



AGAT Laboratories

Science & Technology Seminars 2024.

April 11th | Calgary Petroleum Club

Welcome to the 2024 Science & Technology Seminars!

As Chief Executive Officer of AGAT Laboratories, it is once again my distinct pleasure to welcome you all to the 2024 edition of our Science and Technology Seminars. This year we are focused on celebrating innovation, advancements in science and environmental successes coast to coast to coast.

These sessions are hosted each year as they align with our company purpose “Service Beyond Analysis”. For us our purpose means that we are more than just analytical data, beyond the analysis we provide our ultimate goal is to serve. In that respect, our purpose is upheld by the three pillars critical to our business: Our People, Our Clients and the communities that surround us. Being able to host these technical sessions for you all allows us to showcase our commitment to serving you, our valued clients, while also providing us a chance to highlight the incredible work going on in our communities.

Throughout the year we will continue to stand behind our purpose and prove to you all what an important part of our company you play within our structure. The support that you continue to provide us gives us the stability to remain strengthened and resilient across all operations.

We look forward to this year’s sessions as they are filled with insight from industry leaders looking to share their knowledge and passion. I am delighted that you have chosen to partake in these sessions and to support one another in furthering our professional development.

To our distinguished speakers, please accept a very sincere thank you on behalf of all of us at AGAT as well as our attendees. Without your involvement and support these events would not be possible, and for that we are truly appreciative.

Sincerely,



Marissa Reckmann
Chief Executive Officer

Program

April 11

7:30 AM Registration and Breakfast

8:30 AM Opening Remarks

8:35 AM The Evolution of Emission Management
Lindsay Campbell, Senior Advisor, Carbon Strategies
Validere

9:05 AM Taking Continuous Emission Monitoring Mobile, and Making it Matter!
Cam Rollins, Team Lead - Emissions Assurance, Darryl Bouvier, Team Lead - Emissions Assurance
Vertex Resource Group

9:35 AM ESG: Environmental Risks and Opportunities
Anand Srivastava, Partner
Willms & Shier Environmental Lawyers LLP

10:05 AM Coffee Break

10:30 AM Understanding Project Effects on Community Wellbeing Using a Systems Thinking Approach
Ken Froese, CEO
Gatepost Risk Analysis

11:00 AM Oil Sand 2.0 - The Future of Environmental Stewardship and Economic Growth
Scott Morton, P.Geol, MBA, CEO and Founder
Drift

11:30 AM Lunch and Networking

12:30 PM The Hurdles of Having New Technology Adopted by Clients in the Environmental Industry
Liz Murray, Senior Scientist - QA/QC Manager and Safety Coordinator
Earthmaster

1:00 PM Exploring Microplastics in Drinking Water and Wastewater Systems: Quantification, Adsorption, and Treatment
Kalli Hood, PhD Candidate - Civil Engineering
Dalhousie University

1:30 PM Coffee Break

1:55 PM Renewable Natural Gas or RNG from Landfills and Other Biomass Sources
Tom Jacklin, M.Eng., P.Eng. Principal Environmental Consultant
Advisian

2:25 PM Carbon Capture and Storage – A discussion of Current Regulatory Framework
Kimberly Howard, Partner, Ashley Wilson, Associate
McCarthy Tetrault

2:55 PM The Geothermal Spectrum: From GeoExchange to Geothermal
Emily Smejkal, P. Geo., Geologist
Terrapin Geothermics

3:25 PM Conventional Geothermal Energy – One Path Forward in the Energy Transition Matrix
Dr. Catherine Hickson, P.Geo, CEO
Alberta No. 1

*All presented times are on Mountain Standard Time (MST). Presentations schedule/timing listed is currently tentative and will be updated following registration. Registrants may be eligible for Professional Development Credits with **AIA, APEGA, ACPA, ASPB, Eco Canada, PGO** and **PEO**.

Your Science & Technology Seminars Host



Kelly Howard, Director Business Development
AGAT Laboratories

Bio

Through her nearly 20 years at AGAT Laboratories and over 30 years in the client services field, Kelly has utilized both her degree in biological sciences and extensive service experience to acquire and grow some of AGAT's largest and most significant analytical contracts through her marketing and business development career. She continues to work alongside all of AGAT's production, reservoir characterization, core, oilsands, mining, food, and air monitoring divisions. She also works with our senior management team, creating long term sales initiatives, tools and growth for all laboratory divisions.

