

# New Zealand Geothermal Workshop 2023 Programme

## Tuesday 14 November

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| 3:00 | Registration Open  |
| 5:30 | Schlumberger sponsored Welcome Reception   University of Auckland Engineering Building |
| 7:00 |  |

## Wednesday 15 November

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| 8:00  | Registration Open   |
| 8:30  | Mihi whakatau   |
| 8:40  | Housekeeping: Sadiq J. Zarrouk  |
| 8:45  | <b>Welcome and Opening:</b> Richard Clarke, incoming Dean of Engineering, Sadiq J. Zarrouk and John O'Sullivan, Co-Directors, Geothermal Institute, The University of Auckland, Lecture Theatre 401.401   |
| 9:00  | <b>WORKSHOP AWARDS:</b> Lecture Theatre 401.401   |
| 9:15  | <b>KEYNOTE TITLE:</b> Recent advances in regional-scale geothermal exploration and resource evaluation to unlock hydrothermal potential in the Great Basin region, western USA and beyond<br><b>Keynote Speaker   Dr Bridget Ayling, Capability Lead - Reservoir Strategy, Geothermal Generation and Trading Capability, Contact Energy, New Zealand, Lecture Theatre 401.401</b> |
| 10:00 | Morning Tea   |

|       | Session 1.1 - INDUSTRY UPDATES                        | Session 1.2 - RESERVOIR MODELLING 1   | Session 1.3 - GEOTHERMAL GEOLOGY 1   |
|-------|---|---|--|
|       | SESSION CHAIR   Mason Jackson                         | SESSION CHAIR   Ryan Tonkin   | SESSION CHAIR   Sadiq Zarrouk  |
|       | Lecture Theatre 401.401                               | Lecture Theatre 401.439   | Lecture Theatre 423.342  |
| 10:30 | ICELAND DRILLING   INDUSTRY UPDATE   Sveinn Hannesson | 46   Equation of state modules for Waiwera including water, chloride and non-condensable gas - Adrian Croucher          | 13   Fracture permeability in basement greywacke for supercritical drilling planning - Sarah Millicich   |
| 10:45 | MARUBENI-ITOCHU TUBULARS OCEANIA   INDUSTRY UPDATE    | 23   Numerical model of the Tikitere geothermal system - Michael O'Sullivan   | 26   2012-2023 Comparative Ground Penetrating Radar and Temperature Survey at Orakei Korako, Taupō Volcanic Zone, New Zealand - Bridget Lynne                                      |
| 11:00 |   | 95   Cloud computing for complex geothermal simulations using the parallel software Waiwera - Ken Dekkers               | 65   Geologic Controls on Geothermal System Location and Type - Irene Wallis   |
| 11:15 |   | 73   Fast-tracking numerical modelling projects using Volsung and Leapfrog Energy - Jonathon Clearwater                 | 50   Highlights of Borehole Imaging, Tauhara Geothermal Field Drilling, New Zealand - Sarah Millicich  |
| 11:30 |   | 94   Greenfield resource assessment: maximising early stage data to constrain uncertainty - Tia Jones, Claudia Saunders | 66   Geologic Controls on Permeability Revealed by Borehole Imaging: Case Studies from Sumatra, Indonesia and the Taupō Volcanic Zone, New Zealand - Irene Wallis                  |
| 11:45 |   |   | 102   Updated Geological Structure and 3D Intrusion Model as Veritable Fracture Driver of Fracture Characterization in Wayang Windu Geothermal Field, Indonesia - Meiyanto Purnomo |

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| <b>Lunch and Poster Session:</b> |  |  |  |
| 12:00-1:30                       | 57   Insight into the Geothermal Structure in Tatun Volcano Group, Taiwan - Chi-Hsuan Chen<br>74   The geothermal reservoir characteristics of metamorphic terrain, an initiative of geological and geophysical survey of Qingshui, Tuchang, and Renze, NE Taiwan - Gong-ruei Ho<br>79   Geothermal characteristics of the Paolai Hot Spring area, Taiwan - Shao-Yi Huang<br>64   Regional geothermal exploration in Dongpu Geothermal Field of Central Taiwan - Hsin-Yi Wen<br>86   Exploring mildly acidic to neutral hot fluids through carbonate clumped isotope ( $\delta_{47}$ ) thermometer in the Lihuangtuzping Area - Yi-Chia Lu<br>99   Geothermal Direct Use Implementations and Its Potential Developments in North Sulawesi - Armando Ariakta Aloanis<br>83   A review of non-condensable gases (NCGs) reinjection within the geothermal industry and a comparison with other carbon capture and storage (CCS) technologies - Aston Carmichael<br>39   Numerical Simulator for the Coupled Model of Wells and Fractured Reservoirs - Mitsuo Matsumoto<br>5   Hydrothermal Alteration and Mineralogy Characterization at the Lake-Assal and the Hatchobaru Geothermal Fields - Holeh Mohamed Awaleh |  |  |

