

SOCIETY OF PETROLEUM ENGINEERS

SPE DEWS

FROM THE SECTION CHAIRMAN

DEAR SPE COPENHAGEN MEMBERS,

Next month will mark the end of the 2022/23 SPE-CPH season and I am delighted to write the opening words of the final newsletter for the season.

SPE Copenhagen activities were conducted via a mix of online and physical networking events, social media interaction and this Newsletter. The season started off in September 2022 with a slightly modified Board. Some familiar faces left, while new ones joined.

The board working committee structure was maintained this season and so were the 4 focus areas we set out for the season:

Energy Transition

Transition related technical topics and events, newsletter articles

Membership

Member retention, Young Professionals, students

Events and engagement

Improve social media presence, networking, regional section collaboration

Student Chapter

Enhanced mentoring, interaction, support, and studentfocused events

Throughout the season, our monthly events have included a variety of topics relevant to the energy transition and renewables while still appreciating the continued undeniable dependence of the global economy on Oil and gas, and its products.

In April, we were hosted by Welltec at a very well attended event which included a facilities tour. Early this month, SPE CPH hosted Carlos Ferreira and Michal Stepien as they delivered a presentation on their novel approach using Machine Learning to predict the propagation of CO_2 in geologic formations.

Below is a summary of the monthly events that took place in our section this season:

WE WELCOMED

- Jose Antonio Perez Acero
- Patryk Bijak
- Fabio Rosas Gutterres
- Søren Hartmann
- Natalia Sol Pereyra





- Solvejg Jensen
- Isaac Applequist Loke

	SEPTEMBER 13 17:00 SPE Copenhagen Strædet 13, 1208 K
TOPIC	Distinguished Lecture and Autumn Party at Kalderen 13
HOST	SPE Copenhagen
	SEPTEMBER 28 17:00 Maersk Drilling Face to Face
TOPIC HOST	Decarbonization Initiatives in Mærsk Drilling operations
HOST	Maersk Drilling
	OCTOBER 27 17:00 Rebel Work Space Face to Face
TOPIC	Leading the way to a carbon neutral future by building world scale clean ammonia production and carbon storages
HOST	SPE Copenhagen at Rebel Workspace
	NOVEMBER 14 12:00 SPE Online
TOPIC	From Digital Rocks to Gigatonne Scale CO Storage: Two Revolutions in One
HOST	SPE DL
	DECEMBER 8 17:00 TotalEnergies Facet o Face
TOPIC	Tyra Redevelopment
HOST	TotalEnergies
	FEBRUARY 23 17:00 DTU Offshore Online
TOPIC	Reduction of Environmental Impact of Produced Water by introducing green chemicals
	Compaction phases and pore collapse in chalk - The elastic phase is not elastic
HOST	DTU Offshore Virtual Meeting
	APRIL 18 16:30 Welltec Face to Face
TOPIC	Insights into Welltec's New Energy and Climate Technologies initiatives
HOST	Welltec
	MAY 4 17:00 Rebel Workspace Face to Face
TOPIC	Predicting the CO ₂ propagation in geological formations from sparsely available well data
HOST	SPE CPH at Rebel Workspace
	JUNE 1 17:00 Rebel Workspace Face to Face
TOPIC	Annual General Meeting
HOST	SPE Copenhagen at Rebel Workspace

We are happy with the engagement and interaction figures from our social media (LinkedIn) and website. SPE CPH has become more visible online and there has been significant interaction with sister sections within Europe especially for virtual events.

BOARD ELECTIONS 2023

So far, we have received nominations from a few interested members willing to volunteer on the Board. This is encouraging and we hope they can bring new and fresh ideas.

But there have been challenges.

The decline of our section membership numbers over the last few years has plateaued. Although this is a better situation, it remains a source of concern. A sustainable growth in membership is a must for the continued operation of our dear section.

Corporate sponsorship support is no longer a forgone conclusion as one of our biggest supporters over the years, Maersk Drilling, has merged with Noble and the head office moved to Houston. This means potentially one less source of funding if/when operations are discontinued in Lyngby.

