REGULATORY INCENTIVES FOR NETWORK INVESTMENTS – A SYSTEM DYNAMICS APPROACH FOR ANALYSING THE SUSTAINABILITY OF REGULATORY FRAMEWORK DECISIONS IN THE GERMAN ELECTRICITY INDUSTRY

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Overview

The realisation of challenging energy policy objectives towards the use of renewable energy sources instead of fossil fuels and atomic energy changes the energy policy framework in Germany sustainably. For instance, increasing wind energy plant capacities in costal areas, which shall be integrated into the power grid, lead to a shift of the power generation from the south of Germany to its north (Deutsche Energie-Agentur GmbH, 2013). For this reason, the current climate policy leads to an enormous need of power transportation from the coastline to the main consumption areas. Thus, the present framework descisions affect the power generation, the required transmission distance and the network load adversely.

The necessary adaptation of the energy supply system requires an increasing transmission capability of the electricity grids (Fingerle, 2010). This includes major investments in the extension and restructuring of the transmission and distribution networks (Deutsche Energie-Agentur GmbH, 2013). If necessary investments are not implemented, the rising volatile structure of energy generation may lead to a grid overload. Then, the ensuring of the security of supply and also the whole economy can be negatively affected (Schmitz, 2010).

At the same time, electricity grids are economically regulated since they are natural monopolistic bottlenecks. Regulatory authorities are increasingly fostering the implementation of so called incentive-based revenue or price-cap schemes in order to secure sustainable and efficient network investments. Within incentive-based regulation the electricity transmission and distribution revenues are determined by a complex framework. Costs and revenues are usually decoupled for a significant period, which leads to operational lags in the refinancing of implemented investments (“regulatory time lags”). Therefore, for regulated network operators difficulties arise regarding a complete coverage of investment costs in the near time. Hence, the decoupling substantially determines the financial performance and incentives for network investments. While the implementation of an incentive-based regulation is mainly rated positively by research and practice, its mechanisms often cause some recurring difficulties. Primarily, the conditions of capital-intensive investments, especially the refinancing, induce big business challenges, considering profitability and solvency.

Unattractive investment conditions endanger the required grid extension and thus the attainment of policy objectives in Germany. The regulated network operators will only realise the necessary grid extension and restructuring investments, if the attainment of appropriate revenues can be prognosted with sufficient certainty. Due to the paramount importance of grid extension regarding the sustainable realisation of the energy policy objectives, the implementation of the required investments is desired from an political and economical point of view. Accordingly safe and attractive investment conditions should be created. For realising national and international energy targets, a discussion on how appropriate incentives for network investments can be ensured is vitally important. This controversial question is also discussed in Germany, especially in the context of the realisation of the incentive regulation according to § 21a of the German energy law (Energiewirtschaftsgesetz).

The recent study is intended as a status quo analysis of present regulatory settings of network investments in Germany, and furthermore tries to work out more suitable regulatory instruments to overcome existing investment barriers. The main objective is to create an in-depth understanding of the complex cause-and-effect relationships within the regulatory framework and to justify the adequacy of central regulatory parameters.

Methods

In order to investigate current regulatory settings of network investments in Germany and to identify economically and politically acceptable instruments for network investments, the status quo for network investments within the German incentive-based regulation system is analysed quantitavely.

The analysis is based on a mapping of the regulatory framework for network operators in Germany in a business simulation model for an exemplary grid expansion project and assessed with regard to the economic impacts. A business simulation modell is chosen in the study since recent studies have shown that they can offer support to justify the adequacy of central regulatory parameters (Ballwieser, 2008) and are capable to transparently quantify the impact of regulatory decisions (Estache et al., 2003).

For the analysis, underlying business cases are benchmarked within different regulatory scenarios regarding their long-term impact on the development of key performance indicators based on the methodology of System Dynamics (for example Forrester, 1962; Sterman, 2000; Morecroft, 2007). Within the scope of this study the handling of transmission grid expansion investments according to § 23 of the ordinance on incentive regulation guideslines, an additional cost pass-through element for investments, is singled out as an example for regulatory scenarios.

Results

In order to enhance the regulatory framework, a need for additional incentives for network investments in the German regulatory system can be identified. One major barrier for grid expansion investments are the so called regulatory time lags, which can cause significant earnings and liquidity shortages for the concerned network operators. These time lags lead to considerable problems in the refinancing of implemented investments and cause essential constraints on the investment realisation.

The analysis shows that the implementation of the investment instrument according to § 23 of the ordinance on incentive regulation guidelines has a significantly positive impact on overcoming existing investment barriers. The investigated instrument helps to compensate regulation chances and risks by reducing or closing regulatory time lags. For example, gaps in profitability and solvency can be resolved by the usage of this instrument. The reduction of time lags positively influences the refinancing of implemented investments and fosters the rise of investment security. Thus, additional cost-oriented instruments take on an increasingly important role in incentive-based regulatory frameworks.

Conclusions

The results show that the regulation of network revenues influences adversely the refinancing of grid expansion investments. It is therefore necessary to implement additional instruments into the regulatory framework that foster the realisation of grid expansion projects. A notable reduction of the existing solvency and performance risks and thus an increase of the investment security can be induced by increasing cost orientation.

Since the realisation of network investments needs to be ensured in the long run due to energy policy objectives and due to the security of supply, the regulatory authorites need to guarantee the continued existence and implementation of the guidelines and instruments fostering the realisation of the required investments. Implementing these instruments just for a short time, would not solve the network operators business challenges, considering profitability and solvency. The legislature and the regulatory agency take on an important role as the realisation of these targets depends on their skills. Thus, the results highlight the importance of regulatory commitment to ensure a successful turnaround in the German energy policy towards the use of renewable energy sources. Moreover, they contribute to a sober debate on the sustainable implementation of appropriate instruments for network investments into the German incentive-based regulatory framework.

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