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| 1:30 | <b>MB CENTURY   INDUSTRY UPDATE  </b> Robert Mandjes , Lecture Theatre 401.401                                     |
| 1:45 | <b>NZGA Industry-led CO<sub>2</sub> emissions reductions project update  </b> Kennie Tsui, Lecture Theatre 401.401 |

|      | Session 2.1 - INDUSTRY UPDATES   | Session 2.2 - PRODUCTION & MANAGEMENT 1  | Session 2.3 - GEOPHYSICS  |
|------|--|--|---|
|      | SESSION CHAIR   Clare Baxter   | SESSION CHAIR   Theo Renaud  | SESSION CHAIR   Bridget Lynne   |
|      | Lecture Theatre 401.401  | Lecture Theatre 401.439  | Lecture Theatre 423.342   |
| 2:00 | 29   2022 Annual Aotearoa New Zealand Geothermal Review - Ted Montague | 82   A process model for geothermal power generation - John Burnell  | 47   Towards a national temperature model for New Zealand - Alison Kirky  |
| 2:15 | WAIKATO REGIONAL COUNCIL   INDUSTRY UPDATE   Katherine Luketina        | 43   MakBan Drilling Campaign Offset Wells Monitoring and Post Drilling Production Evaluation - Edward Bermido   | 55   Seismic reflection data acquisition in the Taupō Volcanic Zone: Reprocessing of Broadlands-Ohaaki 1984 seismic data - Callum Kennedy |
| 2:30 | BAY OF PLENTY REGIONAL COUNCIL   INDUSTRY UPDATE   Penny Doorman       | 81   Analysis of Heat Recovery Time Predictions for Multiple Periods of Temporary Reinjection in Geothermal Well Production at Lumut Balai Field - Erwandi Yanto, Aris Budiyanto | 15   Long Term Production in TVZ Geothermal Systems using a 2D Source to Surface Model - Warwick Kissling                                 |
| 2:45 | JRG ENERGY   INDUSTRY UPDATE   John Gilliland                          | 85   Detection and Diagnosis of Abnormal Conditions in the Feed Pumps of a Geothermal Binary Power Plant Using Feature-based Time-series Analytics - Paul Michael Abrasaldo      | 31   Insights into the Waiotapu Geothermal Field using High Resolution SkyTEM Data - Robert Reeves  |
| 3:00 |  | 88   Reinjection Management Evaluation in Karaha Bodas Field 2022 - Kristina Emerald Cici  |   |

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| 3:15 Afternoon Tea |  |  |  |
|                    | Session 3.1 - INDUSTRY UPDATES   |  | Session 3.3 - GEOCHEMISTRY   |
|                    | SESSION CHAIR   Leighton Taylor  |  | SESSION CHAIR   Claire Newton  |
|                    | Lecture Theatre 401.401  |  | Lecture Theatre 423.342  |
| 3:45               | MERCURY NEW ZEALAND   INDUSTRY UPDATE   Stewart Hamilton   |  | 18   REGEMP 2022: Waikato Regional Geothermal Monitoring Programme - Katherine Luketina                          |
| 4:00               | EASTLAND GROUP   INDUSTRY UPDATE   Alice Pettigrew   |  | 53   Reversing Carbon Emissions in the Geothermal Energy Industry Project: A Geoscience Perspective - Eylem Kaya |
| 4:15               | CONTACT ENERGY   INDUSTRY UPDATE   Bridget Ayling  |  | 27   The effect of CO <sub>2</sub> reinjection on silica scaling in geothermal reservoirs - David Byrne          |
| 4:30               | WESTERN ENERGY   INDUSTRY UPDATE   Marcus Prestney   |  | 33   Rhyolite of the Tauhara Geothermal Field: insights and correlations from geochemistry - Mark Simpson        |
| 4:45               | WESTERN ENERGY   INDUSTRY UPDATE   Abandoning Challenging Assets - Decommissioning a bunch of little annoying wells - Ben Drew |  |  |
| 5:00               | SEEQUENT   INDUSTRY UPDATE   Jeremy O'Brien  |  |  |
| 5:15               | SEEQUENT sponsored drinks and nibbles  |  |  |

