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## German energy policy and the way to sustainability: Five controversial issues in the debate on the “Energiewende”

W. Fischer, J.-Fr. Hake, W. Kuckshinrichs, T. Schröder, S. Venghaus\*

*Institute for Energy and Climate Research – Systems Analysis and Technology Evaluation (IEK-STE), Forschungszentrum Jülich GmbH, Germany*

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### ABSTRACT

German governments throughout the last 25 years have accepted the sustainability paradigm and put forth an energy policy that supports the development of renewable energies, the reduction of greenhouse gas emissions and the improvement of energy efficiency. Together with the process of seeking to phase out nuclear power, these objectives constitute the ‘Energiewende’ (energy transition) the Energiewende has reached a level that reveals its challenges and thus makes it a valuable case study. Based on a multi-method stakeholder analysis, frequently debated controversial issues related to the Energiewende have been identified and will be confronted with “reality” in this paper. The set of controversial issues includes the following five aspects: security of electricity supply, rising electricity prices for industry and commerce, rising electricity prices for consumers, impacts of the energy transition on employment, and the effects of the politically instigated speed of the Energiewende on its practical implementation.

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### 1. Introduction

In Germany, the federal governments of the last twenty years, whether led by the conservative Christian Democrats or the Social Democrats, have specified their ideas on a sustainable development of the country and the related energy system. The transformation of the energy system constitutes the core of a comprehensive strategy to redirect Germany onto a future-oriented and sustainable path [1,2]. Beyond the transformation of the energy system, this comprehensive strategy encompasses and operationalizes further social, economic and environmental objectives of sustainable development [3]. In this paper, however, neither the concept of sustainable development nor the comprehensive sustainability strategy itself shall be explicitly addressed. Instead, the focus will be set on its core, the transformation of the energy system. Ambitious energy policy goals, reaching far into the future, now constitute the vision of the Energiewende. This transformation process, however, increasingly evokes controversial debates that may negatively retroact on the comprehensive sustainability strategy (cf. section 3).

The path to a low-carbon society in Germany is guided by the goals set in three documents: the governmental energy concept presented in 2010 [4], an amendment on its energy policy passed in 2011 after the Fukushima nuclear disaster [5], and the coalition agreement between Christian Democrats and Social Democrats of December 2013 [6]. The governmental concept for Germany's future energy supply proclaims very ambitious targets: to increase energy productivity by 20% until 2020 as compared to 1990; to reduce greenhouse gas emissions by 40% (2020) and by at least 80% (2050) compared to 1990. The share of renewables in gross energy consumption is to increase to 18% by 2020 and to 60% by 2050. The share of renewables in gross electricity consumption is to rise to 35% (2020) and to 80% (2050), and the lifetime of the last nuclear reactor is limited to 2022. In December 2013, the newly formed grand coalition of Christian and Social Democrats announced that the expansion of renewable energy, which at the time already exceeded the original targets, should be slowed down and limited to so-called “development corridors”: the share of renewables in power supply was now to reach 40–45% by 2025 and 55–60% by 2035. The 2050 final target, however, is upheld.

Strongly accelerated by the feed-in law (EEG) in the electricity sector, the Energiewende and the corresponding transition process faces challenges on multiple political and economic levels. Critics claim that the decision to end nuclear power generation and the massive expansion of renewables came too suddenly, making it

\* Corresponding author.

E-mail addresses: [wo.fischer@fz-juelich.de](mailto:wo.fischer@fz-juelich.de) (W. Fischer), [j.-f.hake@fz-juelich.de](mailto:j.-f.hake@fz-juelich.de) (J.-Fr. Hake), [w.kuckshinrichs@fz-juelich.de](mailto:w.kuckshinrichs@fz-juelich.de) (W. Kuckshinrichs), [t.schroeder@fz-juelich.de](mailto:t.schroeder@fz-juelich.de) (T. Schröder), [s.venghaus@fz-juelich.de](mailto:s.venghaus@fz-juelich.de) (S. Venghaus).

**Table 1**  
Workshops and the primarily involved stakeholder groups.

Workshop title <sup>a</sup>	Primary stakeholders groups	Date
“Fundamentals of the transformation of energy systems”	Energy industry, energy technology, science	Sept. 9–11, 2012
“R&Dialogue workshop series”	Civil society, industry, NGOs, public authorities	March 6–Sept. 4, 2014
“Financing the energiewende: who bears the costs?”	Science	Feb. 26, 2015
“Redirection of the energy transition in Europe: market-economical, secure, innovative”	Policy	Feb. 19, 2016

