

Session Guide

June 17 - 19, 2024

Calgary TELUS Convention Centre

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OUTLINE

GeoConvention 2024 is excited to host a wide variety of content from our non-profit Earth Science partner societies. The following outline will act as a reference to the sessions that will be hosted at GeoConvention 2024. Please refer to the Call for Abstracts Reference Page for the 2024 Abstract Template and submission instructions.

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Session Title Session Chairs

Active and Passive Seismic for Monitoring of CO2 injection: Best

Practices and Recent Advances Rob Kendall Ben Witten

Carbon capture and storage has dramatically increased over the past few years with exponential growth expected in the near future to meet climate goals. Ensuring long term containment of the plume is critical to the success of these projects. To these ends, various methods of monitoring have been utilized to monitor the injection reservoir and plume. These include, 3D and 4D seismic and induced seismicity monitoring, among others. Active 3D and 4D seismic will be required to understand the baseline reservoir conditions and monitor caprock integrity and CO2 plume migration. Passive seismic will be required to establish background seismicity and to monitor induced seismicity during CO2 injection. In this session we invite talks on best practices, case studies and recent advancements that innovate, optimize or otherwise improve the monitoring of CCS injection projections with local and international abstracts considered.

Authors interested in presenting in this session, please submit to the general "Carbon Capture" session within the Abstract Management System

Advances in AVO inversion and reservoir characterization

Raul Cova

Sean Contenti

Using seismic data to derive rock properties has become a common practice in reservoir characterization workflows. In this session, we aim to review the new advances and developments in the application of AVO techniques to address the current challenges in subsurface characterization. We also hope to illustrate applications of these workflows in new development areas including but not limited to geothermal reservoirs and CO2 sequestration.

Al for Geoscience Integration

David Gray

Jon Downton

Papers describing how geoscience has been integrated into the subsurface workflow to improve and / or speed up reservoir characterization and development.

Al workflow to be integrated and improve speed and accuracy in CCUS projects planning

Carmen

Bernard Laugier

Dumitrescu

Discussion how integration of AI engine will be critical in seismic interpretation toward CCUS project decision making. Develop efficient workflow to be used by industry. Understand positive aspect but also risks of such approach with a focus on solutions

Atlantic Canada - Exploration and Development

Jennifer Young

Bill Goodway

Despite recent downturn transitioning into an industry upswing, there have been encouraging exploration efforts (new, appraisal, and ILX) in offshore Atlantic Canada in recent times. Although with high risk, conventional offshore E&P with low carbon emissions and no pipeline requirement becomes more appealing to the energy industry.

This session is proposed to share perspectives and for further insights into the subsurface resources (proven & yet-to-find) in the offshore East Coast Canada basins - previous exploration discoveries recorded and recent activities in the Orphan, Carson, Flemish & offshore Nova Scotia basins, not ignoring the relatively better-known Jeanne D'Arc basin. A holistic evaluation of the petroleum systems (models) in these basins is anticipated. Discussions on stratigraphic plays and ILX (infrastructure-led-exploration) surrounding the existing producing fields are expected as well.

The (break-even) economics and sustainability of the hydrocarbon resources in these offshore basins have not had sufficient attention in geosciences fora. This session will also discuss and evaluate the commerciality of these offshore resources.

Atlas of the Western Canada Sedimentary Basin 2027; The Big

Picture on Integrated Geoscience in the Digital World

Gregory Lynch

Neil Watson

Atlas of the Western Canada Sedimentary Basin update and modernization into the digital world; with over 180 authors contributing new chapters spanning a broad range of current and traditional regional-scale geoscience themes.

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^{**}Authors interested in presenting in this session, please submit to the general "Carbon Capture" session within the Abstract Management System**

Back to basics Geophysics Kelsey Mah Mostafa Naghizadeh

We have learned many if not all of the basics of our discipline at one point in our career. Can you remember them?

The session intends to be both a refresher and an introduction to geophysical methods, including:

- survey design (reflection, VSP, Microseismic, etc.)
- foundational techniques and tools (well-ties, interpretation pitfalls, synthetic modelling, time/depth processing, non-seismic methods, etc.)
- advanced techniques (AVO principles, prestack inversion, Rock-Physics, geomechanics, machine learning etc.).

