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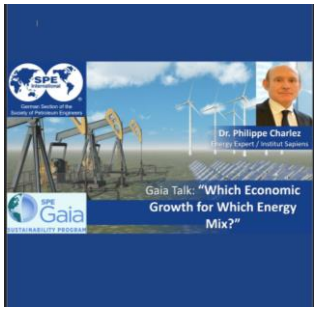
Newsletter of the German Section of the Society of Petroleum Engineers | Volume **31** | Issue **1** | March **2021**

"WHICH ECONOMIC GROWTH FOR WHICH ENERGY MIX?"

SPE International
German Section

Content

COVER



IMPRESSUM

SPE Gaia Talk: "Which Economic Growth for Which Energy Mix?

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KRAFTVOLL

Maßgeschneidert für den Einsatz bei Geothermieprojekten: **Tiefbohranlagen von Herrenknecht.**

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Event Calendar

For latest information and details on SPE Germany events visit our website and/or our event page on Facebook.

connect.spe.org/germany

https://www.facebook.com/SPEgermany/events/

Date	Type	Event	Location
Apr 2021 06	SPE Distinguished Lecture	Digitizing Wellbore with Permanent Reservoir Monitoring and Flow Control: Is there a value? by Varma Gottumukkala	Virtual
Apr 2021 15	GSSPE WebSeminar	Integrated Modeling of Geothermal Sites: Case Studies from Bavaria and the Rhine Graben, by Giovanni Sosio	Virtual
Apr 2021 21	DGMK/ÖGEW	Spring Conference: Shaping the Energy Transition with Upstream and Storage Technologies	Virtual
Apr 2021 21	DGMK	Energy Transition – How to find integrated solutions	Virtual
Apr 2021 27-29	SPE Symposium	SPE Virtual Career Pathways Fair	Virtual
May 2021 24-25	SPE Workshop	Extended Reach Drilling - Latest Technologies and Best Practices	Abu Dhabi, UAE
May 2021 24-27	SPE Conference	SPE Middle East Oil & Gas Show and Conference (MEOS)	Manama, Bahrain
May 2021 27	GSSPE WebSeminar	Geophysical site exploration for final repositories of radioactive waste, by Melissa Perner & Frank Meier	Virtual
Jun 2021 08-10	SPE Workshop	Digital Strategies and Data Analytics - Subsurface to Operations	Virtual
Jun 2021 16-17	SPE Conference	SPE International Oilfield Corrosion Conference and Exhibition	Virtual
Jun 2021 23-24	SPE Symposium	Unconventionals in the Middle East - From Exploration to Development Optimisation	Manama, Bahrain
Jun 2021 29-30	SPE Workshop	Bridging Gulf to Gulf: The Digitally Augmented Post-Pandemic Reality	Virtual
Jul 2021 05-08	SPE Workshop	Drilling and Completions Optimisation	Cairo, Egypt
Sep 2021 07-10	SPE Conference	SPE Offshore Europe Conference and Exhibition	Aberdeen, Scotland, UK

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German Section SPE Chairman Letter

Stefan Wessling, GSSPE Chair, Baker Hughes

Dear Members,

Happy New Year and all the best for yet another interesting period. Despite continuous lockdowns and regulatory changes on short notice, we keep the spirit and continue organizing a good selection of technical events in Germany and even beyond our borders. Some examples for the upcoming quarter are DGMK Frühjahrstagung with a Geoenergy Exploration Game, and web seminars will cover topics about Digitizing Wellbores, Danger of Compliance Cultures, Modeling of Geothermal Sites and Geophysical Site Exploration for Radioactive Waste Repositories. The long-term organization of our Students Technical Congress on November 3 – 5, 2021 proceeds at full speed to continue the traditional offering for our students – this year will be the second online event with potential onsite socializing programs if the Corona situation allows.

An additional highlight to mention is the nomination of Regional and International Awards which are granted by the SPE International. A committee of a few board members and volunteers submitted a handful of nominations for the different categories, with tremendous support received from national and international SPE members. I feel confident to say that members of the German Section provide excellent technical and organizational services for the industry and the society. So, let's root for our nominees to become awarded by the judges.

Worthwhile to mention is the continuous high motivation of my current board! The organization of the above activities could not be achieved without all the voluntary efforts you spend – I highly appreciate your engagement and look forward to a continuation of our monthly board meetings and all the conversations in between. One change in our board concerns our Young Professionals activities: Since the beginning of the year Rasoul Foroutan acts as Young Professional Liaison, taking over from Joschka Röth. We thank Joschka for his fantastic job in leading the YP's activities over the last years, well done! For those willing to become an active member of the board, the annual membership meeting is a good opportunity. This year, the annual meeting will be conducted as a virtual event on Thursday, June 24th, 2021 – safe the date!

