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SIMULATION

2024-2025
ANNUAL REPORT

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OUR COMPANY

Energi Simulation is a not-for-profit organization based in Calgary, Alberta, Canada. Founded in 1978, Energi Simulation promotes and financially supports research and graduate students through research grants at universities.

Our mandate is to invest in leading edge research and innovation in energy resource modelling. The organization is unique for its self-funded strategy, where it has the financial freedom to invest in research, development, and innovation without having to rely on external sources of funding.

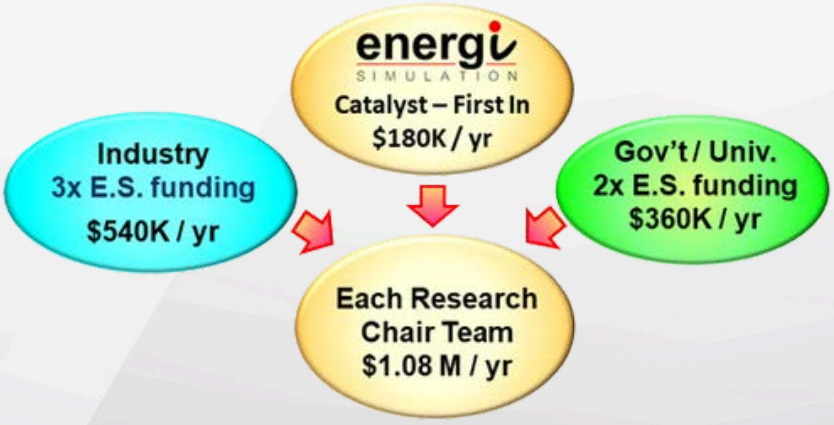
Milestones

$51.5 Million
own research funding

$250 Million
ind./univ. sponsorship

1,000
students graduated

Our Funding Model



Leverage at 5 to 1

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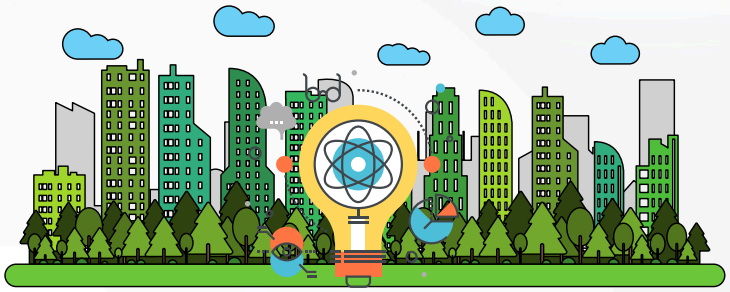
VISION & MISSION

We believe that:

”Diversified sources of affordable Energy are required to meet growing and changing global demand driven by improving standards of living and population growth.

“Petroleum and natural gas will continue to contribute to global progress while technological advances will reduce their impact on the environment.”

VISION



“ Creating a more sustainable energy future through simulation research. ”

MISSION

“ Promote and fund university research in energy resource modelling with industry collaboration and technology transfer. “

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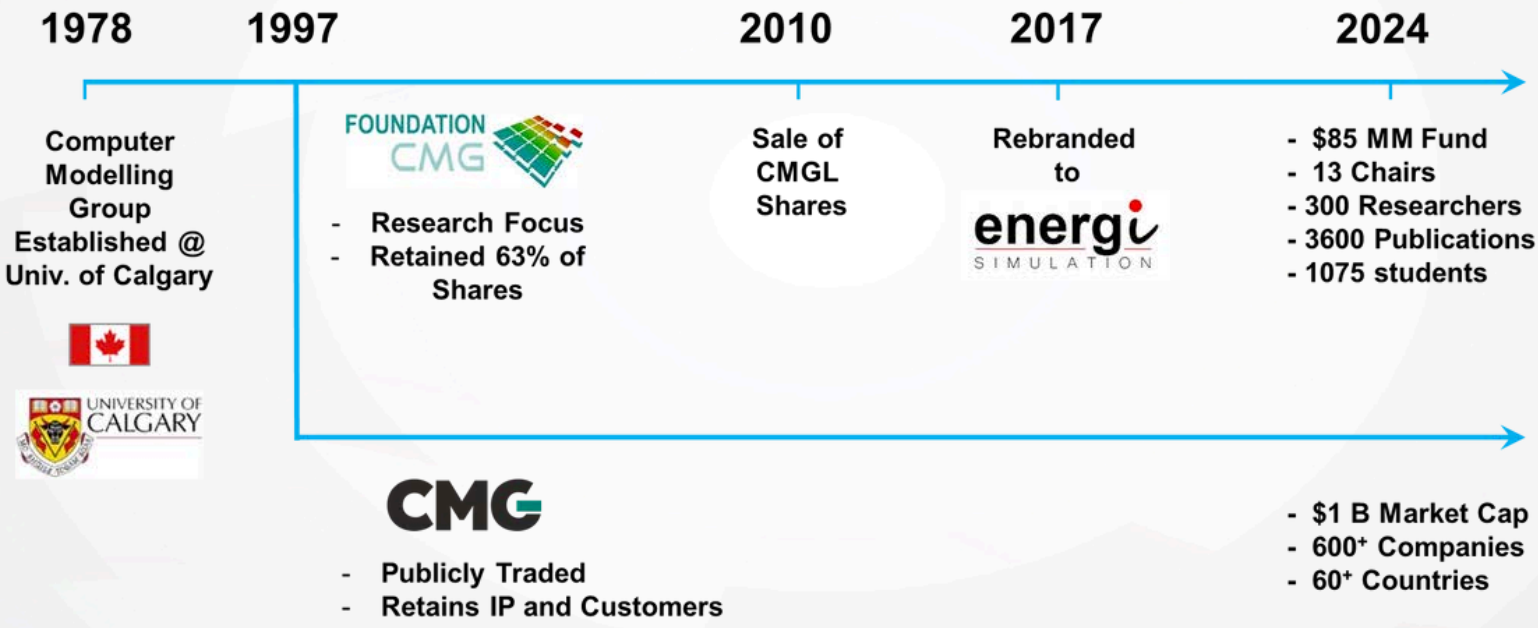
OUR HISTORY