The future of our student chapter is in serious doubt. With the proposed discontinuation of the Petroleum Engineering course at DTU, the September 2022 intake appears to be the last batch of Petroleum Engineering students.

With the above in mind, I have commissioned a small group within the Board into a think-tank. Their mandate is to plot the future of SPE CPH, and it would take to get there. We will need input from our members and in our upcoming **Annual General Meeting on June 1**st, I will elaborate more.

APPRECIATION

A big 'Thank You' goes to our sponsors who have through their kind donations provided the funding to keep our section going. Our sponsors this season included Total Energies, Maersk Drilling (Now Noble Corporation), DHRTC (now DTU Offshore), Welltec and Calsep.

I would like to thank you, our members, for your continued participation and engagement within the section. I am particularly happy to see the attendances at our events from members from the sections.

As is now my custom, I will use this last paragraph to express my heartfelt thanks to the Board of SPE Copenhagen Section. I wrote this last year, and it still holds true:

"A selfless group of people who have dedicated their time and effort towards running the section, organizing various events, organizing field trips, publishing newsletters, mentoring our students, improving the level of member engagement and keeping the section alive."

Thank you, Peter T, Mette B, Hans H, Jonathan H, Mette F, Jose A, Nikolai A, Jaime C, Fabio G, Jedrzej B, Søren H, Alex S, Darya S, Patryk B and Natalia P for your efforts and commitment this season.

MEMBER FEEDBACK

We on the board are always looking for ways to enhance the section and make your membership worth your while. If you have any suggestions or constructive feedback, please feel free to contact any of the Board members via

https://spe-cph.dk/

or our LinkedIn page

https://www.linkedin.com/company/spe-copenhagen-section

MEMBERSHIP RENEWAL

We look forward to you continuing your SPE membership. There is no doubt that we are all facing the effects of inflation, war and the energy crisis among other challenges but through it all, we have continued to inspire and support each other. We as a board will continuously work towards bringing greater value to your membership.

To renew your membership, visit:

spe.org

or click on the link:

http://go.spe.org/sectionrenew

I look forward to seeing you again in September when we will open with a season 2023/24 welcome party. Until then, have a wonderful summer holiday and be safe in your travels.

Yours Sincerely,

Adebowale Solarin SPE Copenhagen Section Chairman



Adebowale Solarin SPE Copenhagen Section Chairman

THE BOARD 2022-2023 SEASON

THE BOARD

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The SPE Copenhagen Section Awards



For the 2022/23 season the Board has decided on a new initiative: The SPE Copenhagen Section Awards.

This is the first edition and all board members have been truly excited about it. The aim is to formally show recognition to some of our most contributing members.

This will not be a one-off as we intend to make it an annual feature on our calendar. The recipients of the first edition of the awards are:



TECHNICAL & ACADEMIC CONTRIBUTOR TO THE SPE COMMUNITY

Ida Lykke Fabricius is professor in engineering geology and petrophysics. She holds a B.Sc. degree in geography, a B.Sc. degree in chemistry, an M.Sc. degree in geology (mineralogy), as well as Ph.D. and dr. techn. degrees in engineering geology. After completing her M.Sc. degree, she worked a few years as a petroleum geologist before joining Technical University of Denmark as a teacher/researcher.

Additionally, Ida has published several SPE Technical Publications as: SPE-180054-MS, Determining Optimum Aging Time Using Novel Core Flooding Equipment (2016); SPE-154489-MS, Effect of Hot Water Injection on Sandstone Permeability: An Analysis of Experimental Literature (2012).

STUDENT SECTION AWARD

Driven by a desire to integrate the power of data analytics into the traditional oil and gas sector, Natalia is currently studying a Master's in Business Analytics at DTU, after pursuing her studies in Petroleum Engineering in Argentina.