Yet, the declining membership numbers (professionals and students) are of critical consideration. It therefore makes me feel proud to say that RWTH Aachen Student Chapter elected a new board with good quorum that guaranteed retaining the same number of student chapters as last year. Over the last months, the future of student chapters was considered at risk, which could be mitigated by continuous efforts and communication between the chapters and our Students Liaison Valentin Goldberg.

We acknowledge that our membership has been slowly but steadily declining since the last few years, and therefore, we are evolving to offer our current and future members the tools, networking, and collaboration opportunities in face of the energy transition. I can only continue encouraging you to actively promote becoming a member of our section SPE.

With a continued optimistic view on soon life events for social networking and collaboration, I wish you all a happy Easter time!

Sincerely yours,

Stefan Wessling

STC'21

STUDENT TECHNICAL CONGRESS

3 – 5 November 2021

CALL FOR ABSTRACTS

ONLINE

Petroleum & Drilling Engineering
Geoenergy-related Geosciences
Geothermics

Submission deadline: 19 July 2021

SPE International

German Section

Submissions for oral presentation, poster, or digital equivalent accepted

Application form & details on https://connect.spe.org/germany/stc/stc-2021

Innovative Drilling Technologies for Geothermal Applications

Presentation By Volker Wittig, Fraunhofer Research Institute for Energy Infrastructures and Geothermal Systems (EIG)
By **Elias Khashfe and Alexander von Scheéle**, RWTH Aachen University

Group Shot: Presentation by Volker Wittig (top left yellow box) and the participants

Together with the SEG (Society of Economic Geologists) Student Chapter, the SPE Student Chapter at RWTH Aachen University invited Volker Wittig to hold a presentation about Innovative Drilling Technologies for Geothermal Applications. Some of the chapters' students got to know Mr. Wittig during a visit to the Fraunhofer Research Institute for Energy Infrastructures and Geothermal Systems (IEG) in October 2020 during a field trip organized by RWTH Aachen University and invited him to share his knowledge and experience with students.

Volker Wittig is the head of the Advanced Drilling Technologies Department at Fraunhofer IEG. As a leading mechanical engineer, he is involved in several ongoing research projects, where not only engineers but also geologists and geoscientists are needed. Currently, the EU-H2020 Geo-Drill, High Pressure Jetting / Stimulation, and drilling control / automation (MOUSE) projects stand out as being the most recent and innovative topics that Fraunhofer IEG is working on.

Technique: Laser Jet Drilling

Mr. Wittig elaborated extensively on today's challenges regarding drilling technologies in geothermal applications. Firstly, he talked about Laser Jet Drilling with mechanical enhancement, where the rock is softened using a powerful laser. Secondly, he proceeded about Electro-Impulse drilling, where the rock is being destroyed with high voltage and pointed out the similarities to plasma pulse drilling. Thirdly, he talked about flame / spallation type drilling combined with mechanical enhancement, a project the Fraunhofer IEG is working on together with ETH Zurich.

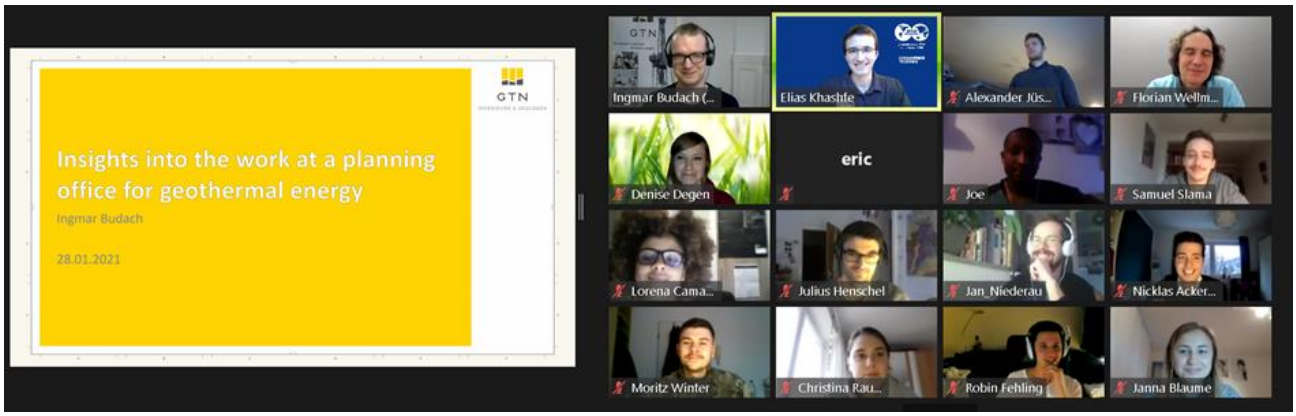
He closed his presentation explaining that Fraunhofer IEG is also enabling technologies and concepts behind new composite materials for drilling units.

