



**Organizers:** Benjamin Bellwald, Antony Price, Adriana Ramirez, Emin Sadikhov, Fiona Sutherland, and Gábor Zelei

**Connection Link:** [https://seg.zoom.us/webinar/register/WN\\_Fgp3E76kTJ2jCsfYIo5B6A](https://seg.zoom.us/webinar/register/WN_Fgp3E76kTJ2jCsfYIo5B6A)

Event times are based on Central European Summer Time

<b>Session 1: Introduction and Organizational structure of CCS Projects</b>				
Start	Stop	Presentation Title	Speaker	Affiliation
12:00	12:10	Welcome and Introduction		
12:10	12:30	The role of geophysics in the Northern Lights	Catalina Acuna	Shell
12:30	12:50	The path to Net Zero Emissions: Vår Energi's perspective	Cedric Fayemendy	Vår Energi
12:50	13:10	Verifying CSEM measurement for CO2 monitoring: A case history	Kurt Strack	KMS Technologies
13:10	13:20	Break		
<b>Session 2: Monitoring options for CCS sites</b>				
Start	Stop	Presentation Title	Speaker	Affiliation
13:20	13:40	4D gravity and subsidence monitoring of offshore CO <sub>2</sub> storage	John Even Lindgärd	Octio
13:40	14:00	Can 4D CSEM be a monitoring solution for offshore CO <sub>2</sub> storage sites?	Aslak Myklebostad & Svein Ellingsrud	Allton
14:00	14:20	CCS monitoring: focused seismic detection to calibrate dynamic models	Habib Al Khatib	Spotlight
14:20	15:20	Discussion and Summary		

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## SHORT ABSTRACTS AND BIOGRAPHIES FROM PRESENTERS:

### 1. The role of Geophysics in Northern Lights

**Abstract:** What will be the role of geoscientists and, in particular, geophysicists in the CCS world is a question that we have in our minds. There have been many conversations around this topic, most of it related to predictions and trends, but what this presentation will show it's a real example: our experience in the Northern Lights. It will be shown how geophysics has contributed to the making of this project and how it will play a fundamental role in the success of it.

**Biography:** Catalina is a geophysicist with broad experience in the geophysics field: from exploration to development, from Quantitative Seismic Interpretation to Non-seismic. Serving the science and business she has also moved around from Venezuela, to the US, Netherlands, Brunei and lastly Norway. More recently she's worked into the subsurface team of the Northern Lights JV as a Sr. CCS geoscientist. She comes from Shell but it's seconded to the NL JV and Equinor

### 2. The path to Net Zero Emissions: Vår Energi's perspective

**Abstract:** In this talk, Cedric Fayemendy will present Vår Energi's ESG and decarbonization goals. The focus will be on one of the company project's portfolio named Barents Blue where Vår Energi and its partners are planning to develop an energy efficient ammonia plant including capture and storage of CO<sub>2</sub>. The presentation will also reflect on the development of CCS projects in Norway.

**Biography:** Cedric Fayemendy graduated as a geophysicist and worked for over 20 years with reservoir characterization and monitoring in Schlumberger, ConocoPhillips and Equinor. Late 2021 he decided to shift focus towards energy management and is now working as a R&D Low Emission Solution Engineer in the research department of Vår Energi in Stavanger Norway.

### 2. Presentation Title: Verifying CSEM measurement for CO<sub>2</sub> monitoring: A case history

**Abstract:** (See attached at the bottom)

**Presenter Biography:** Dr. K.M. Strack is president of KMS Technologies- KJT Enterprises Inc. specializing in integrated seismic/electromagnetic technology for land & marine exploration, appraisal drilling and production monitoring for the geothermal/petroleum industry. He also is CTO for Responsible Energy Services International Inc. that provides data acquisition services to the green Energy industry. Present emphasis is to drive the technology enabling smooth energy transition to zero carbon footprint. In addition to his industry career, Kurt also has a distinguished academic career in Europe (Germany), Asia (China, Thailand, Indonesia and India, and USA where he co-supervised many M.Sc., and Ph.D. student and post-docs.

His company, KMS Technologies, pioneers borehole, borehole-to-surface, and land & marine electromagnetics as link with the 3D seismic Earth model. Previously, he was Chief Scientist for Baker Atlas after various management positions. There he built their Research Department and supported the development of numerous new logging tools. Prior to that Kurt pioneered LOTEM (Transient electromagnetics for hydrocarbon exploration) development and advanced borehole geophysics technologies in Germany, Australia, and the USA. Kurt also serves as Adjunct Professor in the Earth and Atmospheric Geoscience Department and Electrical Engineering Department at the University of

Houston, Mahidol University Bangkok, and at Yangtze University, Wuhan China (borehole geophysics and electrical methods for petroleum applications) (and other universities in China, Malaysia, Indonesia, Saudi and Germany).

Kurt received a Ph.D. from the University of Cologne and a M.Sc. from Colorado School of Mines. He also did graduate work at Macquarie University in Australia and MBA course in the USA. He worked over the past 25 years as consultant, university researcher, and R & D manager in the geothermal and oil industry.