She has been an active member of SPE Copenhagen and in 2022 became the Chair of the SPE DTU Student Chapter. Under her leadership, the membership has grown significantly. Her efforts have helped promote the oil & gas industry among students through various company events, student participation at SPE workshops and competitions abroad.



For all the above contributions and their always proactive attitude, the SPE board awards them these recognitions. SPE Copenhagen will celebrate them in person during the next Annual General Meeting (AGM) on the 1st of June.

CCUS STUDY TOUR PAVES THE WAY FOR DANISH-CANADIAN KNOWLEDGE EXCHANGE

If Denmark is to succeed with the goals of reducing $\rm CO_2$ emissions by 70% by 2030 and introducing a circular economy as part of the carbon value chain, new technologies, new initiatives, and new collaborations are needed within a short time.

In end-April, a broadly composed delegation from the Danish CCUS eco-system covering technology companies, knowledge institutions, organizations, clusters, government, and grant providers crossed the Atlantic to visit Vancouver and Edmonton. The purpose of this CCUS Study Tour was to gather and exchange knowledge and to facilitate relationships that can translate into a future fruitful collaboration with mutual benefits.

Canada world leader within CCUS

Chairman of INNO-CCUS and Head of Technical Services & Support at TotalEnergies, Morten Stage, was part of the high-level delegation of 45 people.

"The ambition is to learn from the best in class and to gain insight into the latest trends in technology and science. Canada is a world leader within CCUS and, especially in Vancouver and Edmonton, commercial facilities for ${\rm CO_2}$ capture are up and running and are the clear proof of CCUS as a key climate technology," Morten says.

The program, which was drawn up in collaboration with Canadian stakeholders, was tightly packed, spread over large geographical areas and covered subjects from talent attraction and education over CCUS technologies to regulatory and political challenges. Visits to various government officials, leading universities, companies, clusters, and ventures were thus on the agenda.

Ahead of Denmark

Every visit and every hour were well spent. The delegation was given a unique opportunity to share Danish - and hear about Canadian - successes and milestones. Morten presented, among other things, how Denmark is rolling out the CO₂

reduction strategy e.g., through mission driven partnerships such as INNO-CCUS. And he found it rewarding to study and understand the Canadian CCUS ecosystem, which in several areas are ahead of Denmark.

"An eyeopener for me was the Canadian entrepreneur mindset, which has resulted in several technologies that have helped bringing Canada to the CCUS level they are at. In Denmark, we need to find more or better ways to support – and encourage - start-ups and entrepreneurs to enable them to set the creativity free, as the success of the entire carbon value chain depends on new solutions and new ways of thinking", Morten concludes.

Study Tour report to come

All in all, the study tour was a success and a strong connection that can reinforce and elevate the cooperation between Canada and Denmark within sustainable technologies have been established. Experiences from the tour will be gathered in a report to be used e.g., in the public debate about the Danish CCUS strategy.

Carbon Engineering Ltd., in Squamish, Vancouver is a pioneer within Direct Air Capture and one of the leading companies in the world on that field. The Danish delegation visited the company's pilot on a direct air capture plant. In 2025, the first large scale plants, which are twice the size as the one in the picture, will be set up in Texas, USA. The facility will consist of 50-60 of these plants and aims to capture 500,000 tonnes of CO₂ /year.

For comparison, 500,000 tonnes/year is also the target for the first subsidy pool for storing CO_2 in the North Sea announced by the Danish Ministry of Climate, Energy and Utilities back in 2021, although this will be from a point source (power plant or waste incineration) rather the Direct Air Capture.



Photo: Morten Stage, TotalEnergies/ INNO-CCUS



Photo: Katrine Thomsen, Ministry of Climate, Energy and Utilities

At the Edmonton Hydrogen/CCUS Conference, Morten Stage and Soren Reinhold Poulsen, Head of CCS and Producing Assets in INEOS Energy Denmark, were interviewed about the scope for the Danish delegation and what they took with them back home from Alberta. The two gents highlighted, among other things, that Canada is interesting because for many years it has operated a CO2 infrastructure and has also injected CO2 into the underground for storage.

