Local experiencies in energy transition

Energy security has recently become a policy priority for the European Union due to growing concerns about environmental challenges and the fact that EU covers about half of its energy needs through imports. Policy-makers in Europe are struggling with the need to achieve energy security and promote a transition towards decarbonised energy sources without undermining wellbeing and patterns of consumption. The collaborative MILESECURE-2050 VII Framework project provides scientific knowledge on these issues and develops models at the European, national and local scales. This article focuses on the analysis developed at the local scale, related to a set of case studies on energy/social systems in transition. The methodological foundation of this work is shortly illustrated as well as the main findings. These highlight the leading role of the human factor in supporting the transition toward a low carbon society.

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Introduction

Security of supply, sustainability, and competitiveness are the three complementary pillars of the European energy policy [1], and have been translated into the main goals of the more recent EU energy strategy [2]. However, while the EU has successfully institutionalized a climate policy, it has not yet been able to formulate a successful energy security policy, although the importance of energy security has been growing in the political agenda as a result of various factors such as, for example, accidents associated with gas imports from Russia and the rise of fossil fuel prices. According to European Commission [3], "if not properly designed, policies aimed at the reduction of GHG emission may affect the resilience of the energy system and its ability to tolerate disturbance and deliver stable and affordable energy services to consumers". In addition, energy security is "frequently used to justify various policies or actions at the same time, with far reaching interventions in the market often without any economically rational justification" [4].

The EU FP7 collaborative project "MILESECURE-2050 – Multidimensional Impact of the Low-carbon European Strategy on Energy Security, and Socio-economic Dimension up to 2050 Perspective" provides new scientific knowledge on these issues and the general objective of regional, territorial, and social cohesion by developing new European models, which support and enable energy security at the European, national, and local scales. More specifically, the project aims to understand and overcome the political, economic, and behavioral traits and trends that led Europe to its difficulties in reducing fossil fuel consumption, and in diversifying its energy balance at rates which guarantee European energy security at the horizon 2050, reduce the threat of climate change, and diminish the risk of an energy gap in the coming decades. The 2050 timeframe is used to assess the legitimacy and efficacy of policies in terms of capacity for societies to transition to energy security, and to consider the long-term, socio-economic impact of such options.

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To better understand the current situation, the MILESECURE-2050 research team adopted the definition by which a secure energy system is one evolving over time with sufficient capacity to absorb adverse uncertain events, so that it is able to continue satisfying the energy needs of its intended users, with "acceptable" changes in volume and price.

Potential threats to energy security were defined from three perspectives: temporality, provenance and society [5]. First, transient disruptions or shocks based on their temporality, such as extreme weather conditions, accidents, terrorist attacks, or strikes can be differentiated from more enduring pressures, or stresses which compromise the long-term ability to develop adequate physical and regulatory conditions to deliver energy supplies to end-users. Secondly, the provenance of threats was defined to allow a distinction between internal and external threats that directly inform the types of strategies that can be put in place for different situations. The third perspective is the role of society, which is crucial to a secure energy system as part of a transition towards a low-carbon economy. The whole process has to be understood as "societal"; as an organic process that is both the result of intentional actions and the product of the interactions of multiple actors and of the intended and unintended consequences of these.

Methodology

In order to build possible scenarios towards the development of low-carbon societies, the MILESECURE-2050 project has assumed a number of methodological concepts from the transition management theory, the path dependency theory and the vision of creative destruction developed by Schumpeter [6]. Such theories are relevant to examine transitional societal processes based on technological changes, and how these changes impact the transitional processes. Future scenarios can be based on complex interactions at different levels of society as a whole between technology (innovative vs end-of-pipe), the social nature of society (individual vs collective), environmental progress, economic situations, and political choices.

The Transition management theory is a concept for developing a paradigm shift within a society, by guiding it through a gradual and ongoing process from one equilibrium to another [7]. Within the transition management theory several approaches for examining societal transitions towards energy security exist, such as socio-technical transitions research, technological innovation systems, and co-evolutionary dynamics.

Socio-technical transitions research combines technical, social, and historical analyses to examine past- and present-day societal transitions, and uses a framework of three different levels: landscapes, socio-technical regimes, and technological niches [8, 9]. The technological innovation systems approach differs from the socio-technical transitions idea in regard to long-term socio-technical changes in that it focuses on understanding innovation from a systems perspective, as opposed to the interaction between technological and social elements. The approach claims that firms and actors innovate mostly in response to incentives coming from the wider innovation system. Hence it studies feedback mechanisms and interactive relations used in the development and application of new knowledge by science, technology, learning, production, policy, and demand. Finally, co-evolutionary approaches seek to explain long-term process of change, claiming that dynamics are determined by casual influences between mutually evolving systems.

In addition to the transition management theory, the concept of creative destruction, as visualized by Schumpeter in economic innovation, argues that processes may need disruptive processes of transformation that accompany radical innovation in order to make efficiency gains [6].

