SHAPE ENERGY 'Research Design Challenge': Control, Change and Capacity-Building in Energy Systems

CHALLENGE A: Control

She's lost control again: A case study on localised energy production in Orkney

Authors:
Smedberg, A.; Light, A.

Countries covered: Sweden, UK

Disciplines: Design, STS

Abstract:
We propose to investigate how to address problems of control in energy production within the complex socio-material infrastructures that surround energy production and consumption.

On the Orkney Islands, in the Highlands and Islands region of Scotland, energy has been a subject of long-standing controversies, intermingled with questions of democracy, technology, and social growth. Between the years of 2000 and 2015, Scotland issued a wave of renewable energy production initiatives. Prior to the initiatives, there was, in Orkney, a shortage of jobs; an increasing generation gap; a trend of islanders leaving their home for the mainland; and a severe case of fuel poverty - one of the worst in the UK at the time. The fuel poverty was a result of the sparse connections to the islands made by the national grid, and the high prices of transporting electricity to the remote location. In combination with the island's suffering economy - with increasing unemployment and a lack of conventionally skilled labour on the islands - the Scottish Government saw an acute need to introduce new industries to Orkney to boost its economy. Coinciding with the Scottish Government's 2020 vision for renewable energy in Scotland, it was deemed that energy generation on the islands would create new jobs locally, benefit the national industry, and provide a more sustainable alternative to conventional energy generation. In fact, the change in legislation not only opened up the opportunity to produce local energy on the islands, it also - unsought - offered myriad locally sourced solutions to energy-tied issues, such as local models of energy storage. Until 2015, when the policies were reversed.

Our team of two researchers from Sweden and the UK (reflecting the cultural DNA of the Orkneys) wishes to investigate how the geopolitical complexities in Orkney could inform a shift in the control of energy production and consumption towards one which is locally situated but globally aware. We intend to visit Orkney's mainland and trace the aftermath of the renewables energy projects from the time when the initiative became reformed in 2015, and apply Bateson's three tier model for analysing complex issues (Bateson, 1978.; Star and Ruhleder, 1996) to our findings.

Reconciling qualitative and quantitative storytelling in just energy decisionmaking: New scenarios for a new energetic metabolism

Authors:
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Countries covered: Sweden, Spain

Disciplines: STS, Future Studies, Scenario Planning

Abstract

Energy transformation is more than a just hardware problem to be solved withtechnical solutions. Although there is a strong need for energy studies from a SSHperspective to seek alternative futures; social scientists also need not be afraid ofcrunching numbers when backing their storylines with quantitative narratives.Therefore, this research design challenge proposal aims at mending the gap betweenthe qualitative and quantitative dimensions by studying energy transformations from atrans-disciplinary perspective. In doing so, it aims at addressing the research question:"What bottlenecks and opportunities arise from a transdisciplinary study of energyfutures?". Navigating across the disciplines can contribute to the debate on what kindof energy futures we want, for whom and who will bear the burden and reap thebenefit. Thus, we argue for a holistic, qualitative and quantitative storytelling onenergy futures by giving meaning to narratives and attaching storylines to facts from amulti-disciplinary perspective.In addressing the societal experimentation dimension of energy transitions(Challenge B), our first proposed methodology is the energy futures/narratives workbuilt on scientifically robust but equally creative and participatory scenario analysis.Alternative energy narratives could both employ forecasting and backcasting methodsby stitching local, regional, national and global scales. In Peter Schwartz's wordsscenarios provide us with "a set of organised ways for us to dream effectively aboutour own future". By reflecting on our plausible, potential and/or possible futures,scenario studies can reveal either exploratory or anticipatory glances for desired ornon-desired energy futures. In qualitative energy scenarios, this takes the shape ofstorylines (ie. similar to shared socio-economic pathways - SSPs- used by IPCC).Our second methodology is the approach of societal metabolism. It is a methodgaining popularity due to its communicative power from the metabolism metaphor aswell as its potential in terms of backing up energy narratives with a quantitativestorytelling strength. Societies metabolise energy and materials to remain operational.Similar to the metabolism of human bodies, societies as well, exert their ownmetabolic needs in terms of energy, water and materials throughput to sustain theirexistence and to carry out basic and required functions. Methodologically, in terms ofapproaching energy futures, this approach helps to map distinctive energy flows bytype (electricity, fuels, heat) into the different socio-economic sectors of economiesand by doing so, one can answer questions such as energy from where, in which form,for which socio-economic sector and for what kind of development?In synthesizing the literature on these qualitative and quantitative energystorytelling, our key aim is to reconcile the gap between ecological economics andsocial sciences and humanities.

