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Introduction to the World Geothermal Congress 2020+1 Technical Program

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ABSTRACT

This paper provides an overview of the Technical Program of the World Geothermal Congress 2020+1, and reports on the content and the development process involved in creating the program.

1. PAPERS

2020+1 will be the largest World Geothermal Congress ever held, with a 42% increase in the number of papers compared to 2015 (and a 350% increase over 1995) – Figure 1. This is a result of the expansion of the worldwide activity of geothermal energy (see Huttrer, 2020, and Lund and Toth, 2020), as well as the increase in popularity of the Congress itself. 1931 papers have been accepted for the Congress, from 100 countries/regions (Table 1). Approximately 20% of the authors expressed a preference to present their paper as a poster.

Papers were submitted in 37 topics, distributed as shown in Table 2.

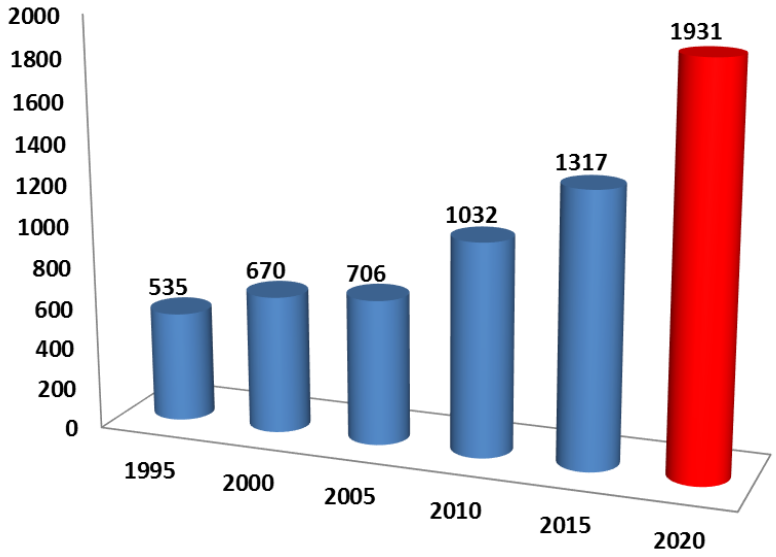


Figure 1: The growth of the World Geothermal Congress in terms of papers submitted (and accepted).

Table 1: Geographical distribution of paper submissions. 100 countries/regions submitted papers.

Country/Region	Total	Papers	Posters
Albania	2	2	0
Algeria	2	1	1
Argentina	4	2	2
Australia	15	13	2
Austria	7	7	0
Bangladesh	2	2	0
Belarus	2	2	0
Belgium	12	10	2
Bolivia	4	2	2

Bosnia and Herzegovina	1	1	0
Botswana	1	0	1
Brazil	1	1	0
Bulgaria	4	2	2
Burundi	2	1	1
Canada	32	27	5
Chile	22	14	8
China	119	65	54
Colombia	24	5	19
Comoros	2	0	2
Congo, Democratic Republic	2	0	2
Costa Rica	12	7	5
Croatia	4	3	1
Cyprus	1	1	0
Czech Republic	3	1	2
Denmark	4	3	1
Djibouti	25	17	8
Ecuador	6	5	1
Egypt	4	1	3
El Salvador	13	11	2
Eritrea	1	1	0
Ethiopia	18	12	6
Faroe Islands	1	1	0
Finland	3	1	2
France	79	74	5
Georgia	1	0	1
Germany	138	121	17
Greece	5	3	2
Guadeloupe	2	2	0
Guatemala	3	2	1
Honduras	3	2	1
Hungary	13	10	3
Iceland	213	190	23
India	29	26	3
Indonesia	151	113	38
Iran	32	17	15
Ireland	5	3	2
Italy	36	32	4
Japan	88	67	21
Kenya	55	43	12
Korea, Republic of	6	3	3
Lithuania	1	0	1
Macedonia	1	1	0
Madagascar	2	1	1
Malawi	6	5	1
Malaysia	2	2	0

