Programme

Danish Offshore Technology Conference 2024

19-Nov-2024

08:00 - 09:00 **Registration and breakfast**

08:00 - 09:00 **Brella 1:1 meetings**

09:00 - 09:15 **Welcome to the Danish Offshore Technology Conference 2024**

Welcome speech by Elena Pachkova, Centre Director, DTU Offshore
Opening speech by Christine Nellemann, Dean of Sustainability, DTU
Practical information by moderator

09:15 - 09:40

The European offshore energy transition – where are we heading? Ditte Juul Jørgensen, Director-General for Energy, The European Commission.

With the new European Commission mandate focussing on competitiveness and a clean industrial deal, the Director General of DG Energy will share her insights into the EU's efforts to deliver on its offshore ambitions and build up a competitive value chain in the offshore sector, be it in wind, hydrogen, or innovative new technologies. While some challenges remain to be on track with our 2030 targets and to make sure that the necessary infrastructure is in place, there is great potential to fully harness our offshore resources.

09:40 - 09:55

The Offshore Energy Transition - inbuilt opportunities and challenges. Malene Rod Vest, Programme Director, DTU Offshore

The offshore energy sector is undergoing a significant transformation, driven by the urgent need to transition to sustainable energy sources and reduce carbon emissions. In recent years, plans for offshore activities have surged, setting the stage for multiple large scale projects in the coming decade, including construction of wind farms, development of CO2 storage sites, abandonment of oil and gas fields and the potential creation of energy islands. The North Sea represents a major opportunity for green energy and carbon mitigation activities, whereas the urgency, the areal requirements, the proximity of activities and the requirement for preserving the marine environment represents a multitude of both opportunities and challenges.

DTU Offshore are involved in several projects with focus on the sustainable development of offshore wind farms, CO2 storage solutions, abandonment of oil and gas infrastructure and advanced monitoring technologies; and all our activities comes with the ambition to 'get it right the first time', i.e. to avoid generating new challenges for the next generation, while being busy solving the challenges most pressing now.

Collaboration across sectors is essential to drive this transition forward. By fostering partnerships between industry, government, and other academic institutions, we can accelerate the development and implementation of innovative solutions for the benefit of the energy transition, the environment and Denmark.

09:55 - 10:20

TotalEnergies in Denmark: Transforming the Danish North Sea into a Powerhouse for Europe's Green Transition. Ole Hansen, CEO, TotalEnergies Denmark E&P

Denmark is a leader in green energy development and implementation, yet nearly 50% of the country's energy consumption still relies on oil and gas, partly sourced from the North Sea. As the largest operator in the Danish North Sea and a long-term partner for Denmark, TotalEnergies plays a crucial role in ensuring energy security and independence. At the same time, the company is heavily investing in scaling up both CO2 storage and renewable solutions to help Denmark achieve its climate goals.

Ole Hansen, Managing Director at TotalEnergies EP Denmark, will provide valuable insights into how the company is working to reduce emissions, accelerate production from existing oil and gas fields, and actively develop renewable and CO2 storage projects to shape the future of the North Sea.

10:20 - 10:50 **Coffee break and networking**

10:20 - 10:50 **Brella 1:1 meetings**

10:50 - 11:15

Pioneering the energy transition in the North Sea. Andreas Jagtøyen, SVP for Renewable and Low Carbon Business Cluster, Equinor.

Equinor has been shaped by 50 years of solving challenges in the North Sea. Today, in an increasingly unpredictable world, our deliveries of oil, gas and wind power provide a vital and stabilising contribution to Europe's energy security.

Equinor's path in the energy transition consists of three strategically important pilars: oil and gas, renewables, and low-carbon solutions. In addition to being among the world's most carbon-efficient oil and gas producers, Equinor operates both Hywind Scotland and Hywind Tampen, the world's first and largest floating offshore wind farms respectively.

Furthermore, Equinor is one of the largest CCS operators worldwide, with nearly 30 years of experience permanently storing CO2 offshore. The Northern Lights project, the world's first cross-border CO2 transport and storage facility, is ready to receive and store CO2 and ensures both Norway and Equinor will remain reliable energy partner to Europe.