Stability and Change in Energy Systems:Islands of innovation in the UK, Czech Republic and France

Authors:
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Countries covered: France, Czech Republic

Disciplines: Economics, Business, Politics, Law

Abstract
The deployment of new energy technologies, due to the colossal capital it assumes and / or theirdecentralized character, is accompanied by the emergence of new collectives (consortium ofindustrialists, territorial networks, etc.). Among them, there is a growing number of collaborationsbetween citizen organizations like energy cooperatives and local authorities like cities. Following this,our research project would like to fill two research gaps by asking two questions:1. What are the forms of collaborations and the role for each stakeholder?2. Do the collaborations between municipalities and citizen groups develop new practices andapproaches of energy?To deal with the first question, the four modes of local governing identified by Bulkeley and Kernare starting points of our research. A key issue lies here in the potential of the collaborations tobroaden and change these existing roles. Through the second question, we will analyze ifcollaborations between community groups and municipalities can create global energy approaches.Several scholars (Seyfang, Park, and Smith, 2013, Forman, 2014, Martiskainen, 2017) show that asignificant number of community energy projects in the United Kingdom use the benefits of energyproduction to finance actions against fuel poverty. In Denmark, several district heating co-operativessuch as Ebo or Hvidovre Fjernvarme combine production and energy-saving actions.However, new investigations are needed to assess whether collaborations between local public bodies and citizen groups develop such approaches and also to what extent is this true in the CEE region (theCzech Republic).The social sciences have focused on describing the motivations of those involved in suchexperiments such as energy autonomy (Dobigny 2016, Bauwens, Gotchev, Holstenkamp, 2015,Oteman, Wiering, Helderman, 2014), local economic development (Walker, 2013, Nadaï Labussière,Debourdeau, Regnier, Cointe, Dobigny, 2015), or describe the type of collaborations between citizensand local authorities (Fudge, Peters and Woodman, 2016). However, we assume that there are twogaps in this literature that we would like to fill. The first gap is that citizens' and municipalities initiatives to produce energy are still largely addressed in isolation. As a result, energy researchprojects remain relatively narrow-focused. However, the combination of these activities is becominga growing concern of the European institutions, as suggested by reports such as Prosumer Energyand Prosumer Power Cooperatives: Opportunities and challenges in the EU countries published by theEuropean Commission in October 2016. The second gap is that scholars mainly describe thecollaborations between public bodies and community but tend to neglect questions such as roles ofcitizens and authorities.

CHALLENGE B: Stability & Change

The role of community energy in shifting energy landscapes: exploring multi-scalar networks of stability and change

Authors:
Hobson, K.; Eadson, W.; Aiken, G.; Dinnie, L.

Countries covered:UK, Luxembourg

Disciplines: Environmental Politics,Social Policy,Human Geography,Sociology

Abstract

Across Europe, energy landscapes have, in recent years, been the subject of significant socio-political interventions that cut across scales of action and include a wide array of stakeholders e.g. from innovations in market mechanisms and regulations (so-called 'top down' approaches) to the growth in off-grid and domestic 'prosumers' of energy (so-called 'bottom up' approaches). The result is a still-shifting complex of supply and demand networks, where once centralised grid systems are recalibrating into inter-linked nodes, with varying socio-economic and geographical penetration, both within European countries and across the EU as a whole.