Mexico	49	34	15
Mongolia	2	2	0
Morocco	3	3	0
Nepal	1	0	1
Netherlands	36	32	4
New Zealand	114	112	2
Nicaragua	6	4	2
Nigeria	1	1	0
Norway	23	18	5
Pakistan	3	2	1
Papua New Guinea	5	5	0
Peru	6	5	1
Philippines	56	47	9
Poland	18	9	9
Portugal	5	4	1
Romania	3	2	1
Russia	24	10	14
Rwanda	3	3	0
Saudi Arabia	1	1	0
Serbia	2	1	1
Slovakia	4	4	0
Slovenia	2	2	0
South Africa	2	2	0
Spain	12	3	9
Sri Lanka	2	2	0
St Lucia	2	2	0
St. Kitts and Nevis	1	1	0
St. Vincent / Grenadines	2	2	0
Sweden	6	5	1
Switzerland	55	48	7
Taiwan	8	3	5
Tajikistan	1	1	0
Tanzania, United Rep of	9	7	2
Thailand	1	1	0
Trinidad and Tobago	1	1	0
Tunisia	2	2	0
Turkey	44	42	2
Uganda	8	8	0
Ukraine	2	1	1
United Arab Emirates	1	1	0
United Kingdom	50	40	10
USA	118	112	6
Vietnam	4	2	2
Yemen	3	1	2
Zambia	4	4	0
TOTALS	**1931**	**1530**	**401**

Table 2: Topics for the Congress, showing the numbers of papers and posters in each, as well as the number of reviewers who reviewed abstracts and/or papers in each topic.

Number	Topic	Papers	Oral	Posters	Reviewers
0	Keynote	1	1	0	1
1	Country Updates	91	68	23	4
2	Environmental Aspects	59	46	13	7
3	Policy, Legal and Regulatory Aspects	42	33	9	3
4	Economics and Financing	28	22	6	4
5	Sustainability and Climate Change	37	33	4	5
6	Case Histories	52	46	6	7
7	Societal and Cultural Aspects	38	35	3	7
8	Business Strategies	32	31	1	4
9	Geothermal Education	29	23	6	5
11	Exploration	144	111	33	18
12	Geology	152	114	38	20
13	Geophysics	158	117	41	18
14	Geochemistry	132	98	34	16
15	Hydrogeology	30	23	7	5
16	Resource Assessment	76	61	15	11
17	Geomicrobiology	1	1	0	1
21	Drilling and Completion Technology	98	82	16	12
22	Reservoir Engineering	110	90	20	15
23	Injection Technology	14	11	3	2
24	Field Management	20	18	2	6
25	Production Engineering, Steam Gathering Systems	42	32	10	5
26	Power Generation	75	54	21	9
27	Corrosion and Scaling	77	69	8	6
28	Direct Use	55	43	12	5
29	Geothermal Heat Pumps	70	50	20	10
31	EGS - Enhanced Geothermal Systems	100	81	19	12
32	Big Data and Data Analytics	14	13	1	2
33	Software for Geothermal Applications	45	38	7	4
34	Health, Tourism and Balneology	8	5	3	2
35	District Heating	30	26	4	5
36	Agriculture	5	3	2	1
37	Advanced Technology (Magma, Geopressure, etc.)	25	19	6	2
38	Integrated Energy Systems, Cascaded Uses	15	13	2	3
39	Minerals Extraction and Processing	6	5	1	1
40	International Collaborations	8	6	2	1
41	Heat from Oil/Gas/Coal Fields	12	9	3	1
.	**TOTALS**	**1931**	**1530**	**401**	**276**