Her client focused experience along with a background in the science field has helped facilitate the production, hosting and ongoing development of AGAT's hugely successful National Technical Seminars, educating clients on new technologies and interesting advancements and other important topics in the energy, environmental science and professional development fields.

Kelly continues to work with the AGAT Laboratories executive team to facilitate constructive and unique marketing opportunities; facilitating brand development, seminar expansion and key company initiatives for growth in these areas.

Your Science & Technology Moderators



**Brent Nassichuk,
Chief Science Officer**

AGAT Laboratories



**Laura Rathgeber,
Vice President**

AGAT Laboratories

Bio

Brent's over 20 years of geological experience in core analysis and reservoir evaluations began with CBM Solutions in 2000, a company which was then acquired in 2007 by Trican Well Service. Brent held the positions of Technical Manager and Director of Geological Services with CBM Solutions and Trican Well Service. In February 2018, Trican's geological division was acquired by AGAT Laboratories where Brent now oversees all geological operations as Managing Director. Prior to working with Trican and AGAT,

Brent completed Bachelors and Masters Degrees at the University of British Columbia. During his graduate studies, Brent focused his research on rock properties and reservoir characterization of the Montney Formation in Northeast British Columbia. While at UBC, Brent was employed as a research and laboratory assistant. Brent is currently responsible for all oversight of geological operations within AGAT Laboratories including analytical, technical, quality and safety programs. Between his Bachelors and Masters studies, Brent also spent a year working in the hardrock mining industry focused on Pb, Zn and Ag exploration. Currently, Brent is a member of the Association of Professional Engineers and Geoscientists of Alberta.

Bio

Upon graduation, Laura gained experience working in an environmental laboratory assisting with the preparation of both organic and inorganic parameters. Following this, she moved into a project management role with an environmental consulting company located in Calgary that serviced a multitude of oil and gas clients in the Alberta area. In this position she was facilitating Phase I, Phase II and large-scale remediation projects. After gaining two years of experience in this position, she joined AGAT Laboratories in 2008 as a Business Development Representative concentrating on the environmental sector.

In 2010, she moved into a national account executive role with AGAT Laboratories. In her role as a national corporate executive, she worked directly with AGAT's national client base with a focus on providing consistent service offerings across AGAT's geographic footprint. In 2015 Laura took on a role with Stantec Consulting as Senior Consultant for Strategic Development and furthered her understanding on the consulting industry while growing Stantec's presence in Alberta and Western Canada. In 2017 she moved into a role as a sales manager for Newalta focused on the waste management division in northern Alberta and BC. Returning to AGAT in the fall of 2018 Laura continues her efforts on a national level while working with the local management team in each area to provide priority customer service and research new areas for growth in the lab industry.

Your Science & Technology Moderators



**Colin Thiessen,
Director Business
Development**

AGAT Laboratories



**Doug Schmaltz,
Technical Services
Manager**

AGAT Laboratories

Bio

Colin Thiessen has over 35 years' experience in core analysis and fluid phase behaviour. Colin has been involved in all aspects of routine core analysis, special core, fluids analysis and enhanced oil recovery, from the laboratory testing to business development, domestic and internationally.

During his time at Core Laboratories and Hycal Energy Research Laboratories, bought by Weatherford) he gained expertise in fluid phase behavior and enhanced oil recovery (EOR), formation damage and flow through porous media as well as other specialized testing for all field types. Colin has presented on various topics to clients and industry societies including: SPE, CSUR, CAPL, CSHm, and CSPG.

Bio

Doug Schmaltz has been in the oil & gas industry for over 22 years and joined the AGAT team after a successful career in laboratory analysis including Rock Properties / Petroleum Services Testing and Advanced Coring Services. Doug joined Core Laboratories in July 2000 as a core technician and quickly moved up the ranks taking on various administrative, operations, and managerial roles before moving in to Business Development in 2008 where he continued on until 2012. Doug then took an opportunity to expand his current knowledge base and experience by joining the business development team at ALS Corpro (Quest Coring / Reservoir Group) in June of 2012 where he promoted both conventional and wireline coring services along with the industry leading pressure coring technology called "QuickCapture™".

During his tenure here he was tasked educating the geosciences community on the various technologies that were available to them in terms of coring tools and their various applications. Doug has also held the position of Director of Client Relations with Loring Tarcore Labs where he managed the business development efforts for the oil sands laboratory and core logging software services. In February of 2017, Doug joined the business development team at AGAT Laboratories and has held several positions to date in both Business Development and Marketing.

