

Why should Oil and Gas go Geothermal? A Risk Assessment

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1. ABSTRACT

Rapid climate change and the aim to achieve the 1.5 degrees Celsius target mean that the business model of the Oil and Gas industry (O+G) is becoming risky. The energy sector accounts for more than 70 % of global CO₂ emissions and if the use of oil, gas and coal stopped tomorrow, we would have solved the climate crisis, but would have a giant economic crisis.

Preventing both, an economic and a climate crisis, there is a solution:

O+G could transform its business model naturally by turning into the geothermal sector, which is in its technical skills and its assets very close to O+G. O+G could also provide the urgently needed financing for geothermal energy.

However, the Oil and Gas companies are still hesitant to undergo a radical transformation, possibly underestimating the strong climate-friendly policies against their traditional business model, which can be brought about by the radical climate changes already in the 2030s.

Germany could establish a political and an economic framework encouraging O+G to turn to geothermal which then other countries could follow. If O+G changes then to geothermal, the communities need less finance to pay and all citizens enjoy a less polluted planet.

Key words: Oil and Gas, Geothermal, Climate change, Political framework, CO₂ Emissions.

2. OUTSET

In the face of rapid climate changes, it has become a priority of many countries to limit CO₂ emissions to achieve the 1.5 degrees Celsius target set in the Paris Climate Agreement. Global energy-related CO₂ emissions has reached ca. 37 billion metric tons in 2022.¹ However, to reach the target of less than 1.5 degrees Celsius of global warming, we need to reduce those emissions to 16 billion metric tons of CO₂ p.a. till 2030.² According to a study published by McKinsey, 90 % of our current global population lives in areas which by 2099 will be uninhabitable if a temperature increase of 3-4 degrees Celsius were to happen as it seems today.³

According to a study by the International Panel on Climate Change, we have 6.5 years left to limit global warming to 1.5 degrees Celsius.[1] Tipping points are expected latest in the 2030s, when 1.5 degrees is reached, and the climate risks might accumulate and climate damages are unpredictable.[2] Then, strong national countermeasures towards CO₂ emissions are likely.

There is hope on the horizon: The electricity production by fossil fuels decreased from 2022 to 2023 in the EU by 17 %, ⁴ which will alarm the fossil industry: Once the trend of decay of fossils is clear, O+G will create an avalanche of shift from fossil to renewable, in order to get the lowest hanging fruits of renewables and thus save their assets as far as possible. This could be the last resort to save the 1.5 Celsius goal of the Paris accord 2015.

3. RISKS OF OIL AND GAS INDUSTRY

O+G is risky because it is responsible for a very significant proportion of the said global emissions. Ca. 70 % of global greenhouse gas emissions come from energy sector and 40 % of global greenhouse gas emissions come from O+G industry.⁵ Therefore it may be one of the first sectors targeted by the climate-friendly policies on national and international level. As the covid pandemic 2020-2022 has shown, national governments can react very quickly and strongly when it comes to natural disasters. Ultimately, radical measures are also possible, such as a possible complete ban on CO₂ emissions. A similar radical move in the

¹ "CO₂ Emissions in 2022", IEA, 2023, Paris, <https://www.iea.org/reports/co2-emissions-in-2022>,

² "Global Energy Perspective 2022", McKinsey&Company, 2022,

³ Earlybird Analysis 2021, McKinsey Global Institute 2020, Zeit 2019,

⁴ <https://www.zeit.de/politik/ausland/2023-08/eu-stromerzeugung-fossile-brennstoffe-erneuerbare-energien>, access: 11.09.2023,

⁵<https://ourworldindata.org/emissions-by-sector>,access: 21.02.2023,

face of a great risk was the stop of car production in the USA during WW2 to produce military equipment. Alternatively, it is possible that because of climate-friendly policies the demand for oil and gas will dramatically fall in the 2030s. Therefore, the quicker O+G leave fossil fuels for renewable sources of energy, the lesser these risks will be.

4. WHY CAN GEOTHERMAL ATTRACT THE OIL AND GAS INDUSTRY?

A viable option for the Oil and Gas Industry can be a turn to geothermal energy. That is primarily because of the similarities between the two sectors. Much of the work of geothermal exploration (possibly up to 90 % in hydrogeothermal systems) is like O+G, including geology and drilling, equipment for drilling, seismic, chemical aspects, and mapping & resource allocation. The main differences are heat exchange, power production and energy distribution. O+G could therefore still make use of their experts and know-how in the new industry what would also give them a kick-start as regards other competitors on the market.