These pioneering developments will be the focus of the presentation but are only the beginning of our net zero journey. Equinor will continue to search for better as we leverage our R&D and innovation capabilities to provide energy for people and progress for society in the energy transition.

11:15 - 11:40

Offshore wind potential and challenges in the North Sea. Henrik Stiesdal, Founder and CTO, Stiesdal.

Offshore wind technology, a relatively young field, recently celebrated 33 years since its first installation. Initially, offshore wind energy was a costly but promising alternative to fossil fuels due to high installation and operational costs. However, the competitive pressure caused by the general shift around 2015 on most markets from fixed feed-in tariffs to competitive auctions dramatically reduced these costs, making offshore wind a competitive energy source.

The European Union has ambitious plans for offshore wind expansion in the North Sea, aiming for 350 GW of installed capacity by 2050, which could supply up to one-third of the EU's electricity needs. The UK is poised to achieve an even higher share of its electricity from offshore wind.

Despite these advancements, significant challenges remain, including slow permitting processes, underdeveloped grid infrastructure, and supply chain bottlenecks. This presentation will explore these issues and propose potential solutions to facilitate the continued growth and integration of offshore wind energy in the North Sea region.

11:40 - 12:15

Panel Discussion: Striking a balance between economic, social and environmental pressure

As energy projects in the North Sea grow, can we ensure maximum benefit with minimum loss?

There are important questions to address, including:

– Competing interests versus collective strategies
– Surplus wind, energy security and market mechanisms
– Uncertainties, risks and integration in PtX and CCS
– Restoration and protection of marine ecologies
– Public approval for offshore developments
– Knowledge gaps and research funding

Panelists
- Anders Køhler, CEO, Floating Power Plant
- Christine Brandstätt, Assistant Professor, Copenhagen School of Energy Infrastructure (CSEI), CBS
- Mathilde Lindhardt Damsgaard, Head of Foundations, PD&En, Vattenfall
- Miriam Bardolet, Director, Energy Transition Funds, Copenhagen Infrastructure Partners
- Simon Ivar Andersen, DTU Offshore

12:15 - 13:15

Lunch and networking

12:15 - 13:15

Brella 1:1 meetings

13:15 - 13:40

The Danish CCS framework and offshore storage of CO2. Lars Aagaard, Minister, and Katrine Thomsen, Head of Division, The Danish Ministry of Climate, Energy and Utilities

In less than five years Denmark has gone from having no CCS policies to becoming a frontrunner on CCS working to become a European Hub for CO2-storage. The Danish subsurface is very well suited for storing CO2 and the government has currently given six permits for exploration of CO2-storage, and more are to come. Furthermore, the government has developed the regulatory framework and subsidy schemes enabling the development of CCS through full value chains that will contribute to the Danish 70 pct. reduction target in 2030 and beyond.

Katrine Thomsen, Head of Division at the Danish Ministry of Climate, Energy and Utilities, is leading this process. She will provide insights on how the ministry is working with the Danish CCS regulation and policy developments including permitting for geological storage of CO2, as well as future perspectives on CCS developments.

14:00 - 15:00

Breakout Session I: Reuse and New Build - Offshore Energy Infrastructure

Offshore infrastructure is a critical part of the energy transition. The expected changes involve energy hubs (to collect and transfer wind power), energy conversion facilities (to add value to wind power), energy storage (to add security and resilience), pipelines (to transmit hydrogen, PtX derivatives and CO2) and injection facilities (to store CO2 and hydrogen).

This breakout session will discuss the aspirations that sustainable commercial activity in the North Sea is central to decarbonising society. There are many questions. How to improve collaboration between the various sectors and different companies? What are the economic and regulatory hurdles? Can existing assets be repurposed? Where are the information gaps? How to foster environmental stewardship? How to engage and satisfy diverse stakeholders?

Please come and contribute to a highly pertinent debate looking at ways to progress plans efficiently and with common benefit.