Mr. Wittig announced that students are more than welcome to submit applications for internships or for a Bachelor's and Master's thesis to the Fraunhofer IEG. This request is not only addressing geoscience students, but rather also mechanical engineering students wanting to get involved in such innovative technologies for broader use. Currently, one geoscience student from RWTH Aachen University is doing his Ph.D. at Fraunhofer IEG. During the Q&A-session some interesting questions arose, so e.g. the most promising method is the laser jet drilling technique, whereas other methods are ten times as expensive compared to traditional drilling.

After the presentation, the participants had the chance to talk to Volker Wittig in a more relaxed environment. We would like to thank Mr. Wittig for following our invitation to hold a presentation for the SPE and SEG Student Chapters at RWTH Aachen University and look forward to further and close cooperation with the Fraunhofer IEG.

Insights into the daily work in a planning office for geothermal energy

Presentation By Ingmar Budach, Geothermie Neubrandenburg GmbH, **Report by Elias Khashfe**, RWTH Aachen University



Group Shot: Presentation by Ingmar Budach (top left) and the participants

As the first web-seminar of this year, the SPE Student Chapter at RWTH Aachen University had the pleasure to host a presentation by Ingmar Budach. Mr. Budach is a geophysicist at Geothermie Neubrandenburg GmbH (GTN) and shared his experience about working in an internationally active planning office for geothermal energy (Figure 1). The services from GTN cover the entire spectrum of geotechnical and engineering solutions, from geological exploration via the design of deep wells and surface thermal water loop up to the heat and power generation plants according to the corresponding consumer systems.

Mr. Budach started his presentation by introducing the medium-sized GTN company, talking about some key facts like number of employees or shareholders. Subsequently, he pointed out that there are four core services that GTN offers: Exploration, Drilling, Reservoir engineering, and building up the power & heating plants. Since he is a geophysicist, Mr. Budach focused on the exploration part. To illustrate this, he introduced various GTN projects located both in Germany (in the Molasse basin, the Upper Rhine Graben and the North German Basin) and abroad.

Selected international projects of GTN

During Q&A, Mr. Budach explained, that GTN is also looking for promising areas for geothermal heat production in North Rhine Westphalia since the consumer potential is quite high, but that the data

availability is still challenging there. He also said that GTN awards master's theses or internships if the applicant's profiles match to GTN's current R&D projects.

On behalf of all students and the SPE Student Chapter of RWTH Aachen University, we would like to thank Mr. Budach for the valuable insights into the planning office of an international geothermal agency.

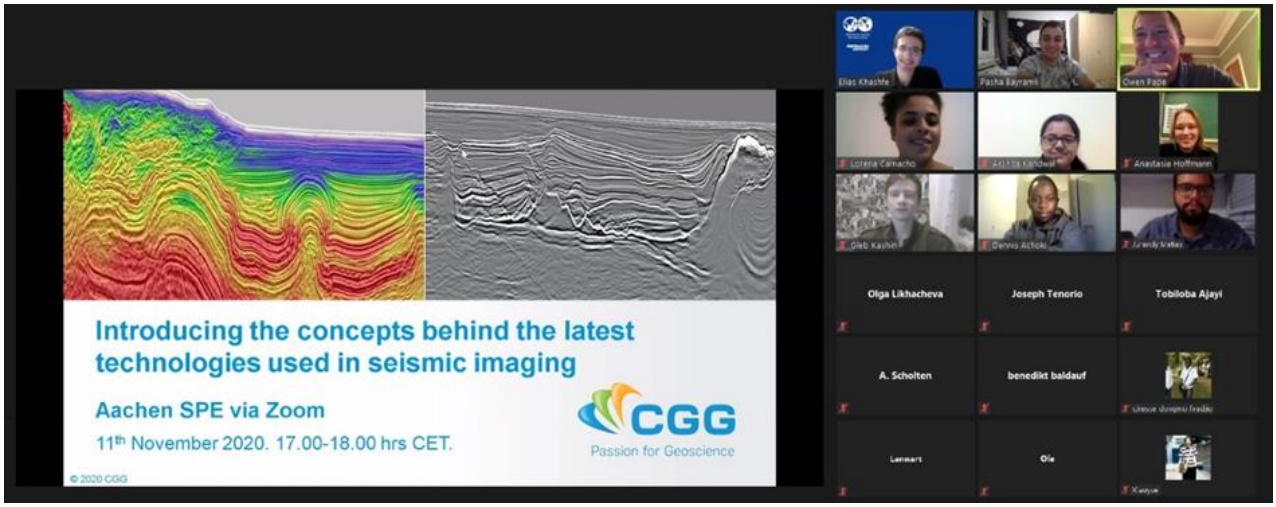
At the end Mr. Budach provided some useful links:

- GTN Website
- Flyer on geothermal project development (in German)
- Project Sandsteinfazies
- Bundesverband Geothermie
- Geothermisches Informationssystem
- European Geothermal Energy Council
- Think GeoEnergy

GTN Projects: Selected international projects developed by GTN

Introducing the concepts behind the latest technologies used in seismic imaging

Presentation by Owen Pape, CGG, **Report by Elias Khashfe**, RWTH Aachen University.



