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"OIL AND GAS PRODUCTION IN GERMANY"
&
"FROM UNIVERSITY TO INDUSTRY: 10 ADVICES FOR A SUCCESSFUL TRANSITION"

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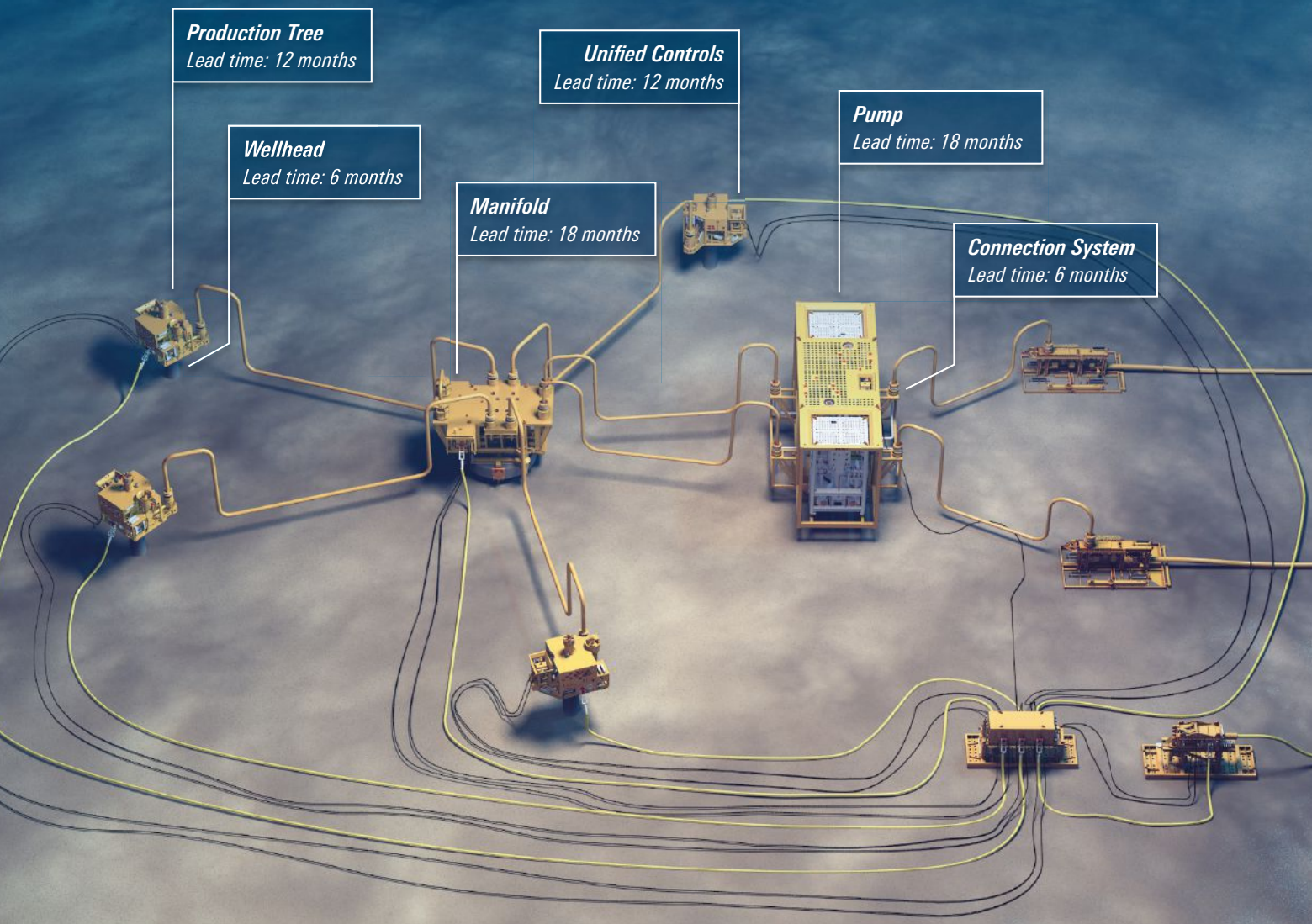

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Content

COVER

IMPRESSUM

Online Seminar: “Oil and gas production in Germany” & Webinar: “From University to Industry: 10 advices for a successful transition”

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45896 Buer

Section Chair:
Dr. Stefan Wessling

EDITOR

Daniela Marum
Baker Hughes, a GE company
Daniela.Marum (at) BakerHughes.com

Kai Stricker
Karlsruhe Institute of Technology
Kai.Stricker(at)kit.edu

SPONSORING

Dr. Andreas Hartmann
Andreas.Hartmann(at) bhge.com

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Calendar of Events

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Date	Type	Event	Location
Oct 6 - 8	SPE Workshop	SPE/EAGE Virtual Workshop: Advances in Reservoir Characterisation and Modelling	Virtual
Oct 21 – 22	SPE Conference	SPE Virtual Annual Caspian Technical Conference	Virtual
Oct 26 – 29	SPE Conference	SPE Virtual Annual Technical Conference and Exhibition	Virtual
Oct 27 – 29	SPE Conference	SPE Annual Technical Conference and Exhibition	Virtual
Nov 2 - 3	SPE Conference	SPE Virtual Norway Subsurface Conference	Virtual
Nov 2 - 6	Conference	Offshore Technology Conference Asia (OTC Asia)	Virtual
Nov 5 – 6	GSSPE Congress	Student Technical Congress 2020	Virtual
Jan 2021 26 - 28	SPE Conference	SPE/IADC Middle East Drilling Technology Conference and Exhibition	Abu Dhabi, UAE
Feb 2021 21 - 24	SPE Conference	SPE/AAPG/SEG Energy in Data Conference	Austin, Texas USA
Mar 2021 9 - 11	SPE Conference	SPE/IADC International Drilling Conference and Exhibition	Stavanger, Norway
Mar 2021 16 - 17	SPE Workshop	SPE Workshop: Intelligent and Advanced Wellbore Technologies	Calgary, Alberta, Canada
Mar 2021 17 - 18	SPE Workshop	SPE Workshop on Digital: Transform & Thrive in Turbulent Times	Vienna, Austria
Mar 2021 23 - 25	SPE Conference	International Petroleum Technology Conference (IPTC)	Kuala Lumpur, Malaysia
May 2021 3 - 6	Conference	Offshore Technology Conference	Houston, Texas, USA
Jun 2021 8 - 11	SPE Conference	SPE Europec featured at 82nd EAGE Conference and Exhibition	Amsterdam, The Netherlands
Sep 2021 7 - 10	SPE Conference	SPE Offshore Europe Conference and Exhibition	Aberdeen, UK
Sep 2021 21 - 23	SPE Conference	SPE Annual Technical Conference and Exhibition	Dubai, UAE

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HERRENKNECHT VERTICAL

German Section SPE Chairman Letter

Dear members,

COVID-19 and the drop in global energy demand continue affecting the way we work, operate, make decisions and communicate. Digitization of events, online meetings, and an overwhelming amount of emails to answer are current commonalities in the day-to-day business of our industry, whereas personal communication and social activities remain restricted to a few close friends and relatives. Formerly introduced mobile work on voluntary basis is replaced by home office over a long time period, such that temporarily implemented home offices need to be adjusted to ensure a comfortable work environment.