The talks will cover the nuts and bolts of various methodologies and the associated assumptions. We will discuss aspects of the assumptions, the implications, where can they go wrong, and how to mitigate the risk. We also aim to include subjects involving where we should be doing more to add value to the development of exploitation of resources.

Back to the Foundation of Alberta's In-Situ Oil Sand: Regional study of the McMurray Formation in the Athabasca Area Wen Lin

In-situ oil sand of Alberta has been boomingly produced using the steam-assisted gravity drainage (SAGD) technology for more than 20 years. However, the best of the resource has been discovered and produced for decades. Most Alberta oil sand producers are relying on squeezing the existing reserves without much replacement to the production gap for the future sustainability. In addition, insufficient understanding of the complicated fluvial to estuarine reservoirs hinders the production efficiency with utilization of steam injection.

Although regional studies of the oil sand reservoir strata (i.e., Cretaceous McMurray Formation) have been conducted in the past 20 years by the Alberta government, the details and depth of the work only allowed for the characterization of existing producing oil sand assets.

With data that lack regional detectability, such as outcrops, cores, well logs, and petrographic analysis, coupled with pervasive application of lithostratigraphy, the understanding of the sequence stratigraphic evolution, as well as the depositional environments of the McMurray Formation remains equivocal, resulting in the absence of an applicable universal geological model. It is the time to go back to the foundation to re-emphasize the regional understanding of the McMurray Formation and the underlying Devonian deposits in the Athabasca area. Utilizing immense data set added from the producing fields, including well log, 3D seismic surveys, and cores, more profound and in-depth regional correlation and mapping in the sequence stratigraphic sense are required to establish a sequence stratigraphic framework, incorporating current producing assets and areas in between, that can guide depositional facies and paleogeographic reconstruction of individual stratigraphic units of the entire interval of interest.

This session is proposed to encourage regional evaluation of the McMurray Formation in the Athabasca area that to shed light on in-situ oil sand resource exploration. More detailed and accurate reconstruction of paleo-depositional environments is critical for the prediction of reservoir distribution outside the current assets, as well as reservoir quality. Perspectives and further insights of the regional work will be shared in the session. Sequence stratigraphy and depositional environment reinterpretation are anticipated. This session will also discuss how regional work being used for oil sand exploration and development and resource assessment. The underlying Devonian study can be applied for water source and disposal."

Bridging the Gap - Geoscience & Engineering

Evan Mutual

Olivia Henderson

Emily Duncan

This session will feature a series of technical talks that covers aspects of integration between geoscientists and engineers and related Examples of collaborative work that was done between the disciplines in the petroleum and renewable energy sector will be discussed. The talks will entail work done from initial exploration through field appraisal, development, production & optimization. This session will provide well rounded multidisciplinary talks for a wide range of audiences with interest in subsurface energy resource industries.

CCS Workflows: What has been borrowed from subsurface energy methods, and what must change from recommended standards?

Ryan Lemiski

Taylor Berezowski

Over the past decade, CCS-focused conferences have featured repurposed book-report style presentations where well-known projects (i.e., Quest, Boundary Dam, Sleipner, etc.) are discussed using, primarily, their published information. Rarely have these presentations walked audiences through the process of adequate site screening, site selection and detailed characterization phases, which are outlined in workflows standards documentation prepared by groups such as the Canadian Standards Association (CSA) and the National Technology Energy Laboratory (NETL). These CCS standards are rather prescriptive in the methods and data acquisition that are recommended for the evaluation of subsurface storage potential, yet Canadian storage hub operators are not explicitly bound to these standards of practice. The intent of this GeoConvention 2024 session is to solicit talks that will present case studies from groups/individuals that have used the standards to explore and appraise storage potential, highlighting synergies and/or differences between standard workflows and borrowed methodologies from oil and natural gas exploration and resource development.

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CCUS - Shaping Tomorrow's Sustainability

Francis Morin

Greg Maidment

With multiple CCUS projects emerging across Canada, this will be a tremendous opportunity for attendees to hear from a series of proponents on their upcoming operations in Western Canada. The session will be a forward-looking half day to showcase some of the exciting recent announcements.