Your Science & Technology Moderators



**Duncan Unrau,
Director Petroleum
Testing and Field
Services**

AGAT Laboratories



**Peter Bradshaw,
Senior Account
Executive**

AGAT Laboratories

Bio

Duncan began working with AGAT Laboratories in 2007 as a Field Service Technician taking oil and gas samples, and calibrating AQM stations in the Fort St. John area. During his time in Fort St. John he also helped set up both the Fort Nelson Branch and AGAT Laboratories first mobile gas laboratory. In 2010 – as a result of his continued effort to improve operations in the Fort St John branch – he was promoted to manage the Edmonton field services operations, and again in 2016 to Manager of Petroleum Testing overseeing all operations for all petroleum testing division. Duncan has several years of experience managing operations in in the Western Canadian sedimentary basin in the oil and gas service and air quality testing division.

Duncan assisted in setting up and operating AGAT Laboratories' first mobile gas laboratory and the Fort. St. John gas laboratory. In addition, Duncan helped set up the Fort Nelson field services branch and participated in the scientific research and development project on oxygen analysis in underbalance drilling operations. Duncan also set up the new oil and gas laboratory in Edmonton currently oversees the Lubricant Testing, Petroleum Testing Services, Source Testing and Air Quality divisions. Duncan is also currently an executive member of the Industry Measurement Group.

Bio

Peter is a Sales and Account Management professional with 20 years of repeated success and sales growth. He is exceptional at building and maintaining open relationships with people from all levels of an organization. Peter started his time at AGAT Laboratories in 2007 as a Business Development Supervisor where he helped launch the Environmental Services Division in Edmonton, growing off the success AGAT had in Calgary and Grande Prairie.

After gaining valuable experience outside of AGAT Laboratories, Peter returned to the company in 2023 as a Senior Account Executive. In his current position he plays a vital role in supporting current operations by providing new opportunities and strategies to attract customers.

The Evolution of Emission Management



Lindsay Campbell, Senior Advisor, Carbon Strategies
Validere

Abstract

Validere will provide the audience with an overview of the emissions landscape including a summary of 'what's out there'. We will present a current understanding of oil and gas methane emission profiles, how operators can improve their understanding of emissions through measurement, and then look at current and future regulatory and voluntary landscapes.

After setting the stage, Validere will focus on how producers can leverage robust and measurement-informed emission baselines to make strategic decisions and work towards real-time emissions assessment, response, and prediction.

Bio

Lindsay Campbell is the Senior Advisor, Carbon Strategies at Validere and brings almost 15 years of experience in the Alberta oil and gas sector. Prior to joining Validere, she worked with the Alberta Energy Regulator (AER) as a Senior Emissions Specialist. In this role, she was a lead contributor in the development and implementation of methane emission reduction requirements in Directive 060. Lindsay also created a new regulatory process that enabled the deployment of innovative methane detection technologies at a scale not realized before in Alberta.

Prior to joining the AER, Lindsay worked in Government Relations for Encana (now Onvintiv), a major gas producer in Canada and the U.S., where she evaluated the environmental and operational implications of emerging provincial and federal climate and air policies, as well as water and wetland policies. Lindsay started her career in oil and gas working as an environmental engineer for Ecoventure, a consulting firm focused on reclamation and remediation for the oil and gas industry. This work gave her the opportunity to evaluate oil and gas sites across the Duvernay and Montney formations and the Horn River Basin.

A licensed Professional Engineer, Lindsay holds a B.Sc. in Civil-Environmental Engineering from the University of Alberta.

Taking Continuous Emission Monitoring Mobile, and Making it Matter!



Cam Rollins,
Team Lead -
Emissions Assurance
Vertex Resource Group



Darryl Bouvier,
Team Lead -
Emissions Assurance
Vertex Resource Group

Abstract

The project review addresses a critical environmental issue in Canada - the accurate inventory of methane emissions from tanks and compressors at oil production and processing facilities. Previous studies have indicated that large, abnormal, episodic events can significantly contribute to a facility's emissions. However, these events are challenging to detect and quantify due to their sporadic nature.

Our first use case will be with the Aamjiwnaang First Nation, a community that has been grappling with extremely poor air quality. This initiative aligns with Vertex's commitment to providing positive social benefits and creating meaningful impacts in local communities. If proven effective, this method will offer an efficient and cost-effective solution for industry to monitor tanks and determine the sources of currently unknown releases.