Group Shot: Presentation by Owen Pape (top right) and the participants

The SPE Student Chapter at the RWTH Aachen University had the pleasure to host the presentation by Owen Pape. Owen is a Recruitment Technical Advisor and Geophysicist at CGG, a French geophysical service company providing services in the field of geology, geophysics and reservoir engineering and remote sensing to companies primarily within the energy industry (Figure 1).

Owen started his presentation by introducing the application of seismic imaging in the E&P-industry and where the key challenges lie, e.g. near-surface velocity anomalies, complex salt tectonics.

He then explained in an illustrative way the process of Inversion as a cake, where the recipe is known, but not the amounts of each ingredient. The imaging scientist then looks at this cake, adjusts the amounts of ingredients, and tries again until they achieve the perfect cake. Bon appétit!

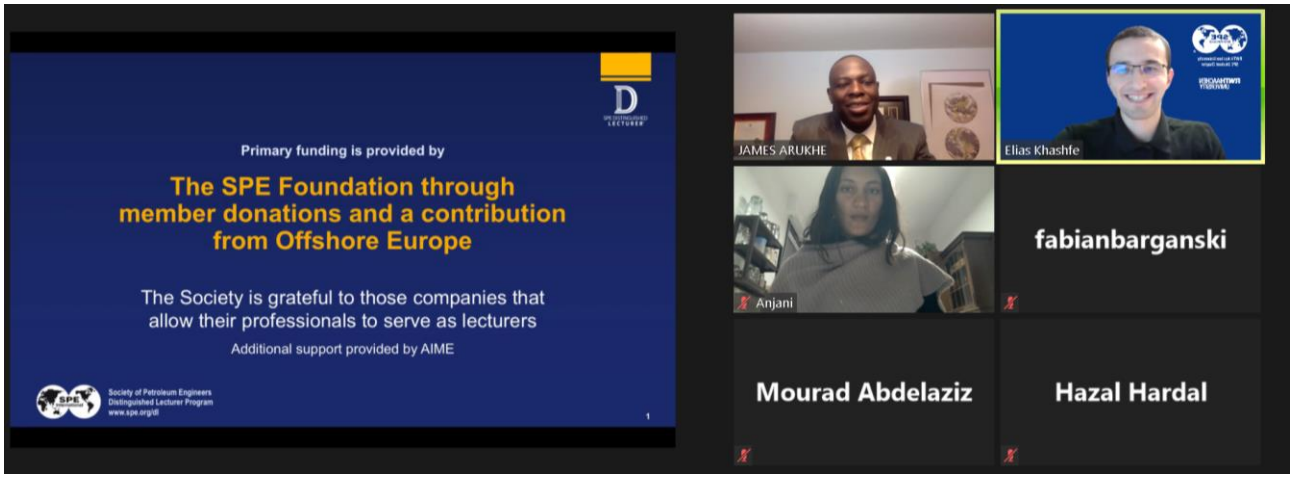
Three examples of techniques based on inversion that CGG uses were then presented: Full-Waveform Inversion (FWI) to generate high-resolution earth models by minimizing the difference between observed and modeled seismic waveforms; Ghost Wavefield Elimination, to improve the resolution of the seismic data and Least-Squares Migration, which provides images with better balanced illumination, improved signal-to-noise ratio, reduced migration artifacts and more interpretable seismic amplitudes.

During Q&A he explained that CGG processes and analyses many different types of data from all over the world and also talked about the impact of the pandemic on the company and the people who make it up. CGG's business model has proven resilient through the pandemic and they are now recruiting students who graduate in 2021 and genuinely invited the audience, especially geophysicists, to apply at CGG.

On behalf of all students and the SPE Student Chapter of the RWTH Aachen University we would like to thank Owen for the valuable insights to CGG. You could reach Owen at his email: owen.pape@cgg.com

Active Oilfield Development while Preserving Fragile Ecosystems

Presentation by Dr. James O. Arukhe, Saudi Aramco, Report by **Elias Khashfe**, RWTH Aachen University.



Group Shot: Presentation by Dr. James O. Arukhe (top left) and the participants

For the last presentation of this year, the SPE Student Chapter at RWTH Aachen University had the pleasure to host a presentation by Dr. James O. Arukhe. Dr. Arukhe is a Project Engineer at Saudi Arabian Oil Company and SPE Distinguished Lecturer. Saudi Aramco, as the largest oil company in the world by revenue (2020), has a special responsibility regarding active field developments while carefully monitoring associated health safety or environmental impacts.

Dr. Arukhe started his presentation by introducing the Framework for the Manifa oil field and Saudi Aramco. He pointed out, that economic growth and environmental protection are possible, and that collaboration between the local community and the company help achieve the "impossible". He underlined the shift of paradigms to persevere, engage bright minds, and allocate appropriate time for critical offshore field development projects because time bounding these may only serve to run projects aground.

