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# Shale Gas and Oil in Germany – Resources and Environmental Impacts

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In light of the controversial debate on “unconventional” oil and gas resources and the environmental impacts of “fracking”, the Federal Institute for Geosciences and Natural Resources (BGR) conducted a comprehensive resource assessment of shale gas and light tight oil in Germany and studied the potential environmental impacts of shale gas development and hydraulic fracturing from a geoscientific perspective.
Here, we present our final results (BGR 2016), incorporating the majority of potential shale source rock formations in Germany. Besides shale gas, light tight oil has been assessed. According to our set of criteria – i.e. thermal maturity 0.6-1.2 %vitrinite reflectance (VR; oil) and >1.2 % VR (gas) respectively, organic carbon content > 2%, depth between 500/1000 m and 5000 m as well as a net thickness >20 m – seven potentially generative shale formations were indentified, the most important of them being the Lower Jurassic (Toarcian) Posidonia shale with both shale gas and tight oil potential. The North German basin is by far the most prolific basin. The resource assessment was carried out using a volumetric in-place approach. Variability inherent in the input parameters was accounted for using Monte-Carlo simulations. Technically recoverable resources (TRR) were estimated using recent, production-based recovery factors of North American shale plays and also employing Monte-Carlo simulations. In total, shale gas TRR range between 320 and 2030 bcm and tight oil TRR between 13 and 164 Mio. t in Germany. Tight oil potential is therefore considered minor, whereas the shale gas potential exceeds that of conventional resources by far.
Furthermore an overview of numerical transport modelling approaches concerning environmental impacts of the hydraulic fracturing is given. These simulations are based on a representative lithostratigraphy model of the North-German basin, where major shale plays can be expected. Numerical hydrogeological modelling of frac fluid migration in the subsurface has been conducted, as well as stress modelling to estimate frac dimension magnitudes and the potential frequency of induced seismity. The results of these simulations reveal that the probabiltiy of impacts on shallow groundwater by the upward migration of fracking fluids from a deep shale formation through the geological underground in the North German basin is small.

BGR 2016 – Schieferöl und Schiefergas in Deutschland – Potenziale und Umweltaspekte, 197p, Hannover, 2016:
http://www.bgr.bund.de/DE/Themen/Energie/Downloads/Abschlussbericht_13MB_Schieferoelgaspotenzial_Deutschland_2016.pdf