth case study material, participation in local authority networks and engagement with policy makers in England and Scotland, we ask to what extent differences in central / local government relations (simplistically characterised as more coordinated in Scotland and competitive in England) are likely to have consequences for investment in, and configuration of, district heating.

Lessons from the adoption of wind energy in Portugal: formation of local absorptive capacity and legitimacy, Nuno Bento & Margarida Fontes (DINÂMIA'CET, ISCTE-IUL, Portugal)

The spatial diffusion of sustainable innovations and the importance of local absorptive capacity in early adoption are studied through the comparison of the diffusion of wind energy in Denmark and Portugal. The novelty of this research consists in revealing patterns of spatial diffusion and technology up-scaling, and explaining them with the help of concepts issued from the sustainability transitions literature. In particular, the technological innovation systems approach and the actor-oriented analysis focusing on the role of organizations and networks for the emerging innovation systems. An acceleration of diffusion of wind technologies was found to have occurred in Portugal. The analysis permitted to identify some key drivers of this process. In a first exploratory stage, science & technology policies emerged as initial “motor” of change supporting the fulfilment of critical functions of the innovation system (providing legitimation, and direction of search, enabling resource mobilization, knowledge development and experimentation). The formation of expectations attracted key actors whose involvement/advocacy provided additional resources and legitimacy and accelerated technological development and market formation. However, this acceleration can be partly explained by a strategy that combined partnership-based technology transfer of state-of-the-art technology from “core” countries (involving companies and international manufacturers) and local absorptive capacity that permitted to assimilate transferred knowledge and integrate it with local competences. In early stages, public acceptance was fostered by policies (e.g. a mandatory contribution to municipalities corresponding to 2.5% of wind farms gross income). Nevertheless, there are raising signs of contestation as more wind turbines are
installed with environmental impacts and electricity prices increase to compensate for tariff deficits partly attributed to generous feed-in tariffs. The analysis of these processes can help to improve the design of strategies that can be subsequently deployed to foster local adoption of low carbon innovations.

- From promise to problem. Making Photovoltaic Happen in France, Béatrice Cointe (Centre International de Recherche sur l’Environnement et le Développement, France)

My contribution will focus on the efforts to create a market for photovoltaic in France since the mid-2000s. The emergence of grid-connected photovoltaic as a technology for electricity production is a fairly recent one, as it started in the early 2000s. However, over the last decade, the PV economy underwent dramatic changes: installed capacity increasingly exponentially, a global market dominated by China developed, incentive schemes throughout Europe were seriously reconsidered. French PV went through a political crisis similar in many ways to those that occurred in other European countries (Germany, Italy, UK…). The emerging French PV sector, or what is left of it, is currently standing in the midst of both political and market uncertainties – a radical change if we consider that, only four years ago, it was enjoying a rapid growth fuelled by political incentives. To better understand these changes, I will focus on the evolution of the economic instruments used to support PV deployment, chiefly feed-in tariffs. Taking an STS perspective on market creation devices, and paying particular attention to the overflowings and matters of concerns they can trigger, I will study the gradual transformations of incentives as the market they were supporting grew. To this end, I will start from early debates on the design of economic instruments for the support of renewable electricity in Europe, and retrace their development “in-the-wild” in the French case. I will pay specific attention to the co-production of markets framings, politics, and technologies as I will try to understand the shift from PV as a promise still far from fulfilment to PV as an actual, material and political problem.
11. Users, Practices and Technologies

- *The social construction of heating and cooling practices*, Susana Fonseca (ISCTE, Portugal)

For decades energy has been considered a central element of political strategies, public speeches, a driver for innovation and technology development (not only by trying to find more sustainable sources of energy, but also by trying to increase efficiency of its use). This conference aims at discussing how it is possible to design cities for people and for the planet, combining the needs and expectations of human beings with the constraints posed by the need to make every action sustainable in the short and in the long run. With the present short paper our aim is to highlight how important the design moment is to balance sustainability and human needs. For over four decades human behaviour or as we prefer in our research field, social practices, have been understood as a “non-technical” barrier to a more energy efficient society. A set of tools have been thought of, included in public policies and implemented in a concerted effort to help agents to follow the right path and to assume practices that are widely considered, among political and technical arenas, as rational. Although such an approach has had some difficulties in achieving the expected results, justifications for the failure are usually associated with the mix of measures taken and not as a proof that something is wrong with the initial approach. Using data from in depth interviews to families and energy experts, we try to highlight how building regulations, technology developments and the generalization of access to artificial indoor temperatures may result in increased energy consumption and the disappearance of traditional practices, by creating new needs and a new concept of “normal temperature”.

- *Governing the practices of energy use? The Norwegian policy debate on smart electricity meters*, Tomas Moe Skjølsvold (Norwegian University of Science and Technology, Norway)

The need to change energy consumption practices and energy production regimes raises many questions suitable for analysis by STS scholars. This paper deals with a ten-year long policy debate in Norway, where the question was whether or not it should be mandatory to install so-called smart electricity meters. The result was a principal decision in 2008 stating that by 2013 (later pushed back to 2019) all households should have this technology installed. I study controversies in this debate, and particularly the role of competing visions of the future. An important aspect in the deliberations is the role of individuals and households in energy transitions, and the links between individual change and societal changes. On the one hand many believe that an infrastructure of smart electricity metering will enable households to make more “rational” decisions in the electricity market. This will translate into a future where there is less need to expand production and transfer capacity which will be positive in both climatic and economic perspectives. On the other hand many actors raise questions about the assumptions that go into this reasoning. How do we know that installing 2.3 million advanced electricity meters will lead to the desired individual changes in practice and the aggregate outcome that we want on a societal scale? From decades of studies in STS we certainly know that inscriptions and intended ways of technology use are often met with competition and anti-scripts. Mandatory installations of “smart” meters entail governance on two levels. First, it is an attempt to steer a technology development trajectory in a desired direction, and secondly it is an attempt to alter the practices of electricity consumers. The paper looks at how such issues are dealt with in the 10-year long discussion.