The economy of our petroleum industry does not seem to get back to a level as high as 2019, and companies have to adopt their business to prevent from significant loss in revenue. In consequence, operating and servicing companies reduce headcount and centralize business units to economically most attractive locations. In Germany, the petroleum industry experienced significant cuts to an extent which seem to make a soon recovery impossible.

Societies as the German Section SPE adopted their portfolio by online events, while the conduction of onsite activities remains hardy plannable. However, we should not resign from planning ahead and I consider this time critical to collaborate with additional societies of similar interest for geoscience, petroleum and the high-end technology which allows producing affordable energy. As a first step, we nominated additional officers to help evaluate and organize common events, amongst others in collaboration with the DGMK, VDI, DGG and potential other societies. In that respect, I'd be more than happy to receive feedback from you members about interests, formats and engagements you like to envision for our near future. A simple email to stefan.wessling@bakerhughes.com is much appreciated.

Sincerely Yours,

Stefan Wessling

STC'20

STUDENT TECHNICAL CONGRESS

SAVE THE DATE

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Virtually

Petroleum & Drilling Engineering
Geoenergy-related Geosciences
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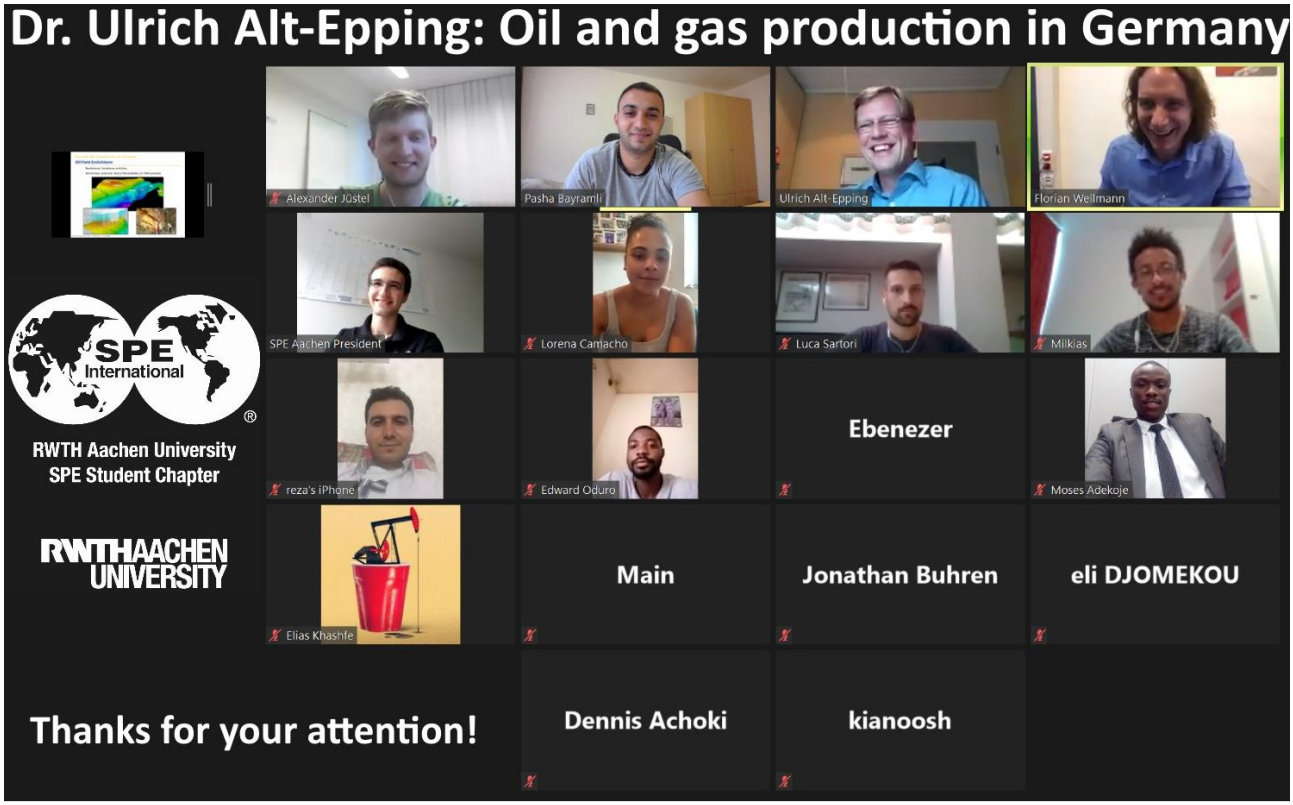
German Section

Event Report – Online Seminar: "Oil and gas production in Germany"