Bios

Cam Rollins, is a Team Lead - Emissions Assurance at Vertex, and is a trailblazer in environmental services. His journey began with modeling carbon storage in forestry, sparking a lifelong passion for nature-based climate solutions. Today, Cam leverages cutting-edge tools to drive innovative, data-driven solutions for emissions management. A proud alumnus of the University of Alberta and former Councilor for the College of Alberta Professional Foresters, Cam's work is fueled by a deep commitment to environmental stewardship and community engagement. He believes in the power of collaboration and actively seeks opportunities to engage with communities, fostering partnerships that drive positive change. His mission? To ensure future generations enjoy nature as he did, while revolutionizing emission monitoring techniques for a more sustainable and inclusive world.

Darryl Bouvier, is a Team Lead - Emissions Assurance at Vertex, and a proud member of the Cote First Nation. He is a key member of the leadership group at Vertex, leading Indigenous Partnerships and Relationships. With a background in banking and over 30 years of experience in Indigenous inclusion, Darryl excels in fostering partnerships that benefit Vertex, industry, and most importantly, create employment opportunities for Indigenous communities.

ESG: Environmental Risks and Opportunities



Anand Srivastava, Partner

Willms & Shier Environmental Lawyers LLP

Abstract

Environment, Social and Governance (ESG) factors have become key considerations for investors locally and globally. ESG signals a move by lenders and investors towards companies and projects that promote positive environmental, social, and corporate governance initiatives.

This presentation will provide an overview of ESG, explain some of the benefits arising from ESG, and set out some of the associated risks and liabilities.

Bio

Anand Srivastava (he/him), B.Sc. (Hons.), J.D., is a Partner at Willms & Shier Environmental Lawyers LLP. Anand's practice focuses on environmental legal advice and environmental litigation. With prior education and experience in environmental toxicology, he assists clients to facilitate practical solutions to complex environmental legal issues. He works with a wide variety of clients on issues relating to environmental regulatory compliance with federal, provincial and municipal laws, contaminated sites, environmental due diligence, and exposure to environmental risks and liabilities. Anand is called to the Bar in Alberta and Ontario.

Understanding Project Effects on Community Wellbeing Using a Systems Thinking Approach



Ken Froese, CEO
Gatepost Risk Analysis

Abstract

Technical human health risk assessment (HHRA) using measured and modeled chemical and toxicological data has been the primary approach for evaluating whether a major industrial project will pose a risk to human health. HHRA is often used to address a community's concerns over past, present, or future chemical exposures and health outcomes like cancer, and it is a requirement in most environmental impact assessments. However, HHRA has significant limitations in addressing these concerns. Also, individual and community wellbeing is more complex than risks from exposure to chemicals emitted- or remaining from industrial projects. So, while the HHRA may show very low risks of health effects, communities or individuals remain concerned about health effects from the project.

Systems thinking is a process mapping technique that can help us understand complexity and uncertainty in new projects or remediation projects, including energy transition projects and policies. For example, the 'system' may involve a new or expanded copper mine, a rare earth mine, or the closure and remediation of a coal mine as part of the energy transition.

Systems thinking can provide a visual mechanism to understand vastly different perspectives of project effects between community members, project proponents, and regulators, or between a holistic, values-based assessment (e.g., community wellbeing) and a western science/Newtonian-based assessment

(e.g., technical process-centred). It offers a non-linear approach to identifying and understanding components of a system and their interrelationships.

I will use systems thinking methods to describe a holistic approach for assessing community wellbeing in major projects. Examples from the Giant Mine in NWT, Faro Mine in Yukon, and Oil Sands in Alberta will help demonstrate various benefits of using the approach.

Bio

Dr. Froese is the owner and CEO of GatePost Risk Analysis and has 30 years of professional environmental experience in chemistry, exposure assessment, ecotoxicology, and all aspects of human health risk assessment, from designing sampling programs through reporting and expert testimony in public hearings. He is designated as a Professional Chemist in Alberta and British Columbia. Dr. Froese is an Adjunct professor in the School of Public Health Sciences at the University of Waterloo, Ontario. He is also a Director on the Giant Mine Oversight Board (2016 - current), a watch-dog agency overseeing the remediation of the abandoned Giant Mine in Yellowknife, NWT. Dr. Froese's current work includes community technical support for various major mining and mine remediation projects in BC, NWT, and Yukon, risk-based and systems- thinking approaches to environmental management and related stakeholder- and rights-holder engagement.