Agenda

Introduction
Dave Quirk, Energy Transition Advisor, and Anders Krag, Commercial Director, DTU Offshore

Energy hubs in the North Sea – a developer perspective
Torben Glar Nielsen, Senior Advisor, Copenhagen Energy Islands, Copenhagen Infrastructure Partners

Towards 2050 offshore energy hubs are expected to play a critical role in offshore wind buildout and system integrated offshore hydrogen production. This pose the questions to how future offshore energy infrastructure is to be build, enabling cost-efficient solutions for consumers and industry. The talk will present a commercial view on the opportunities and challenges by building offshore infrastructure and repurposing offshore infrastructure in the North Sea.

PORESENSE: A sensor technology for detecting underwater methane leaks
Jaskaran Singh Malhotra, PhD student, DTU Offshore

As offshore oil and gas wells are decommissioned and plugged, reliable monitoring of potential leaks becomes increasingly critical. Traditional methods, which depend on detecting visible bubbles or gas plumes, often fail to identify smaller leaks that pose significant environmental risks. To address this gap, we have developed an innovative sensor technology using quartz resonators paired with specialized porous materials, which is capable of detecting methane at sub-ppm concentrations in water. Integrated into a compact, low-power prototype with micropumps, this sensor enables remote, continuous monitoring of methane leaks, ensuring environmental safety and compliance with stringent regulatory standards.

The importance of offshore infrastructure for Atlantic cod communities
Bruno Ibanez-Erquiaga, PhD student, DTU Aqua

In the North Sea, ageing offshore oil and gas (O&G) platforms are subject to complete removal through decommissioning at the end of their operational life, assuming that full removal represents the best ecological outcome. However, increasing evidence suggests that these platforms may serve as important habitats for marine species, including fish, due to their reef-like structures, food provisioning, and the restrictions on fisheries around them.

For example, preliminary investigations indicate that Atlantic cod (*Gadus morhua*), a key species for North Sea fisheries but experiencing population declines, is closely associated with offshore platforms. Yet, the mechanisms driving this association are not well understood, and comprehensive assessments of the ecological impacts of O&G platforms, and their full removal, on fish communities and fisheries remain limited.
We explored the associations between a platform in the North Sea and the fish assemblages observed along a distance gradient ranging from 1 to 600 meters away from the structure, with a particular focus on Atlantic cod. Additionally, we used fish tracking to follow 50 cod individuals for one year near the platform.

Our findings indicate that platform proximity is associated with higher fish biodiversity, abundance, and larger body sizes for key species, including cod. The findings indicate that O&G platforms may serve as artificial reefs, offering essential habitat and refuge for marine species in the area. Given these results, we recommend that the ecological consequences of full platform removal, especially the potential loss of local biodiversity, be carefully evaluated to inform future decommissioning planning.

14:00 - 15:00

Breakout Session I: The subsurface as part of the energy transition

The energy transition is progressing and the role of subsurface storage of both energy and CO_2 is becoming central. At the same time, the subsurface could also be part of generating sustainable energy for the transition.

This breakout session will focus on the role of the subsurface in the energy transitions and how to understand the associated impact on the marine environment.

Agenda

Introduction, DTU Offshore

The Subsurface as Part of the Energy Transition
Co-host Susanne Poulsen, CCS Consultant, Copenhagen Infrastructure Service Company.

Over geological time, wind and weather systems have deposited sedimentary basins deep below our feet in Denmark, holding vital resources such as drinking water, fossil energy, heat, and storage space.

In the 1850'es we managed to drill the first deep water wells in Denmark though the chalk layers down to the groundwater basins where we still harvest our drinking water from today. Through time we perfected our subsurface mapping- and drilling skills, and in 1972 we commenced producing hydrocarbons from even deeper wells in the Danish sector of the North Sea. Only 12 years later, namely in 1984, the first deep geothermal well was switched on in Thisted. In the same year, a deep well into the Stenlille structure (exploring for oil) found a perfect summer-storage space for natural gas. And finally, last year the first CO_2 injection happened in a re-purposed hydrocarbon well as a pilot project in the Danish sector of the North Sea, and during the next couple of years the first dedicated CO_2 storage exploration wells will be spudded, various places in Denmark.