Elias Khashfe, Alexander Jüstel, RWTH Aachen



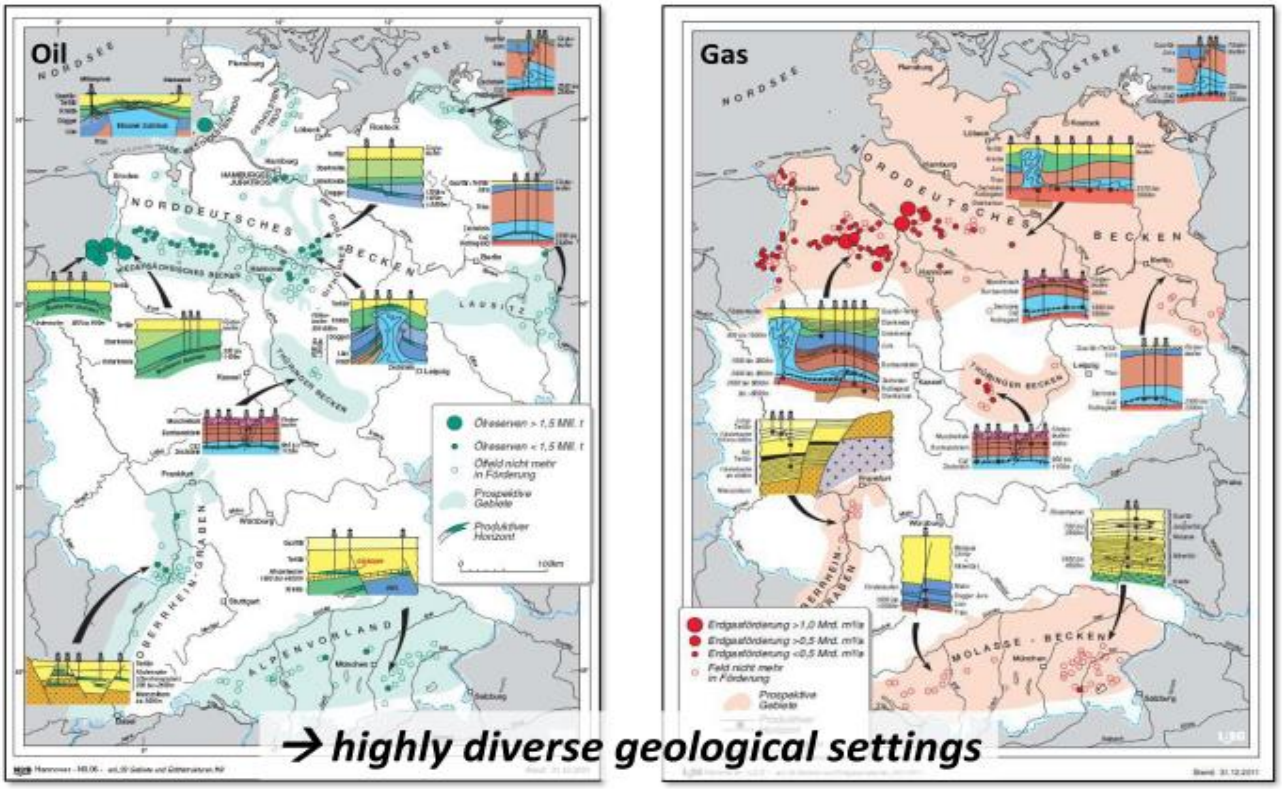
The image shows Dr. Ulrich Alt-Epping (3rd in first row), his presentation and the participants including host Alexander M. Jüstel.

On June 30th, the SPE Student Chapter at RWTH Aachen University had the pleasure to welcome Dr. Ulrich Alt-Epping, Senior Geologist at Wintershall DEA (Ill. 1) for his presentation about Oil and Gas production in Germany.

Germany and oil? That sounds more like fiction than reality. Yet, Dr. Alt-Epping showed in his presentation detailed that there is a demand. Various energy outlooks (World Energy Council, International Energy Council, BP, Royal Dutch Shell), agree that oil and gas will be the most important primary energy source in foreseeable time. Once the crises end and the economies are growing again, especially the increase of crude consumption in China and India need to be served by oil companies. In addition, there is fewer exploration successes for new fields, which leads to a higher development of existing fields and unconventionals.

In this way the role as a geologist is more important than ever. He must collect, integrate, and interpret these data. He also needs to identify "sweet spots" and drilling targets and their potential hydrocarbon volumes. Assessment of subsurface risks and uncertainties. The only limitation is that there are mostly small and relatively old fields in Germany, which are already in end production phase. Especially the oil field in Emlichheim at the border to the Netherlands could be named as something like a "high end technology playground ". Therefore, it was needed to drill horizontal producers and injectors. Wintershall DEA did Wireless seismic acquisition and an efficient water treatment. Together with a good public perception due to close relations the oil field in Emlichheim is continuously producing since over 70 years.

At the end Dr Alt-Epping talked about unconventionals in Germany. There were few attempts to explore the potential, e.g. Wintershall Düste Z10 in tight sand gas well or EMPG trying to explore shale gas potential in Northern Germany. Most of these projects failed or were aborted due to massive public or political resistance. Due to the strict laws in Germany it is effectively not possible to produce oil or gas from unconventionals.



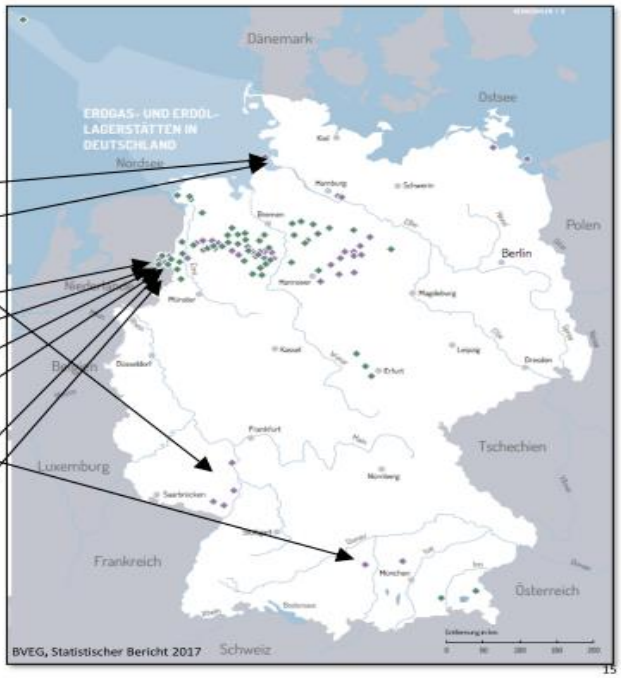
The highly diverse (different structural and stratigraphic traps like salt domes or lateral facies changes) geological setting of oil and gas fields. (taken from the presentation slides, c.f. LBEG (Landesamt für Bergbau, Energie und Geologie, Niedersachsen).

At the end of the talk, a Q&A session was opened, and participants from all over the world had the opportunity to ask Dr. Alt-Epping any open questions. The old oil fields are now in the last tertiary (steam) phase of production, which is, together with the current pandemic situation, leading to a high volatile future of Wintershall DEA in Germany and it is impossible to foresee what will happen in the near future.

The SPE Student Chapter at RWTH Aachen University would like to thank Mr. Alt-Epping for providing the students with a great overview of Oil and Gas production in Germany from the beginning to present and for his Meaning of future development.

Most productive oil fields in Germany (2019) [t]

Mittelplate	792 390
Dieksand	239 112
Römerberg	134 006
Emlichheim Öl	133 536
Rühlermoor-Valendis	129 140
Georgsdorf	75 633
Bramberge Öl	64 810
Aitingen Öl	32 657
Scheerhorn/Adorf Öl	31 553
Ringe Öl	26 982



SPE Student Chapter, RWTH Aachen – 30th June 2020 – Dr. U. Alt-Epping 15

HC provinces in Germany. The by far most productive oil field is the offshore platform Mitteplate, maintained by Wintershall DEA, the biggest producer of oil in Germany.