Also, today's companies are responsible for their footprint at any time.

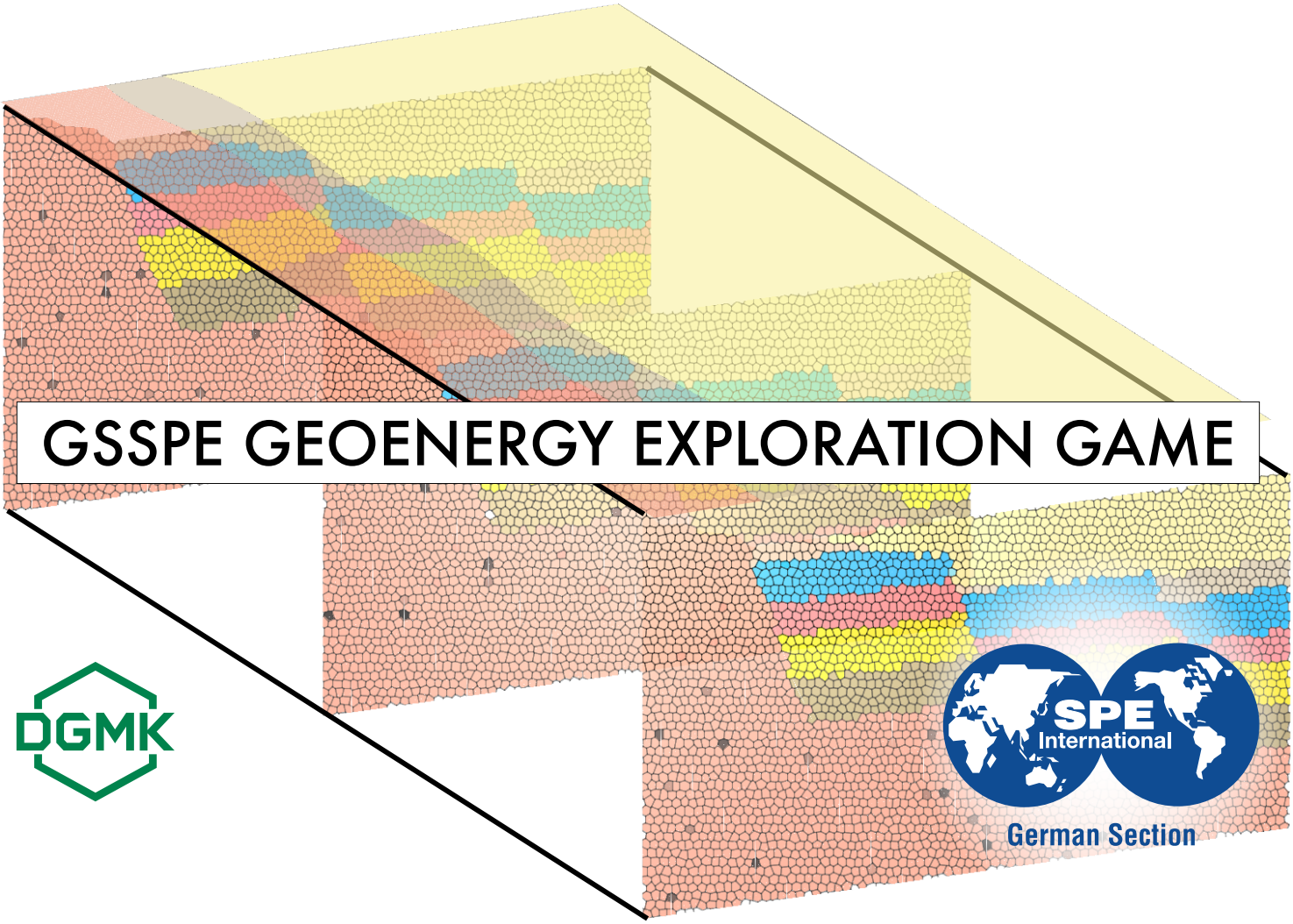
Figure 1. The unique Manifa oil field in Saudi Arabia (picture taken from aramco.com)

He then focused on the Environmental Impact Assessment. From the beginning, the engineers and scientist knew what will be unavoidable. They would have to deal with loss of large sea floor area, alteration in hydrodynamics and water circulation, reduced average fishery catch or displaced fishing grounds. With all these in mind, they created a unique structure of on- and offshore oil production (Figure 1).

Centered in a lagoon, oil and gas are extracted as little as possible affecting the ecosystem. In fact, due to the artificial bay, the biodiversity even increased. Saudi Aramco is aware of its responsibility towards society and nature and has created a nearly ideal structure with the Manifa field.

During Q&A Dr. Arukhe explained, that Saudi Aramco chose this unique mixture between on- and offshore drilling field because the company wanted to preserve its natural heritage for future generations. For this, the company has an 24h-emergency plan to immediately react in case of a spill.