2. TECHNICAL PEER-REVIEW

All of the abstracts, and all of the papers, were subject to peer review by a topic expert, and many papers received more than one review. The reviewers accepted or rejected the abstracts, reviewed the papers and suggested revisions, and ultimately accepted or rejected the final paper (Figure 2, and Table 3). One reviewer in each topic was responsible for arranging the papers into thematically consistent sessions in the Congress. A total of 240 reviewers worked on the program (Table 4), from 28 countries. The 1931 papers were arranged into either oral or poster sessions, initially based on author preference (Figure 3). The oral presentations were arranged

into 184 virtual sessions (Table 6), and 43 in-person sessions (Table 7), which provided insufficient time slots for all who wished to make oral presentations. Accordingly, a number of papers were made posters instead of oral presentations, arranged into four virtual poster sessions and one in-person poster session. Additionally, most in-person sessions have a "reserve" paper, which is given as a poster, but can be added into the oral presentation schedule if a scheduled author does not attend the session. In practice, most of the reserve papers are likely to be presented orally, as it is typical that some scheduled authors may not be able to attend.

3. EDITING AND REFORMATTING

30 editors worked on the papers (Table 5). After being reviewed, papers were flagged as needing improvement in English, and/or refinement of the formatting to bring the paper into greater compliance with the Congress template. The editors were mostly graduate students or professors in Iceland, New Zealand, Canada, Japan, China and the US. The participating universities were Reykjavik University, University of Auckland, Stanford University, Tohoku University, Institut National de la Recherche Scientifique, (Canada), University of Virginia, and China University of Geosciences, Beijing.

About 30% of the submitted papers were edited for English, and 75% were reformatted (Table 3).

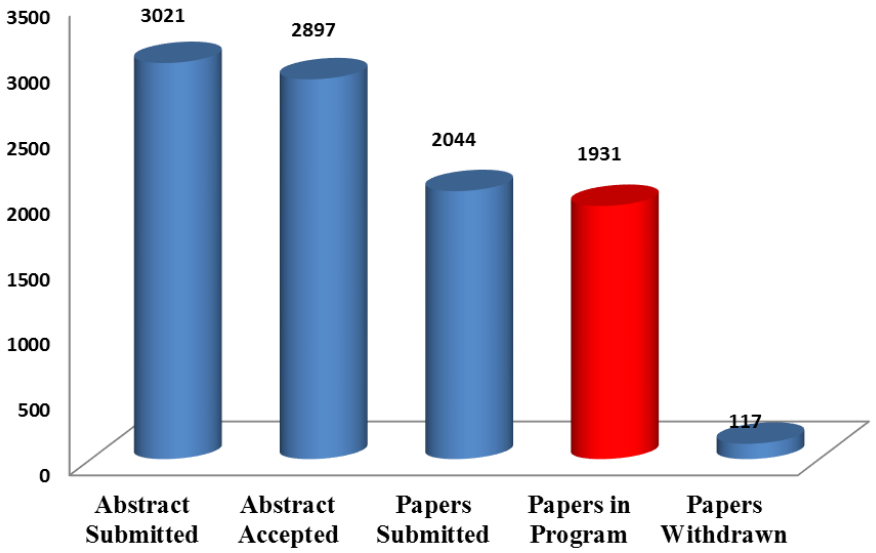


Figure 2: Progression of submissions – from abstracts to completed papers in the program.