Key components of these networks are 'local' or 'community' energy projects and programmes, which have allegedly flourished in recent years. In countries such as the UK, estimates have up to 5000 groups, and this field has been the subject of notable political attention. This is evidenced through, for example, the publication of the 2014 Community Energy Strategy, which followed up on various streams of funding for pilot projects e.g. Low Carbon Communities Challenge, as well as the Big Green Challenge (funded by the innovation charity, Nesta). Hopes are high for innovative, low-carbon forms of localised energy generation and consumption to play a significant role in the transition to more sustainable energy systems. For example, the now-defunct UK Department of Energy and Climate Change outlined how community energy groups have a part to play in 'the global race to decarbonise our society'; increasing energy security; the creation of 'green growth and green jobs'; and helping people struggling with energy bills (DECC, 2014; 2015). Advocates and practitioners likewise have high hopes, although arguably advocate localisation of a different flavour (see Hobson et al 2016) e.g.:

'By placing democratic control, shared benefits and active participation at the centre of energy generation and demand reduction projects, community energy can create a foundation for the step change in the action needed to reduce the impact of climate change and to increase our energy security' (http://communityenergyengland.org).

Research and researchers are also playing an active role, charting and debating the motives, successes and failures, and thus the socio-political and environmental impact, of such initiatives. Research has examined, for example, individual and household changes in attitudes and practices as a result of involvement in localised renewable energy supply (e.g. Rogers et al., 2012). However—as the quote above underscores—aspirations for community energy over-spill the mere collation of individual / household level changes in energy use, form, and demand, aiming as well to impact the political, normative and socio-economic contexts that energy supply and demand sits within, and in turn, is integral to shaping. The

research challenge identified in this proposal is the socio-environmental influence of community energy projects on current energy landscapes.

Feeding back or feeding forward? A new lens into building energy use

Authors:
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Countries covered: UK, Poland

Disciplines: built environment energy evaluation research

Abstract
What changes and what remains stable when feeding back building(s) energy use to its users, designers, contractors or institutional clients? Building performance evaluations of both existing and new buildings across the EU have tended to reveal the at times vast difference between the predicted and actual energy use (De Wilde 2014, Palmer et al., 2016). Buildings contribute in some EU states to almost 40% of overall energy use with developing countries within and outside the EU showing an alarming percentage growth expected with rapid global urbanisation (IEA 2016). Whilst some of research community addresses the problem by making better ways to predict (Oliveira et al., 2017), others suggest solutions lie in more effective construction, operation and feedback of a building's energy use (Baborska-Narozny et al., 2016).

Developing energy feedback strategies such as metering, displays, certification and billing is viewed as a key approach to changing energy-use behaviour and reducing demand (Bull and Yanda 2017). The focus has tended to be, however, on the end user, with little mention of how designers (architects, planners, engineers and builders amongst others) respond to feedback derived from building performance studies. In addition, we know little of how those who design buildings and those who use them respond through action or inaction (similarly or differently) to any feedback strategies. What changes and what remains stable? Feedback is suggested to enable an assessment of the problem and encourage better practice and learning, but does it?

How is feedback approached and actioned if at all by different actors who conceive a design and use its output? What logics guide the process of change and how does stability occur? The study draws on concepts from institutional theory, which emphasizes the role of socio-cultural factors in legitimating taken-for-granted behaviours, rules, conventions and attitudes (Thornton et al 2015). Whilst institutional theory contains a wide range of conceptual variants, its prevailing premise is in enabling an understanding of how meanings shift and become taken for granted and institutionalized (Selznick 1949). The key idea behind institutional logics in particular is that much organizational action reflects a pattern of doing things that evolves over time and becomes legitimated within an organization or domain (Jepperson 1991).

The purpose of this study is to explore the questions by drawing together institutional theorists working in the wider field of sustainable development across organizational and

institutional domains and researchers in the built environment concerned with understanding building energy use and demand. Too frequently these research domains have tended to work in isolation, publishing and presenting in divergent academic channels.

Envisaging the unintended social consequences of a transition from fossil fuel based toelectric and electronic mobility

Authors:
Wagner, A.; Lis, A.; Ruzzenenti, F.; Walnum, H.J.

Countries covered: Poland, Italy, Norway

Disciplines: Energy Economics, Sociology, Social Anthropology, Engineering &Sciences

Abstract
This project will investigate the unintended consequences of a transition from a fossilfuelled to an electric mobility analysing two case studies:Norway, where electric cars are spreading faster than any other country in the world (23% ofsales) and Poland, where the internal combustion engine is still dominant in the people'simagination.