On behalf of all students and the SPE Student Chapter of RWTH Aachen University, we would like to thank Dr. Arukhe for the valuable insights into the Manifa oil field of Saudi Aramco. You could reach Dr. Arukhe at his email: james.arukhe@aramco.com



GSSPE GEOENERGY EXPLORATION GAME

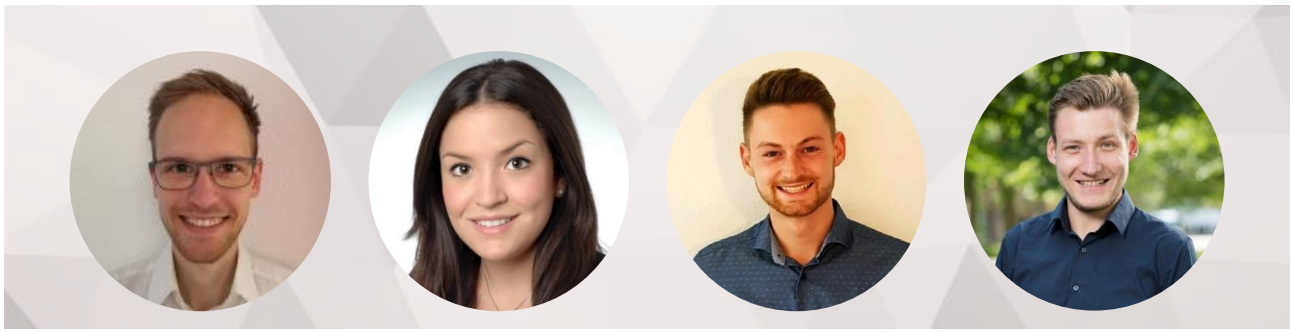
Topic Room at DGMK/ÖGEW Spring Conference 2021
Shaping the Energy Transition with Upstream and Storage Technologies
21 April 2021 — 13:30 CET — online

Registration:
https://dgmk.de/en/events/dgmk-oegew-spring-conference-2021-shaping-the-energy-transition-with-upstream-and-storage-technologies/

Be part of the first Geoenergy Exploration Game by the German Section of the SPE! This collaborative game builds on your engagement, your knowledge, and your discussions! Together with the other participants, you have to identify geoenergy reservoirs, decide which play you want to explore and tackle multiple challenges. This interdisciplinary and interactive session aims at students, YPs, and interested professionals.

SPE Student Group Karlsruhe

By Lukas Müller, SPE Student Group Karlsruhe



From left to right Student Group Karlsruhe Board: Lukas Müller, President; Aura Alvarado de la Barrera, Vice-President; Frédéric Pistor, Secretary; Kai Stricker, Treasurer

Dear Reader,

On the following lines, we would like to introduce you to our SPE Student Group in Karlsruhe. Founded in 2016 by our faculty advisor Prof. Dr. Christoph Hilgers within the course of Applied Geosciences at the Karlsruhe Institute of Technology (KIT), we have been providing a lot of interesting events, seminars (recently referred to as weSPE) and field trips to the students at KIT. Throughout the years we were able to grow an amazing network with connections all around the world and even made a few friends along the way!

While not an official chapter, due to our small member count, we shine through our activity and motivation in making the GSSPE and our own student group important parts in the development of a geoscientific student. With our flagship event, the Student Technical Congress 2020, being the first online version of the event, we are looking forward to applying our knowledge for this year's STC 2021!

For this year, our board is made up of the following members:

Lukas Müller: acting president of the SPE student Group in Karlsruhe. I am currently in the last year of my MSc in Applied Geosciences at KIT, focusing on geoscientific modeling and reservoir geomechanics, with interests in all sorts of reservoirs, be it geothermal or petroleum. Afterward, I am mostly looking to apply my experience with geoscientific modeling in practice!

My rock of choice is the red Buntsandstein in the upper rhine graben, not only the most important rock of the region I grew up, but also being an interesting reservoir for geothermal applications!

Aura Alvarado de la Barrera. I am the vice-president of the SPE Student Group at KIT since 2020. In October 2019, I came to Karlsruhe for my master's degree after working for Wintershall Dea GmbH. At KIT I am studying Applied Geosciences with a focus on reservoir characterization and mineral resources. I would describe myself as a classic but modern geologist, so I love the fact that the work starts in the field, goes through the lab, and ends up in front of the PC with a finished model. My favorite minerals are salt minerals, not only because it is essential for human life, but also because they are incredibly exciting minerals whose petrophysical properties are unique. It is also used in many important industries, starting as a trap in oil and gas reservoirs, as a cavern reservoir, as final storage, or as a raw material.