Authors interested in presenting in this session, please submit to the general "Carbon Capture" session within the Abstract Management System

Celebrating 50 Years of Geothermal Excellence by Canadians Catherine Hickson Emily Smejkal

Geothermal Canada, formally the Geothermal Association of Canada, was founded 1974 by a handful of Canada's pioneering geothermal professionals. Established during a time when the world anticipated running out of fossil fuels in a few short decades, Canadian's were at the forefront of the developing global industry. Early federal funding pushed several projects forward that are today finally seeing revitalization. Projects such as the City of Regina's direct use heat project and the high temperature volcanic hosted system at Mount Meager, are getting renewed interest and investment. In 2023, geothermal electrical power was produced in the Swan Hills after a hiatus of 40 years since the 1983 electrical production at Mt. Meager. This session seeks submissions that provide historical perspectives on projects as well as modern updates from projects both here in Canada and abroad where Canadian's are playing an essential roll in project development.

**Authors interested in presenting in this session, please submit to the general "Geothermal" session within the Abstract Management
System**

Core logging through the lens of Machine Learning and Deep Learning

Shervin Manzuri

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Shervin Azad Shalmani

In this session, we discuss the latest research and development to log the core using computer vision, Machine Learning and Deep learning. Also we will evaluate how much we can expedite and automate this step.

Critical Minerals: Exploration, Mineralogy and Environmental

Challenges Mashrur Zaman Yongyi Li

Critical minerals are essential components for the energy transition. Based on the latest lists, approximately 60 metals and non-metals have been identified as critical minerals that include base metals, rare earth elements (REEs), platinum group elements (PGEs), radioactive elements (U and Th), and non-metallic minerals. Critical mineral development and production produce significant economic gains and at the same time pose environmental risk.

Critical mineral deposits are geologically complex and associated with various igneous activities, metamorphic alternations, and sedimentary processes. The success of critical mineral exploration requires concerted efforts of geology, geophysics, mineralogy, geochemistry, and other disciplines.

This technical session intends to focus on the following topics:

- 1. Detection, determination, and characterization of critical mineral deposits
- 2. Geological, mineralogical, and geochemical investigations
- 3. Geophysical, petrophysical, and drilling studies
- 4. Mining, extraction, and development
- 5. Environmental consequences of critical minerals exploration, exploitation, and development

Duvernay Jerome Biollo Ian DeWolfe

With over 1,200 producing wells drilled in the last 11 years, the Duvernay Formation continues to be an active and attractive play. This session will showcase novel studies that improve our understanding of the exciting Duvernay source rock reservoir, with particular focus on how to deploy old and new techniques for optimization while mitigating risks from induced seismicity and parent-child well relationships? What are the most effective techniques for mapping and predicting reservoir properties? How does geology influence drilling, stimulation, and production strategies and effectiveness? How can geological, geophysical, and engineering data be correlated for multi-disciplinary characterization? This session aims to address these and other issues that are of interest to both industry and academic audiences.

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Geomodelling Jeffery Larsen Tim McCullagh

Join us for a focused session on geomodelling, where we will delve into the effective and precise practices that make geomodels invaluable tools. We are inviting contributions that not only highlight the key steps in creating a geomodel but also showcase the unique advantages these models offer. This session is perfect for professionals keen to demonstrate their expertise in the entire geomodelling process – from gathering accurate data and analyzing it, to building detailed models and ensuring they are reliable.

We welcome submissions that emphasize the importance of each stage in geomodelling. Your work should illustrate how careful data collection, innovative analysis, and sophisticated modeling techniques contribute to the development of robust and dependable models. These geomodels play a critical role in understanding geological formations, aiding in resource extraction, and guiding decisions in various environmental and engineering projects. By sharing your experiences and insights, you will help highlight the essential role of geomodelling in today's oil and gas industry.

Geothermal Energy - Harnessing the Heat Below our Feet! Robinson Olugbemiro Catherine Hickson

The prospect for geothermal energy as robust adequate replacement to other renewable energy alternatives is getting brighter and irresistible.

However, at global installed capacity of only 14,621 MW (IRENA, 2023), there is still work to be done. Especially, further validation of baseload capacity, lifecycle economic payback and net zero/negative CO2 emissions credentials of geothermal energy - as the most sustainable carbon-free heating and electrification pathway.

This session will attract/disseminate latest perspectives, prognosis and the global renewable status of geothermal energy from/to industry professionals, researchers, government & investors.

