

# Exploring Business Opportunities - New Network Configurations for Sustainable Energy Systems

## Working Paper

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### Abstract

Understanding and developing new frameworks for addressing issues related to climate change, inequality and the current model of economic growth is gaining momentum. These issues are often thought of as discrete ones. However, recent research shows that they are connected and addressing them requires the ability to understand their holistic and systemic nature comprising of both societal, technological and even economical aspects. Especially, energy systems offer a compelling platform to study the systemic approach as energy production and consumption lie at the heart of our global economy. We propose that multi-partner networks conceptualized from the perspective of energy systems uncover the underlying ideas and paradigm(s) that imperil change yet in these revelations also offer opportunities for intervention. This working-in-progress study examines an energy transition process to map the focal networks and make sense of the on-going interactions in order to build insights into the network characteristics and capabilities that could then help identify and trigger new sustainable business opportunities and models. Accordingly, the study fills a gap in research in networks by extending the idea of sense making to capture narratives during socio-technical transitions.

*Keywords: Transition, Networks, Sustainability, Energy*

### Introduction

Recent research pinpoints that energy-related behaviour is dependent on socio-economic incentive structures as well as political, institutional, and organisational frameworks (e.g. Mannberg et al., 2014). Energy transition is seen as a system-wide ongoing process where transformative initiatives and actions change citizen-consumers' energy-responsible behaviour. However, often the regional and local levels are not addressed regarding policy development and integration in energy transition. Thus, there is a need to create more understanding on energy-related activities at these levels and to develop proper methodologies and tools for effectively coping with future challenges (Kostevšek et al. 2016). As a starting point, municipalities and cities are claimed to be appropriate micro-units for establishing sustainable energy systems (Burton & Hubacek 2007).

In relation to a bigger picture it is evident that by 2050 up to three billion people are likely to join the global middle class (WBCSD 2009<sup>1</sup>; Dobbs et al. 2011) and in the past 50 years alone, the earth's ecosystem has depleted significantly owing to the current model of growth (Steffen et al., 2015). If this system of production and consumption is maintained, the estimated natural

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<sup>1</sup> World Business Council for Sustainable Development, 2010. Vision 2050: The new agenda for business.

resource consumption is expected to rise by three to six times by 2050 (Assessment 2005). Often, the innumerable problems we face, from ecological crisis to deep social inequalities and political and economic instabilities are articulated and thought of as disconnected issues. However, there is reason to believe that these issues are interconnected and we need to rethink the current model of growth and development in order to avoid further damaging the environment and aggravating growing inequalities. (Blok et al., 2015). For instance, there is now enough evidence linking international trade to biodiversity threats in developing countries (Lenzen et al. 2012) species threats from global supply chains (Moran and Kanemoto 2017), and undermining national emission targets (Kanemoto et al. 2014). In order to address these challenges, there is a need to understand their systemic nature and one way to conceptualize this is through the energy system as energy is embedded in the products and services that drive our economies. This also implies that creating an agenda for transitioning towards sustainability would mean sensing and identifying narratives and practices that are legitimized by the incumbent system and its dominant social paradigm. Doing so will help in recognising the points of intervention and reveal business opportunities that support the transition process.

From the network point of view, the role of sense making for managing complex business networks (Henneberg et al., 2010) and agenda construction for driving radical innovation within the context of emerging business fields (Möller, 2010) has been explored within network research. Studies have focused on managing in environments that involve complex interactions between network and knowledge economies, globalization, and technological dynamism (Henneberg et al., 2010; Möller, 2010; Möller, et al., 2005; Ritter et al., 2004). Network research has identified and articulated the importance of building different types relationships and networks to tackle complex challenges faced by firms (Möller and Rajala, 2007). In his article, Möller (2010) draws upon studies using insights from evolutionary economics, sociology of technology, and innovation studies on the evolution of socio-technical regimes. As an example, the diffusion of electric cars create long term and large-scale shifts. These changes affect markets, regulation, culture, industrial networks and infrastructure (Geels, 2005, 2002; Kemp et al., 2001).