An example of a successful transition in that area is A.P. Moller-Maersk A/S, a Danish

company who has completely abandoned O+G some 7 years ago and has decided to set up a company, Innargi A/S, solely for the purpose of the development of geothermal energy projects.

Currently in the geothermal sector there are also many other pioneers (without an O+G background). For example, there is German Vulcan Energie Ressourcen GmbH, a company which is working on an innovative solution of acquiring lithium from the geothermal brine. Canadian Eavor Technologies Inc. is developing petrothermal energy for heat and power, a new technology, which is still tested in e.g., Geretsried, Bavaria.⁶ As it can be seen, the geothermal industry is already developing quickly but the change could be even more significant if the O+G were to put their resources into the geothermal sector.

Another reason for the O+G to move to geothermal sector is that the geothermal industry could be shaped like the O+G from an economic perspective and thus become more attractive for O+G. The business model of O+G is based on spread investments with industrialized large-scale projects all over the globe, where one project benefits from the experiences from many former projects.

⁶ <https://www.thinkgeoenergy.com/drilling-starts-for-first-commercial-eavor-loop-in-geretsried-germany/>, access: 07.09.2023,

Currently, the geothermal sector is scattered, and it is uncommon that one company owns more than one or maximum a few geothermal plants, thus initial mistakes can repeat and the overall experience of the project developer is often limited and thus costs for traditional geothermal projects are often higher than if they would have been performed by O+G on a large scale. Geothermal companies with large scale projects coming from O+G, like Innargi, do normally not ask e.g. for subsidies or state backed exploration risk insurances and thus can be profitable without subsidies, because the costs of a futile borehole can be balanced by the success of the other borehole by large scale and the lesser costs of an integrated geothermal system with a lot of experiences of former projects. One of the reasons for this phenomenon is lack of know-how of the company owners who are very often local authorities or local utilities and get often experiences from one project, but cannot built on former experience of other projects

A comprehensive management of the coordination of geology, drilling and later maintenance of the boreholes, which have been experienced in many former projects reduces systemic mistakes, which might occur, if different subcontractors work on these

different fields in smaller projects or do it for the first time.

O+G, with its vast resources, could create a scalable industrialized model of business just like it did in their own sector. That way, the geothermal sector could potentially become much more professional and profitable on a large scale. That is what the pioneer companies like Vulcan, Eavor and Innargi are trying to do. Should they succeed, the geothermal sector will be a real alternative for the O+G sector not only in technical, but also in economic terms.

5. WHY IS OIL AND GAS INDUSTRY STILL ATTRACTIVE DESPITE OF THESE RISKS?

It is remarkable that despite those risks, O+G still does not think about a complete transition to renewable sources of energy. One of the reasons for it may be that O+G has always been profitable. For 50 years, O+G has been making 2.6 billion USD profit a day.⁷ In fact, many new investments regarding developing new oil and gas fields are expected – according to studies, up to 570 billion USD p.a. will be spent on new oil and gas development and exploration by 2030.[3] Such new fossil fuel investments

⁷<https://www.theguardian.com/environment/2022/jul/21/revealed-oil-sectors-staggering-profits-last-50-years>, access: 21.02.2023,

might provoke strong countermeasures by national governments in the 2030s if climate changes dramatically.

Another reason may be that big companies are occasionally sleepwalkers to disruptive changes. A good example of that is Kodak, once a worldwide producer of photography equipment. In 2005 the company still had a turnover of 12 billion USD, but it missed the digital revolution and the development of smartphones made Kodak go bankrupt in 2012.⁸

Another example is the German car industry. E.g., Volkswagen Group paid over € 30 billion in fines and indemnifications before changing to electric cars.⁹ Big companies can apparently sometimes miss its chance to transition until it is too late.

6. PROPER RISK ASSESSMENT GIVES NATURAL RISKS PRIORITY OVER POLITICS

It is however untrue to say that O+G do not think about a transformation at all.

O+G has in Germany and the EU successfully lobbied for hydrogen as the “backbone” of the

energy transformation, since at least gas is supposed to serve for quite some decades for the production of hydrogen, even though in climate terms hydrogen wastes up to 40 % of power and is not sufficiently available and thus is rather a niche product for high temperature and heavy vehicles than the “backbone” of the energy transformation.¹⁰

O+G is already changing and is aware of the risks of the climate change. Many big Oil and Gas companies in fact have already started investing in geothermal projects. In the face of the rapid climate changes those decisions are, however, not enough. As mentioned before, we now need radical moves and cuts on CO₂ emissions, otherwise we may face severe climate consequences already in the 2030s. Many industries prefer to ignore scientific prediction of natural disasters and believe in the present political framework in their risk assessments. This assessment is wrong since it is nature and its interpretation that set the ultimate framework for the risks and not politics with their current measures.

