IMPACT OF RE POLICY ON ENERGY SECURITY IN THE GERMAN HEATING SECTOR

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Overview

The growing deployment of renewable energy technologies in Germany has been accompanied by a discussion on its impact on businesses, industries, households, and the economy as a whole. This discussion has been mainly cost-driven and focused almost entirely on the electricity sector. The benefit effects of renewable energy deployment however stayed on the side-line of this discussion. A holistic scientific assessment accounting for the multiplicity and complexity of these effects in the form of a cost-benefit-analysis is missing. In the light of rising burdens for consumers, e.g. additional cost arising from RE electricity support have increased considerably from 4.7 bill Euro in 2008 to almost 19 bill Euro in 2014 (Monitoring Report 2015), identifying and quantifying of benefits becomes even more urgent. Therefore, this paper addresses the issue of energy security as an example of the heating sector in Germany. Energy security is not clearly defined in political discussions. It encompasses effects across the system, micro- and macro-economic level (Breitschopf, B., Held, A. 2014). Therefore, before assessing and quantifying energy security as a benefit a clear definition and categorization of the effect is needed. This paper builds on recent works of (Schlotz 2013, Breitschopf and Schlotz 2014) by suggesting relevant aspects of energy security and quantifying them for the German heating sector.

Methods

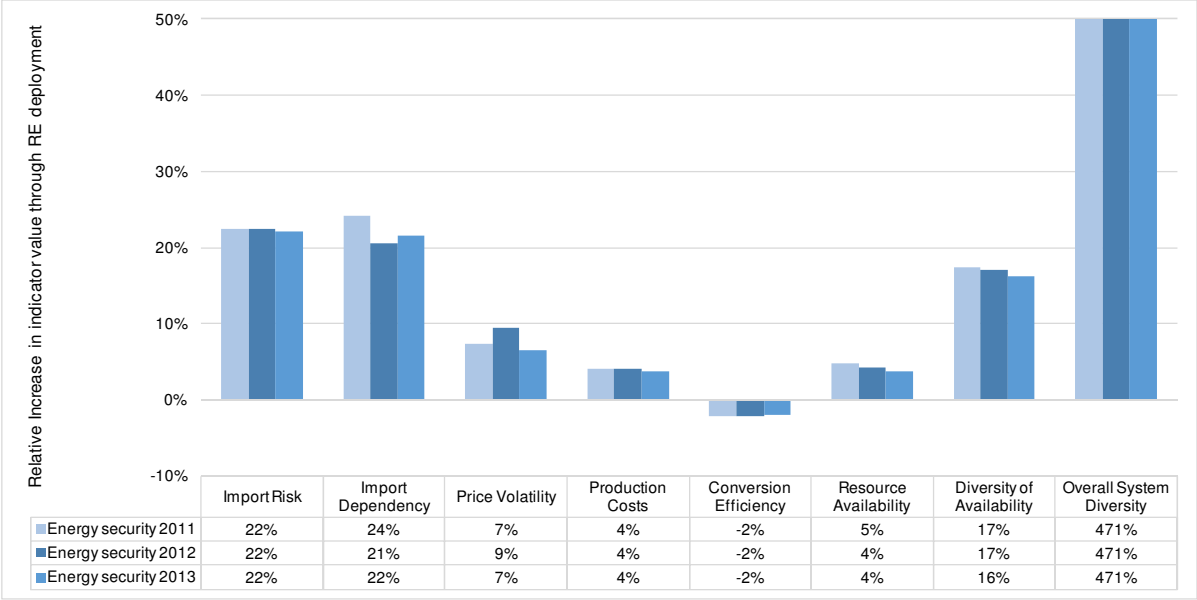
To develop an approach allowing to measure energy security a literature review is conducted. Based for example on Vidova (2010), Cherp & Jewell (2011), Sovacool (2012) and others, main dimensions and characteristics of energy security are identified and respective indicators are adopted. These indicators should cover the most relevant characteristics and dimensions of energy security. Main aspects of energy security are availability, accessability, affordability, sustainability of energy. Based on these characteristics, indicators are selected. Some indicators are assessed stepwise, i.e. additional factors are included to show how they impact the indicator value. To apply the approach to the German heating sector, the current structure of the heating sector, i.e. the generation technologies, application areas and sectors are needed. To emphasis the impact of RE use on energy security, a reference structure of the heating sector is applied, in which no RE are used for heating. Applying the selected indicators and comparing their values for the heating sector with and without RE shows the impact of RE use on these indicators, and hence on energy security.

Results

Main indicators are import dependency and risks, as political instability or regional conflict could lead to shortages (availability) of imported fuels from certain countries. This results in higher prices and hence makes energy more costly. Price volatility is another indictor as it reflects the short-term changes in prices and hence addresses exposure to price changes, and hence affordability as does production costs. The availability of resources as well as the diversity of resources or suppliers and of the technologies/systems reflect accessability and availability of energy. The indicator values are assessed for a heating system with RE and without RE. The difference of the indicator values of the heating system with RE is depicted as percentage to the reference scenario (no RE in the heating system) in Figure 1. The results comprise the years 2011 to 2013 as no current data on the use of energy sources by

application and sectors is available. However , it is evident that a system with RE displays a much lower import dependency and risk. Similarly, availability and system diversity are larger while conversion efficiency is rather unchanged (2% differences). Overall, with respect to the given definition of energy security and the selected set of indicators, RE significantly contribute to energy security.

Figure 1: Development of selected indicators for energy security, in Germany from 2011-2013.



	Import Risk	Import Dependency	Price Volatility	Production Costs	Conversion Efficiency	Resource Availability	Diversity of Availability	Overall System Diversity
Energy security 2011	22%	24%	7%	4%	-2%	5%	17%	471%
Energy security 2012	22%	21%	9%	4%	-2%	4%	17%	471%
Energy security 2013	22%	22%	7%	4%	-2%	4%	16%	471%

Source: diverse sources, own compilation and calculation

Conclusions

The impact assessment of RE on energy security is based on a given definition and selection of indicators. This set of indicators could be enlarged or refinded as well as the calculation of the indicators adjusted. For example conversion efficiency is only relevant under fuel scarcity and difficult to compare across different heat generating technologies, while system diversity needs to include further aspects. Or, the indicator components for example political instability, fungibility, significantly affect the value of indicators. And, finally, some indicator components are difficult to assess or quantify. Nevertheless, this approach represents an applicable and upgradable approach for assessing the impact of RE on energy security in the German heating system.

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