Oil Sand 2.0 - The Future of Environmental Stewardship and Economic Growth



Scott Morton, P.Geol, MBA, CEO and Founder
Drift Source Technologies

| Abstract

Drift is working on a technological disruption for oil sands – something that will change the way the world discusses our greatest natural resource. We know the issues, oil sands are expensive; financially, environmentally, and socially. What if there was a different way to produce the oil sands, that does not include making a huge hole or pumping massive amounts of steam into the ground? These are the types of questions we asked!

At Drift we're innovators solving complex problems with practical solutions, and we did have guiding principals during our discussions: We couldn't invent anything, to risky, but the solution had to be better for the environment and cost less than our current thermal and mining solutions. So, we pulled technology from ancient times, the 70s, 90s and 00s to come up with our novel Gravity Assisted Bitumen Extraction™ (GABE™) process.

Join us for Oil Sands 2.0 where we blend environmental stewardship with economic growth.

| Bio

Scott Morton is the CEO and Founder of Drift Source Technologies. Prior to founding Drift, Scott worked in all three areas of oil and gas; as a consultant, in government and most recently for a major oil and gas producer at an oil sands mine. Scott took on progressively senior roles at the production company and left as the mine hydrogeologist in charge of Mine Subsurface Water Management. With over two decades of experience, Scott focused on managing multi-stakeholder projects and leadership.

At Drift Scott is responsible for delivering on the pilot program, and funding opportunities. At home he is just trying to survive two teenagers!

The Hurdles of Having New Technology Adopted by Clients in the Environmental Industry



Liz Murray, Senior Scientist - QA/QC Manager and Safety Coordinator

Earthmaster

Abstract

Nature-based technologies for treating and conserving contaminated soil are gaining popularity as companies look for ways to reduce remediation costs and their carbon footprints to address ESG expectations from shareholders and the public. Treating soil onsite, especially using nature-based methods, is a sustainable way of remediating and conserving soil, reducing carbon emissions associated with soil hauling and landfilling, and reducing industry dependence on landfills.

This talk will provide an overview of the logistics and hurdles of getting new technologies, specifically biological ones, accepted as remediation options in the Canadian oil & gas industry.

Bio

Elizabeth Murray is a Senior Scientist - QA/QC Manager and Safety Coordinator with Earthmaster Environmental Strategies in Calgary, Alberta. She is a graduate of Lakehead University in Thunder Bay, Ontario and Queen's University in Kingston, Ontario.

She has a Ph.D. in human genetics and she has worked for more than 20 years in medical related research and in plant based biotechnology, developing biologics as treatments for human diseases. Elizabeth has worked in environmental sciences for over 12 years and plays a lead role in the analysis and reporting of phytoremediation research and results. She also manages the research and development of Earthmaster's PEPSystems® technologies.

Exploring Microplastics in Drinking Water and Wastewater Systems: Quantification, Adsorption, and Treatment



Kalli Hood, PhD Candidate - Civil Engineering
Dalhousie University

Abstract

Microplastics are an emerging contaminant of concern. In water systems, they may act as a sink for other contaminants and facilitate contaminant transport. The removal efficiencies of microplastics using different treatment technologies have not been thoroughly investigated. Furthermore, quantifying microplastics in water matrices is challenging due to a lack of standardized sampling and analytical approaches.

Here we describe progress towards 1) a rapid aging method for polystyrene beads using UV-LED light, 2) investigating removal efficiency of aged and unaged polystyrene under conventional treatment in water and wastewater, 3) a method to quantify the size, absorbance, and metals content of tagged polystyrene (PSS) polymers using asymmetric flow field-flow fractionation with UV-visible light absorbance, mutiement, and multiangle light scattering detection (FFF-UV-MALS-ICP-MS), and 4) comparing heavy metal partitioning to microplastics, natural organic matter, and transition metal oxide colloids using FFF.

Signs of degradation in SEM images were observed after UV exposure and FTIR spectra matching spectra of environmental samples indicated successful aging. Jar tests indicated pristine microplastics were removed least effectively while those irradiated with 3060 mJ/cm² were removed most effectively.

