

Middlesex University Research Repository

An open access repository of

Middlesex University research

<http://eprints.mdx.ac.uk>

Hurnaus, Thomas Andreas (2020) Wie lassen sich die wirtschaftlichen und volkswirtschaftlichen Chancen von Hydraulic Fracturing als unkonventionelle Fördermethode von Erdgas im Rahmen der Energiewende bewerten? DBA thesis, Middlesex University / KMU Akademie & Management AG. [Thesis]

Final accepted version (with author's formatting)

This version is available at: <https://eprints.mdx.ac.uk/32252/>

Copyright:

Middlesex University Research Repository makes the University's research available electronically.

Copyright and moral rights to this work are retained by the author and/or other copyright owners unless otherwise stated. The work is supplied on the understanding that any use for commercial gain is strictly forbidden. A copy may be downloaded for personal, non-commercial, research or study without prior permission and without charge.

Works, including theses and research projects, may not be reproduced in any format or medium, or extensive quotations taken from them, or their content changed in any way, without first obtaining permission in writing from the copyright holder(s). They may not be sold or exploited commercially in any format or medium without the prior written permission of the copyright holder(s).

Full bibliographic details must be given when referring to, or quoting from full items including the author's name, the title of the work, publication details where relevant (place, publisher, date), pagination, and for theses or dissertations the awarding institution, the degree type awarded, and the date of the award.

If you believe that any material held in the repository infringes copyright law, please contact the Repository Team at Middlesex University via the following email address:

eprints@mdx.ac.uk

The item will be removed from the repository while any claim is being investigated.

See also repository copyright: re-use policy: <http://eprints.mdx.ac.uk/policies.html#copy>

ABSTRACT

VOR- UND NACHNAME (AUTOR)	Dr. rer. nat. Thomas Hurnaus
TITEL DER DISSERTATION	Wie lassen sich die wirtschaftlichen und volkswirtschaftlichen Chancen von Hydraulic Fracturing als unkonventionelle Fördermethode von Erdgas im Rahmen der Energiewende bewerten?
DATUM (ERSTEINREICHUNG)	21.05.2020
STUDIENPROGRAMM	Doctor of Business Administration
ABSCHLUSS VON	Middlesex University

Generally, it can be concluded that natural gas prices will stay constant or decrease slightly within the “Energiewende”. Nevertheless, factors such as geopolitical tensions or increased resistance to fracking in the US may have an influence. In the case of such an event, natural gas prices may also increase sharply.

According to current knowledge, the Posidonia Shale would be most suitable for an unconventional shale gas production using Hydraulic Fracturing (also known as fracking) in Germany. However, additional test drillings are required to determine further important parameters, such as the acid resistance of the formation. Multiple measures to reduce the risk of hydraulic fracturing were developed within this work. For example, the use of frac fluids based on slickwater. Considering the required measures, experts estimate costs of 8 to 15 million euros per unconventional shale gas well. The annual operating costs were assessed to be within 7 to 11 million euros per well site. Furthermore, the productivity of the Posidonia Shale was estimated within this thesis. By analyzing this data (investment and operation costs, natural gas price and productivity) with the net present value method, it could be concluded that an unconventional shale gas production in Germany is highly economical if the natural gas price is constantly increasing within the “Energiewende”. By contrast, if the natural gas prices are staying constant or decreasing, the project would be unprofitable. In such a case, it could only be profitable if strong synergy effects would significantly lower investment and operations costs. However, in Germany, the presence of shale formations is

limited so that such synergy effects can only be realized if the unconventional shale gas production is extended into Europe. Alternatively, the high productivity of the Posidonia Shale can also contribute to profitable shale gas production. Based on the limited data, such an assumption would be very risky and needs to be confirmed by checking with the first shale gas wells in Germany.

Next, the effect on the national economy was studied. For this reason, 22 opportunities and risks linked to hydraulic fracturing were evaluated. Thereby, a value in use of - 1.77 was determined confirming that also for the national economy the unconventional shale gas production using fracking is not feasible. The negative value in use predominantly arises from the fact that the benefit to the community is too low to compensate for the negative effect of hydraulic fracturing on the well-being of humans.

Thus, it can be concluded that an unconventional shale gas production in Germany only makes sense if the natural gas price is constantly increasing, and the perceptions of people regarding fracking are improving. People need to be more open-minded towards the method and should be confident that everything is under control when small incidents occur. According to the experts, this can only be achieved if people are well informed about the technology and measures to guarantee a high safety level. This process can be supported if the number of incidents linked to fracking in the US further decreases.

At this point, the question arises as to whether there are feasible alternatives to the unconventional shale gas production available. Many experts suggest the further development of renewable energy, geothermal power and hydrogen energy. However, with regard to power production based on hydrogen, further research is required to achieve this kind of energy in stable, inexpensive and high volumes.