Frédéric Pistor: I come from the beautiful Palatinate. In my free time, I like to be out and about, preferably in good company. As a long-time district league soccer player, I am open to almost any team sport, but also sometimes pull my opponent at the table tennis table. Besides my master's studies in applied geosciences, I am the secretary in the SPE Student Group at KIT and help the team to keep its overview. What I like most about my studies is the versatility of the topics and the close relation to practice. Of particular interest to me is the development of new resources with a responsible approach to the environment. Therefore, my focus is a bit on reservoir geology, as well as renewable energies. Of course, all stones are super in their way, but due to the regional reference, I connect most with the red sandstone.

Kai Stricker: I am the new treasurer of the SPE Student Group at KIT. During my studies of Applied Geosciences at KIT I was one of the co-founders of our student group in 2016. After some time studying abroad in Norway and writing my master thesis with Baker Hughes in Celle, I returned to Karlsruhe and the KIT in 2019 after finishing my master's degree. Since then, I am working as

research associate in the group of Geothermal Energy and Reservoir Technology that is part of the Institute of Applied Geosciences. My research focuses on heat storage in former hydrocarbon reservoirs. Since about 1,5 years I am also active in the German Section of the SPE and am part of the newsletter editorial team and responsible for the organization of the annual SPE student congress (STC).

My favorite rock represents the Black Forest, the area where I am originally from – the Granite. It is not only one of the first rocks we learn something about in our studies of Applied Geosciences but is also one of the most important rocks for enhanced geothermal systems, making it a crucial part of the energy transition!

If you want to keep updated on our work, follow our LinkedIn group page! Feel free to message us, if you have any questions or suggestions or you would like to present your own work/company to a motivated group of students

.

Gaia Talk by Dr. Philippe Charlez "Which Economic Growth for Which Energy Mix?"

BY SPE GERMANY – YOUNG PROFESSIONALS GROUP

SPE Gaia: In this edition, SPE Sustainability Program brought Dr. Philippe Charlez to present "Which Economic Growth for Which Energy Mix?"

Energy transitions are a significant structural change in an energy system. Historically, these changes have been driven by the demand for different fuels and its availability. Such transitions can also result from depletion of existing energy sources, as it happened in Europe with whale oil for illumination and wood for iron smelting.

However, the current transition to renewable energy, and perhaps other types of sustainable energy, is different. In this case, it is largely driven by a societal recognition that global carbon emissions must be brought down to zero to keep global warming below 1.5 °C by 2030. Consequently, and since fossil fuels are the largest single source of carbon emissions, a proposal to limit the quantity of fossil fuels that can be produced was raised and accepted by the signatories of the so-called *Paris Agreement*. This agreement one of the most important results of the 2015 United Nations Climate Change Conference, also known as COP21, held in the city of Paris, France.

In recent years, the term energy transition has been coined in the framework of a move towards sustainability through increased integration of renewable energy in the realm of daily life.

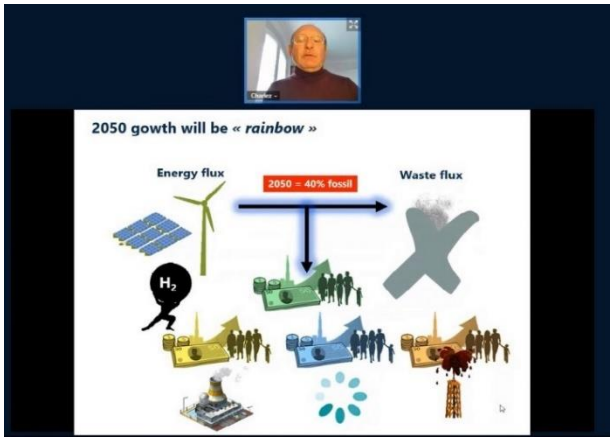
Introduction: Kerstin Kogler introducing Dr. Charlez.

To better understand the link between energy transition and economic growth in the energy industry, the Young Professional Committee of the German Section SPE hosted a Gaia Talk on March 25th, 2021. During this virtual event, Dr. Philippe Charlez (Senior Technical Advisor at Total and Energy Expert at Institute Sapiens -

France), presented the topic "Which Economic growth for Which Energy Mix?".

The SPE Gaia Sustainability Program, created by SPE HSE and Sustainability technical discipline, aims to enable all individuals in the oil and gas industry to act in the service of sustainable socio-economic development through their professional societies—empowering those at every level within organizations to create actions to address the planet's sustainability challenges.