Economically and Environmental Benefits of CO2-Enhanced Oil Recovery

Cruz Marrune, TU Bergakademie Freiberg

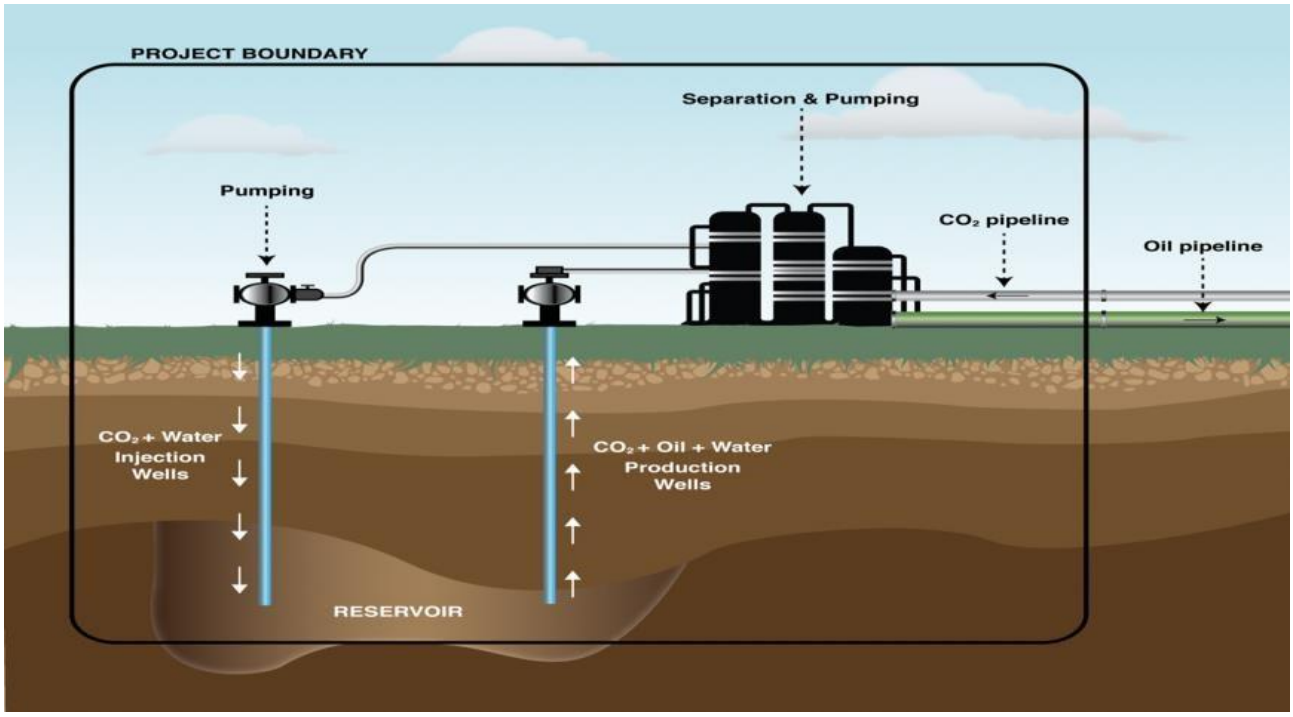


Figure 1: Main elements of CO2-EOR facilities and boundaries for economic analysis.

Abstract

According to many studies, CO2 injection can recover additional oil from reservoirs by reservoir pressure increment, oil swelling, and the reduction of oil viscosity, reducing the physical force holding the trapped oil effectively and optimizing the areal sweep efficiency. Therefore, CO2-EOR can be used to enhance miscible and immiscible oil recovery.

This paper provides an overview about the economic and environmental perspective of CO2EOR in the USA. CO2-EOR has emerged as a major option for productively utilizing CO2 captured from electric power, anthropogenic sources and other industrial plants. Not only can oil fields provide secure, well characterized sites for storing CO2, they can also provide revenues to offset the costs of capturing CO2 and therefore fighting the Climate Change issue. With application of CO2-EOR technologies in geologically favorable formation like in Persian Basin, the volume of CO2 stored could exceed the CO2 content of the oil produced and that is we need for the reduction of annual CO2 emissions.

Keywords: CO2-EOR; miscible and immiscible recovery, CO2 capture, storing

1. Introduction/EOR Background

Oil production Field is generally conducted in three main stages: primary, secondary and tertiary. Primary oil recovery refers to oil production that is reliant on the natural difference in pressure between the reservoir pressure and the production well pressure, also called the “Natural drive”. Secondary oil recovery is generally used when primary oil production methods are no longer effective. Usually, water or gas is injected into the reservoir to increase the reservoir pressure, which acts as an artificial drive. Typically, primary and secondary oil recovery results in a recovery efficiency of about 33% of original oil in place (OOIP). Enhancement usually takes place near the end of the lifespan of the reservoir in order to further increase the total amount of oil recovered and can be achieved by many techniques including gas injection, chemical injection, ultrasonic stimulation, microbial injection or thermal recovery.

Due to the benefits of CO2, the paper will only focus in CO2 injection. Global warming is a major issue for the

world, as increased amounts of CO2 and other greenhouse gases in the atmosphere have resulted in increment in sea levels and changes in Climate. Due to human activity, the CO2 concentration currently exceeds pre-industrial levels by approximately 40%. The average atmospheric concentration of CO2 is 401.6 parts per million. To stabilize the CO2 concentration in the atmosphere within acceptable levels, the production can be reduced, or released CO2 can be used or stored (knows as synergy effect) and therefore we can target the aim of the Paris Agreement to sets out a global framework to avoid dangerous climate change by limiting global warming to well below 2°C and pursuing efforts to limit it to 1.5°C.

This paper is part of my seminar presentation at University and the objective is to provide basic technical information regarding the environmental and economic benefits of CO2-EOR process, with Data from different Fields in the USA that institute of Drilling Engineering and Fluid mining, TU Freiberg has purchased.

2. Why Carbon Dioxide?

CO2 has two characteristics that make it a good choice for this purpose: it is miscible with crude oil, and it is less expensive than other similarly miscible fluids. In order to fully understand why we use CO2 it is important to look at the properties of CO2 that make it good for the EOR propose. The critical pressure and temperature of CO2 are 73.82 bar and 31.1 °C, respectively, and at this point, CO2 gas and liquid coexist. At higher than critical pressures and temperatures, CO2 is in the supercritical state and forms a phase whose density is close to that of a liquid, even though its viscosity remains quite low (0.05–0.08 mPas). This dense phase or supercritical state, CO2 can extract hydrocarbon components from oil more easily than gaseous CO2. Although the low CO2 viscosity is detrimental to oil sweep, with the CO2 dissolution in oil, the oil viscosity is also lowered, which in turn helps improve oil recoveries.