His geophysical work started with internships in Astrophysics in the Middle East and nuclear properties of materials in Eastern Europe, followed by earthquake analysis and thermal conductivity methods development and geothermal exploration in the US. After that he focused on electromagnetic methods for oil & gas and geothermal in Germany. Subsequent he spent a decade developing new logging tools and methods in Logging industry. In the past 20 years he is building novel equipment for land and marine electromagnetics/seismic present being applied to CO<sub>2</sub> monitoring

Kurt has over 200 publications, 1 textbook & authors/co-authors more than 40 patents. He received two Fulbright scholarships and numerous international grants/awards. His interest is integrating geophysics with other disciplines, technology transfer and project development. He is a member of SPWLA, AAPG, ASEG, BDG, DGG, EAGE, EEGS, GRC, SPE, SEG and TSEG. He was Co-Chair of the Technical program for the IPTC in Bangkok 2012 and active in many committees. He was the industry representative on the IAGA EM division and still provides frequent workshops at their bi-annual meetings.

The SPWLA granted Kurt a Distinguished Technical Achievement Award in 2003 for new logging technologies. SEG granted him the Reginald Fessenden Award for the development of through casing resistivity and 3D induction logging. The Russian Academy of Science elected him a Foreign Member and gave him the Kapitsa Gold Medal of Honor for his innovations to borehole geophysics and pioneering work to surface geophysics (Lotem). Kurt was Distinguished Lecturer for the SPE (1998-1999) and SPWLA (2004-2005). In 2007-2008 he received the SEG's Presidents Special Services Award. 2012 Kurt is co-recipient for KMS Technologies' Cecil H. Green Enterprise Award from the SEG.

### **3. Presentation Title: *4D gravity and subsidence monitoring of offshore CO<sub>2</sub> storage***

**Abstract:** Gravimetry and subsidence surveys have monitored hydrocarbon-producing reservoirs and CO<sub>2</sub> storage in the Norwegian continental shelf for over two decades (Alnes et al., 2010). This technology provides insights into reservoir dynamics with a short turnaround time and cost-efficiency than 4D seismic technology. The surveys are based on using a vessel and a remotely operated vehicle and take, depending on field size, 1-5 weeks to complete.

4D gravity is sensitive to density changes alone. Therefore, its interpretation is not subject to ambiguities from competing signals like pressure-induced changes in the case of seismic measurements. The 4D gravity and subsidence technology can delineate the location of fluids injected in the subsurface and investigate their physical state and density, as well as the distribution of lateral pressure in the geological storage reservoir. The magnitude and the wavelength of the 4D gravity and seafloor deformation signals can easily be forward modeled to evaluate the feasibility of this monitoring option at a particular site.

**Biography:** John Even is responsible for business development at OCTIO Gravitude. Geophysics at heart, John loves to talk about the new technologies and their potential to change the status quo in the geo-

service industry. John has extensive experience in the oil and gas service industry and has led multiple management roles at OCTIO.

#### 4. Presentation Title: Can 4D CSEM be a monitoring solution for offshore CO2 storage sites?

**Abstract:** CSEM has historically been used to de-risk offshore oil and gas prospects prior to drilling activity. Allton is committed bringing CSEM to the next level developing 4D CSEM technology including new software and hardware. Gas saturation changes is challenging to monitor using seismic technology as the seismic signature changes little with varying saturation. Saturation changes will however result in changing resistivity values and as such detectable using advanced 4D CSEM technology. Same principles will be valid for CO2 monitoring as resistivity will increase with increased injection volumes. 4D CSEM can therefore be a cost-effective tool to monitor and verify injected CO2 storage sites.

**Biography:** Dr Svein Ellingsrud holds the position as CTO in Allton and responsible for all technical development in the company. Svein have extensive experience from the oil and gas industry after 10 years in Equinor and one of the founders of EMGS were he also held the position as CTO.

#### 5. Presentation Title: CCS monitoring: focused seismic detection to calibrate dynamic models

**Abstract:** “Do you really need a 4D seismic full field image?” Most if not all experienced 4D geophysicists must have heard this question already. From manager, decision maker, purchasing and Reservoir engineers. When it comes to CCS monitoring, where the economic model is harder than O&G, this question become inevitable.

In this talk, we will introduce a focused monitoring method that will capitalize on existing data to propose a light & agile monitoring solution. This solution is using existing CCS feature: long term monitoring, strong 4D seismic response and known or simple models to calibrate dynamic models.

The goal of the focused monitoring approach is to be able to know “when you do need a full field 4D” because you know your dynamic model is wrong and CCS monitoring is all about avoiding surprises.

**Biography:** Habib Al Khatib, CEO & co-founder of SpotLight, a startup offering frugal & agile active seismic focused monitoring solution to calibrate dynamic reservoir models.

With a master’s degree in Geology from Ecole Nationale Supérieur de Géologie of Nancy, Habib started his career in seismic reservoir characterization at CGG. After 3 years, he moved to S&M then business development for permanent reservoir monitoring and finally ended up as an innovation manager at the CTO office. Habib never had a “will” to become an entrepreneur, but his technical skills linked to the business exposure he had during his years within CGG, gave him enough background to become a startupper. He wasn’t alone in this journey as in 2017 he co-founded SpotLight with Elodie Morgan. Backed by a top-class experts and strategic committee, SpotLight grew from 2 founders to an 11 people startup, and the journey is far from been over: The will to contribute in the energy transition supported the development of SpotLight toward CCS monitoring where he believes economically, operationally and environmentally acceptable monitoring solution are in need.

On a personal side, Habib is almost 40 (still 39 at the time of the conference) and is married with 3 children (7-5-3 years old). He enjoys working at SpotLight (obviously), supporting the French national rugby and football team and was a platinum player at StarCarft 2.

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