CCUS Study Tour Purpose

The Study Tour was organized by ATV, CLEAN and Green Hub Denmark with the purpose to gather inspiration and knowledge, and to create new networks that can foster and leverage fruitful research and corporate collaborations, with mutual benefits for Canada and Denmark.

THE FINAL PHASE FOR TYRA II HAS BEGUN



Work is progressing full steam ahead at Denmark's largest gas field, Tyra, where the very last phase of the redevelopment has kicked off.

After the successful installation of two new jackets, eight platform topsides, six bridges and a flare tower, the Tyra Redevelopment is in its final phase: The Hook-up and Commissioning, or HUC.

HUC is a massive undertaking that prepares the new facilities for first gas to Denmark and Europe in the winter season 2023/24 – an important step towards energy security and independence.

HUC involves a diverse team of experts: engineers, scaffolders, painters, electricians, blacksmiths, inspectors, riggers, welders, supervisors, IT experts and more. In total, more than 1,200 people are part of the offshore team and over 250 people contribute from onshore to this huge endeavor where more than 25 local companies are involved.

Before the production of Tyra can be re-started, the team needs to:

- Connect the power, control, process, utility, and communication systems across all platforms
- Reinstate the 42 wells to resume extraction of natural gas from underground reservoirs
- Reconnect the pipelines from the surrounding platforms to Tyra and to onshore
- And every system must be thoroughly tested to ensure safety and reliability



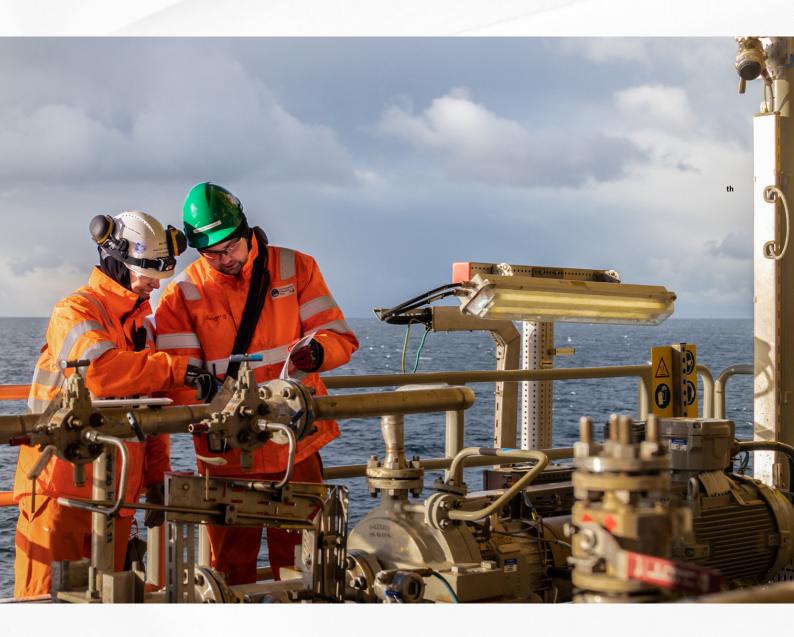


The first major milestone in 2023 was to kick off the reinstatement of wells with the more than 3 tons heavy valve assemblies, so-called Christmas Trees, which have been refurbished from the old Tyra.

Throughout the year, additional big milestones are achieved, including the start-up of the gas turbine generators, reconnection of the infrastructure and export pipeline to Denmark, and re-establishment of gas flow into the Tyra facilities.

Once the final phase is completed and Tyra II back on stream, the field is expected to deliver 2.8 billion cubic meter gas per year at 30% lower ${\rm CO_2}$ emissions compared to the former platforms – and again make Denmark a net exporter of natural gas.