Research questions:
- How are the unintended consequences of electromobility imagined andconceptualized by different social actors and by different configurations of them inparticular socio-technical systems?
- What are the institutional responses co-producing technological development in thiscase?
- What are the mechanisms of dealing with uncertainty?
- What roles do state and bottom-up initiatives play in the process of transformation toelectromobility?

Concept: Among the uncountable aspects that have been deeply affected by oil one of themost relevant is transportation. Private mobility is essentially the result of internalcombustion which is bonded to liquid fuels if it is to work efficiently and economically. Indeed,the unstoppable progress of efficiency in transports has caused dramatic changes in oursociety.Rationale: electric cars are currently prompted as a solution to lead private mobility out of itslongstanding dependency on oil. However, aside from the technical and thermodynamicshortfalls, few consider the unintended consequences of electromobility on society. Twomain consequences of the introduction of mass e-vehicles are very often underestimated forthey possible implications on social practices: the predictable, significant reduction intransport costs and the envisaged advent of automatization. Both phenomena compete tocreate the condition for a large rebound effect which could not only lead to a dramaticincrease in energy use, but also to a structural change in driving behaviours, withunpredictable consequences on the structure of society itself. What will our society look likewhen private mobility will not be curbed by high fuel costs, nor by organic boundaries, suchas the circadian time?The importance of collective imaginaries for structuring social life has recently beenunderlined through concepts of social expectations, anticipations and narrations on thefuture1. A mutual relation between techno-scientific practices and

sociotechnical imaginarieshave been highlighted2. Culturally determined future expectations and public forms ofreasoning shape practices and policies of science and innovation. It's an important factor of thedynamics of stability and change.

Learning from past and current energy transitions to build sustainable and resilient energy futures: lessons from Ireland and The Gambia

Authors:
Greene, M.; Schiffer, A.

Countries covered: Ireland, UK

Disciplines: Human Geography, Design

Abstract
How do everyday energy practices intersect with processes of socio-technical change?In the context of the predominant neoliberal approach to development, energy policies in both industrialised and developing countries have been predominantly techno-centric in nature. However, it is increasingly recognised that energy is not just a technical but also a deeply social issue (Shove and Walker, 2014). Most research on energy systems change conducted over extended socio-historical timescales has centred on a macro-level systems scale of analysis. For example, transition theories, such the Multi-Level Perspective (MLP) (Geels and Schot, 2017, Grin et al., 2010), have gained considerable traction within sustainable development literature over the past few decades. However, much less work has explored the lived experience of system change and more specifically the dynamics in energy transitions from contextually situated, experiential perspectives. As a result, energy policies and associated institutions have been largely removed from the lived experiences, challenges and opportunities people face in their daily lives leading to the following research question: How do everyday energy practices intersect with processes of socio-technical change?

Within a techno-centric paradigm, policy-influential approaches to change (Challenge B) arguably fail to consider the complex human dimension that delimits people's intersection with energy. Without human insight, top down approaches to energy transitions may for example exacerbate local inequalities by excluding large parts of society from the benefits commonly associated with change such as energy access delivery (Schiffer, 2016). Therefore, context specific knowledge that includes a focus on how processes of social differentiation, power and capability as well as spatial and temporal (e.g. biographic, seasonal) factors impact on people's relationship with the energy system is crucial (Greene and Rau, 2016, Greene, 2017). Whether change is aimed at delivering or improving energy access or stimulating reductions in the resource intensity of lifestyles, a lack of realistic insight into human needs and aspirations obscures understanding of the lived experience of stability and change (Bhushan & Kumar, 2012: iv).

How can institutional change in complex socio-technical systems be guided by an analysis of underlying values?

Authors:
Märker, C.; Milchram, Chr.