MILESECURE-2050 builds upon and expands the above mentioned approaches used to understand and explain societal transitions, and ultimately demonstrates how this new knowledge base can be applied to European policies. Currently, while these concepts are in a process of development, they do not fully explain nor allow for the induction of a societal energy transition. Indeed, in many ways current research places an unequal focus on a limited number of factors, be it the individual, society as a whole, technology, history, political, economic or other factors. A holistic approach to studying societal transition is instead needed. MILESECURE-2050 takes the approach that multiple interrelated and co-evolving perspectives (environmental, geopolitical, lifestyle and cultural, political, technological, economic and combined) must be examined to explain possible modes for societal transition. And both present day and

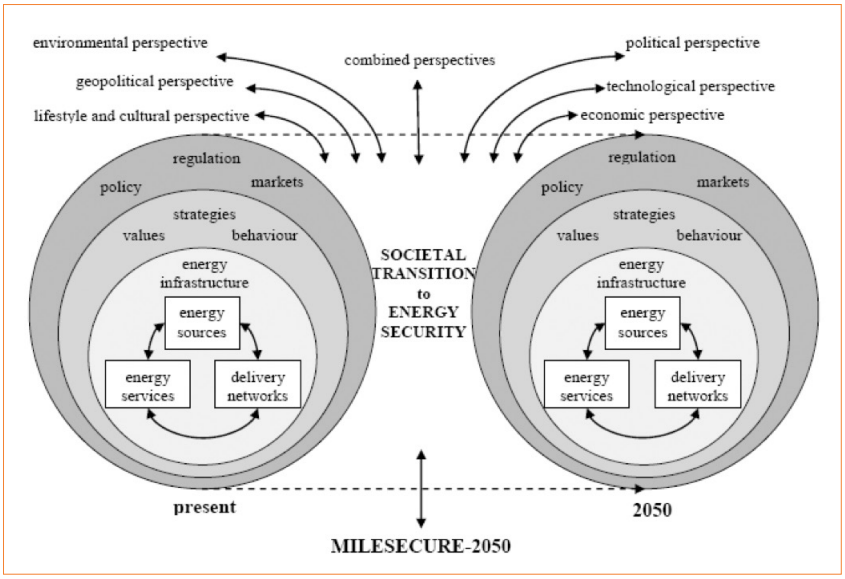

FIGURE 1 Multiple perspectives on societal transition
Source: MILESECURE-2050 DoW, 2012

historical factors play a critical role. These perspectives can be viewed independently or in a combined manner, and each perspective can be used to understand certain aspects of how a society can change, though a society ultimately moves down a path according to elements from all perspectives (see Figure 1). MILESECURE-2050's hypothesis is that while societal transition is dependent upon changes within these independent perspectives, it is ultimately the combination of these perspectives which leads to societal transition (or stability). In this context, it is possible that multiple pathways for transition exist, or can be created by a number of various combinations.

Therefore, a major objective of MILESECURE-2050 has been the identification of both the options and factors influencing the energy transition processes and its societal effects. This has required the evaluation of a set of concrete experiences on energy transition at the local level, named Anticipatory Experiences (AEs), that anticipate the basic features of a broader and more complex transition to environmentally sustainable ways of producing, consuming, and distributing energy within all European societies. The approach adopted considers the AEs as energy systems in transition and, then, as social systems in which energy management is considered primarily as a social world that is changing.

Starting from 1500 projects found in different databases both of the European Commission and independent bodies, 90 AEs from 17 different European countries were selected, concerning different sectors (energy production, but also mobility, housing, services and industry) [10, 11]. They are all local experiences, but they have different size: from small towns to big cities.

All experiences developed environmentally sustainable ways of producing, consuming and transporting energy. Their anticipatory character may be assimilated to their ability, at the present time, to take decisions and develop practical solutions to resolve issues related to the future, first of all those of climate change and the depletion of "carbon" energy resources. Because of their anticipatory character, AEs have been considered as a basis for the empirical study of what might happen in the context of energy systems in transition.

Results

The main result of the analysis of AEs is that energy transition does not seem to present itself as a gradual change. In fact, it does not take the form of the mere penetration into society of new greener and efficient technologies (technological drive); nor it is "merely" the introduction of new rules or restrictions that citizens must accept (normative drive or consent drive); neither it consists only in new attitudes toward consumption (and savings) to be interiorised by the population (ethical or lifestyle drive). Each of the above drives is present in the experiences considered, but all three are based on a vision of change in which both the social and the anthropological/individual dimensions are relegated to a function of "acceptance" of measures and decisions that come from the outside.

Although these visions of energy transition recognize the

importance of social and anthropological impacts and feedback, they tend to consider the human factor as a mere receptor, not an agent of change. Therefore, what is actually lacking is the perspective of human agency, as a constitutive element of the transformation of the energy systems.

In short, the human factor becomes the driver of energy transition in at least three distinct levels:

i The set-up of energy production and consumption becomes more visible and closer to citizens. In this framework we witness citizens gaining the ownership of the means of energy production; the spread of new technical skills; the activation of social networks for the installation and maintenance of low-carbon technologies.

ii The energy issue becomes a direct interest of citizens who actively participate in the regulation, orientation, management (also in economic terms) and monitoring of measures and policies of energy transition.

iii There is a strong personal effort on the energy transition through an intense emotional involvement; a highest attention to several aspects of everyday life (food, waste collection, energy consumption, body care and health); an increased use of physical effort in the field of mobility (but not only), i.e. through the use of bicycles or with an increased inclination to move on foot or by public transport.

Conclusions

While the leading role of the human factor is a chance to concretely put to effect a transition toward a low-carbon society, the MILESECURE-2050 research team has observed that it can be accompanied by the emergence of new risks such as: conflicts, tensions, resistances and oppositions that may put energy security in danger. This means we are facing a new risk typology which needs to be taken into account in the governance of the energy transition.

In order to deal in an appropriate manner with this "leading role" of the human factor both in respect with energy transition and with the risk to security, a paradigm shift is needed, both in the study and in the governance of energy systems in transition.

In conclusion, the adoption of a "human energy" approach is proposed, which is able to properly consider the leading role of the human factor in the heart of the energy systems themselves.

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