Energy systems have been undergoing a process of transformation in the last few decades resulting in coordination of energy-related infrastructures and paving the way for new kinds of network configurations. One such transformation relates to a transition from the current centralized energy systems to more decentralized ones based on renewables. This transition process is opening up opportunities for studying how actors are engaging with the transformation ideas relating to the transformation of communities (or regions) to energy neutral along with, in some cases, energy producing ones. The development has changed the traditional roles of producers and consumers in the energy markets in a way where consumers also become the producers of energy or electricity.

The system-wide transformation offers unique co-evolutionary opportunities for innovations and a segment of academic literature has emerged in an attempt to understand the dynamics and directions of such sociotechnical transformations. As discussed above this literature is acknowledged in network studies as well, however, those studies have been focused on understanding how managers understand and make sense of opportunities in such complex transition processes. This work-in-progress study attempts to turn the focus on how communities are engaging with the idea of energy self-sufficiency where there is a clear blurring of roles of

consumers and producers. Understanding these emerging networks is crucial for commercializing these new systems. The aim of this paper is to develop an understanding of the various ongoing interactions within these transition networks and offering insights into the network characteristics and capabilities that could then help identify new business opportunities.

The research will use data collected from the project Paths towards Energy Transitions (PETs) that is studying the ‘Energy Village’ concept developed by the Vaasa Energy Institute at the University of Vaasa ([www.energiakyla.fi](http://www.energiakyla.fi)). The initial concept was later on expanded to Energy Self-sufficient Regions project where several communities and municipalities are involved throughout the regions of Ostrobothnia, Central Ostrobothnia and Lapland.

### **Embeddedness of Energy**

Energy is often described as ‘the ability to do work’, (Shove and Walker 2014), but that definition neatly plays into what has been described as the ‘physics imperialism’ in energy research and policy (Cooper 2017; Castree and Waitt 2017). Physical scientists do understand that energy is embedded in everything around us, and that, it is the fundamental phenomenon underlying the creation of the universe along with gravity. However, physical scientists like to draw a boundary around the energy that humans use to get things done, as Stephenson (2017), points out in an imaginary conversation between a social scientist and a physical scientist. Therefore, historically, energy systems have been influenced chiefly by technical progress and will continue to do so even in the future, as we try and redesign our energy systems to serve our needs without undue burdens to ‘humans and their environment (Spreng 2017). However, this presents a rather narrow perspective of energy, because many of our social aspirations are manifested through opportunities provided by global markets and shaped by economic policies and these aspirations also have profound implications for energy systems as well (Spreng 2017). According to the International Energy Agency, 2017<sup>2</sup>, the global economy relies on vast energy inputs, 70 per cent of which continue to be fossil fuels. Fossil fuels are one of the main causes of climate change and the challenges involve ways of reducing the fossil fuel related emissions, address issues related to unequal access to energy, resolve environmental degradation, reduce geopolitical tensions related to access to energy and defuse vested interests in maintaining high levels of use of fossil fuels. While technology plays a key role in solving these issues, the transition process has economic, social and political dimensions, a socio-technical agenda, that calls for an interdisciplinary focus (Stephenson 2017; Spreng 2017).

Thus, analyzing an energy systems transition from a socio-technical perspective and adhering to the fact that transitions include aspirations far more complex than the choice of cleaner technology, we need to unveil and understand the structures maintaining it. These structures or mechanisms are usually tied to a dominant social paradigm (DSP) that structures society’s beliefs and perceptions of the world (Kilbourne, McDonagh, and Prothero 1997). It is argued that the dominant social paradigm (DSP) of Western societies is tied to materialism and incompatible with sustainability as it answers to the ‘growth imperative’, meaning that human well-being is tied to material acquisition which again reinforces overconsumption of non-renewable and polluting resources. (Kilbourne & Middlestaedt 2012). Thus shifting from the

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<sup>2</sup> <https://www.iea.org/newsroom/news/2018/march/global-energy-demand-grew-by-21-in-2017-and-carbon-emissions-rose-for-the-firs.html>

incumbent, fossil dominated energy system to zero emission production and consumption also entails the need for a paradigm shift. The way people make sense of and give meaning to things is rooted in the socio-cultural context one was born and socialized into. (Giesler and Veresiu 2014, Humphreys and Thompson 2014). The effects of these inherited belief-systems often remain opaque in day to day interactions as they have become part of and serve the interests of the dominant institutions at the core of modern Western societies: political, industrial and economic (Kilbourne and Middlestaedt 2012.)

