



Original research article

Understanding the regional process of energy transition in Marin County, California: Applying a Three-Phase-Model based on case studies from Germany



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ABSTRACT

The transition from conventional energy sources toward a sustainably renewable energy-based system is being discussed in many parts of the world, on regional and larger levels. This article aims to broaden the understanding of regional transition processes by exploring the case of Marin County in the United States. The article expands on the heuristic Three-Phase-Model of regional transition (3PM), which was grounded on three case studies in Germany. As such, we compare the Marin County case with the original three cases. We present results on how the transition toward a local, renewable energy-based system emerged and developed in Marin County. Using the 3PM as a guideline, we also explore the differences and similarities to transition processes in the German cases. Although the wider institutional context is very different from Germany, the overall regional transition process in California was very similar in regards to the specific type and role of actors, their activities, the role of motives and artifacts. What differed most was that conflicts influencing process dynamics were much more evident in Marin County, especially the conflict with the incumbent utility and the conflict over localization of renewable energy production. We suggest adapting the 3PM according to these findings.

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1. Introduction

In recent years there are increased discussions about the necessity to change current energy systems, given their high dependence on conventional fuels, toward a more sustainable, low-carbon system based on renewable energy and a considerable reduction in energy demand. This is also seen in the scientific literature (e.g., Solomon & Karthik [39] on lessons learnt on past energy transitions, Araújo [1] on the evolving field of energy transitions, Verbong & Loorbach [45] on transition studies and the governing of energy transitions, Müller et al. [32] on a conceptual framework for energy autarky, Ruppert-Winkel & Hauber [35] on renewable energy self-sufficiency and its dimensions, Stablo & Ruppert-Winkel [42] on the role of energy conservation in local transition processes). Any attempt at change also brings with it resistance, conflicts and other societal challenges (cf. [22]) Radical shifts from the traditional path are not linear processes.

In the field of transition studies, ‘processes of change’ are defined as large-scale transformations within the society (or impor-

tant subsystems) from one socio-technical system to another [11,45]. For transitions of the energy systems this means a change in centralized, (mostly) fossil-fuel based production systems [21]. Such transition processes are being established in different regions across the world. Many examples are mapped on the Go 100% Renewable Energy campaign website [14] and many are described in the scientific literature (e.g., [32,35 and literature cited therein,41]). Understanding the emergence and development of these regional transitions and processes can clarify the bigger picture of energy transition and help to work toward the establishment of a sustainable energy-governance structure overall (cf. [9]). Governance of the energy infrastructure plays a crucial role in these socio-technical transition processes [15] and hence needs to be analyzed, within specific regional processes as well as embedded throughout the surrounding environment. In the context of emerging energy systems it is also important to explore which different social groups are involved as the complex social processes that shape energy systems “will evolve in a mutually constitutive and dynamic process with actors and their interests” ([40], p. 25).

The case of Marin County, California, is an ongoing effort of such a regional socio-technical transition toward a renewable energy system. This paper aims to understand such regional transition processes better by exploring the case of Marin County and using this

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exploration to further develop the Three-Phase-Model of regional transition (3PM) [17]. As this model is grounded on three German cases, the paper compares and contrasts the Marin County case to the German cases and offers suggestions to adapt the 3PM to a broader application. Our guiding questions are: how did the transition toward a new, local, renewable energy-based system emerge in Marin County? Who were the actors, what were their motives, and what role did artifacts play in this transition process? What are the differences and similarities compared to transition processes in the German cases? What adaptations are necessary in the 3PM with regards to the Marin County case results?

This paper first presents conceptual frameworks related to energy transition processes, emphasizing the 3PM (Section 2). The methodology of the empirical case study of Marin County is outlined and the case is introduced, as well as a brief outline of the German cases for purposes of comparison is given (Section 3). Results on the emergence and development of the transition in Marin County are presented using the 3PM framework (Section 4); this section incorporates differences and similarities to the German cases. Results are discussed along with the usefulness of the 3PM (Section 5), and the paper closes with a short outlook and conclusion (Section 6).

2. Transition models of the energy system

The most debated and widely discussed framework in order to understand socio-technical transitions is the Multi-Level Perspective (MLP; [10,12,45]). The MLP explains transitions as a result of processes interacting among three levels: the micro-level of niches, the meso-level of regimes and the macro-level of landscapes. Radical innovations in a system usually occur on the micro-level of niches. They provide the protected space for radical novelties, shielding them from the harsh mainstream market selection and resistance from the prevailing regimes [11]. Regimes are the dominant rule-sets guiding the interaction between different social groups. Actors align their activities and form “networks with mutual dependencies” [11]. These socio-technical regimes are usually stable because of established interactions among patterns, routines, regulations, sunk investments and adapted lifestyles [11]. Change in the incumbent regime is usually incremental, reinforcing the system rather than challenging it [45]. Aspects out of reach of the actors constitute the socio-technical landscape of a system, including the geography, climate and resources of the land as well as the broader political, economic and societal trends.