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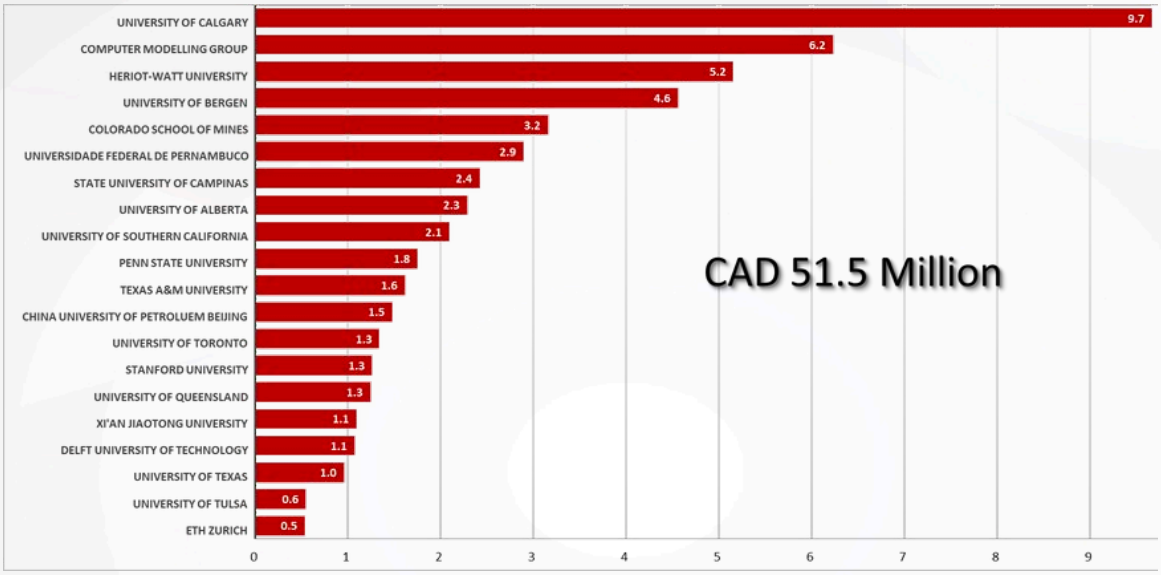
RESEARCH SPONSORSHIP

Energi Simulation has invested $51.5 million in research since our inception, which shows our continuous commitment to sponsoring simulation research with the desire to drive progress and make a meaningful impact on the world



SUPPORTING GLOBAL RESEARCH

Energi Simulation has supported 19 universities and 37 professors over the last 2 decades. Currently we are supporting 13 Research Chairs from around the globe.

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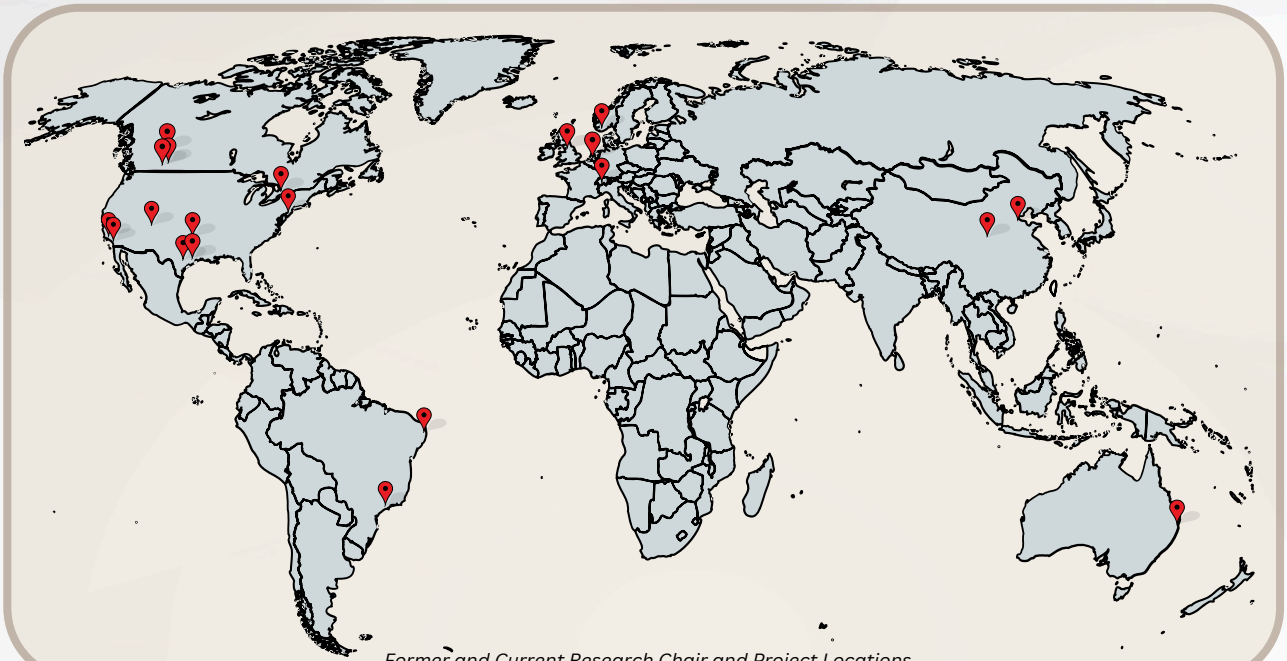
RESEARCH CHAIRS IN 2024