Early FFF-UV-MALS-ICP-MS data suggest that lead preferentially partitions to humic isolates over larger PSS polymers (150,000 kDa), whereas smaller PSS polymers (10,000 kDa) may more readily adsorb lead.

Bio

Kalli Hood is a PhD candidate in Civil Engineering at Dalhousie University's Centre for Water Resource Studies. She also holds a MSc in Community Health and Epidemiology. Kalli's dissertation is focused on understanding lead and corrosion control strategies in light of climate change adaptations. Her research interests lie at the intersection of water engineering solutions and public health.

Renewable Natural Gas or RNG from Landfills and Other Biomass Sources



**Tom Jacklin, M.Eng., P.Eng. Principal
Environmental Consultant
Advisian**

Abstract

Landfill gas containing methane adds significantly to global warming if released to the atmosphere. Many landfill sites are capturing landfill gas for flaring, to generate power or to further process it into RNG.

This paper will look at the potential supply of LFG from landfills for a project in South America for potential upgrading into RNG. RNG also known as biomethane or upgraded biogas is a rapidly growing market in that can help decarbonize the gas system and deliver sustainable change. Biomethane or RNG can replace fossil fuels including natural gas which has similar physical and chemical properties. Collection and processing of landfill gas was examined and its pathways to convert these sources into RNG at ten landfill sites. Challenges with collection and processing biogas to upgrade it to RNG will be explored and presented.

This paper will analyze the landfill biogas system and provide commentary on what potential role RNG / biomethane can play in decarbonizing it.

Bio

Tom is a Professional Engineer with Advisian, he has over 30 years of experience in energy projects focused on project management, project development, and business development. Tom has extensive experience providing technical, commercial, and business strategy guidance within the waste management and renewable energy sectors. His experience includes development of Renewable Natural Gas (RNG) projects in Canada and internationally.

Carbon Capture and Storage

A discussion of Current Regulatory Framework



Kimberly Howard
Partner
McCarthy Tétrault



Ashley Wilson
Associate
McCarthy Tétrault

Abstract

Carbon Capture and Storage – A discussion of the current regulatory framework governing CCS in Alberta, including a discussion of certain regulatory challenges and proposed solutions to filling the legislative and policy gaps and a discussion of the stacking of various credits and offsets.

Bios

Kimberly is a partner in McCarthy Tétrault's Energy & Infrastructure Groups and the Co-Lead our the National Environmental Group. Her practice focuses on energy (including electricity and oil and gas), regulatory, and environmental law. Kimberly's practice involves a broad range of regulatory and commercial work involving pipelines, natural gas and electric utilities and energy projects, including renewables, energy storage and carbon capture, utilization and storage. She has experience in all aspects of energy project development and has appeared before several regulatory tribunals, including the Canada Energy Regulator, the Alberta Energy Regulator, the Alberta Utilities Commission, the Alberta Environmental Appeals Board and the British Columbia Energy Regulator.

Kimberly is an active volunteer in the Calgary and surrounding community. She is a Director of the ALS Society of Alberta, the Canadian Energy Law Foundation, and Survive and Thrive Cancer Programs.

Ashley is an associate of the Business Law Group at McCarthy Tétrault in Calgary. She maintains a general corporate practice which includes corporate finance and securities, corporate governance and mergers and acquisitions. Her practice also includes energy (including electricity and oil and gas), regulatory and environmental law. Ashley has experience advising clients on a variety of corporate transactions, including private placements, asset and share transactions, corporate reorganizations and securities transactions. She also has experience advising on regulatory compliance as well as assisting with appearances in front of the Alberta Environmental Appeals Board.

Ashley continues to volunteer with the firm's Pro Bono projects and initiatives and is involved with the firm's fundraising efforts for the United Way.

The Geothermal Spectrum: From GeoExchange to Geothermal



Emily Smejkal, P. Geo., Geologist

Terrapin Geothermics

Abstract

For the general public there has long been confusion between shallow “earth battery” geothermal systems and deep “naturally occurring heat” extraction geothermal systems, as both are referred to as “geothermal” systems, despite having very different characteristics. This confusion has implications for regulators, consumers, investors and granting agencies. In reality, the “geoenergy” spectrum is exactly that – a spectrum of technologies that extends from low CAPEX heat pumps and heat exchangers using the shallow subsurface (<300m) as a battery to store ‘excess’ heat (GeoExchange®), to high CAPEX projects tapping the deeper natural occurring earth heat (geothermal). An additional complexity is heat storage technologies using industrial waste heat looking to store that heat in the shallow subsurface. Continuing to aggregate low temperature, GeoExchange® and heat storage developments into the larger “geothermal” basket is leading to negative consequences for both geothermal and GeoExchange® investors, regulators, and the public.