- *A multi-level approach to energy options across EU: The role of supra-national governance, values and trust*, Carla Mouro, Paula Castro, Nicole Kronberger & Patrícia Duarte (CIS-ISCTE, Portugal)

The European Union (EU) sustainability policy has in the last decades directed several efforts to promote sustainable forms of energy production. This topic brings together environmental concerns and technological
innovation, two domains traditionally seen as opposite. To help understand how the publics mobilize for this debate, we examined the Science & Technology (S&T) and Public Understanding of Science (PUS) 2010 Eurobarometer resorting to a multi-level approach. We examined the role of both cultural aspects, like worldviews and institutional trust, and country-level distinctions, namely the stage of accession to EU. Results show that support for both solar and nuclear technologies are (positively) predicted mainly by institutional trust. Moreover, egalitarians and those who prefer the lifestyle change solution for climate change are the ones more supportive of solar energy and less supportive of nuclear energy. Active involvement in S&T and Environmental matters is mostly dependent on the level of awareness about environmental problems, but is also related to believing that technology will provide inexhaustible resources. At the contextual-level, we found that newer EU member-states are less supportive of solar energy, more supportive of nuclear energy and less actively engaged in civic participation than older EU member-states. The findings highlight the intricate liaison between environmental and technological matters in the public debate about energy production and bring to the fore the relevance of legal innovation as determinant of value change.

- **The enrolment of consumers in smart grids**, Greg Wallenborn (Université Libre de Bruxelles, Belgium)

Smart metering, dynamic prices, flexibility, demand response, active consumers, smart appliances... All this terms have been recently linked to “smart grids” and mark the possible advent of consumer engagement into grid management. However, nobody knows how smart grids will be shaped as different actors strive to translate their interests into materialised devices (e.g. smart meters, electrical vehicles) and while many smart grid pilots are being developed all over the world. Consumers and prosumers are one of the main unknowns of smart grid future. They are often considered as important actors, or co-managers of the grid although it is not clear how this “material participation” (Marres 2012) would occur. Do smart grids require smart and reactive users or, on the contrary, passive users who would delegate decisions to technology? Through the cases of smart metering (SM) and demand response (DR), I aim at analyzing the different roles that users are supposed to play within smart grids SM is a two-way communication system between consumers and the grid. In analyzing SM with practice theory (Shove et al. 2012) I show that 1) the recruitment of users into pilots is a tricky process, revealed by different controversies; 2) feedback on consumption does not lead to energy savings, unless display devices are integrated into preexisting practices. DR refers to different actions that can be taken by consumers to modify their electricity usage in response to a signal that reflects special conditions within the electricity system (such as high prices or risk of grid congestion). DR exhibits the uncertainty about “who should do what and when”. In examining DR pilots and tools, I show that 1) actions have to be understood as distributed agency between humans and appliances; 2) the evolution of practices and electricity usage depends on the power attributed to consumers within distinct disciplinary frameworks (economics, engineering, sociology, ...). I conclude that smart grid development offers the opportunity to carry out STS experiments that perform coevolution between practices and infrastructures. In the perspective of increasing intermittent sources of electricity, we can view SM and DR as the beginning of a deeper involvement of consumers in grid activities. Other scenarios however have to be developed to understand what engagement could mean.

- **Key socio-economic elements to energy poverty in the ‘developed’ world: the case of Spain**, Iván Lopez (University Carlos III of Madrid, Spain) & Javier García Breva (Fundación Renovables, Spain)

Energy poverty is the inability of a household to meet a minimum amount of energy services for basic needs, such as keeping the house under conditions of climate suitable for health (18-20 °C in winter and 25 °C in summer). The causes of this energy insecurity are diverse: low household income, poor quality housing, high energy prices, and high housing prices, among others. Its consequences on welfare are also varied: inadequate
housing temperatures, incidence on physical and mental health (including nursing premature mortality), risk of debt and disconnection of supply, damage to buildings, waste of energy, emissions... Energy poverty has been an issued studied mainly for ‘undeveloped’ countries, but barely for ‘developed’ countries. Recently, the European Economic and Social Committee in 2011 adopted a statement on "Energy poverty in the context of liberalization and the economic crisis" (Official Journal of the European Union of February 11, 2011). The proposal was to take into account energy poverty when developing any proposed energy policy, and it is claimed that, considering it a new social priority that needs support at all levels, to improve building energy efficiency is a key issue to address energy poverty. In Spain, although statistics indicate that 10% of the Spanish population is unable to maintain their housing with a suitable temperature for the cold months (Survey of Living Conditions 2007 - National Institute of Statistics), it has not yet been made a complete study on energy poverty. This paper aims to identify the key socio-economic elements of poverty energy in Spain, as a relevant approach for other European countries as well.