Former and Current Research Chair and Project Locations

Dr. Zhangxing (John) Chen
Reservoir Simulation

Dr. Behnam Jafarpour
Subsurface Energy Data Science

Dr. Sebastian Geiger
Sustainable GeoEnergy

Dr. Giovanni Grasselli
Fundamental Rock Physics and Rock Mechanics

Dr. Ryosuke Okuno
Carbon Utilization & Storage

Dr. Hadi Hajibeygi
Subsurface Storage & Multiscale Modelling

Dr. Rick Chalaturnyk
Reservoir Geomechanics

Dr. Maren Brehme
Geothermal Exploration and Operation

Dr. Arne Skauge
Low Net Carbon EOR

Dr. Leonardo Guimarães
Underground Storage and Reservoir Management Optimization

Dr. Denis Schiozer
Short-term Reservoir Management and Digital Fields Concepts

Dr. Eric Mackay
CCUS and Reactive Flow Simulation

Dr. Apostolos Kantzas
Energy Transition

ENERGI SIMULATION SUMMIT

Every year, Energi Simulation hosts an '*Energi Simulation Summit*', where our Research Chairs and their students share their current/ongoing research to industry and the academic community. The summit is hosted in a hybrid format (in-person & virtual), so that everyone from around the world can attend our biggest research event of the year. In addition to the summit, the organization hosts a private event called the '*Energi Simulation School*' , where Chair's students get the opportunity to learn relevant topics from Oil & Gas, Geothermal and CCUS in workshops and lessons hosted by a group of Research Chairs and industry guest speakers.

Energi Simulation Summit 2024

- **308** Attendees
- **33** Countries

Energi Simulation hosted it's Energi Simulation Summit 2024 at The Rimrock Resort Hotel in the rocky mountain town of Banff, Alberta, Canada. In addition to presentations from our Research Chairs, we also welcomed keynote speakers Bryan Helfenbaum, VP of Clean Energy at Alberta Innovates, and Anders Nygren, Interim Dean at the Schulich School of Engineering, University of Calgary.

New this year was our Energi Gala, where guests enjoyed networking, dinner and a keynote speech from Jeanine Vany, VP Co-founder and Executive Vice President, Corporate Affairs at Eavor Technologies Inc.

ES Summit 2024 Video Replays:
https://www.youtube.com/channel/UC3HWdYub1tgbnUDTfSsvDTA/videos

Energi Simulation School 2024

STAYING CONNECTED: ANNUAL CHAIR REVIEWS

Staying connected with our Research Chairs and their teams is essential for remaining updated about the latest progress in their research. These visits enable the teams to connect and grow with the Energi Simulation team, industry advisories and one another. Building global research connections not only broadens knowledge but also promotes collaboration, inspiring solutions that can address the energy needs of today and tomorrow.

April 2024
Delft University of Technology

Learn more about Dr. Hadi Hajibeygi here:
https://www.tudelft.nl/en/2021/citg/de-aarde-als-batterij-hadi-hajibeygi

Hadi Hajibeygi's ES Summit 2024 Presentation:
https://www.youtube.com/watch?v=5r6u_w7Nzxo&t=51s

Learn more about Dr. Sebastian Geiger here:
https://research.tudelft.nl/en/persons/s-geiger

Sebastian Geiger's ES Summit 2024 Presentation:
https://www.youtube.com/watch?v=LGdTPFy_zFw&t=13s

"Understand, Intervene, and Improve" were the approaches to research remarked by Dr. Stefan Aarninkhof, Dean of Civil Engineering and Geosciences, at the opening session of the annual Energi Simulation Centre for Geoenergy technical symposium at Delft University of Technology on April 8, 2024.

Energi Simulation Management, Duke Anderson and Andrew Seto, participated in-person and met with our Research Chairs (Professors Sebastian Geiger and Hadi Hajibeygi), their research teams, and advisory board members. Excellent presentations and posters were made on energy transition research topics, including carbon capture and storage, geothermal energy, and underground hydrogen storage. The Netherlands is leading in the technological advancement and field applications on many fronts, and Energi Simulation Chairs are there to provide support.

For CCS in a fractured reservoir, Professor Hajibeygi's use of projection-based embedded discrete fracture model (pEDFM), with relative permeability hysteresis, provides a more realistic representation of CO_2 plume migration, dissolution, mixing and trapping in the reservoir, helping with more accurate well placement.

We were also excited to learn that the once-in-a-generation geothermal project on campus was progressing well. Professor Geiger is creating a digital twin of the project, integrating reservoir characterization and reservoir modelling for a better understanding of the geothermal system and its operation. His open-source rapid reservoir modelling (RRM) tool for screening geothermal systems will also prove useful in the exploration and development of other geothermal resources worldwide.

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STAYING CONNECTED: ANNUAL CHAIR REVIEWS

April 2024

ETH Zürich

Duke Anderson, Andrew Seto and three advisory board members (Susan Fellows, Dr. David Bruhn, Dr. Albert Genter) visited Research Chair, Dr. Maren Brehme, and her research team (Energi Simulation EXPO group) at ETH Zürich during April 11-12, 2024.