Contributions are anticipated to explore, discuss and brainstorm;

- Exploration and drilling
- Brine & waste management
- Reservoir characterization
- Project risks & mitigation strategies
- Synergy with CCUS & coproduced minerals
- Scalability
- Canadian and global untapped potentials
- Lookback & lessons learnt from geothermal projects worldwide

Geothermal research and projects in Alberta

Louis Chabot

Catherine Hickson

This session would showcase the various research and projects in geothermal, that were in progress and missed the 2023 Geoconvention. In particular, this session would showcase the various research work currently being conducted by the various Government Agencies (e.g. AER, AGS) and by the Universities (e.g. UofC, UofA) as well as providing updates on the projects being led by Companies (e.g. Novus Earth, AB No.1, EAVOR) in the field of geothermal with a particular focus on Alberta.

Helium Duncan Mackenzie Calin Dragoie

As a product of radioactive decay of the metamorphic basement, Helium is found at the base of sedimentary basins, always associated with other gases. A global shortage of helium spurred a new wave of exploration in the Western Canadian Sedimentary Basin.

GeoCor

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James Brydie and Barbara Sherwood Lollar

Hydrogen geological storage and natural resources, an old concept to meet a modern challenge, global decarbonization

Omid Haeri Ardakani L

Hydrogen and its derivatives are considered to be one of the major components of the transition to a Net Zero economy by 2050. International Energy Agency (IEA) forecasts suggest that hydrogen will be a key part of this energy mix for the decarbonization of a large part of heavy industry, transport systems, and agriculture. However, immense volumes of H2 will need to be stored and made available for use when needed. In addition, since 2022 the potential to explore and produce naturally occurring hydrogen resources has received significant attention. Therefore, global research on Underground Hydrogen Storage (UHS), and natural H2 resources, has accelerated in recent years. Naturally occurring hydrogen, naturally produced throughout geological time, has migrated, and accumulated in geological reservoirs. Canada is set to become a leader in the global hydrogen economy with its unique geology and abundant evaporite deposits and depleted oil and gas reservoirs. Furthermore, has a unique terrain that contains major natural hydrogen source rocks (i.e., exposed Canadian Shield). Extensive academic, government and industry expertise will play a leading role in developing both hydrogen storage and natural hydrogen scientific and economic fronts.

Numerous studies globally have already started natural hydrogen exploration, and are now investigating efficient, economic, and safe hydrogen storage in geological reservoirs. In this session the latest international advances in underground hydrogen storage as well as natural hydrogen exploration research will be presented in GeoConvention 2024. This is a major international energy industry venue in Canada, excited to share the current knowledge on these major topics for the transition towards a clean energy future.

Hydrogeology Deepreet Mand Sanaullah

Hydrogeologic characterization, aquifer testing, and geochemical systems focussing on the subsurface and groundwater-dependent environments are the primary themes for this session. Topics include: geology of aquifer systems, hydrostratigraphy, aquifer mapping, aquifer testing, isotopic analysis, age dating, modeling, naturally occurring contaminants, reactive contaminants, emerging contaminants, contaminant fate and transport, groundwater-surface water interaction, and wetlands. This session focuses on characterization of the subsurface and differs from the Groundwater Resource Management session which is focused on sustainable water management. Contributions from academia and industry are encouraged.

Induced Seismicity: Monitoring, Risk Management, and Mitigation Strategies

Sepi Karimi

Rick Nakamoto

Induced seismicity has gained increasing attention due to its potential risks to the environment and/or public safety. To address these challenges effectively, it is crucial to enhance our understanding of induced seismicity, develop robust monitoring systems, and establish risk management strategies. This session will bring together experts, researchers, and industry professionals to discuss the latest developments in monitoring, understanding, and mitigating induced seismicity. We invite presentations and discussions that shed light on the scientific, environmental, and policy-related aspects of this issue.

Measurement, Monitoring, and Verification (MMV) of Injected CO2 in WCSB CCS Projects: Technologies, Case Studies, Challenges, and Lookbacks

Alex Renaud

Marie Macquet

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A detailed Measurement, Monitoring, and Verification (MMV) plan plays an integral part in any commercial CCS project, yet it is often overlooked in the early planning stages of a project. The importance for a company to demonstrate and verify the containment and conformance of CO2 injected into the subsurface cannot be understated. Energy regulators across western Canada require that companies submit MMV and closure plans based on project-specific risk assessments, including the use of the best available technologies to monitor the atmosphere, surface, ground and surface water, and the subsurface. This session is open to the wide variety of technologies (geological, geophysical, geochemical, and engineering) used for MMV, case studies, and any related challenges and successes.