As we listen to the presentations in today's breakout session dedicated to how the subsurface plays a role in the energy transition, let's try and think about how we continue to transfer (and retain) skills from oil and gas industry to geothermal and CCS and other subsurface energy storage projects? What are the risks if we do not manage this knowledge transfer? And how do we realize synergies (and avoid interference) between the various subsurface projects?

Subsurface CO_2 Storage: Opportunities and Challenges in the Dynamic Domain.
Hans Horikx, Advisor, DTU Offshore.

Subsurface CO_2 storage offers a promising solution for reducing carbon emissions to the atmosphere, but it is not without its risks and challenges, as the geological environment is being changed by human intervention. Better understanding of the dynamics involved, combined with implementation of effective monitoring and management strategies, can help ensure safe and sustainable storage of CO_2.

This presentation will dive into the risks and uncertainties related to subsurface CO_2 storage in a dynamic environment. It will address evaluation and risk mitigation requirements necessary for the upscaling of CO_2 storage opportunities in Denmark, illustrated with examples from the Bifrost project and other DTU Offshore research projects.

CO_2 storage environmental baseline
Bodil Wesenberg Lauridsen, Senior Researcher, Katrine Elnegaard Hansen, Postdoc, and Lasse Tésik Prins, Researcher, GEUS.

A main concern and hazard associated with offshore CO_2 storage is leakage through the overburden sediments reaching the seabed and into the water column. We hypothesize that an early indicator of CO_2 leakage from a CCS reservoir will be increased methane in the surface sediments, with thermogenic/long chain molecular signatures. In the SEEP and SEABAS research studies, we have conducted a multiproxy study involving geophysical data identifying the pathways of possible seepage, microbial and gas data characterizing the present type of seepage and sedimentary data, variations in elements and fauna characterizing the past seepage history at a storage site. Hereby we have tested the possibilities for proxy-based identification and development of toolboxes for identifying both methane and CO_2 seepages in the abandoned reservoirs and at possible CO_2 storage sites in the Danish North Sea. We propose that such a comprehensive seabed baseline analyses based on multiple tools is carried out prior to storage.

14:00 - 15:00 **Breakout Session I: Water-Energy Nexus in the Energy Transition: Unveiling the Challenges**

The global energy transition is bringing new challenges, especially where water and energy systems meet. This session will explore key issues like resource limitations, environmental impacts, and changing regulations. Experts will share their insights into the major obstacles in managing water use across traditional and new energy sectors.

Attendees will leave with a better understanding of the challenges that must be tackled to ensure sustainable and efficient water management as the energy landscape continues to evolve.

Agenda

The Water-Energy Nexus in Energy Transitions.
Tomás Bredariol, Energy and Environmental Policy Analyst, International Energy Agency.

Energy and water are deeply and fundamentally connected. This presentation will provide a global overview of this nexus and discuss the outlook for water use in energy transitions. Clean energy can help to ease the water crisis, but not all low carbon technologies have low water needs. It will conclude with strategies to better manage water-related impacts in extractive industries, including measures to reduce water needs and minimise water pollution.

Nuclear in the energy transition: Status and perspectives of nuclear power as part of the Danish energy system.
Bent Lauritzen, Senior Researcher and Head of Centre for Nuclear Energy Technology, DTU Physics.

Global nuclear energy capacity is projected to nearly triple by 2050, with a primary focus on producing CO2-free baseload electricity with minimal environmental impact. Small modular reactors, especially advanced nuclear technologies like molten salt reactors, offer even greater potential by generating both electricity and industrial heat.
Nuclear energy can significantly enhance energy security. However, concerns about safety, waste management, and the costs of new nuclear developments, along with the challenges of integrating nuclear power into a grid increasingly dominated by variable renewable energy sources, make it a heavily debated technology—even in Denmark.

This presentation will explore several key questions: What is the future of advanced nuclear energy? Could nuclear waste serve as a valuable energy resource? And what role might nuclear energy play in Denmark's energy system?

Efficient water purification for offshore wind and power to x
Luciana Mendes, Global Sales Manager Desalination & FWG, Alfa Laval.

Although ultra-pure water for the electrolysis process only accounts for less than 2% of the total investment in a renewable hydrogen plant, it is crucial for proper electrolyzer operation. Failure to properly maintain it can lead to significant downtime and high costs.