Countries covered: Germany, The Netherlands

Disciplines: Politics, Economics, Philosophy

Abstract

In order to reach objectives of climate change mitigation and to move onto sustainable development pathways energy systems not only need to become smarter and more efficient. They also need to be managed in a more integrated manner with other resource systems. Institutional change has to incentivize and support the transition to more sustainable energy systems. However, this is highly complex because energy systems are socio-technical systems within which technological, institutional, and social changes are closely intertwined. Besides techno-economic aspects, informal societal values and concerns need to be considered when thinking about changes in policy structures and processes necessary for an effective and integrated governance. Furthermore, energy systems are also interlinked with various neighboring resource sectors like water and food production. Neglecting these interconnections within future energy systems would inevitably lead to unintended side-effects and conflicts that could impede the overall goal of sustainable development. To analyze political and institutional processes within such complex governance systems a valuable analytical approach is needed that accounts for these interconnections.

Addressing Challenge B: Stability and Change, we propose that the above mentioned complexities can be addressed by an approach in which an analysis of underlying values relevant for changing energy systems serves as the structural basis for analyzing and guiding institutional change processes. In a broad sense, values are fundamental normative guiding principles to which changes in a society should adhere and which are considered to be intersubjectively shared. In a more narrow context of socio-technical systems, values provide basic criteria for considering social and moral dimensions in system design. An analysis of values can therefore provide a better understanding of the relatively stable principles upon which institutional change in energy systems should be based.

We apply a twofold, iterative methodological approach. The first part of our approach consists of a qualitative content analysis of the public debate on changing energy systems, using newspaper articles as sources. Those are interpreted through a systematic process of coding to identify themes or patterns and thus to gain an in-depth understanding of the public debate and to extract value-laden statements. These arguments are analyzed with respect to underlying values, their interpretations and perspectives of different societal groups. These results serve as input for the second part of our research, in which we analyze the role of formal and informal actors and institutions in the current governance of energy systems.

Including a spatial perspective into research on socio-technical transitions: case studies in the Swiss energy and German transport sector

Authors:
Schippl, J.; von Wirth, T.

Countries covered: Germany, The Netherlands

Disciplines: Economic Geography, Human Geography, Technology Assessment

Abstract
This proposal is related to challenge B. We argue that the spatial context of innovation diffusion needs more attention when analyzing processes of stability and of institutional change in energy transitions. We use two empirical examples to demonstrate how spatial patters matter for the development patterns and also for governance of sociotechnical transitions in the energy and in the transport sector. On that basis we discuss how such spatial perspectives can be integrated into the existing theories about the transitions of sociotechnical configurations (e.g. in form of regimes and niches).

The concept sociotechnical regime is usually at the center of transition research. Such regimes are coined by the highly institutionalized set of formal and informal rules, habits, beliefs, norms in a certain field (Fuenfschilling and Truffer, 2012; Geels 2002). The idea of the regime proved well to be able to integrate factors and actors of rather different natures into a concept of strong explanatory power. However, the spatial dimension so far has rather been neglected. Usually, regimes appear as a spatially rather homogenous conglomerate. In particular in case of spatially highly sensitive infrastructures, such as transport and (renewable) energies, such a homogenous understanding does not seem to fully exploit the potential of the regime-concept. Over the last years, scholars pointed at this conceptual deficit (see Coenen et al., 2012; Hansen and Coenen, 2015, van Welie et al. 2017).

We draw on two empirical case studies on the diffusion of new technological concepts into existing regimes: the case of the diffusion of electric mobility in Germany and the case of innovation diffusion in the course of the Swiss energy transition. We assume that the adoption of new technologies in both fields is influenced by the spatial settings. Adoption of new technologies by end-users is linked with processes of chance in investment decision. Early adopters are characterized by a high willingness to invest in so far not widespread and well-known technologies. Our research will help to sheet light on the question in which way spatial patterns matter for the pace and for the direction of co evolutionary processes of change. We will in particular try to find out whether there are significantly different diffusion pathways in urban and rural areas – with different entry points for policy options to support or accelerate the diffusion. We see this as first step of a larger scale research program on the relevance of spatial patterns for institutional change. Based on the comparative analyses of the two case studies, we will describe how such a larger research program could look like.

How do energy start-ups and energy societal experimentation projects in Israel and Germany constitute the inside (conformity) and outside (rebellion)?