Authors interested in presenting in this session, please submit to the general "Carbon Capture" session within the Abstract Management System

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Montney Sochi Iwuoha Matthew White

The Montney Formation is one of the most prolific producers in Canada. Both conventional and unconventional development opportunities exist in the Montney, with a significant portion of the activities over the past decade focused in the unconventional portion of the play.

The unconventional activities are driven by horizontal drilling and multi-stage hydraulic fracturing. Large unconventional development projects are taking place in British Columbia and Alberta alike, with stacked wells targeting multiple stratigraphic horizons for gas and condensate.

In this session, we discuss the latest research and development to log the core using computer vision, Machine Learning and Deep learning. Also, we will evaluate how much we can expedite and automate this step.

Mountains to Margins - New Ideas in Global Exploration and Development

Kent Wilkinson

Catherine Huff

This session will be devoted to international exploration and development projects with the focus on new ideas, concepts, data and geoscience models within both global onshore and offshore basins.

Multi-Scale Reservoir Modeling: Bridging the Gaps Between Geology and Production Forecasting

Renjun Wen

TBD

This session seeks presentations related to methods and case studies of reservoir modelling by integrating data and models at multiple spatial scales to improve the practice of reservoir production forecasting based on 3-D reservoir modeling. We seek presentations from researchers and application specialists in multiple disciplines, sedimentologists, geomodelers, and production simulation engineers. Case studies that highlight both success and failure of integrating geological models and production forecasting are especially welcome.

Near-Surface Geophysical Methods

Svetlana Bidikhova

Dmitri Skorinski

Near-surface geophysical methods (Electrical, Magnetic, Electromagnetic, Seismic Refraction and Reflection

New advances in brine hosted mineral deposits

Brendan Bishop

Kirsten Pugh

Global demand for lithium is driving interest in new sources required for the energy transition, including brines from sedimentary basins. This session will highlight recent advances in this field which has implications for exploration, development, and extraction of lithium from sedimentary basins, with a focus on western Canada (Western Canadian Sedimentary Basin and the Williston Basin). Case study examples will include mapping, geochemical fingerprinting, lithium source, and emplacement theories.

Authors interested in presenting in this session, please submit to the general "Critical Minerals" session within the Abstract Management System

Open Hole Multi-Lateral Drilling

Cole Ross

TBD

Petrophysics

Nasir Rahim

Kelly Skuce

Petrophysics, Log Analysis. Data Science, Pitfalls in Reserve Evaluation

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Revival of the carbonates – some basics, advances and applications to

the Energy Industry David Hills Eva Drivet

Since the early 1900's, carbonate systems have played a significant role worldwide in hydrocarbon production, encompassing a substantial portion of both conventional and unconventional reserves. Fast forward to the 2020's, they have emerged as focal points for diverse applications, including lithium brine extraction, helium exploration, and geothermal potential assessment. Carbonates also serve a crucial role in the management of hydrocarbon resources, serving as repositories for water disposal and CO2 sequestration. As the industry's focus shifts back to carbonate reservoirs, it becomes imperative to remain abreast of the latest advancements in carbonate sedimentology, while also ensuring a thorough understanding of the depositional and diagenetic processes governing reservoir quality.

Our session aims to guide the audience from fundamental aspects of carbonate sedimentology to a nuanced understanding of the latest advancements in the field. We emphasize process-oriented approaches to unravel the complexities of carbonate rocks across geological epochs. Our particular focus will encompass developments in carbonate sedimentology, diagenesis, biogeochemistry, stratigraphy and how it all relates back to reservoir character and quality.

This session hosts leading experts in their field from both global and local spheres, along side promising up and coming carbonate sedimentologists. Topics addressed span a wide spectrum of methodologies, including fieldwork, subsurface core analysis, petrography, petrophysics, geochemical investigations, as well as detailed and large-scale facies mapping and modeling. These contributions will collectively enhance our comprehension of the intricate and heterogeneous nature of carbonate reservoirs.

Our session will foster vibrant discussions and facilitate the exchange of knowledge among participants. It is designed to be inclusive, catering to individuals of all experience levels, ensuring that everyone can derive value from the discourse.