While the MLP is an analytical tool conceptualizing long-term transitions, there are normative models serving to guide the activities of processes of change. Transition Management, introduced as the official Dutch government policy around 2000, gives such an operational model for implementing transitions [20]. With the lessons learned over the last decade, the concept of Transition Management has evolved into a governance approach. Combined with the MLP and the multi-phase model [34],¹ this concept aims to understand and influence energy transitions, and is now referred to as Transition Governance. Transition Governance emphasizes long-term thinking (at least 25 years) at the system level in terms of multi-domain, multi-actor and multi-level perspectives with flexible objectives and diverse selection. Niche innovation should be encouraged and there should be a focus on frontrunner actors. Radical change is important, but should be done in small steps to avoid backlash by the incumbents. There are many researchers contributing different perspectives based on empirical studies (see Ref. [45] for a collection of some of these contributions). This empiri-

cal research, however, is currently limited to Europe. As different socio-political contexts may require different models, it would help to have more open research in other regions.

Müller et al. [32] present a model of energy autarky, the regional production of energy with local resources, which they enhanced with three principles aiming at sustainable regional development: the use of local renewable energy resources, decentralization and increased energy efficiency in supply and demand. Müller et al. [32] identify projects and regional initiatives in Austria, Switzerland and Germany that match their energy autarky model. Nevertheless, comparative empirical research on regions aiming for energy autarky, and how they define it, is still needed.

The Three-Phase-Model of regional transition (3PM) by Hauber & Ruppert-Winkel [17] is based on the comparative study of three different cases in Germany of regional processes of socio-technical change aiming to achieve energy self-sufficiency through the use of renewables. Renewable energy self-sufficiency (RESS) is often linked to the idea of sustainability, integrating the goal of considerably reducing energy demands (also with strategies for adopting less affluent lifestyles). It also links to social values like high citizen/stakeholder engagement (for the different dimensions of RESS see Ref. [35]). Hauber and Ruppert-Winkel [17] propose the 3PM as a heuristic tool to identify elements that shape change within the socio-technical energy system, specifically focused on the regional level. Fig. 1 provides an overview of the 3PM. The three phases comprise: (1) the pioneer phase, (2) the pivotal network phase and (3) the extended network and growing market phase. They can be distinguished with regard to the following elements: (a) actors and their activities (including the sub-aspect of relations and interactions), (b) motives of actors and (c) the role of *artifacts*.² These elements are nested in the *institutional and geographical wider-context*, which is used to delineate the boundaries of research cases. While the institutional context describes wider institutional settings like national laws, the geographical context refers to the geographical space in which the transition is occurring, e.g., the administrative district. These wider contexts have a direct influence on the process. This article argues that the 3PM provides elements found in regional transition processes in at least two different countries and that these analytical elements allow comparisons between different cases. The following analysis emphasizes the model and uses the case of Marin County to build upon it.

The pioneer phase of the 3PM is shaped by the activities of individual actors trying to initiate innovations related to renewable energies. These pioneers are often perceived as radicals or “eco-weirdos” by other regional actors. Two types of pioneers can be distinguished in this phase of the process. *Technical pioneers* are looking for technical or practical solutions for new energy supplies in their respective settings. *Political pioneers* are involved in *policy inventions*, developing new policy ideas about the regional energy system. Working as individuals or in little *pre-networks* (small isolated groups), pioneers are ordinary citizens and normally not part of the political or economic establishment of the region. This phase has a bottom-up character as it is initiated by the activities of these pioneers, whose basic motives are pragmatic (searching for technical solutions) or ecological (searching for a more sustainable production and use of energy).

The pivotal network phase is characterized by the pioneers’ increasingly better organization. They start forming networks and working as *entrepreneurs*, in the sense that they try to convince other social groups of their idea. The involvement and engage-

¹ The multi-phase model presents systematic change in four phases: predevelopment, reconfiguration, acceleration and stabilization [34].

² Artifacts are material things that play a role in the transition process, e.g., a renewable energy plant or a feasibility study. The technical terms taken from the 3PM are highlighted in italic and introduced in this section and then used in the result section without further explanations.

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