This presentation will discuss the full spectrum of geothermal technologies, where they can be dispatched and the best application for each. The regulatory requirements for each technology will also be discussed.

Bio

Emily is a professional geologist at Terrapin Geothermics with over 10 years of experience in the Oil and Gas sector. Her work has been primarily with the Western Canadian Sedimentary Basin, where she spent the first portion of her career working on heavy oil deposits. There, she planned and executed drilling programs for both new and existing oil fields. While working on SAGD (steam assisted gravity drainage) heavy oil projects, Emily was a geologic specialist for both wellbore integrity and surface facility geochemistry projects. Since 2021, she has transitioned her subsurface expertise to geothermal energy development and is currently working for Alberta No.1 and Terrapin Geothermics. Her work remains primarily in the Western Canada Sedimentary Basin through Alberta, Saskatchewan and the Northwest Territories. She is also currently serving as secretary of Geothermal Canada.

Conventional Geothermal Energy – One Path Forward in the Energy Transition Matrix



Dr. Catherine Hickson, P.Geo, CEO

Alberta No. 1

| Abstract

Geothermal energy continues to fail to get traction in Canada; despite several provincial and territorial governments supporting its merits. Maybe it is the continuing repetition of the rhetoric regarding the high capital costs, or just that Natural Gas, despite its carbon footprint, is so much cheaper. However, with a more in-depth analysis of the costs of variable renewable energy (wind and solar) it can be shown that geothermal power generation is cheaper than solar and wind, when peaker NG or battery storage are taken into consideration. In fact, the capital costs of a 10MWe (producing more than 80,000 MWe per year) geothermal plant are similar to the 70 MWe solar that would be required to produce the same amount of MWe hours; and this does not include the peaker NG or battery storage backup required for grid stability. Establishing and maintaining grid stability with non-baseload renewable energy, is extremely costly as several jurisdictions have discovered. In addition to higher costs grids with significant variable renewal energy are unstable. This instability was well demonstrated in January 2024 during the extreme cold snap.

In Canada, especially in the prairie provinces where there are thick sequences of sedimentary rocks with naturally occurring brines, conventional geothermal energy is a very good option for electrical and thermal energy. In addition to being base-load with a capacity factor of great than 95%, the injection wells can be used for carbon sequestration or water disposal. Conventional geothermal energy projects are not just carbon neutral, but with sequestration become carbon negative.

Recently there has been emphasis of Engineered and Advanced Geothermal Systems (EGS and AGS). While these new technologies seem to have a promising future, there are still no projects internationally that have shown commercial reliability and cost effectiveness, especially for AGS, the latest kid on the block. In addition to EGS and AGS still being in pilot stages, carbon sequestration is not an option for these projects.

| Bio

Dr. Hickson is the CEO at Alberta No.1 and is a globally respected geothermal resource development expert. She was born and raised in Alberta. She received her PhD from the University of British Columbia in 1987 and now makes Burnaby her home. She was a research scientist with the Geological Survey of Canada for 25 years. After her retirement she joined Magma Energy Corp. (later to become Alterra Power Corp., now Innergex) in 2008 as VP Exploration and Chief Geoscientist. She led Magma's exploration and advanced resource assessments globally, spending significant time on projects in Chile, Iceland, Italy, Peru and the U.S.

Project highlights include greenfield exploration in eight countries, discovery of resources ~320 MW (inferred) and resource management of operating plants: Soda Lake (15 MWe), Svartsengi (75 MWe) and Reykjanes (100 MWe). Following her departure from Alterra, she joined Terrapin Geothermics, where she is Chief Geologist. She is also CEO of Terrapin's flagship project, Alberta No. 1. A green field geothermal project south of the City of Grande Prairie.

The logo for AGAT Laboratories is centered on a background of a blue and purple gradient with abstract geometric patterns. The word "AGAT" is written in a large, bold, white, sans-serif font. Below it, the word "Laboratories" is written in a smaller, white, sans-serif font. The background features a network of white lines and dots, resembling a molecular structure or a data network, with a bright light source on the right side creating a lens flare effect.

AGAT

Laboratories