## Thursday 16 November

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| 8:45  | Housekeeping   |   |   |
| 9:00  | <b>KEYNOTE TITLE: Improving Geothermal Energy Production: Forward Modelling and Data Assimilation with Consideration of Uncertainty</b><br><b>Keynote Speaker   Associate Professor Denis Voskov, TU Delft, The Netherlands, Lecture Theatre 401.401</b>               |   |   |
| 9:45  | <b>TRIVENI TURBINES   INDUSTRY UPDATE   Shailesh K., Tushar SV , Lecture Theatre 401.401</b>   |   |   |
| 10:00 | Morning Tea  |   |   |
|       | Session 4.1 - INDUSTRY UPDATES   | Session 4.2 - DRILLING & WELL TESTING   | Session 4.3 - ENVIRONMENTAL ASPECTS 1 / SOCIAL ASPECTS/<br>MĀTAURANGA MĀORI   |
|       | SESSION CHAIR   Jeremy O'Brien<br>Lecture Theatre 401.401  | SESSION CHAIR   Adrian Croucher<br>Lecture Theatre 401.439  | SESSION CHAIR   Ru Nicholson<br>Lecture Theatre 423.342   |
| 10:30 | JACOBS   INDUSTRY UPDATE   Jane Brotheridge  | 16   Machine Learning Opportunities for Geothermal Drilling Operations: An Overview - Aira Aspiras  | 62   Using Temperature Methods to Improve Geyser Monitoring at Rotorua, New Zealand - Brook Keats   |
| 10:45 | LFF NEW ZEALAND   INDUSTRY UPDATE   Matt Goodin  | 70   Geothermal Temperature and Pressure Transient Analyses of Well CHI-8A, El Salvador During Pressure Falloff - Jorge Alberto Rangel Arista | 8   Geothermal Systems of the Bay of Plenty Region, Aotearoa New Zealand - Inventory and Systems Extent - Mariana Zuquim  |
| 11:00 | MTL   INDUSTRY UPDATE  | 69   Collaborative and Holistic Applications Drive Record Drilling Performance in Mak-Ban Geothermal Field, 2020-2022 - Aira Aspiras          | 61   Groundwater Modelling Assessment of Shallow and Deep Geothermal Aquifer Interactions Around Otumuheke Stream, Wairākei-Tauhara Geothermal Field - Jake Scherberg |
| 11:15 | CASIL TECHNOLOGIES   INDUSTRY UPDATE   Jim Johnston  | 19   Cementing and Aerated Drilling Solutions for Curing Shallow Loss Circulation - Aira Aspiras  | 17   State of the Environment Reporting using the DPSIR Model in the Waikato Region - Katherine Luketina  |
| 11:30 | ITALMATCH CHEMICALS GB LTD   INDUSTRY UPDATE   Davide Parravicini  | 76   Reducing Casing Heatup Rates in Geothermal Production Wells by using Coiled Tubing Gas Lift - Matthew Sophy                              | 48   Incorporating Māori world views in the Rotorua geothermal system management plan - Tamara Mutu   |
| 11:45 | NIKO ENGINEERING   INDUSTRY UPDATE   Chayan Ghosh  | 107   Preliminary Analysis of Geothermal Drilling Results in Eastern Taiwan - Hsin Han Chen   |   |
| 12:00 | Lunch  |   |   |
| 1:00  | <b>KEYNOTE TITLE: Managing geothermal – a Local Government perspective on changing relationships and responsibilities</b><br><b>Keynote Speaker   Penny Doorman, Geothermal Programme Leader, Bay of Plenty Regional Council, New Zealand, Lecture Theatre 401.401</b> |   |   |
| 1:45  | <b>ORMAT TECHNOLOGIES INC.   INDUSTRY UPDATE   Rotem Ezer, Lecture Theatre 401.401</b>   |   |   |