Follow the final phase of the project on tyra2.dk



Young Professional Life Consultancy

By Lucas F. F. Corrêa, Calsep A/S, e-mail: Ic@calsep.com



Lucas Corrêa, Consultant, Calsep A/S

Working as a consultant in a software development company has been an incredibly exciting experience for me. I consider myself lucky to be in a unique position as I have been hired as a consultant for the R&D department. This means that my daily activities require me to switch between two different modes of operation. R&D tasks are slow-paced and are driven by the company's forecast of industry's future needs. On the other hand, consultancy projects require quick action and depend on what our customers need presently. This allows for a very dynamic work routine that I highly value. It also requires me to have an all-encompassing view of our clients' activities, which I learn from my colleagues and in networking events.

Moreover, this job provides me with the opportunity to be a part of some inspiring discussions. I often participate in meetings where we discuss the physical soundness of thermodynamic models and how clients will perceive them. I am constantly amazed by my colleague's ability to combine these different views of the technology we develop. It is also insightful to see the point where theory turns into real-life applications. This experience allows me to apply my theoretical knowledge, which I learned during my university days, while developing new skills.

Although my job is primarily office-based, it has taken me to various places during my short tenure. One of the essential aspects of the job is to showcase the work we are doing and receive feedback from other specialists. As a result, I have participated in conferences and workshops in different cities in Denmark and overseas. These events provide an excellent opportunity for cultural exchange and knowledge sharing. It is also fulfilling to see people take an interest in our work and engage in thought-provoking discussions.



Senior Consultant Peter J. Herslund and Consultant Lucas Corrêa (Calsep)



From left to right Regional Manager APAC Adil Pottayil, Consultant Lucas Corrêa and Senior Consultant Lay Tiong Lim (Calsep)

Overall, it has been an incredibly rewarding experience for me to work as a young engineer in close collaboration with the oil & gas industry. I am surrounded by experienced professionals who provide me with valuable insights into the industry. I get to apply the knowledge I gained during my studies regularly while staying updated on new technologies, consumer behavior, and trends in the oil & gas sector. I look forward for all the experience that working in this field will bring me.

Lucas F. F. Corrêa
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EU'S LARGEST GEOTHERMAL PLANT IS ABOUT TO BE MADE



In October, a 30-metre-tall rig will arrive at Sumatravej 11 in Aarhus to drill the first well. The first part of the wells will be drilled with a water driller. Currently, the buildings at the site are being demolished to allow for site preparations.

In January of 2022, Innargi and the district heating company Kredsløb announced the development of EU's largest geothermal heating plant in Aarhus with the ambition to provide 20 percent of Aarhus' district heating in 2030. Currently, preparations are taking place at two locations to prepare for the drilling, and on 1 May, Innargi began extensive seismic surveys of the subsurface to allow for even more detailed planning in the months to come.

The first well will be drilled in the fall of 2023.

Seismic surveys around Aarhus

It was unusual scenes that played out in Aarhus in the beginning of May. For five days, four white vibro-trucks did a seismic survey along two routes in the city of Aarhus. Beforehand, geophones were installed along the route to pick up the vibrations that the trucks send into the subsurface. The vibrations reached appr. 5 kilometres into the ground and will now help Innargi map the subsurface, allowing for a detailed planning of the drilling campaign to avoid delays.

"To make the most of the geothermal energy in the ground, we need to know the subsurface, the layers, as well as the depth of the water. These surveys will help us map the subsurface in greater detail and play a vital role for us in the detailed planning the drilling campaign," says Søren Christian Børsmose, Project Director in Innargi.



Four vibro-trucks drove through the streets of Aarhus in early May to map the subsurface.

After Aarhus, the vibro-trucks will continue with the seismic surveys in both Holbæk and Greater Copenhagen to investigate the potential for geothermal heating there as well.

Drilling to start in the fall of 2023

The geothermal heating plant in Aarhus will consist of a total of 17 wells at seven different locations once it is complete in 2030. The first drilling will start in October where Innargi will do two exploration wells at different locations to test the reservoir and water flow. Following these tests, a third well and the first heat plant will be ready by 2025 to deliver the first heat to the citizens of Aarhus. Following this milestone, the remaining wells will be drilled. All seven heating plants will be commissioned by 2030.