Authors:
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Countries covered: UK, Israel

Disciplines: Public Policy, Politics & International Studies, Environmental Management

Abstract

Germany and Israel are two countries that have both marketed themselves as pioneers in energy transitions – Israel as innovative "start-up nation", Germany as leading through its "Energiewende". While Israel is ranked no. 1 in the WWF Global Cleantech Innovation Index, Germany achieved a higher share of renewables and greater commercialization of cleantech start-ups. Start-ups represent an interesting paradox: they view themselves as outsiders and rebellious non-conformists in contrast to established companies, while simultaneously striving to achieve this status of "established company". In this regard, according to the Israeli Energy cleantech companies' database, only a small percentage of Israel's energy start-ups actually achieved this and are considered "mature companies" (7%). Small-scale eco-village energy projects represent another societal experimentation niche in energy. These also view themselves as "outsiders" to the system, yet do not aspire to become akin to established actors, rejecting them instead. Another difference between energy start-ups and eco-villages with energy projects is the fact that community projects can exist as outsiders for decades, whereas start-ups will have long failed and closed by then. Furthering this insider/outsider status, both energy start-ups and eco-villages are employed by the Israeli and German governments in nation branding.

The multi-actor network involved in our research consists of 1) Start-ups/community projects. 2) Government. 3) "Traditional" firms. 4) Consumers/wider society. We are interested in this network and the interrelationships constituted therein as well as the imaginaries involved. While Geels posits in his multi-level perspective that small scale pioneer niche experimentation will often be blocked by "regimes" (the government and mature companies),in their critiques Berkhout et al. and Meadowcroft assert that this view is inherently ideological, as it discourages or precludes radical transformations necessary for sustainability, instead de-politicising it into mere "transition management", although "What is needed is a fundamental break with existing practices and routines." The idea of a "transition", "experimentation" and "niches" implicitly preclude this necessary fundamental break. Berkhout et al. identify transition management as a neoliberal project which highlights corporations as the correct or desirable actors for change, cautioning that "with respect to 'normatively driven, purposive socio-technical transitions' (such as those related to sustainable development), top-down drivers may be of more significance.Thus the environmental movement has been particularly successful when it has explicitly 'targeted the incumbent regime' (for example, campaigns against the nuclear industry, or waste incineration), rather than attempting to promote a particular successor; …. [which] 'represents a direct antithesis of the bottom-up niche based model'."

Our research question is "How do energy start-ups and energy societal experimentation projects in Israel and Germany constitute the inside (conformity) and outside (rebellion)?" We will hence explore the symbolic meaning of energy start-ups and energy societal experimentation projects in Israel and Germany.

CHALLENGE C: Capacity-Building

What works for Consumer Engagement in Energy Transition: Experimenting a Behavioral-Sociological approach

Authors:
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Countries covered: Italy, Norway

Disciplines: Behavioral and Experimental Economics, Sociology and Social Research

Abstract
Key institutions in policymaking, like the European Union, have increasingly recognized the role of active consumer in energy transition. This is made apparent in the Horizon2020 "Secure, Clean and Efficient Energy" work programs (EC, 2016) and the EU´s Strategic Technology Plan (EC, 2015).
Engaging consumers in the process of transiting to a more sustainable system is, however, not a simple matter. That is the reason why interconnections and cooperation between different disciplines from social sciences are required to identify the most effective intervention and, ultimately, inform policy design.
This project aims to i) develop a framework that combines the behavioral economic approach with the sociological one to identify an interdisciplinary intervention that engages consumers in energy transition, ii) provide the methodological basis to quantify its efficacy, and iii) offer how-to-be evidence-based policy propositions to promote energy transition through consumer engagement.
By engaging with the application of psychological insights to economic analysis, Behavioral Economics unveils a realistic picture of individual decision making: individual preferences are not stable, but distorted by universally shared biases, such as anchoring, framing and endowment effects, that the context of the moment of decision makes salient (Tversky & Kahneman, 1975). As a result, Behavioral Economics provides policy makers with relevant insights to influence behavior, like increasing sustainable consumption (OECD, 2017). What Behavioral Economics is only recently starting acknowledging is the central role that social context has on behavior, preferences and perceptions (Hoff & Stiglitz, 2016). Indeed, critical sociological inquiries have already clarified that the contexts and the subjectivities (individual and collective) bear an inextricable link with energy demand (Shove and Walker, 2014). Therefore, interventions that disregard the interconnections between behavior and social context might result ineffective and questionable from an ethical, energy justice standpoint (Jenkins et al., 2017).
As a means to engage consumers in the betterment of energy behaviors and to let their local contexts and subjectivities play an actual role, we suggest an approach that put them at the