The Group provided updates on their laboratory, numerical modelling and field studies, with techno-economic analyses, that should not only improve the chance of success for geothermal resource exploration plays, but also help optimize industry operations. Working at the world-renowned university, Dr. Brehme's team aims to support and help accelerate the development of geothermal energy projects worldwide, transitioning towards a cleaner energy future.

Dr. Brehme is currently leading the heat storage and circulation experiments for two real field pilot / demonstration projects, namely the Bedretto underground lab and the Schaffhausen test site, where heat recovery could be greater than 70%-100%. Results from these two field projects are expected to deliver a market-ready technology to the industry.

Learn more about Dr. Maren Brehme here:
https://geg.ethz.ch/maren-brehme/

Maren Brehme's ES Summit 2024 Presentation:
https://www.youtube.com/watch?v=Ic2jDw_cKpE&t=15s

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STAYING CONNECTED: ANNUAL CHAIR REVIEWS

April 2024

University of Southern California

On April 24, 2024, Duke Anderson, Andrew Seto and other Advisory Board members from Chevron and Aramco visited Prof. Behnam Jafarpour (Energi Simulation Industrial Research Chair in Subsurface Energy Data Science) and his team to review their research program at the University.

Overall, Energi Simulation was very pleased with the progress made in applying leading-edge artificial intelligence and machine learning technologies to geological CO_2 storage, geothermal systems, unconventional reservoirs, and subsurface description and dynamics. The training of graduate students who would become the future pillars for supporting the energy transition efforts is also one of the main goals of our Chair programs, and Professor Jafarpour has been successful in providing outstanding coaching and training for them.

On February 18, 2025, the CO2 - SMART NSF Center for CO_2 storage research was officially launched at the University, with representatives from the university, industry sponsors and government agency in attendance. Led by Professor Jafarpour and the engineering research team at the University of Southern California, in cooperation with Professor Sanjay Srinivasan and the geoscience research team at Penn State University, this National Science Foundation (NSF) supported industry-university cooperative research center (IUCRC) will focus on bridging the gap between academic research and industrial deployment.

Learn more about Dr. Behnam Jafarpour here:
https://viterbi.usc.edu/directory/faculty/Jafarpour/Behnam

Behnam Jafarpour's ES Summit 2024 Presentation:
https://www.youtube.com/watch?v=ezJwAUmT4Iw&t=13s

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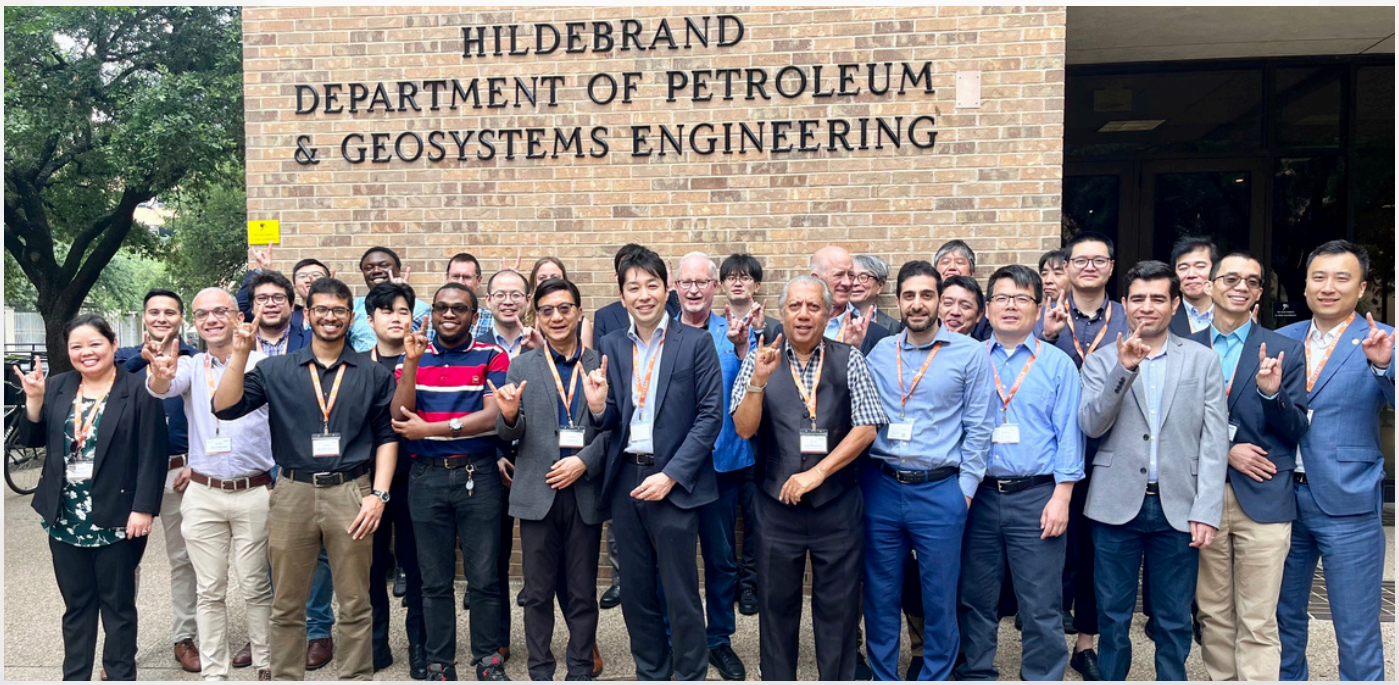
STAYING CONNECTED: ANNUAL CHAIR REVIEWS

May 2024
University of Texas at Austin

The 2nd Energi Simulation IAP on Carbon Utilization and Storage meeting was held at UT Austin on May 23-24, 2024. Representing Energi Simulation, Duke Anderson, Andrew Seto and Bob Gochnour participated in the annual chair program review, with 50 other researchers and sponsors who also attended in-person or online.