3. How does it work?

Basically, the CO2 EOR process is primarily a function of how CO2 interacts with oil which is determined by the property of miscibility, when multiple liquids can mix together completely becoming one homogenous liquid. First, a pipeline delivers the CO2 to the field at supercritical state and is directly injected into the reservoir and moves through the pores spaces of the rock, encountering residual oil, becoming miscible with the oil, and forming a mixture that is swept towards the producing wells (Figure 1). Because of its special properties, CO2 improves oil recovery by lowering interfacial tension, swelling the oil, reducing oil viscosity, and by mobilizing the lighter components of the oil.

4. Results of the analyzed data

The production plot shown below illustrates how different fields can respond to EOR processes (Figure 2). This example, for different Fields in the USA, shows how much oil was produced in 2010 with the EOR properties (Viscosity and Depth). The tendency of the curves shows that the total oil produced increase with increasing the depth and decreasing its viscosity. The differences can be explained because different of the miscibility characteristic. The CO2 reach normally his miscibility above 4000 ft. and works only for light oil. As we see, even with high depth, the total produced oil decrease because of the high viscosity of the oil. It's important to mention that viscosity and depth are not the only decisive parameters. To decide the CO2-EOR processes depends not only on the geological properties but also decisive are the economic aspects.

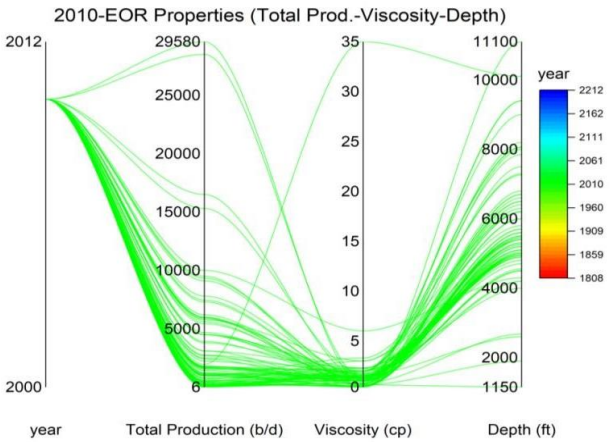


Figure 2: Total oil production from different Fields in the USA due the EOR

The following plot shows the same analyzed data from different fields that was observed in Figure 2, but here the figure illustrate how different fields can respond to CO2–EOR over four years (Figure 3). In 2010 started the CO2 flood to improve the oil recovery. As we see the red curve Viscosity of 35 cp has low oil production, because CO2 works better in light oil. In 2012 and 2014 they have an average of 10000 bbl/day due the low viscosity and high permeability, porosity and depth.

5. CO2 flooding processes

The injected CO2 may become miscible or remain immiscible with the oil, depending on reservoir pressure, temperature, and oil properties. Miscible process is when the gas is injected above the Minimum miscible pressure (MMP) and develop multiple contacts

and mix completely with the oil and achieve the dynamic miscibility (forming a single phase), resulting much improved oil recovered. When the reservoir pressure is below the MMP, the CO2 will not form a single phase and will be immiscible. However, CO2 will dissolve in the oil causing oil swelling, viscosity reduction and improving the sweep efficiency. Some time, CO2 is injected in cycles alternating with volume of Water to help overcome the gas and reducing the CO2 channeling. This method is known as conventional Water-alternating-gas (WAG).

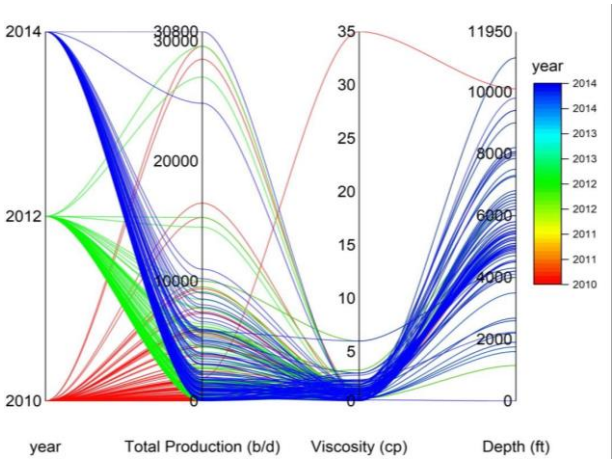


Figure 3: Total oil production from different Fields in the USA due the CO2-EOR with different oil viscosity

6. Economic and environmental benefits

The principal aim of the CO_2-EOR is to achieve a win-win situation or synergy effect, which means, the produced CO_2 by Power plants and industry will be captured and used it to increase effectively oil production in the depleted oil reservoir and stored into the reservoir in order to reduce the greenhouse gas effect on the Earth's atmosphere. That means that with the synergy effect is possible to reach the aim of the Paris Climate change conference.

Theoretically it is possible to estimate the Storage capacity from reservoir with the "direct replacement method". The method is based on the assumption that the volume presently occupied by the recoverable hydrocarbons would be replaced by an equivalent volume of injected CO_2.

$$CO_2\ storage\ capacity = Recoverable\ oil\ volume \times CO_2\ Density/1000$$

Where the Volume of recoverable oil in the reservoir in m_3 and is calculated at surface conditions by applying the formation volume factor. The Density of CO_2 in our case was 645 kg/m_3 in average, both at Reservoir conditions. The different data that was analyzed have an optimistic CO_2 capacity average from 149 million tonnes. Based on Roychoudhury et al. (2016) for well-selected, designed and managed geological storage sites, experts calculate that the rock formations are likely to retain over 99 percent of the injected CO_2 for over 1000 years. The challenge in this process is finding cost-effective and economic technologies to capture the CO_2 from industrial and power generation sources. While technologies are available for CO_2 capture, more work is required to improve and develop new technologies to reduce capturing cost (and increase operational efficiency) to enable an even greater amount of CO_2 to be economically captured.

Another benefit of CO_2-EOR are Taxes. The federal government in United States enacted an additional tax credit for CO2 sequestration, providing USD 10 per ton for CO_2 stored in the process of CO_2-EOR by Section 45Q tax credit, 15% tax-credit applies to all costs associated with installing the CO_2-flood, CO_2 purchase cost, and operating costs for injection. The federal government in U.S. also provides severance tax reduction and/or extension of existing severance tax reduction for oil produced with CO_2 from anthropogenic sources.

