

Bottom-up energy transition. An analysis of successful and failed niche projects as basis for an energy transition as an overall social learning process

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The energy transition is one of the most complex transformation processes of this century. In view of the threat of climate change, the energy supply system, developed over more than a hundred years, with its energy supply chains and energy consumption patterns is planned to be largely replaced by a new system protecting the climate and the environment by the year 2050. An optimisation of the existing system alone will not suffice to reach the necessary climate protection goals. Due to the accelerated phase-out of nuclear power in the wake of the reactor accident at Fukushima in 2011, time pressure and the need for action in Germany are particularly great, since the shut-down of nuclear power plants leads to an increasing combustion of coal for power generation, which has negative effects on climate development. The large energy supply companies have so far invested very little in the expansion of power generation from renewable energies and economically still strongly depend on their fossil fuel-based power plants. Since it is not yet clear which new technologies are suitable for renewable power production - especially for the energy transition - and will establish themselves in markets, they are holding back large investments for the time being.

The question, however, is: With which actors and groups of actors can an energy transition be promoted in view of the tight time frame? And how can and must these groups be supported to make success more likely? Until now, it has been the citizens and private investors in particular who have invested in power generation from renewable energies. Contrary to large-scale projects with high investment costs and long planning periods, the cooperation of niche actors and regime actors (in the sense

of the multi-level perspective) can serve to realise projects in a smaller size, and in a less expensive and faster manner. Since it is not yet foreseeable which technologies and forms of cooperation are the most promising for implementing the energy transition, various alternatives must be tested. Small social niches could, in this respect, serve as lab spaces for the transformation process of the energy transition. For planners and politicians, the bottom-up energy transition approach creates the possibility of simultaneously testing different solution approaches in a trial-and-error process, and thus promoting the energy transition. This path can be faster and more promising than to push for the expansion of large-scale infrastructures. Moreover, this allows to diversify the risk of misinvestments, while possible setbacks and failures can thus be more easily compensated in society as a whole. However, here too, a rethink in the culture of planning must take place.

Since the success of projects in the transformation process of the energy transition cannot be predicted, it is not only the successful projects that contribute towards the advancement of the energy transition; the failures too are an important part of this process. The energy transition is a learning process and must also be understood as such in planning. The knowledge exchange between project initiators, administrations, policy, companies, and planners must be strengthened to accelerate an energy transition. This paper demonstrates, with reference to various case studies, how successful as well as failed initiatives and projects have advanced, supported or countered the energy transition. The selection of projects is intended to cover the range of planning levels in which individual or groups of niche actors become active. Therefore, exemplary projects with different numbers of project participants are examined. This includes the individual use of renewable energy sources on one's own plot of land, extending up to the collaborative generation of power in a quarter or even a region. In doing so, the focus lies on German projects, complemented by case studies from other European countries with similar political, social, and economic framework conditions. The following questions are examined more closely: Why were projects successful and why did they fail? Where do project initiators and project implementers require support on the part of policy or the economy (regime actors)? Where, how, and by whom was it attempted to counter project implementation? What

type of resistance and endorsement existed for the projects? What consequences result from this for other energy transition projects? What technical and social innovations were applied and/or developed in a given project? It is ascertained which insights can be used as a basis for the development of guidelines for the learning / planning process of the energy transition.

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