By 2030, it is expected that 303 GW of electrolyzers will be installed, which will require 1.8 million cubic meters per day of ultra-pure water — equivalent to the water consumption of 12 million people. Additionally, 20 to 40% of the energy supplied to electrolyzers becomes excess heat. Combining these two factors — the large amount of excess heat generated and the significant need for ultra-pure water — Alfa Laval offers innovative technology that uses this excess heat to purify seawater, river water, brackish water, or wastewater to ultra-pure standards. This not only preserves natural freshwater reserves but also increases process efficiency by over 30% by utilizing waste heat.

Using thermal purification in renewable hydrogen production reduces the capital investment in the balance of plant (BoP) by minimizing or eliminating the need for additional cooling solutions. At the same time, operating expenses are reduced through decreased chemical and energy consumption.

This presentation will focus on how a proven, legacy technology can safeguard ultra-pure water production and increase process efficiency in one simple step.

15:00 - 15:30 **Coffee break and networking**

15:00 - 15:30 **Brella 1:1 meetings**

15:30 - 16:15

Breakout Session II: Reuse and New Build - Offshore Energy Infrastructure

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Repurposing Offshore Pipeline for CO_2 Transportation: Technical Considerations and Consequence/Risk Modelling
Pei Yen Lee, Senior Process Specialist, and Jesper Kok Frost, Senior Project Manager, Ørsted

This presentation explores the technical challenges and engineering requirements for repurposing existing offshore pipelines for CO_2 transportation. We will discuss critical factors such as material compatibility, pressure management, and the impact of CO_2 composition. Additionally, we will cover methods for consequence and risk modelling to ensure safe CO_2 transport. We conclude the presentation with a summary of how we will apply these insights as we take the project forward.

What is still needed to make future offshore systems work?
Dave Quirk, Energy Transition Advisor, DTU Offshore

15:30 - 16:15

Breakout Session II: The subsurface as part of the energy transition

The energy transition is progressing and the role of subsurface storage of both energy and CO2 is becoming central. At the same time, the subsurface could also be part of generating sustainable energy for the transition.

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Agenda

LoCo2: Bio-Geo-Chemistry of CO2 leakage and implications on life in seabed environment.
Ali Mahmoodi, Postdoc, DTU Offshore.

Project LoCo2 is focused on assessing the impacts of a potential CO2 leakage from geological storage reservoirs on life in seabed sediments. To achieve this goal, a multi-stage workflow will be implemented, encompassing bio-geo-chemically reactive flow modelling of CO2 leakage through overburden and seabed sediments, experimental analysis of the toxic effects of CO2 and associated impurities as well as other leaking fluids on selected benthic organisms, and ecological modelling. We aim to develop an evaluation toolkit, which can be used to assess the risk and ensure the long-term safety of future large-scale offshore CO2 storage for life in seabed sediments.

Wellbore Generated H2 with Downhole CCS
Stuart Gillick, CEO, Metharc.

If we adapt the energy cycle to generate H_2 production in the wellbore it will create cost savings, process efficiencies, and a free, sustainable, biproduct of at-source carbon capture and storage (CCS). Our process aims to future-proof hydrocarbon assets (both Natural Gas and Biogas) against emerging climate laws, as it is a more environmentally responsible way to enable the continued exploitation (not production) of methane resources. When producing hydrogen using this climate-beneficial method, zero carbon is produced to surface, making it a simpler and more immediate way to reduce carbon production and emissions, while providing economic longevity through the adaptation and reuse of existing infrastructure (wells, pipelines etc.). By capturing carbon downhole, the future need for downstream atmospheric capture of this same carbon is eliminated.

To make the biggest climate impact, we need to focus on the root-cause of global warming, i.e., hydrocarbon production and use. We are prioritising energy security by maintaining energy production via the exploitation of methane, while focusing on a rapid reduction in carbon production. Our patented wellbore process is in the form of a tool that is installed in the well completion string at or near the reservoir depth.

We are a Danish deep-tech startup, developing novel hydrogen production & CCS technology for the oil & gas, biogas and geothermal industries.

Close out. DTU Offshore and co-host.