7. Outlook

With the goal to maximize recovery, a miscible CO2-EOR process is preferred over the immiscible one. For the CO2-EOR process, the CO2 can be injected either as a continuous stream, water-alternating-gas (CO2), also known as WAG, or just the gas. Because injection volume of CO2 and water in a WAG flood has a major influence on the recovery factor, it should be evaluated for maximum recovery. The amount of CO2 stored depends on the profitability of CO2-EOR, which in turn is influenced by the value of CO2 to an EOR operator. Regardless of whether governments create the latter value through subsidies, tax credits, emissions trading or tax on the emitters, concrete financial benefits arise from encouraging additional CO2 storage in oil fields.

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Event-Report – Webinar: “From University to Industry: 10 advices for a successful transition”

Lorena Camacho, Elias Khashfe, Julius Imarhiagbe, RWTH Aachen University

Figure 1: The presentation held by Adeline Parent, hosted by EAGE President Alexander Magnus Jüstel and moderated by SPE Vice-President Lorena Camacho.

On 22th of June our guest Dr. Adeline Parent held a remarkable webinar “From University to Industry: 10 advices for a successful transition” as a joint-event with the EAGE Student Chapter (ill. 1). Adeline Parent has a Doctorate in Structural Geology and is a Senior Basin/Petroleum Systems Analyst at Schlumberger. In addition, she is a board member of the EAGE Women in Geosciences and Engineering, where she advocates for more participation of women in geosciences and engineering and a strong gender equality.

Dr. Parent gave some statistics about the employment rate and educational level in Europe (Figure 2). The clear message was that being employed is a tremendous challenge, therefore, knowing the differences between academy and industry, such as responsibilities, flexibility, collaboration, workplace culture, individual impact,

salary and career advancement could be the distinguishing factor that a young graduate may need to stand out. Furthermore, on becoming employed, Dr. Parent showed that young people in general have more possibilities than older people, nevertheless this trend may depend on the specific country and its politics.

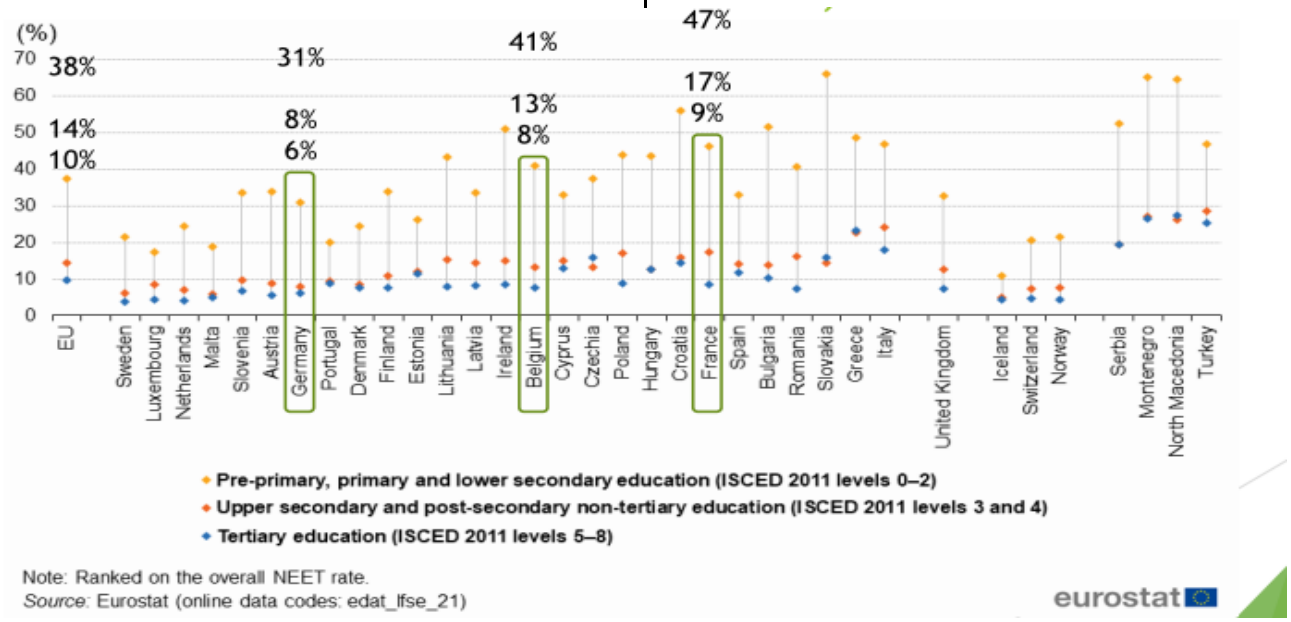


Figure 2: People between age 20 – 34, neither in employment, nor in education and training, by educational attainment level, 2019.

Overall, while academia path has its own schedule, large sense of autonomy, continuity in research publications, among others, the industry is based on applied research, also it is more focus on teamwork and it has a clear integration between science and business where opportunities are broader.

Finally, Dr. Parent gave the ten key advices that could lead to a successful transition especially for young graduates planning to transit from the university into the industry:

1. **Choose wisely the internship or first work experience:** This could be done to gain experience, increasing contacts or acquiring references.

2. **Be honest about your skills:** It is important to set solid foundations and adjust the learning curve to a personal level, additionally, being clear and honest about which skills are needed to improve.

3. **Negotiating your salary:** According to a survey from Burtch Works in 2019, 69% of people who attempted to negotiate obtained a salary increase and 22% of professionals received at least a benefit. Therefore, it is highly recommended to evaluate your salary. Do not be afraid to negotiate it.

4. **Never disregard your subordinate:** They are the next generation of scientists and working with them in the future could be highly probable.

5. **Building and maintaining your professional network:** It is very important to maintain relationships with colleagues from your previous job/internship and university. They could help you while searching for a job, give you advice about a project or a career path or give guidance for job interviews.

6. **Find multiple mentors:** One must fit the career profile that you are trying and aspiring to build, others should teach new skills or are influential in terms of the job application.

7. **Do not be afraid to move or travel:** Moving to a new job in a new city or country is a guaranteed way to help improve skills and experience. Since nowadays, in many organizations, international experience is necessary to get the top job.

8. **Learn another language in addition to English**

9. **Publish your work:** This may give you the advantage of switching between the industry and academia at any time

10. **Always be one step ahead of technological change:** It will help you switching path between academia and industry, once the opportunity is available. Most importantly, it could help you becoming business critical. For example, consequently to the Covid-19 pandemic and the “stay-at-home” order, there was a clear change on the way of work, transforming the workplace by moving the work to the worker instead of

the worker to work. Furthermore, telecommunication became the new collaboration technique.