A good example of the unreliability of current politics for future risks can be seen in Poland where the government introduced in 2016

⁸<https://www.independent.co.uk/news/business/analysis-and-features/the-moment-it-all-went-wrong-for-kodak-6292212.html>, access: 07.09.2023,

⁹<https://www.bbc.com/news/business-61581251>, access: 14.02.2023,

¹⁰<https://www.weforum.org/agenda/2021/08/hydrogen-carbon-intensive-energy-solution/>, access: 07.03.2023,

legislation which almost completely stopped the development of wind energy for years in Poland trying to favor “Polish” coal. However, in the face of growing energy prices by coal and the dissatisfaction of the citizens with the air pollution, the Polish government withdrew the legislation, stopping renewable energy.¹¹

The predicted radical natural changes in the 2030s can therefore leave other governments with no option but to rapidly tighten the CO₂ emissions laws.

7. GERMANY AS A POSSIBLE TRENDSETTER

Germany could play a crucial role in encouraging O+G to move to Geothermal. The country is the 7th worst CO₂ polluter in the world, but it is responsible “only” for 2 % of the world emissions.¹² At first sight it cannot therefore bring a radical change and contribute to limiting the CO₂ emissions globally. However, it could establish a market design for O+G to stop new investments in Oil and Gas and instead to put that money into geothermal energy. That way Germany could not only contribute to lowering its own emissions but in

fact affect the global energy emissions (ca. 40 % of the global total emissions).¹³

Germany has already published a Cornerstone Paper in November 2022 which includes several changes which should simplify investments in the geothermal sector. For example, geothermal procedures should be accelerated, open access to geological and geothermal data should be granted and subsidies should be available. However, those changes are not enough. In fact, some O+G are not very keen on subsidies. Arguably, a better solution would be to install tax holidays for RES investments (a similarity to the US Inflation Reduction Act 2022). That way the German government could approach and communicate with O+G on transformation and all investment risk would stay with Oil and Gas. Moreover, tax holidays are often cheaper than subsidies.

If Germany and then other governments adopt that model, a leverage of 20 in CO₂ reduction could be possible. (from max 2 % of CO₂ emissions within Germany to max 40 % on the planet). That way, together with phasing out coal, a drastic reduction of CO₂ emissions on a global level could be possible.

¹¹<https://notesfrompoland.com/2023/02/09/polish-parliament-approves-law-to-unblock-building-of-onshore-wind-farms/>, access: 07.09.2023,

¹²<https://www.statista.com/statistics/271748/the-largest-emitters-of-co2-in-the-world/>, access: 07.09.2023,

¹³ <https://ourworldindata.org/emissions-by-sector>, access: 21.02.2023,

8. IF OIL AND GAS CHANGE TO GEOHERMAL, THEY OFFER 3 BENEFITS FOR OTHER STAKEHOLDERS

If O+G changes to geothermal, they offer 3 benefits for other stakeholders.

First, the energy production industry would profit from the financial means and skills of O+G. That is because Oil and Gas would bring the capital, the geological know-how and the drilling experience for establishing geothermal plants. That way the global development of geothermal energy could really accelerate.

The second beneficiary of a said transition would be the communities and cities. Outsourcing the development of geothermal plants to big Oil and Gas companies would mean that cities and utilizes could save their liquidity and take advantage of the much broader knowledge of the exploration and drilling risk of O+G. Furthermore, using the contracting system would mean that the control over the plants would be given back from O+G to cities when the investment is paid off. That way communities and cities could avoid financial and geological risks connected to geothermal energy while still benefiting from it.

Finally, the transition of big Oil and Gas companies to Geothermal would be profitable for all citizens, as geothermal energy production does not pollute the climate anymore and therefore it could significantly contribute to the reduction and ultimate elimination of climate change and the air pollution in the cities.

9. CONCLUSIONS OF THE RISK ASSESSMENT

If big Oil and Gas integrate the time scale of the climate risks it is likely that their traditional business model will not allow new Oil and Gas plants and investments. Strong measures of national governments against CO₂ emissions in the 2030s are likely if climate disasters occur. Geothermal is the best way to reduce these risks of O+G. The German government has the chance to create a market design to not only reduce CO₂ emissions in Germany (2 % of global emissions) but also by its market design to attract big Oil and Gas to investment into geothermal, thus facilitating a reduction of up to 40 % in global CO₂ emissions by the energy sectors.

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