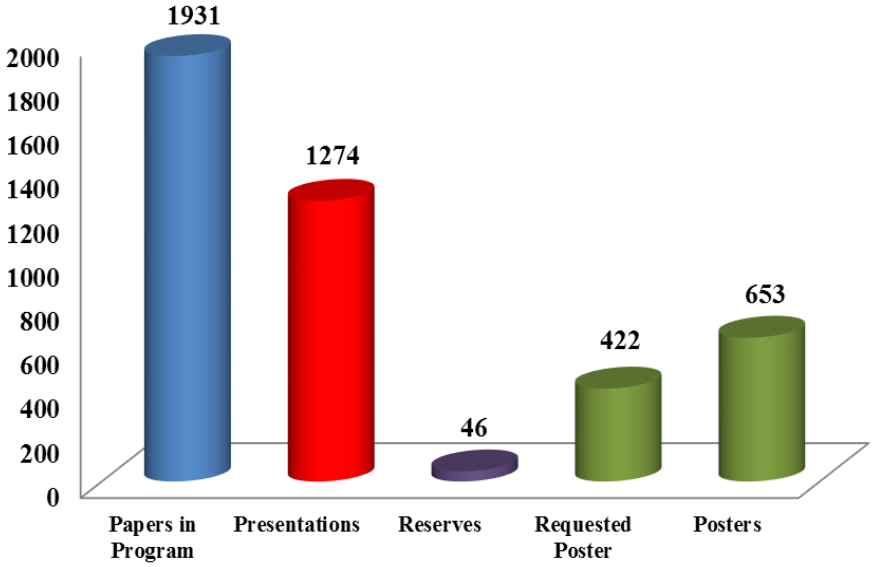


Figure 3: Arrangement of the papers into the technical program.

Table 3: Progression of the papers through the review, editing and allocation processes.

Abstract Submitted	3021
Abstracts Rejected	57
Abstract Accepted	2897
Papers Submitted	2044
Papers Rejected	22
Papers Withdrawn	117
Revisions Requested	805
Revisions Received	767
Edited for Format	1217
Edited for English	529
Papers in Program	1931
Presentations	1274
Reserves	46
Requested Poster	422
Posters	653

Table 4: Topic reviewers for the papers. 240 reviewers in total, from 28 countries.

Reviewer	Company [Country]	Topic [papers]
Gerry Huttrer	Geothermal Management Company, Inc., [USA]	1. Country Updates [90]
John W. Lund	Emeritus Director Geo-Heat Center, [USA]	1. Country Updates [90]
Aniko Toth	Ana-Geo Ltd., [Hungary]	1. Country Updates [90]
Chris Bromley	GNS Science, [New Zealand]	2. Environmental Aspects [56]
Fahmi Dereinda	PT Pertamina (Persero), [Indonesia]	2. Environmental Aspects [56]
Darri Eythorsson	University of Iceland, [Iceland]	2. Environmental Aspects [56]
Sigurdur Gardarsson	University of Iceland, [Iceland]	2. Environmental Aspects [56]
Katherine Luketina	Waikato Regional Council, [New Zealand]	2. Environmental Aspects [56]
Regina Victoria Pascual	Energy Development Corporation, [Philippines]	2. Environmental Aspects [56]
Málfríður Ómarsdóttir	United Nations University Geothermal Training Prog, [Iceland]	2. Environmental Aspects [56]
Varun Chandrasekhar	GeoSyndicate Power Ltd, [India]	3. Policy, Legal and Regulatory Aspects [44]
Mark Chrisp	Mitchell Daysh Ltd, [New Zealand]	3. Policy, Legal and Regulatory Aspects [44]
Phoebe Parson	University of Waikato, New Zealand, [New Zealand]	3. Policy, Legal and Regulatory Aspects [44]
Christian Boissavy	French Geothermal Association for Professionals (A, [France]	4. Economics and Financing [25]
Randall Morgan Greene	Iceland School of Energy, Reykjavik University, [Iceland]	4. Economics and Financing [25]
Hezy Ram	Ram Energy Inc., [USA]	4. Economics and Financing [25]
Jim Randle	GT Management, [Indonesia]	4. Economics and Financing [25]
Gudni Axelsson	Iceland GeoSurvey, [Iceland]	5. Sustainability and Climate Change [34]
Ingimar Haraldsson	United Nations University Geothermal Training Prog, [Iceland]	5. Sustainability and Climate Change [34]
Tamaki Ishikawa	Japan Science and Technology Agency, [Japan]	5. Sustainability and Climate Change [34]
Ladislaus Rybach	ETH Zurich, [Switzerland]	5. Sustainability and Climate Change [34]
Koichi Yamada	Japan Science and Technology Agency, [Japan]	5. Sustainability and Climate Change [34]
Miklos Antics	Gpc Ip, [France]	6. Case Histories [52]
Alfonso Garcia-gutierrez	Mexican Center for Innovation in Geothermal Energy, [Mexico]	6. Case Histories [52]