At the end of presentation, Q&A session was held in which Dr. Parent talked about different topics. One question was to further elaborate the 10th advice, and Dr. Parent gave the following example: try to appropriate programming languages like Python.

At the beginning a small poll was conducted and showed a wide range of nationalities of the participants, such as Netherlands, Norway, Indonesia, Nigeria and Kenya, giving an exceptional and international audience. Another poll showed that the participants were mainly from the RWTH Aachen University but not only (Figure 3).

RWTH Aachen University SPE Student Chapter appreciates our host Dr. Adeline Parent for her excellent and very interactive presentation and wish her all the best

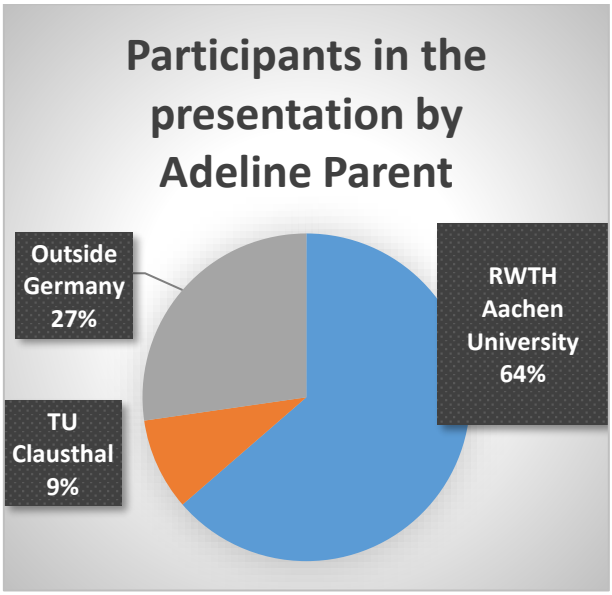


Figure 3: Localisation of the participants. TU Clausthal: Technical University of Clausthal. RWTH: Rheinisch-Westfälische Technische Hochschule.

Geomodeling in the Weisweiler area

Alexander Jüstel, RWTH Aachen University

In February 2019, students of the SPE Student Chapter at RWE Aachen University visited the International Geothermal Center in Bochum (now: Fraunhofer IEG). Through networking, I got to know Volker Wittig and through him, I was connected to Prof. Rolf Bracke, head of the Fraunhofer IEG. He offered me an exciting master thesis topic, which is introduced in the following:

The subsurface between the cities of Aachen and Cologne, Germany, will be explored for its potential for deep geothermal energy production (>400 m, >20◦C) in consequence of the shutdown of local lignite-fired coal power plants between 2029 and 2038. The working area is located east of Aachen within the foreland of a Variscan fold and thrust belt and within the Lower Rhine Basin, a seismically active Cenozoic rift basin. Subsurface investigations in these areas have focused on the exploitation of shallow lignite and hard coal. Several genetically different geological models of the deeper subsurface of the deformation front of the fold and thrust belt in the working area are therefore still controversially discussed as direct data deeper than lignite and hard coal deposits is sparse.

This thesis aims at collecting available geological surface and subsurface data within the working area and integrating it into an initial structural geological model (25 x 16.5 x 3.5 km). A new geomodel-driven approach evaluating data-based model uncertainties will result in a range of representations of the subsurface in contrast to established unique models. Information entropy will be used to visualize the uncertainties of the resulting models. Strategies of how to fill data gaps and reduce these model uncertainties are proposed as a result of this new approach. All working steps are performed with the open-source geomodeling package GemPy, utilizing implicit modeling based on a potential field approach. A particular focus will be set on carbonaceous lithologies as they have been proven to be economically viable for deep geothermal energy production for example in the Bavarian Molasse Basin, in the Netherlands or France. These lithologies are said to be present in the subsurface in the vicinity of the coal-fired power plant in Weisweiler in the center of the study area, which is connected to the regional district heating network. It is planned, that heat produced by deep geothermal energy will then be fed into this network.

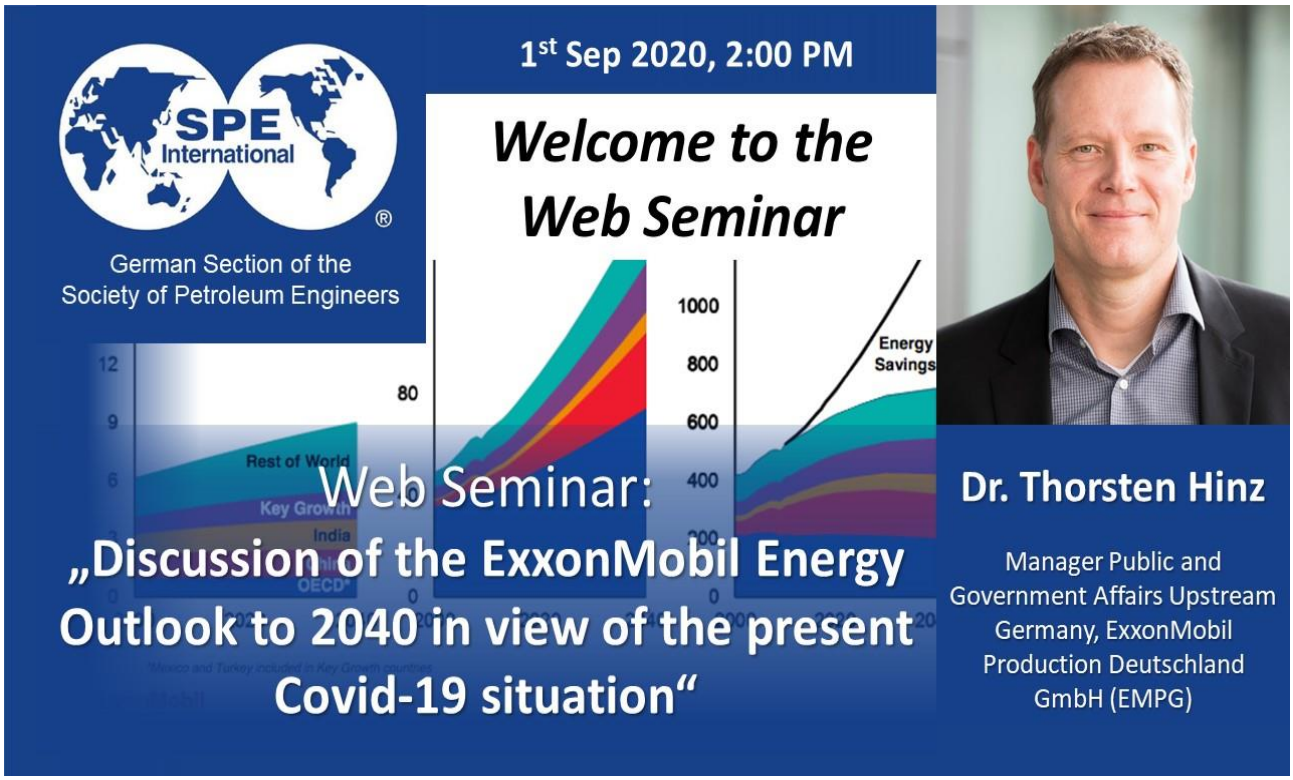
The modeling indicates, that an initial consistent geological representation of the study area up to a depth of 3 km below sea level cannot be constrained from the available input data, which does not exceed depths of 250 m. Conceptual assumptions need to be made as an attempt to fill data gaps and to construct this initial geological model.