From oil to water

Innargi is founded by A.P. Møller Holding A/S and relies heavily on competencies from the oil and gas industry.

"Many of us have +20 years of experience from oil and gas, and now we are putting it all to use in preparing to drill onshore in urban areas. Even though it means that we need to take new things into consideration, our oil and gas heritage gives us a very strong point of departure," says Søren Christian Børsmose, Project Director in Innargi.



Copenhagen Section Student Chapter News

SUCCESSES OF STUDENT CHAPTER MEMBERS IN PETROBOWL AND SPE PAPER CONTEST



"Jakub Drochomirecki (left) and Christoffer Duss (right) with Laura Precupanu (center), the SPE Regional Director Europe."

We have some exciting news to share with all of you! During the 10th edition of the Annual Student Energy Contest (ASEC) held in March in Zagreb, two of our chapter members: Jakub and Christoffer had the opportunity to participate in two SPE competitions: the PetroBowl contest and the SPE Paper Contest. We are happy to share with you that our chapter performed exceptionally well, showcasing our knowledge on an international stage.

Let's start with the PetroBowl contest, a quiz competition that puts teams head-to-head in a series of rapid-fire rounds, testing their knowledge on technical and non-technical industry-related questions. Out of the 13 teams that participated from across Europe, we proudly secured the 4th place. Despite being the only team with fewer than 4 members, we displayed great teamwork and determination throughout the contest. We are grateful for the support we received from our chapter and

whole community, which played a crucial role in our success.

Furthermore, we would like to highlight the achievement of Jakub in the SPE Paper Contest. Jakub's paper titled 'Application of Bio and Biobased Surfactants as Demulsifiers for Destabilization of Water in Crude Oil Emulsions' earned him the 1st place in the masters, division of the contest. As a result, Jakub will be representing both our chapter and the region during the ATCE 2023 (Annual Technical Conference and Exhibition) in San Antonio, USA.

It is important to note that the SPE coordinates 14 regional student paper contests at the undergraduate, master's, and PhD levels. These contests offer students the chance to compete with peers in their respective regions, vying for the opportunity to advance to the International Student Paper Contest held during ATCE. The papers of the winners who proceed to the International Student Paper Contest at ATCE will be published in the conference proceedings and on OnePetro. This recognition not only provides a platform for students to showcase their research but also contributes to the body of knowledge in the industry.

We would like to extend our thanks to everyone who supported our chapter members throughout these competitions, especially to SPE Copenhagen Section and Calsep A/S. Your encouragement and assistance played a significant role in our success.

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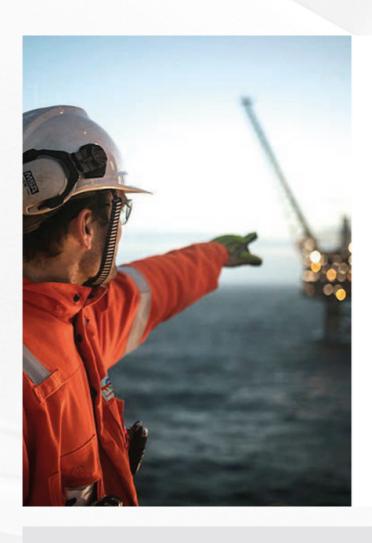


A dynamic leader in offshore drilling

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noblecorp.com





Denmark's long-term energy partner

We are in the middle of a global energy and climate crisis that highlights the need for energy solutions here and now. As one of the world's largest energy companies, TotalEnergies knows that the future belongs to renewables. This is why we are in full swing transforming our business to help secure a green future for Denmark.

Our focus is on maintaining an energy-efficient and safe production of oil and gas, with the rebuilt Tyra platform at the center, while leveraging our many years of experience as an energy supplier in Denmark. We will do this by expanding our activities to wind, solar, and Carbon Capture and Storage (CCS).

TotalEnergies has great ambitions to be at the forefront of green energy production with the objective of being among the top five players in renewables by 2030.

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