|             | Session 5.1 - INDUSTRY UPDATES   | Session 5.2 - SCALING & CORROSION   | Session 5.3 - RESERVOIR MODELLING 2   |
|-------------|--|---|---|
|             | SESSION CHAIR   Samatha Alcaraz<br>Lecture Theatre 401.401                         | SESSION CHAIR   Wei Gao<br>Lecture Theatre 401.439  | SESSION CHAIR   Rony Nugraha<br>Lecture Theatre 423.342   |
| 2:00        | GNS SCIENCE   INDUSTRY UPDATE   Isabelle Chambeport                                | 22   Modelling Particle Tracking of Moisture Droplets in Geothermal Steam Pipeline - Kim Fong Chan  | 37   Changes in geothermal reservoirs due to hydrothermal eruptions and fault reactivation - James Patterson  |
| 2:15        | GEOHERMAL INSTITUTE   INDUSTRY UPDATE   Sadiq J. Zarrouk, John O'Sullivan          | 56   Laboratory HCl acid condensate testing of geothermal casing steels - Soroor Ghaziof  | 32   Investigating Influences on Hydrothermal Fluid Flow in the Taupō Volcanic Zone with Numerical Models Constrained by Magnetotellurics - Sophie Pearson-Grant                          |
| 2:30        | THORNDON COOK   INDUSTRY UPDATE   Roger Hudson                                     | 38   Update on the CaSiI technology: economically solving global silica scaling, enabling low temperature direct heat extraction and electricity generation - Michael Schweig | 78   The influence of boundary conditions in a reservoir model on the accuracy of the simulation results - Bo Jin   |
| 2:45        | WING   INDUSTRY UPDATE   Katherine Newman  | 41   Development of a novel HT calcite scale inhibitor for geothermal applications - Davide Parravicini, Alessandro Guidetti  | 60   Ensemble Methods for Geothermal Model Calibration - Alex de Beer   |
| 3:00        |  | 42   Case study: Silica Inhibitor Trial in Central America Plant - Alessandro Guidetti, Jonhson Kuy   | 24   Numerical modelling of tracer tests in the Ohaaki geothermal system - Michael O'Sullivan   |
| 3:15        | Afternoon Tea  |   |   |
|             | Session 6.1 - INDUSTRY UPDATES   | Session 6.2 - DIRECT USE  | Session 6.3 - ENVIRONMENTAL ASPECTS 2   |
|             | SESSION CHAIR   Mike Allen<br>Lecture Theatre 401.401                              | SESSION CHAIR   Bart van Campen<br>Lecture Theatre 401.439  | SESSION CHAIR   John O'Sullivan<br>Lecture Theatre 423.342  |
| 3:45        | NZTE - Indonesia   INDUSTRY UPDATE   Putri Wuningsari                              | 103   Update of Direct Geothermal Energy Use Inventory and Management for New Zealand - Lucy Carson   | 49   Vegetation in the Wairākei-Tauhara Geothermal System: History and Future Options - Christopher Bycroft   |
| 4:00        | NZTE - Philippines   INDUSTRY UPDATE   Maricon Popanes-Lim                         | 67   Low-Temperature geothermal – a decarbonising solution for covered crop growers in New Zealand? - Anya Seward   | 44   Geothermal vegetation of the Waikato Region: 2023 update - Sarah Beadel  |
| 4:15        | NZTE - Taiwan   INDUSTRY UPDATE   Peg Tsai   | 63   Assessing the potential of low to intermediate temperature geothermal resources for direct use - Maureen Nechesa Ambunya, Willis Ambuso                                  | 104   Preliminary ESG Consideration for Geothermal Development in Indonesia: What Relevant Environmental, Social and Governance Aspects Need to be taken into Account? - Dewi Permatasari |
| 4:30        | NZTE - Japan   INDUSTRY UPDATE   Zea Rose  |   |   |
| 4:45 - 5:45 | NEW ZEALAND GEOTHERMAL ASSOCIATION ANNUAL GENERAL MEETING, Lecture Theatre 401.401 |   |   |
| 6:30        | NZGW Conference Dinner   |   |   |
| 10:30       | Wynyard Pavilion, 17 Jellicoe Street, Auckland CBD                                 |   |   |