Excellent progress has been made in the experimental and numerical modelling studies of nanobubble or formate/CO_2 for EOR/CCS, CO_2 novel ideas. We are very pleased with the efforts of Professor Ryosuke Okuno (Energi Simulation Research Chair) and his research team at UT Austin in developing leading-edge technologies to help accelerate the energy transition to Net-Zero.

Professor Okuno's recent laboratory testing and reservoir simulation results indicated that the use of nanobubble or formate with CO_2 injection could significantly increase the CO_2 utilization efficiency for capture, mineralization and storage capacity. The next phase would be pilot testing to prove technical and economic viability under field conditions.



Learn more about Dr. Ryosuke Okuno here:
https://ryosukeokuno.com/

Ryosuke Okuno's ES Summit 2024 Presentation:
https://www.youtube.com/watch?v=ySJKYiwPVE0&t=62s

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STAYING CONNECTED: ANNUAL CHAIR REVIEWS

October 2024
Universidade Federal de Pernambuco

Learn more about Dr. Leonardo Guimarães here:
http://lmcg.ufpe.br/chair/

Leonardo Guimarães's ES Summit 2024 Presentation:
https://www.youtube.com/watch?v=Fn_nUEU1oN4&t=14s

Duke Anderson, Andrew Seto, and Denis Schiozer visited Research Chair Professor Leonardo Guimarães and his research team at the Universidade Federal de Pernambuco in Recife, Brazil, during Oct. 7-8, 2024.

In addition to maintaining part of his current research program on reservoir modelling and robust optimization, Professor Guimarães would shift his focus to underground storage, mobilizing his geomechanics expertise to support CCUS, salt cavern stability, CO_2 mineralization, and other energy resource modelling projects.

The industry sponsors (Petrobras, Braskem, Repsol-Sinopec) in attendance were interested in addressing the techno-economic-environmental challenges as they aim to build a sustainable energy future for the nation.

Professor Guimarães' research team was successful in utilizing the coupling of reservoir simulation and geomechanics for robust well control optimization of the Olympus field. Through coupling of fluid flow and geomechanics, with mechanical mesh refinement and multivariate analysis of principal components, they also found that it is possible to adjust pseudo-coupling tables to obtain results very close to the full two-way scheme, while reducing computational costs by up to five times without losing accuracy.

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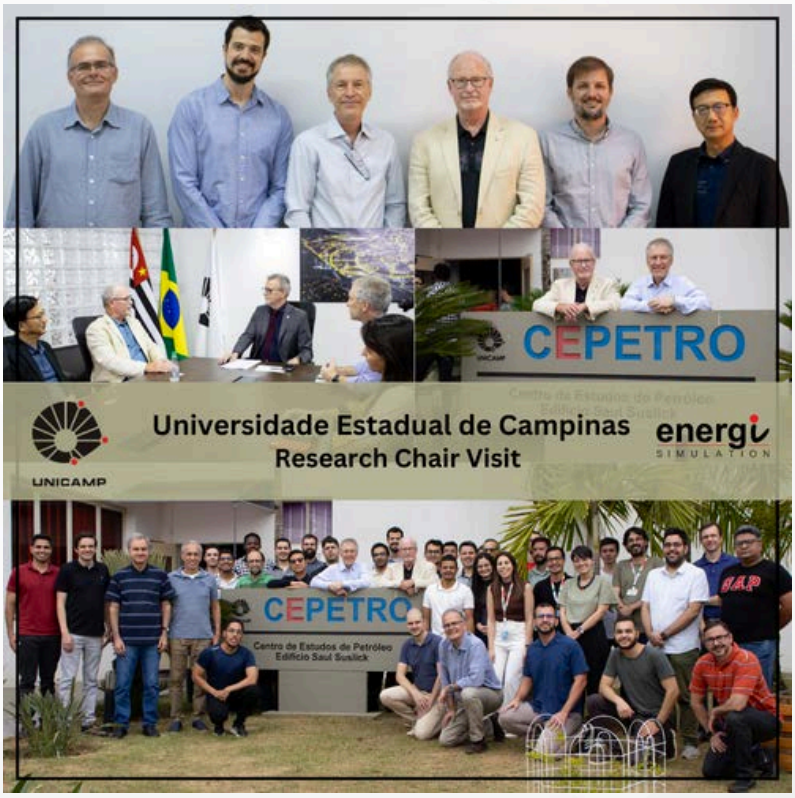
STAYING CONNECTED: ANNUAL CHAIR REVIEWS

October 2024
Universidade Estadual de Campinas

Duke Anderson and Andrew Seto visited Research Chair, Professor Denis Schiozer, and his research team at the Universidade Estadual de Campinas during Oct. 10-11, 2024.

Industry sponsor representatives also attended the hybrid meetings where students presented their work on integrated reservoir management and optimization, digital fields concept, 4D seismic data assimilation, EOR schemes, intelligent well placement, and machine learning. With many global industry players gravitating to Brazil where many forms of energy are abundant, we expect Professor Schiozer's research team to play an important role in advancing the technologies needed to support energy transition in the country and globally.

Professor Schiozer's state-of-the-art closed-loop field development and management tool in 3 stages (life-cycle, short-term and real-time) has been successful in helping operators to optimize hydrocarbon production and make prudent business decisions. Similar approach may be adopted for the development of other energy resources.