center of the process. Our approach is multidisciplinary as it combines Participatory Energy Budgeting (PEB) with Behavioral Economics. Behavioral Economics offers options for policymakers to influence behavior by incorporating costless adjustments to infrastructural design (Thaler and Sustein, 2008), such as by providing feedback (Casal et al., 2017). Despite its virtues, such an approach disregards, first, the active role played by consumers who are unconsciously nudged to pursue the policy maker´s goal, and, second, the dynamic influence played by social context on behavior. PEB (Capaccioli et al., 2017) offers a solution to these limitations. By adopting a democratic and participatory approach for the redistribution of common funds among the members of a collectivity, it suggests a process model for the collective governance of the energy savings deriving from the collective performances on energy behavior improvements.

Do learnings on community participation in island microgrid projects map across to urban quasi- or islanded-microgrid contexts, and if so, how?

Authors:
Fell, M ; Neves, D.

Countries covered: UK, Portugal

Disciplines: Psychology, Engineering

Abstract:
Renewable energy (RE) and distributed systems play a key role assuring security of supply and energy awareness, and turning the consumer into a producer (the so-called prosumer). They have enabled increased energy self-sufficiency, while helping to meet environmental targets and promoting energy efficiency, whether through the application of individual home-systems, or microgrids that can be connected to the national energy grids. This transition has multiple challenges that are currently being addressed mostly by the utilities (operation, RE integration, supply flexibility). However, there are still limited solutions to demand management challenges [1].

Small island systems and their communities have been the target of multiple studies [2,3,4], given their advantageous environment for becoming living labs of policies and new technological solutions. While in small islands the main threat is considered the lack of resilience and continuous energy supply, they are a perfect setting to learn which drivers lead end-users, either residential or commercial, to participate in such programs.

There is increasing policy and commercial interest in managing non-island grids at multiple spatial scales. Cities now too face challenges associated with grid congestion and high penetrations of RE. Planners are turning to community energy and peer-to-peer energy markets as ways to encourage flexibility and help actively manage these issues. Challenges to the successful implementation and financing of such flexibility projects certainly include economic factors, such as the low incentives or returns on investment [5,6,7], but also the extent to which consumers/prosumers feel motivated to participate. In particular it is

interesting to consider the contrast between island [8] and urban contexts [9], where questions of ownership, boundaries and visibility of the grid might be expected to differ.

We are interested in the extent to which lessons learned in an small island context can help inform the development of urban quasi-microgrids, which are both tightly integrated with the wider grid but have a level of independent management. Our challenge paper will be focused on the research questions: How do island/urban dwellers view ownership and boundaries of the electricity grid? How do these views differ from or resemble each other? Can successful participation approaches from island contexts be 'mapped over' to urban ones and, if so, for whom and under what conditions? And how can this understanding inform, and be informed, by energy systems models to optimize grid management at a variety of spatial scales?