### **Networks in Socio Technical Transitions**

Transitions affected by technological innovations result in several changes across our socio economic systems related to user practices, regulations, industrial networks (supply, production, distribution), infrastructure, including meaning and culture (Möller, 2010; Geels, 2002, 2005). The transition to renewable energy systems, especially within the context of energy sufficient region, could be loosely framed on Abernathy and Clark's (1985) description of 'architectural innovations' that result in changes in user dimensions related to relationship with customer base, applications, channels of distribution and service, customer knowledge and ways of communication, along with technology and product dimensions related to design, production and organisational systems, managerial and technical skills, supplier relations, equipment and related knowledge and experience base. However, when the context narrows down to energy self sufficient communities, this frame is not enough, as in such transition processes actors are continuously engaging in the process through multiple identities that could include being a producer and consumer (prosumer) at the same time, knowledge expert and producer and consumer, and roles that just emerge out of the transition process. In addition to opportunities for studying new network configurations, such arenas also present ideas for new business ideas that are uniquely connected to the new energy paradigm thus challenging the dominant (institutional) structures.

### **Methods**

This is a qualitative study and relies largely on action research as its process-oriented approach to science makes it a natural fit for studying transitions, as they are processes as well (Wittmayer et al., 2014). The very nature of the research project demands this approach as the central idea is to create a space for collaboration and joint knowledge production, where researchers are among the many providers of knowledge while also facilitating the exploration pathways. This process-oriented approach is distinct from what Miller (2013) describes as the knowledge-first approach, in which researchers contribute the scientific knowledge and societal actors the goals and values (Wittmayer et al., 2014; Miller, 2013).

The action research arenas have included regional workshops and meetings and the facilitation process has entailed organizing and doing the citizens participation workshops. Extensive data collection in the form of notes on meetings and discussions and recordings of meetings is currently underway. There is also secondary data in the form of time schedules, information on participants and other printed material, that is being compiled. The main data will be transcribed and discourse analyzed.

### **Findings and Discussions**

From the initial data gathering process we find that, most gatherings follow the same pattern where almost all participants are 45 + (age) men usually working in the forest or farm industries. The main agenda of the project is to have more biogas facilities built (implying higher level of energy self-sufficiency for the region) and this single-minded focus creates a certain path lock in from the beginning. Every time a SWOT analysis is done for a region, forests are automatically categorized as big “asset”. This conversation trajectory puts exclusive focus on a single energy source and options such as solar, geothermal, wind, and other forms of renewable energy are not discussed. Power structures and the national / global market systems are made visible in the local context in many ways; wind power is usually not considered as it is seen as something local actors cannot participate in, given the complexity and capital intensity, wind is seen as an option that should be considered only by big companies. Surprisingly though, nuclear power is usually seen as the savior, even though the technology is both complex and controversial and will also involve only big companies with no local ties. Somehow, the shadow of Nuclear is ever-present and there appears to be an agreement that as far as Nuclear is concerned local energy production can take a back seat.

The initial findings gleaned from the notes on the ongoing interactions from the five regions, without having analyzed the discourses, indicate that the Finnish energy transition outside the Helsinki area is leaning towards the bio-economy agenda. Forest and its byproducts appear to be high on the agenda as far as the solution for the Finnish renewable energy transition is concerned. Simultaneously, the dominance of Nuclear and the related agenda seem to be pushing the urgency related to climate change issues into the background, ironically indicating to local energy producers that such issues are too big to manage locally. This reveals a top-down decision-making approach yet the objective is clearly to devolve this process to regional levels. It would be interesting to see how businesses view this and what kind of sense they are able to make of these conflicting agendas.

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