Learn more about Dr. Denis Schiozer here:
https://www.unisim.cepetro.unicamp.br/

Denis Schiozer's ES Summit 2024 Presentation:
https://www.youtube.com/watch?v=7h8d94vc0qU&t=56s

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STAYING CONNECTED: ANNUAL CHAIR REVIEWS

November 2024
University of Calgary

Learn more about Dr. Apostolos Kantzas here:
https://ucalgary.ca/labs/geothermal-energy/centre

Apostolos Kantzas's ES Summit 2024 Presentation:
https://www.youtube.com/watch?v=kUW9E98KZfg&t=9s

On Nov. 12-13, 2024, the Energi Simulation team visited the University of Calgary to review Professor Apostolos Kantzas' research chair program in energy transition. Representatives from Cenovus Energy, Canadian Natural Resources Limited (CNRL), Cascade Institute, Remedy Energy Services Inc., KALiNA Distributed Power Limited, Algar Geothermal, Alberta Innovates, PRTC and the University of Regina also participated.

Good progress has been made through the Energi Simulation Centre of Geothermal Systems Research led by Professor Kantzas, in geothermal simulation, energy harvesting, as well as thermal and elastic property determination. Research on the fundamentals of unconventional resources also continues to support the industry in maximizing the energy efficiency of heavy oil and bitumen recoveries.

With "Every Joule Counts" as a slogan, Professor Kantzas and his team are focusing their research on the laboratory testing and numerical modelling of conduction and convection as related to geothermal and geo-energy systems, from reservoir, wellbore, to surface plant.

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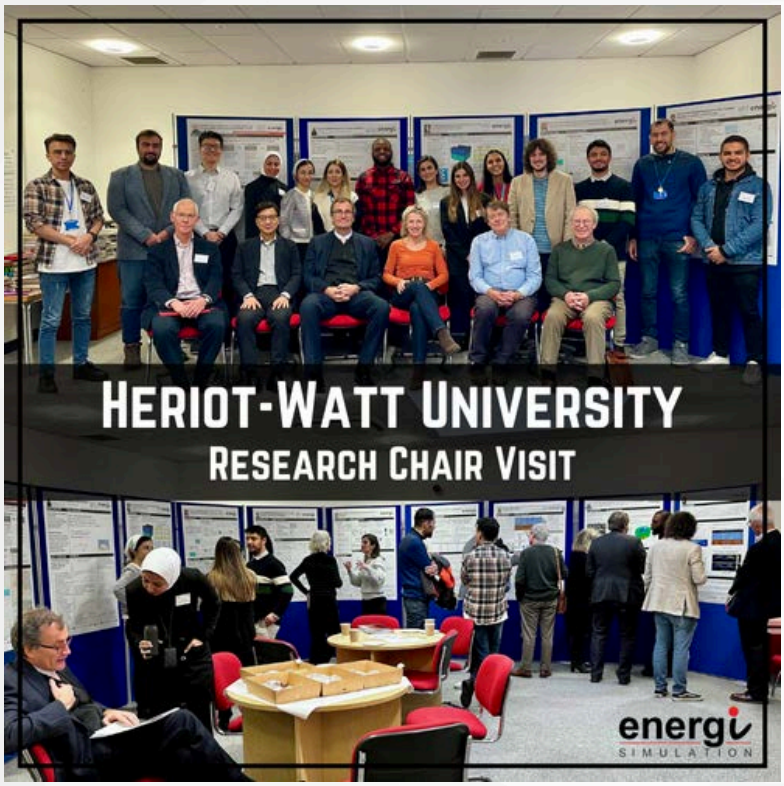
STAYING CONNECTED: ANNUAL CHAIR REVIEWS

November 2024
Heriot-Watt University



Professor Eric Mackay, Energi Simulation Industrial Research Chair in CCUS and Reactive Flow Simulation, and his graduate students showcased their latest research work at the advisory board meeting during Nov. 19-20, 2024. Advisors Andrew Seto, Tim Good, Roger Murray, Susan Fellows and Phil Christie, as well as SCCS secretariat Richard Stevenson and Gillian White attended the annual event.

Geochemical reactions between injection and reservoir fluids that lead to scale formation, and the response to scale inhibitors, are being studied in the laboratory and through geochemical modelling to help with prediction and prevention measures. Optimal injection brine compositions and scale inhibitors could be designed for CO_2 / polymer EOR, CO_2 storage, and geothermal brine production.

Professor Mackay's research team on flow assurance and scale technology is world-class, and they continue to provide strong support to the industry.

Learn more about Dr. Eric Mackay here:
https://researchportal.hw.ac.uk/en/persons/eric-james-mackay

Eric Mackay's ES Summit 2024 Presentation:
https://www.youtube.com/watch?v=JOg82jkJ-rw&t=17s

The research team's modelling of CO_2 injection at various scales (near-well, field, basin) has provided insights on the development of CCUS projects. For instance, when considering CO_2 storage in tilted aquifers, the impact of the direction of brine flux on plume migration ought to be assessed. The impact of CO_2 injection rate on flow profile and halite deposition should also be considered.

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STAYING CONNECTED: ANNUAL CHAIR REVIEWS

January 2025

ETH Zürich

Learn more about Dr. Maren Brehme here:
https://geg.ethz.ch/maren-brehme/

Maren Brehme's ES Summit 2024 Presentation:
https://www.youtube.com/watch?v=Ic2jDw_cKpE&t=15s

Duke Anderson, Andrew Seto, and four other advisory board members visited ETH Zürich to review Dr. Maren Brehme's research chair program during Jan. 16-17, 2025.

Innovative studies on the geothermal energy storage and circulation at the Bedretto (Switzerland) test site, and the use of an underwater drone to explore for geothermal resources under a lake are very impressive.