The resulting models allow to illustrate the spatial distribution of Paleozoic units. The evaluated model realizations with data-based uncertainties reveal vertical depth variations of model nits of up to 900 m within the working area. The base of two hypothesized carbonaceous reservoir units of the initial model are forecast at depths of approximately 500 m b.s.l. and 1,500 m b.s.l. in the southwestern part of the model area east of Aachen and at depths of 1,300 m b.s.l. and 2,100 m in Weisweiler, respectively. Temperatures for these units are calculated with a geothermal gradient of 30◦C reported for the RWTH-1 well. It was drilled in the city of Aachen with a depth of more than 2,500 m. Resulting temperatures range between 30◦C and 75◦C for the respective units in the working area. The depth variation of 900 m would lead to possible temperature differences of up to 27◦C between temperatures of the shallowest model realization and the deepest one.

These temperature and depth variations require to reduce uncertainties for a safe and successful exploration and production of deep geothermal energy. Acquiring seismic data will facilitate obtaining the spatial distribution of layers and faults, and thus, further reduce spatial uncertainties and seismic hazards within this hypothesized geothermal system. Deep exploration wells are necessary for petrophysical investigations of hypothesized reservoir units under in-situ conditions and to constrain a velocity model for the depth migration of seismic data.

Recorded web seminar by Dr. Thorsten Hinz "Discussion of the ExxonMobil Energy Outlook to 2040 in view of the present Covid-19 situation"

Kerstin Kogler, DVV Media Group, Joschka Röth, RWTH Aachen University



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Global markets were shocked by the pandemic in March 2020 and are only slowly recovering since then. A sudden drop in demand even contributed to an historic moment with temporarily negative oil prices. The Covid-19 outbreak hit the global economy in a phase of transition in which market predictions were complicated and career perspectives were already difficult enough, especially in the petroleum industry.

To better understand the magnitude of the pandemic shock and its consequences for the energy industry, the Young Professional Committee of the German Section SPE hosted a web seminar in close collaboration with DVV Media Group on 1st September 2020. During this virtual event, Dr. Thorsten Hinz (Manager Public and Government Affairs Upstream Germany, ExxonMobil Production Deutschland GmbH, EMPG), presented the topic "Discussion of the ExxonMobil Energy Outlook to 2040 in view of the present Covid-19 situation".

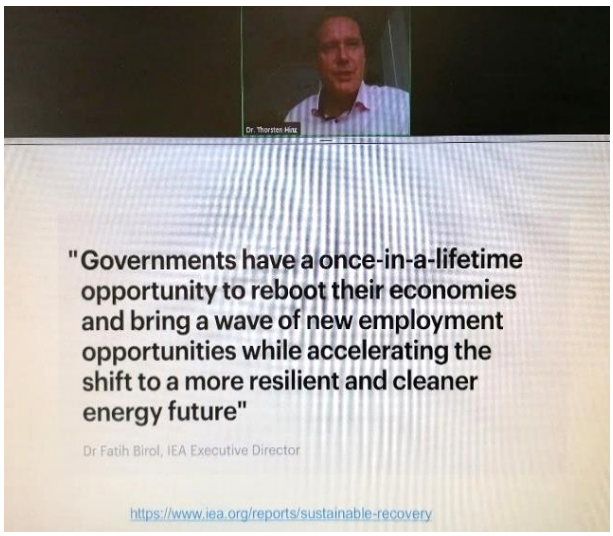
More than 40 participants attended the meeting and had the opportunity to influence the discussion during interactive polls and during the subsequent Q&A session. The event was recorded and the full 90 minutes as well as the presentation slides are publicly available on the website of DVV Media Group.

During his presentation, Dr. Hinz highlighted the "dual challenge", which involves access to modern energy for everybody while protecting the environment. Satisfying the growing demand and simultaneously reducing impact on climate change will remain the focus of energy policy and global players of the energy industry.

In the beginning he underlined, that long-term population growth and further improvement of living standards especially in Asia/Pacific will shift global energy demand by + 20 % until 2040. He also mentioned that many different energy outlooks from different organizations repeatedly come to very similar conclusions: oil and gas combined will remain about 50 % of the future energy mix, while specific preferences by sector and geography will only cause minor trend variations.

Mainly driven by the growing market of electric cars, a general shift towards renewable energy is expected, but will probably not exceed 35 % of the share until 2040. Nevertheless, global carbon dioxide emissions are expecetd to rise by about 5 %. Besides investment in carbon capture and storage (CCS), also development of advanced biofuels and other low-emission technologies will be useful and necessary contributions of the petroleum industry to meet the dual challenge.

From the interactive polls, it became clear that the majority of the audience expects a “second wave” and the recovery from the pandemic will take about 2 years. Further, the participants are expecting a mid-term drop of oil and gas demand by about 10 % and are estimating jobs at risk in the petroleum industry in the order of 20 %. According to Dr. Hinz, jobs at risk will be about 1.2 million, which represents “only” about 10 % from total. It will be exciting to see, if these predictions and expectations will come true or if the impact will be less severe. In general, we hope for a quick end of the pandemic and a fast recovery of the global economy.



In conclusion, for the oil & gas sector the ongoing deficit in demand is expected to continue for the duration of the pandemic, which will lead to a substantial drop in performance and employment. But after the global economy will have recovered from this temporary crisis, the petroleum industry will have a strong comeback mainly driven by long-term increasing demand for modern and efficient energy. The current times of uncertainty and low performance provide excellent opportunities to support market consolidation and will help to create synergies to be able to not only meet future energy demand, but also to achieve agreed emission goals.

The Young Professional Committee of the German Section SPE would like to thank Dr. Thorsten Hinz for his informative lecture and for sharing his perspective and expertise. Special thanks go to DVV Media Group for hosting and recording the online live session.