## Friday 17 November

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| 8:45  | Housekeeping   |   |
| 9:00  | <b>KEYNOTE TITLE: The Role of Kiwis in the International Geothermal Industry</b><br><b>Keynote Speaker   Jim Randle, Consultant, GT Management, Indonesia, Lecture Theatre 401.401</b>                   |   |
| 9:45  | <b>UPFLOW   INDUSTRY UPDATE   Andrew Marsh, Lecture Theatre 401.401</b>  |   |
| 10:00 | Morning Tea  |   |
|       | Session 7.2 - PRODUCTION & MANAGEMENT 2  | Session 7.3 - HINDSIGHT & FORESIGHT   |
|       | SESSION CHAIR   Eylem Kaya   | SESSION CHAIR   Michael Gravatt   |
|       | Lecture Theatre 401.439  | Lecture Theatre 423.342   |
| 10:30 | 89   <b>GeoEjector: Extracting geothermal fluid from a low-pressure geothermal well</b> - Maria Gudjonsdottir  | 9   <b>Integrated Real-Time Geothermal Operational Optimization and Improvement using a Robust Data Management, Visualization, and Diagnostic Analytics Platforms as a Digital Transformation</b> - Fajar Khamim Mustofa, Muhammad Vito Hamza |
| 10:45 | 91   <b>Study &amp; Design of Binary ORC Using Wet Cooling Tower (Existing) of Unit V &amp; VI in Lahendong Geothermal Field, Indonesia</b> - Adhiguna Satya Nugraha                                     | 72   <b>Impact of Project Variables on Tariffs Required for Economic Development of Geothermal Projects</b> - Jim Randle  |
| 11:00 | 10   <b>Double Energy Input IV, a proposal for a novel source of energy</b> - Daniel Ramirez Ordas   | 3   <b>Flexible geothermal application within the New Zealand electricity market</b> - Andrew Marsh   |
| 11:15 | 51   <b>Supercritical Well Performance Simulation using GFlow Wellbore Simulator: A Case Study of Ultra-hot IDDP Wells in Iceland</b> - Julius Marvin Rivera   | 45   <b>Carbon Negative Geothermal: Theoretical Case Study for Biogenic CO2 Removal at Ngāwhā Power Station</b> - Karan Titus   |
| 11:30 | 21   <b>Comparison of Icelandic Supercritical Well Forecasts with Subcritical Geothermal Production Well Outputs</b> - Julius Marvin Rivera  | 80   <b>Application of the United Nations Framework Classification for Geothermal Projects in the Waikato Region</b> - Greg Ussher  |
| 11:45 | Lunch  |   |
| 12:45 | <b>WING Panel   Challenges and opportunities in building a resilient and diverse Geothermal workforce   Facilitator: Katherine Newman, 401.401</b>   |   |
|       | Session 8.2 - RESERVOIR MODELLING 3  | Session 8.3 - GEOTHERMAL GEOLOGY 2  |
|       | SESSION CHAIR   Mike O'Sullivan  | SESSION CHAIR   Bridget Lynne   |
|       | Lecture Theatre 401.439  | Lecture Theatre 423.342   |
| 1:45  | 12   <b>Understanding Mineralogical and Geochemical Evolution in Geothermal Reservoirs through Reactive Transport Modelling</b> - Dale Emet Altar  | 59   <b>Regional geothermal exploration and potential assessment in the Taitung Hongye area, Eastern Taiwan</b> - Pei-Shan Hsieh  |
| 2:00  | 105   <b>Kawah Kamojang Pilot Injection Test: Production Monitoring Evaluation and Numerical Reservoir Modelling Study to Support Kamojang Injection Optimization Program</b> - Fathan Hamim Abdurachman | 106   <b>The Impact of an Active Strike-slip Fault to The Principal Horizontal Stress Orientations and Fluid Flow in the Karaha Bodas Geothermal Field, Indonesia</b> - Muhammad ikhwan   |
| 2:15  | 58   <b>Quantifying Geothermal Resource Potential and Uncertainty Analysis using a Natural State Model of Kotamobagu Geothermal Field in North Sulawesi, Indonesia</b> - Bei Nagoro                      | 28   <b>Combining geophysical, isotopes and geological studies toward geothermal models at Hongchailin for geothermal power generation in NE Taiwan</b> - Jian-Cheng Lee  |
| 2:30  | 71   <b>Development module of a geothermal reservoir in sedimentary rocks in Taiwan</b> - Bieng-zih Hsieh  |   |
| 2:45  | 108   <b>An Integration Solution of Geomodelling Tools in a Geothermal Modelling Framework</b> - Jeremy Rihet  |   |
| 3:00  | Workshop close - Sadiq J. Zarrouk, John O'Sullivan   |   |