Research on geothermal clogging and generalized conceptual models for exploration campaigns are also topical. Dr. Brehme's team strives to foster drilling success, efficient and safe operations for the geothermal industry, through research that involves the integration of field work, laboratory testing and numerical modelling, with economic and environmental considerations.

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STAYING CONNECTED: ANNUAL CHAIR REVIEWS

February 2025

University of Toronto

On February 5, 2025, Duke Anderson, Andrew Seto and industry sponsor representatives from Cenovus Energy, ConocoPhillips, ShearFRAC and CMG attended (in-person or online) a HQP symposium and an advisory committee meeting at the University of Toronto, hosted by professor Giovanni Grasselli, Energi Simulation industrial research chair in geomechanics for energy transition.

Great progress has been made in measuring and characterizing geomechanical properties of rock, and improving the understanding of hydraulic fracturing operations. Numerical modelling tools such as the 'Richter Predictor' and AI fracture simulator are useful in helping to de-risk hydraulic fracturing, to avoid induced seismicity, casing deformation, surface uplift or subsidence, while enhancing the performance of subsurface energy extraction or storage. Professor Grasselli and his talented research team continue to provide strong technical support to the energy industry in their risk mitigation and production optimization efforts.

Learn more about Dr. Giovanni Grasselli here:
https://geogroup.utoronto.ca/

Giovanni Grasselli's ES Summit 2024 Presentation:
https://www.youtube.com/watch?v=weDg7v4mA7s&t=16s

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STAYING CONNECTED: ANNUAL CHAIR REVIEWS

February 2025

University of Southern California

The CO2-SMART Center, sponsored by the National Science Foundation (NSF) and 6 industry partners, was officially launched at the University of Southern California (USC) on Feb. 18, 2025. Energi Simulation research chair, Professor Behnam Jarfapour (USC) and Professor Sanjay Srinivasan (Pennsylvania State University) are two partner site directors of the center, which has research focused on CO_2 storage modelling, analytics and risk reduction technologies (CO2 - SMART).

In addition to advancing the science and technology of geologic carbon storage (GCS), this one-of-a-kind NSF industry/university cooperative research center (IUCRC) also aims to inform GCS policies and regulations, develop workforce and educate the public, and ensure safe & cost-effective deployment. Representing Energi Simulation as a sponsor/industry advisory board member, Duke Anderson and Andrew Seto attended the event, and were pleased to see the center program being geared towards the use of laboratory experiments, numerical modelling and artificial intelligence tools to help explain and predict GCS performance. We hope that other industry players would join the center in our concerted effort to help accelerate the safe and cost-effective deployment of commercial-scale GCS.

Learn more about Dr. Behnam Jafarpour here:
https://viterbi.usc.edu/directory/faculty/Jafarpour/Behnam

Behnam Jafarpour's ES Summit 2024 Presentation:
https://www.youtube.com/watch?v=ezJwAUmT4Iw&t=13s

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STAYING CONNECTED: ANNUAL CHAIR REVIEWS

March 2025

University of Alberta

Energi Simulation Management, several Board members and industry representatives attended the NSERC/Energi Simulation Industrial Research Consortium in Reservoir Geomechanics and GeoSAFETY workshop hosted by Dr. Rick Chalaturnyk at the University of Alberta Calgary Centre, during March 4-6, 2025.

Based on studies using state-of-the-art laboratory equipment for high pressure high temperature testing, physical modelling and numerical modelling techniques, the research team presented results on the geomechanical effects of subsurface energy resource development and operations. Armed with real field data from the Underground Test Facility (UTF) for bitumen recovery studies and the Aquistore CO_2 storage project, the group would investigate existing and anticipated future challenges in the energy addition landscape. They aim to provide innovative and improved solutions for the safe, effective, economical, and sustainable use of subsurface pore space, involving hydrocarbon recovery, geothermal energy, CCUS, hydrogen storage, nuclear waste disposal, or other energy sources.

Learn more about Dr. Rick Chalaturnyk here:
https://apps.ualberta.ca/directory/person/rc11

Rick Chalaturnyk's ES Summit 2024 Presentation:
https://www.youtube.com/watch?v=mlxr1R_d1ig&t=29s

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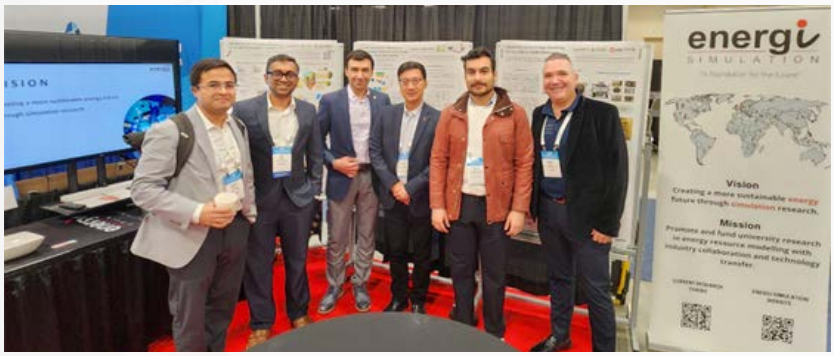
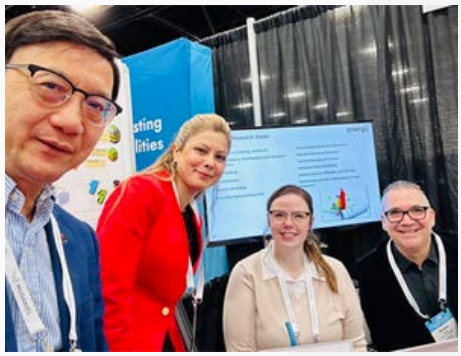
IN THE LOOP: CONFERENCES

Energi Simulations keeps two fingers on the pulse; being in the loop of the energy sector is crucial for staying informed about the latest research, innovations, and regulatory changes shaping the industry. Opportunities to hear from world renown researchers (which include our Research Chairs), industry experts and policymakers who share valuable insights, helps guide the direction of the type of research we sponsor and highlight pressing energy challenges.