Through the Wall

Authors:
Hanna, J.; Auger, J.; Watts, L

Countries covered: Portugal, Denmark

Disciplines: Fiction, Speculative Design, Ethnography

Abstract
Energy, in all its forms, is essential to modern and future living. Ourinseparability from energy is not just a matter of electricity consumption anduse, but includes our inseparability from all infrastructures of generation,transmission, and storage. Our lives are energy rich, but our relationship withenergy is threadbare; electricity is ethereal and distant, a number on a meter.The community-led project our paper will describe has already begun to changethat relationship. It is the design and prototype of an energy generation andstorage solution—a gravity battery we call 'The Newton Machine'—built fromwhat is to hand, what is in the local landscape, with local expertise.In the simplest terms we are proposing to remove the wall that makes energyintangible. The wall (and plug socket) facilitate generic and problematicapproaches to both the design of electrical products and the way they are used.The metaphorical removal of the wall reveals local contexts and affords theopportunity to highlight local terrains, materials, and the knowledge and skills ofcommunities.Peripheries are often considered 'remote' and far from the design future.However, peripheries, particularly island peripheries, have long beenunderstood as 'advance indicators' or 'extreme reproductions of what is futureelsewhere' (Baldacchino 2007). Small perturbations in global systems, such asenergy, are felt more quickly and distinctly than in the city. For example, at theedge the lights go out more often in the storm. This through-the-wallrelationship between people, energy and environment at the periphery is aharbinger of climate-changed energy futures in the city. What happens at theperiphery is not behind the times, in other words, but is a litmus test for theurban centre.The Orkney Islands, off the northeast coast of Scotland, have been a test bed forelectricity technology for over sixty years: the UK began wind turbine tests therein the 1950s. More recently, the islands have had Smart Grid technologyinstalled on their local grid and lithium grid batteries. The islands are developingtheir own hydrogen fuel network to bypass the grid; they have already investedin their own energy future, by individuals installing over 700 micro wind turbines(more per

person than anywhere else in the country). There is a rapidlyexpanding electric car network. These islands are an important site for testingenergy futures, with a highly aware and energy technology literate community.The island of Eday is particularly energy aware and proactive. Although Eday is aremote island with a population of less than 200, they are well acquainted withthe importance of energy and its relevance to their lives and the island'seconomy. The remote location makes shipped-in fossil fuels expensive. Fuel

poverty is widespread—due to energy cost, housing standards, incomes andclimate. Recognising their fragility, Eday's residents have taken active steps toimprove their energy outlook.

Beyond the average consumer: Exploring the potential to increase the activity of consumers in loadshifting behaviours by means of custom-made applications

Authors:
Schweiker, M.; Huebner, G.

Countries involved: Germany, UK

Disiplines: Planning (architecture), psychology, cognitive neuroscience

Abstract
This proposal addresses Challenge C looking at the role of the consumer in future energy systems, in particular regarding demand-side management (DSM) and the potential of load shifting actions. The call addresses the role of "prosumers" and "energy citizens" to be that of "average consumers".However, this proposal, which is based on our previous research findings (Shipworth, D., Huebner,G., Schweiker, M., & Kingma, B., 2016), argues that in fact it is not enough to understand the averageconsumer. On the contrary, we need to understand individual preferences of consumers to ensureeffective design of and interaction with future energy systems.Space heating and cooling together are the largest drivers of energy and power in buildings andhence offer the greatest potential for load shifting. They are inextricably linked to thermal comfort,i.e. if we feel too warm, too cold, or just right in our environment. Likely load shifting scenarios inbuildings would hence be to change temperature settings to reduce energy / power during specifictime intervals, which could compromise occupants' thermal comfort.
It is well known that comfort requirements vary widely between people, with physiological (e.g.Kingma & van Marken Lichtenbelt, 2015; Mozaffarieh et al., 2010), psychological (e.g. Schweiker &Wagner, 2016), and cultural factors (Brager & de Dear, 2003; Chappells & Shove, 2005; Shove,Chappells, Lutzenhiser, & Hackett, 2008) contributing to interindividual differences. However, thereis still substantive unexplained variance in comfort experience – and comfort actions – betweenpeople, making it likely that additional individual factors play a role. A source for identifying suchfactors can likely be found in concepts from the field of differential psychology such as the FiveFactor Model (FFM) of personality traits (John & Srivastava, 1999) or the Theory of Basic HumanValues (Schwartz, 1992).
Research related to energy demand needs to address the variety of consumers – what are theirneeds, and what actions do they take to satisfy their needs? Knowing about individual

needs andpreferred actions is essential in developing custom-made tailored solutions, increasing theiracceptance amongst consumers, thus making it more likely that they will be actively used.The proposal has as its research question: Does knowing individual preferences for thermal comfortand adaptive actions lead to greater participation of consumers in load shifting behaviours throughtailored solutions?