Sedimentology, Stratigraphy and Paleontology

Sean Fletcher

Erin Pemberton

Seismic Acquisition

Michael Hons

TBD

Seismic Processing, Imaging and Inversion

Svetlana Bidikhova

Faranak Mahmoudian

Seismic data processing, depth migration, anisotropic depth migration, velocity model building, FWI, seismic inversion. This session aims to provide attendees with valuable insights into seismic data processing and inversion techniques, and their practical applications. Key highlights of the session would include:

Cutting-Edge Techniques: Presentations and discussions will showcase the most up-to-date seismic processing methods and inversion algorithms, ensuring that participants are exposed to the latest industry trends.

CO2 Capture and Storage: Special emphasis will be placed on the role of seismic processing and inversion technology in CO2 capture and storage, addressing its significance in the context of environmental sustainability and the energy transition.

Monitoring and Spotting: The session will elucidate how seismic data and it's derivatives can be effectively employed for accurate monitoring and pinpointing, offering valuable guidance for geoscientists and professionals in the field.

Overall, this session aspires to be an invaluable resource for those seeking to stay at the forefront of seismic processing and inversion, making it an essential component of the CSEG conference agenda.

Speaker Series: Technical Talks by CEGA 2023 Award Recipients Alison Essery Kennedy Nwafor

Invitation Only Following up on the success of the session at 2023 Geoconvention, 6 winners of the major annual CEGA Awards from this year will be invited to speak on current topics over a wide range of leading-edge technical studies. All speakers must speak to current topics of interest to the delegates. Talks will range widely across exploration plays, development technology, to new interpretations, new techniques or technologies, as well as operations.

Subsurface Data Science: A Modern Frontier of Exploration

Bobby Gunning

James Johnson

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Join us in this technical session to uncover how data-driven methodologies are reshaping the subsurface domain. Explore the transformative power of modern technology stacks, enabling process automation, enhanced decision-making, and the equitable access to multidisciplinary insights. Witness how data science serves as a tool to scrutinize and refine existing technical assumptions.

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The Critical Role of Geomechanics in Storage and Geothermal

Projects Amy Fox Anna Rogers

Hastened by government initiatives and incentives, storage (e.g., carbon capture) and geothermal projects are ramping up all over the world, including in Canada. Early in these projects there is a strong focus on geological characterization of the subsurface. In far too many cases, however, geomechanics, which will be absolutely critical to the long-term success of many of these projects, is not addressed early or even not addressed at all. In cases where geomechanics is addressed, it is often only to the extent that it is mandated to be by regulations or application requirements rather than self-imposed technical due diligence and planning. This session is intended to focus on the reasons geomechanics is so important in these projects and highlight case studies where it is being given the attention it deserves.

Authors interested in presenting in this session, please submit to the general "Carbon Capture" or "Geothermal" session, as appropriate within the Abstract Management System

The Role of AI in the Energy Sector – Panel Discussion

Marissa Reckmann

Doug Schmaltz

This session will look at the pragmatic application of artificial intelligence, emphasizing its pivotal role in augmenting efficiency and performance across existing and emerging energy projects. Our panel will feature seasoned professionals from the oil and gas and renewables sector and the AI domain. The panel is intended to provide a nuanced perspective on the integration of AI-driven data analytics and will focus on practical use cases and tangible outcomes. We aim to demonstrate how AI technologies can be harnessed to optimize operations, enhance predictive maintenance strategies, and streamline decision-making processes. This session serves as a bridge between traditional energy practices and cutting-edge AI advancements, offering a realistic and impactful exploration of the transformative potential within the oil and gas and renewables segments of the energy sector.

If interested in presenting as part of this panel, please email info@geoconvention.com with your area(s) of expertise and your bio and the chairs will follow up with next steps.

Workplace Culture, Diversity, Inclusion

Alicia Bjarnason

Jessica Dongas

This session seeks contributions focused on equity, diversity and inclusion in the geoscience educational/working spaces. Topic suggestions could include: ESG (environmental, social and governance) in mining, Decolonization of the resource sector, EDI and innovative potential, GeoEthics, EDI and its connections to both mental and physical safety at work, conflict-resolution, HR and OHS best practice design for sexual harassment policies, the use of social innovation in cultural systems change.

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