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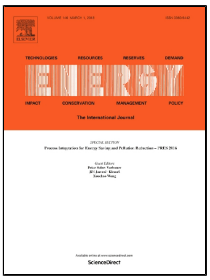

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PII:	S0360-5442(18)30473-0
DOI:	10.1016/j.energy.2018.03.065
Reference:	EGY 12523
To appear in:	*Energy*
Received Date:	14 September 2017
Revised Date:	09 March 2018
Accepted Date:	12 March 2018

Please cite this article as: Philipp Hauser, Heidi U. Heinrichs, Bastian Gillessen, Theresa Müller, Implications of diversification strategies in the European natural gas market for the German energy system, *Energy* (2018), doi: 10.1016/j.energy.2018.03.065

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Implications of diversification strategies in the European natural gas market for the German energy system

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Highlights

- Coupling of a European natural gas market model with a German energy system model
- Six scenarios cover changes in natural gas infrastructure and reduction of CO_2 emissions
- Infrastructure determines German imports and exports more than cross-border prices
- Climate policy effects the German natural gas demand only in low price scenarios
- Higher system costs of a CO_2 cap are caused by the residential sector

Abstract:

The energy system is facing changes across Europe, motivated by CO_2 emission reduction targets and driven by the expansion of renewable energy sources (RES). Germany is carrying out efforts to reshape its future energy system to be mainly based on RES. Nonetheless, flexible generation capacities like natural gas (NG) power plants will still be needed in the coming decades. Recent developments in the NG market have been characterised by uncertainties on the supply side as plans have been put forth for new pipelines to facilitate Russian or Caspian NG towards Europe as well as increasing volumes of liquefied natural gas entering the market. This paper aims to show the interdependence between infrastructure developments and primary NG demand in the German energy system. The authors analyse impacts for the German 'Energiewende' on a time horizon from 2010 to 2050. Coupling a European NG model with a German energy system model, we develop six scenarios regarding climate policy in Germany and European diversification strategies in infrastructure expansion. The results show, that NG prices influence sectoral changes especially in the residential sector. Further strategies to reduce CO_2 emissions in the entire energy system should also consider NG as part of the solution.

Keywords: European natural gas market, German energy system, diversification strategy, natural gas infrastructure, CO_2 cap, linear optimization

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