Colin Harvey	Harvey Consultants Ltd, [New Zealand]	6. Case Histories [52]
Eylem Kaya	University of Auckland, [New Zealand]	6. Case Histories [52]
Jerry Salera	State of CA - Department of Conservation-DOGGR, [USA]	6. Case Histories [52]
D Keith Smithson	Reykjavik University, [Iceland]	6. Case Histories [52]
Benedikt Steingrímsson	Iceland GeoSurvey (ISOR), [Iceland]	6. Case Histories [52]
Kyle Bahr	Tohoku University, [Japan]	7. Societal and Cultural Aspects [35]
Andy Blair	Upflow, [New Zealand]	7. Societal and Cultural Aspects [35]
Laurie Hietter	Panorama Environmental, Inc., [USA]	7. Societal and Cultural Aspects [35]
Susan Hodgson	Consultant, [USA]	7. Societal and Cultural Aspects [35]
Horst Kreuter	GeoT, [Germany]	7. Societal and Cultural Aspects [35]
Hiromi Kubota	CRIEPI, [Japan]	7. Societal and Cultural Aspects [35]
Masami Nakagawa	Colorado School of Mines, [USA]	7. Societal and Cultural Aspects [35]
Umut Destegul Solaroglu	SPERO, [Turkey]	8. Business Strategies [30]
Henning Hansen	[Norway]	8. Business Strategies [30]
Dennis Nielson	[USA]	8. Business Strategies [30]
Carsten Sorlie	Equinor, [Norway]	8. Business Strategies [30]
Rosalind Archer	University of Auckland, [New Zealand]	9. Geothermal Education [28]
Ali Ashat	Lab. Geothermal ITB, [Indonesia]	9. Geothermal Education [28]
Rolf Bracke	GZB - International Geothermal Centre, Bochum, [Germany]	9. Geothermal Education [28]
Juliet Newson	Reykjavik University, [Iceland]	9. Geothermal Education [28]
Caity Smith	US - East Africa Geothermal Partnership, [USA]	9. Geothermal Education [28]
George Allan	Mercury NZ, [New Zealand]	11. Exploration [145]
Kelly Blake	DoD Geothermal Program Office, [USA]	11. Exploration [145]
Varun Chandrasekhar	GeoSyndicate Power Ltd, [India]	11. Exploration [145]
Wilfred Elders	University of California, Riverside, [USA]	11. Exploration [145]
Adam Hawkins	Cornell University-Energy Institute, [USA]	11. Exploration [145]
Kazuya Ishitsuka	Kyoto University, [Japan]	11. Exploration [145]
Egbert Jolie	German Research Centre For Geosciences GFZ, [Germany]	11. Exploration [145]
Maryam Khodayar	Consultant and Researcher In Geoscience, [Iceland]	11. Exploration [145]
Katsuaki Koike	Kyoto University, [Japan]	11. Exploration [145]
Travis McLing	Idaho National Labortory, [USA]	11. Exploration [145]
Asnawir Nasution	Faculty of Earth Science and Technology, ITB, [Indonesia]	11. Exploration [145]
Helen Robinson	University of Strathclyde, [United Kingdom]	11. Exploration [145]
Andrew Sabin	NAVFAC ESC, [USA]	11. Exploration [145]
Eva Schill	KIT Karlsruhe, [Germany]	11. Exploration [145]
Adam Schultz	Oregon State University, [USA]	11. Exploration [145]
Suryantini Suryantini	Institute Teknologi Bandung (ITB), [Indonesia]	11. Exploration [145]
Tobias Weisenberger	ISOR Iceland GeoSurvey, [Iceland]	11. Exploration [145]
Jeff Witter	Innovate Geothermal Ltd., [Canada]	11. Exploration [145]
Graeme Beardsmore	University of Melbourne, [Australia]	12. Geology [149]
Greg Bignall	GNS Science, [New Zealand]	12. Geology [149]
David Bruhn	GFZ Potsdam, [Germany]	12. Geology [149]
Philippe Calcagno	BRGM, [France]	12. Geology [149]