March 2024

Energi Simulation attended as an exhibitor at the SPE Canadian Energy Technology Conference and Exhibition on March 13-14, 2024, at BMO Centre at Stampede Park, Calgary, Alberta, Canada. During the conference, presentations were made by the research teams from Energi Simulation Research Chairs, Rick Chalaturnyk and Ryosuke Okuno.





June 2024

On June 19th, WING Canada hosted an in-person Geothermal Business After Hours Event in Calgary. The Geo Energi Centre at the University of Calgary was one of the sponsors. Representing Energi Simulation, Aneta Monica attended the event, together with Director Apostolos Kantzas and his research team.

GEO energi centre

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IN THE LOOP: CONFERENCES

September 2024

Marking its 100th year anniversary, the SPE celebrated the opening of the annual technical conference and exhibition in New Orleans style, at the Ernest N. Morial Convention Center on Sep. 23, 2024. Andrew Seto, Energi Simulation VP Technology, two of our Research Chairs on CCUS (Prof. Behnam Jafarpour, Prof. Ryosuke Okuno) and several graduates students were in attendance.

Prof. Jafarpour and Prof. Iraj Ershaghi hosted a reception for invited industry participants to learn about USC's CO2-SMART research program on the second day. The technical program is very comprehensive, and the urgency towards a more sustainable energy future was well recognized.

October 2024

The GHG Control Technologies Conference was successfully held in Calgary during Oct. 20-24, 2024. Representing Energi Simulation, William Smith, Duke Anderson, Andrew Seto, Prof. Eric Mackay and Prof. Rick Chalaturnyk participated in the event.

Both the technical and business sessions provided very comprehensive updates and insights into the technologies, policies and regulations, and business strategies needed to accelerate the development of CCUS projects. Meeting the Net-Zero target by 2050 requires a concerted effort from all stakeholders in the world, and CCUS is a key catalyst to supporting a sustainable energy future.

CELEBRATING SUCCESS

Success for one is a success for us all; anytime one of our Research Chairs shares exciting news and recognition of their hard work, commitment or dedication to advancing knowledge, we want it to echo around the world! We share these success stories on our website blog and company LinkedIn; tune in to receive the live updates as they happen to help grow our unique research network!

May 2024

We are thrilled to share that, Energi Simulation Research Chair, Giovanni Grasselli, has been awarded the Engineering Medal for Entrepreneurship by PEO (Professional Engineers Ontario) that will be formally presented at the Ontario Professional Engineers Awards (OPEA) later this year.

The Engineering Medal – Entrepreneurship award recognizes professional engineers for applying new technologies or innovative approaches that have enabled new companies to get started, and/or assisted established companies to grow in new directions.

July 2024

Congratulations to Energi Simulation Research Chair, Behnam Jafarpour, and team from the USC Viterbi School of Engineering and Penn State College of Earth and Mineral Sciences, for having received funding from the National Science Foundation (NSF) to establish a center for CO_2 Storage Modeling, Analytics and Risk Reduction Technologies (CO2-SMART).

The team will lead the charge in advancing safe and cost-effective geologic CO_2 storage science and technologies, and will be dedicated to innovation in geologic sequestration of carbon dioxide as a technology to enable industrial decarbonization at scale.

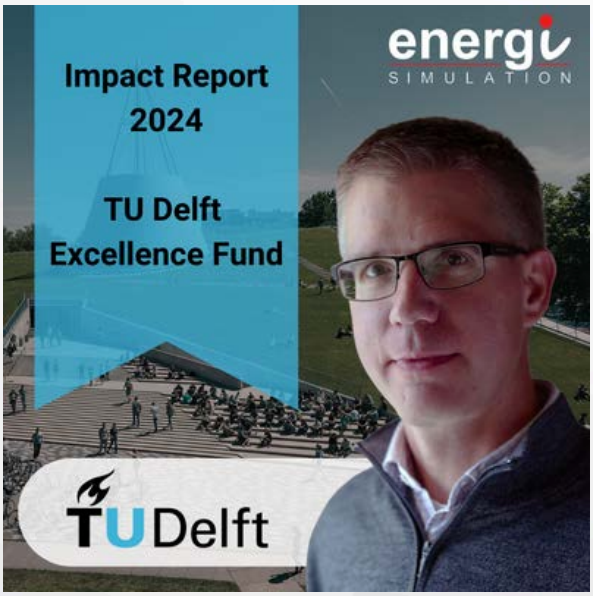
CELEBRATING SUCCESS

October 2024

Congratulations to our Research Chair, Behnam Jafarpour, for being honored at the SPE's Annual Technical Conference and Exhibition (ATCE) in New Orleans with the 2024 Society of Petroleum Engineers (SPE) International Data Science and Engineering Analytics Award.

This prestigious award is presented annually to an individual who has made significant contributions to the field of petroleum engineering through advancements in data science and engineering analytics.

December 2024



Delft University of Technology shared their latest Impact Report 2024 – (TU Delft Excellence Fund) that included the incredible work done by Energi Simulation Research Chair, Dr. Sebastian Geiger, and their research teams.

Sebastian's commitment to inspiring the new generation of engineers and his passion for Geoenergy are exemplary of a great mentor and scholar; congratulations on the work done so for!