15:30 - 16:15

Breakout Session II: Water-Energy Nexus in the Energy Transition: Discovering Innovative Solutions

As the energy transition moves forward, finding practical solutions to water and energy challenges is more important than ever. This session will highlight new ways to improve water management, starting with a presentation on how to minimize the discharge of harmful chemicals in offshore operations. Following that, a panel of experts will debate the latest innovations and policies aimed at protecting the environment and making energy production more sustainable.

Attendees will leave with fresh ideas on how to tackle these pressing issues.

Minimizing the Discharge of Harmful Chemicals Offshore
Simon Ivar Andersen, Professor, Chemical Impact of Offshore Energy Production, DTU Offshore.

Offshore energy production—whether from oil and gas, wind farms, or ship propulsion (which inherently involves converting fuel to energy)—has significant environmental impacts, many of which involve the discharge of harmful chemicals into the marine environment. As society rapidly introduces and scales up new technologies to address climate challenges, there is a risk that the impact of these chemical discharges to the marine ecosystem may be less prioritized, despite the tremendous pressures it faces.

History shows that failing to address the environmental risks of new technologies can have severe consequences, as seen in the oil and gas industry, where control measures were implemented only after significant damage. Achieving true sustainability requires early identification, analysis, and mitigation of potential risks, including chemical exposure, to protect the marine environment.

This presentation will explore gaps in current technology applications, particularly the use of chemicals, where existing workflows and insights could allow us to address these issues proactively. By applying lessons learned from managing produced water in oil and gas, we can ensure a more sustainable energy transition while minimizing harmful chemical discharges offshore. Asking the right questions and challenging new "green" technologies are crucial steps in safeguarding the environment and ensuring that sustainability is not compromised.

Panel debate: Tackling Water Challenges in the Energy Transition
Join us for an interactive debate on how to address key water management challenges facing the energy sector.

Panelists:

- Bent Lauritzen, Senior Researcher and Head of Centre for Nuclear, Energy Technology, DTU Physics
- Isabelle Moraes Amorim Viegas, Postdoc, DTU Offshore
- Luciana Perina Mendes, *Global Sales Manager Desalination & FWG*, Alfa Laval
- Tomás Bredariol, Energy and Environmental Policy Analyst, International Energy Agency

16:25 - 16:50

The interplay of energy, trade and manufacturing: insights from Energy Technology Perspectives 2024. Amalia Pizarro Alonso, Energy Technology Analyst, International Energy Agency

In recent years, the world has focused on the implications of a new energy economy for energy security, economic growth and international efforts to reduce greenhouse gas emissions. However, with the widespread adoption of clean energy technologies in many countries, other factors are emerging. Three strategic public policy areas - energy, industry and trade - have become increasingly intertwined, creating tensions and trade-offs as governments navigate their clean energy transitions. Policymakers now face difficult choices to maintain competitive, well-functioning markets that promote cost-effective transitions, while strengthening resilient clean technology supply chains. This will require tough choices about which industries to prioritise, how to engage with international trading partners, and where to focus innovation. The deepening links between energy, trade, manufacturing and climate are the focus of the latest edition of the IEA's flagship technology publication, Energy Technology Perspectives (ETP) 2024.

Under current policy settings, the market for clean technologies triples by 2035, close to the average value of the global crude oil market in recent years, with China as the largest market value. The current market value of materials such as steel, aluminium or ammonia is already almost two-thirds of the global oil market, and the transition to near-zero emissions materials is slower under current policy settings. The production of near-zero emission materials will increase the demand for CO2 and hydrogen storage. In recent years, there has been an increasing number of project announcements, which would align with achieving climate pledges, but few of these have a committed investment, creating uncertainty about how many projects will be realised. The North Sea stands out as a leader in announced CO_2 storage projects, with nearly 25% of the world's announced storage capacity for 2030 and two-thirds of the world's offshore capacity. Accelerated innovation will be critical to achieving net-zero emissions by 2050, as 35% of CO2 emissions reductions by 2050 would rely on technologies that are not yet on the market.

16:50 - 16:55

Closing remarks

17:00 - 19:00

Poster session and tapas