Luis Carlos Gutierrez-Negrin	Geoconsul, GEMex Project, CeMIE-Geo, [Mexico]	12. Geology [149]
Maxine Lahan	PNG Mineral Resources Authority, [Papua New Guinea]	12. Geology [149]
Bridget Lynne	University of Auckland, [New Zealand]	12. Geology [149]
Mary Mann	Geothermal Resource Group, [USA]	12. Geology [149]
Geoffrey Mibei	UNU-GTP, [Iceland]	12. Geology [149]
Leland Mink	[USA]	12. Geology [149]
Joseph Moore	Energy & Geoscience Institute, [USA]	12. Geology [149]
Xavier Musonye	Reykjavik University, [Iceland]	12. Geology [149]
Joel Renner	[USA]	12. Geology [149]
Irene Ronoh	Kenya Electricity Generating Company, [Kenya]	12. Geology [149]
Fabian Sepulveda	Contact Energy, [New Zealand]	12. Geology [149]
Biao Shu	Central South University, [China]	12. Geology [149]
Drew Siler	USGS, [USA]	12. Geology [149]
Gene Suemnicht	EGS Inc., [USA]	12. Geology [149]
Sachihiro Taguchi	Fukuoka University, [Japan]	12. Geology [149]
Elizabeth Torio Henriquez	LaGeo S.A. de C.V., [El Salvador]	12. Geology [149]
Chandu Bolisetti	Idaho National Laboratory, [USA]	13. Geophysics [151]
Alain Bonneville	Pacific Northwest National Laboratory, [USA]	13. Geophysics [151]
Elizabeth Bullock	The University of the West Indies, St. Augustine, [Trinidad and Tobago]	13. Geophysics [151]
Karen Christopherson	Chinook Geoconsulting, Inc., [USA]	13. Geophysics [151]
James Crowell	University of North Dakota, [USA]	13. Geophysics [151]
William Cumming	Cumming Geoscience, [USA]	13. Geophysics [151]
Yunus Daud	Geothermal Laboratory, Universitas Indonesia, [Indonesia]	13. Geophysics [151]
Makoye Didas	TGDC, [Tanzania, United Rep of]	13. Geophysics [151]
Magnus Gudmundsson	University of Iceland, [Iceland]	13. Geophysics [151]
Frank Horowitz	Dept. Earth & Atmos. Sci., Cornell University, [USA]	13. Geophysics [151]
Tsuneo Ishido	Geological Survey of Japan, AIST, [Japan]	13. Geophysics [151]
Bruce Julian	Foulger Consulting, [USA]	13. Geophysics [151]
Muturia lichoro	Geothermal Development Company Ltd. (GDC), [Kenya]	13. Geophysics [151]
Jun Nishijima	Kyushu University, [Japan]	13. Geophysics [151]
William Pettitt	Geothermal Resources Council, [USA]	13. Geophysics [151]
Samuel Scott	Reykjavik University, [Iceland]	13. Geophysics [151]
Freysteinn Sigmundsson	University of Iceland, [Iceland]	13. Geophysics [151]
Kasumi Yasukawa	JOGMEC, [Japan]	13. Geophysics [151]
Erlindo Angcoy Jr	Energy Development Corp., [Philippines]	14. Geochemistry [130]
Bridget Ayling	Great Basin Center for Geothermal Energy, [USA]	14. Geochemistry [130]
Rosella Dulce	Energy Development Corporation, [Philippines]	14. Geochemistry [130]
Nilgun Gulec	Middle East Technical University, [Turkey]	14. Geochemistry [130]
Leakey Ochieng	Geothermal Development Company, [Kenya]	14. Geochemistry [130]
William Osborn	Geothermal Resource Group, [USA]	14. Geochemistry [130]
Lara Owens	Ormat, [USA]	14. Geochemistry [130]
Agnes Reyes	GNS-Science, [New Zealand]	14. Geochemistry [130]
Farrell Siega	Mercury NZ, [New Zealand]	14. Geochemistry [130]