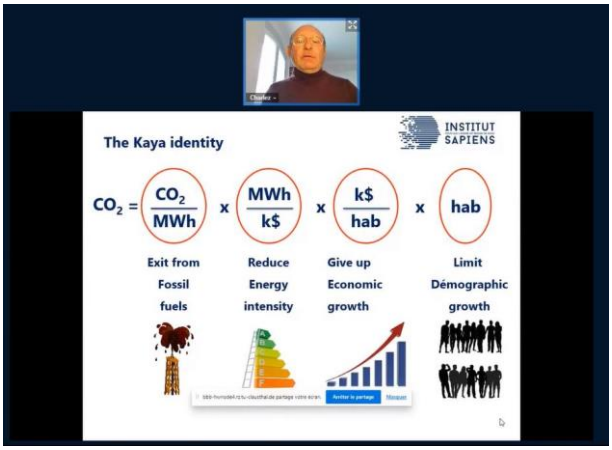
The Gaia Talk started with introduction of SPE Germany Young Professional group The Gaia Talk started with introduction of SPE German Section Young Professional group activities by Kerstin Kogler (YP Officer) who had moderated the Gaia webinar. Around 50 participants attended the Gaia Talk and had the opportunity to influence the discussion during the subsequent Q&A session. The event was recorded and the full 80 minutes as well as the presentation slides are publicly available on LinkedIn page of Young Professionals - SPE Germany.



Energy Generation Landscape 2050: Dr Charlez expects the energy landscape by 2050 would be a "rainbow" of sources.

Dr. Charlez started his presentation with some general consideration about natural energy systems and its investigation in modern society. Dr. Charlez defined the most efficient modern and growth society as one that optimizes the carbon intensity using the different renewable energy mix. Later Dr. Charlez introduced the Kaya Identity which focuses on all the leverage of energy transition and all four aspects of this equation which is based on decarbonization of energies. Next Dr. Charlez clarified the interaction between COVID 19 lockdown economic decline and consequent reduction of CO_2 emission.

Dr. Charlez continued his presentation with talking about Green Economy and its components. From his prospective 75 percent of free carbon electricity and 25 percent of biomass would be an ideal mix for a green economy system. Later he explained the manageability concept for fossil and nuclear energy sources to accommodate 75 percent free carbon electricity defined in Green Economy model.



The Kaya Identity: total emission level of carbon dioxide can be expressed as the product of four factors: demographic growth, GDP per capita, energy intensity, and carbon intensity.

In conclusion, transition is not a technology challenge, it is a scale effect. Continuing economic growth with free carbon electricity would require no geographical constrains, no intermittence, concentrated and storable energy. From Dr. Charlez opinion 2050 energy growth will not be green (still 40 percent fossil energy) but a rainbow including green energy, nuclear, natural gas and oil and most probably coal would be disappeared from the energy mix.

The Young Professional Committee of the German Section SPE would like to thank Dr. Philippe Charlez for his informative lecture and for sharing his perspective and expertise. Special thanks go to Kerstin Kogler (DVV Media Group) for moderating the online live session.

Geothermal News

By Valentin Goldberg, Karlsruhe Institute of Technology

Drillrig in Lankow at night: by Stadtwerke Schwerin. Image source: Landeshauptstadt Schwerin website (www.schwerin.de)

Successful drilling of an injection well in Schwerin

The city of Schwerin has the ambitious goal to become CO2-neutral by 2035. An aquifer in 1340 m depths provides the opportunity to make geothermal energy contribute significantly to this transition towards a climate-friendly energy supply. Stadtwerke Schwerin wants to provide ecological district heating to the district Lankow which is located above the aquifer. Within the reservoir, a large quantity of thermal waters with a temperature of approximately 56 °C are found. In the unique project, this comparatively low temperature will be used via heat pumps. Thus, the water will be heated up to about 80 °C before entering the district heating network.

If the work at the Schwerin-Lankow drilling site continues as perfectly as before, the geothermal plant can be connected to the grid in the first quarter of 2022. The sustainable district heating will then be able to cover at least 10 percent of the heat demand in Schwerin. Moreover, with future wells, this percentage can be increased up to 60 percent according to today's knowledge about the subsurface.

Sources:

- Stadtwerke Schwerin, Geothermie in Schwerin-Lankow – Injektionsbohrung
- Landeshauptstadt Schwerin, Geothermiebohrung in Schwerin-Lankow läuft wie geplant
- TV:Schwerin YouTube Channel: Stadtwerke Schwerin: 1.340 Meter tiefe Bohrung für Geothermie

Largest geothermal energy plant in Germany begins implementation

The HKW Süd (heating plant south) is operating for more than 120 years and is the oldest conventional heating producing facility of the Stadtwerke München. Operating in the district Sendlingen the plant has been renewed constantly and is now facing the next step for a contemporary energy supply.

Germany's largest geothermal energy plant to be built shall provide 80.000 people with district heat in a sustainable way. After the succesfull completion of the last of the 6 wells in 2020 the joint project develops the power plant in parallel at different sites between the

Isar, Schäftlarnstraße, and Großmarkthalle. After final long-term pumping tests, the plant will be connected to the grid in the 2021 heating season. The geothermal plant is to be expanded by the end of 2023 to include hot water storage which will enable even better use of the geothermal heat.

Sources:

- Linder website: LARGEST GEOTHERMAL ENERGY PLANT IN GERMANY
- SWM Magazine: Der neue Energiestandort Süd.

Heizkraftwerk Süd in Munich (Image Source: SWM/Rainer Viertelboeck)

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