<sup>a</sup> Authors' translations. For documentations of the workshops, cf. respectively [19]: Gruber L, Hake J-F. Grundlagen für die Transformation von Energiesystemen [Fundamentals for the transformation of energy systems]. Energie & Umwelt/Energy & Environment, Advances in Energy Systems Analysis 4. Jülich, Forschungszentrum Jülich GmbH2013 [20], Ernst A. Integration of the German energy transition in the EU-context. Energie & Umwelt/Energy & Environment. Jülich: Schriften des Forschungszentrum Jülich; 2015 [21], IEK-STE. Finanzierung der Energiewende: Wer trägt die Kosten? [Funding the Energiewende: Who bears the costs?]. Jülich2015 [22], Wirtschaftsrat Deutschland. „Neuausrichtung der Energiewende in Europa: marktwirtschaftlich, sicher, innovativ“ [Redirection of the energy transition in Europe: market-economical, secure, innovative]. 14 Klausurtagung Energie-und Umweltpolitik2016.

impossible for German power utilities and other industrial companies to calculate their future investments. They also warn that the transition progresses too fast, that electricity blackouts will become more likely, that increasing prices might weaken the German economy, reduce available income of the private households and put heavy burden on the low income groups, and that renewable energies are not a “job-generating engine”, as often proclaimed. Criticism is thus rarely directed towards the long-term objective to establish a decarbonized energy system based on renewable energies. Instead, in the political debate the focus of the criticism is mainly set on challenges related to the efficiency and effectiveness of the instruments, in particular the EEG [7,8] and its compatibility with the emission trading system of the European Union [9], or the future design of the electricity market, e. g., the role of capacity markets [10,11].

In this paper the focus is set on those fears and expectations identified to be most commonly discussed among the different stakeholder groups. We argue that the German energy transition is an evolutionary rather than a revolutionary process and some of the critical claims mentioned. Setting the focus on the electricity sector – not only due to its importance for a highly developed industrial country, but in particular because the Energiewende is most advanced in the electricity sector. For each of the five identified controversial issues – i.e., security of electricity supply, rising electricity prices for industry and commerce, rising electricity prices for consumers, impacts of the energy transition on employment, and the effects of the politically instigated speed of the Energiewende on its practical implementation – the analyses will show that some fears are justified, while others are exaggerated. To do so, we consolidate and critically discuss the perceived developments for each controversial issue with the available empirical evidence. The chosen research approach can best be described as a multi-method policy-analytical approach based on both qualitative analysis and empirical data combined with a literature- and evidence-based state-of-the-art analysis.

## 2. Research method

Qualitative policy analyses provide valuable insight into social effects and change processes induced by policy decisions and thus serve as valuable complements to standard quantitative approaches. The policy of the energy transformation is a complex cross section policy. Its effects impact multiple major policy fields – the economy, the society and the technical infrastructure. With the continuing realization of the Energiewende, also underlying subtle or unobvious repercussions and dynamics occur, which can best grasped using a qualitative policy analysis approach [12]. The high degree of complexity of the energy transformation leads to not only objective, but often primarily perceived trade-offs or conflicts among objectives within and between policy fields. Often discussed

is, for example, the expectation that an increasing share of “domestic” renewable energy will lead to higher geostrategic security, but that it, on the downside, may result in lower technical security (i.e., grid stability, blackouts) due to intermitting renewable supply, or in the need for increased efforts to maintain supply security. It is widely discussed that high electricity prices could spark innovation, but may also put energy intensive industries under significant pressure or imply a financial burden on low income groups. At the same time, increased employment in the renewable sectors is feared to be countered by a rapidly diminishing labor market in fossil electricity production and related sectors. Taken together, these common fears translate into the broadly advanced opinion that the electricity structures and systems impacted by the policy-driven speed of the Energiewende need more time to adapt to the changing political and economic environments. This has sparked a controversial debate about whether, under the current circumstances, the pursued speed of the energy transition – and specifically the expansion of renewable energies – is actually reasonable, or whether a slower speed might be less expensive and thus possibly more cost effective [13,14].

In order to address this question and uphold the acceptance of the Energiewende among the population and the industry, the most common fears and expectations must be properly addressed [e.g.,15,16]. To identify these issues, a series of workshops were chosen for a dialogue with the different stakeholders involved in and affected by the Energiewende. Specifically, these included the following (Table 1). Although the workshops were generally open to a broad audience, specific, primary stakeholder foci were set at the different events. This setup was deliberately chosen in order to observe and screen the discussions within different stakeholder groups for the respectively perceived core topics related to the Energiewende.

In addition to the qualitative evaluation of these workshops, a technology monitoring survey has been conducted annually since 2009 in the form of a representative survey ( $n > 1000$ ) of the German public regarding the perception of new energy technologies. The survey data analysis included descriptive and inferential statistical analyses, comparative analyses with respect to different energy technologies, as well as structural equation modelling [e.g., 17,18].

This multi-method research approach revealed that primarily five controversial issues related to the German Energiewende reoccur frequently within the different stakeholder groups – namely (a) security of electricity supply, (b) rising electricity prices for industry and commerce, (c) rising electricity prices for consumers, (d) impacts of the energy transition on employment, and (e) the influence of the politically instigated speed of the Energiewende.

In order to reflect these empirical research findings with their relevance in the current scientific literature, a confirmatory

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