Stuart Simmons	Energy & Geoscience Institute, University of Utah, [USA]	14. Geochemistry [130]
Andri Stefansson	Univesrity of Iceland, [Iceland]	14. Geochemistry [130]
Fusun Tut Haklidir	Istanbul Bilgi University, [Turkey]	14. Geochemistry [130]
Mahendra Verma	Instituto Nacional de Electricidad y Energías Limp, [Mexico]	14. Geochemistry [130]
Natalia Vinograd	St. Petersburg University, [Russia]	14. Geochemistry [130]
Edwin Wafula Wanyonyi	Kenya Electricity Generating Company, [Kenya]	14. Geochemistry [130]
Anna Yushantarti	Center For Mineral, Coal, and Geothermal Resource, [Indonesia]	14. Geochemistry [130]
Paul Brophy	EGS Inc., [USA]	15. Hydrogeology [31]
Niels Grobbe	[USA]	15. Hydrogeology [31]
Keigo Kitamura	Kyushu University, [Japan]	15. Hydrogeology [31]
Nicole Lautze	University of Hawaii, [USA]	15. Hydrogeology [31]
Noriaki Watanabe	Tohoku University, [Japan]	15. Hydrogeology [31]
Graeme Beardsmore	University of Melbourne, [Australia]	16. Resource Assessment [71]
Dave Boden	Truckee Meadows Community College, [USA]	16. Resource Assessment [71]
Patrick Dobson	Lawrence Berkeley National Laboratory, [USA]	16. Resource Assessment [71]
Mariana Eneva	Imageair Inc., [USA]	16. Resource Assessment [71]
Richard Esposito	Souther Company, [USA]	16. Resource Assessment [71]
Sabodh Garg	Geologica Geothermal Group Inc., [USA]	16. Resource Assessment [71]
Hideshi Kaieda	Central Research Institute of Electric Power Indus, [Japan]	16. Resource Assessment [71]
Juliet Newson	Reykjavik University, [Iceland]	16. Resource Assessment [71]
Jack Norbeck	United States Geological Survey, [USA]	16. Resource Assessment [71]
Paul Siratovich	Upflow, [New Zealand]	16. Resource Assessment [71]
Robert Vagnetti	U.S. Department of Energy - NETL, [USA]	16. Resource Assessment [71]
Yuran Zhang	Stanford University, [USA]	17. Geomicrobiology [1]
Volkan Aslanoglu	Middle East Technical University, [Turkey]	21. Drilling and Completion Technology [85]
Stephen Bauer	Sandia National Laboratories, [USA]	21. Drilling and Completion Technology [85]
Douglas Blankenship	Sandia National Laboratories, [USA]	21. Drilling and Completion Technology [85]
Carlos Fernandez	Pacific Northwest National Laboratory, [USA]	21. Drilling and Completion Technology [85]
Magnus Jonsson	University of Iceland, [Iceland]	21. Drilling and Completion Technology [85]
Alexandre Kane	SINTEF, [Norway]	21. Drilling and Completion Technology [85]
John Mclennan	University of Utah, [USA]	21. Drilling and Completion Technology [85]
Shigemi Naganawa	Akita University, [Japan]	21. Drilling and Completion Technology [85]
Tatiana Pyatina	[USA]	21. Drilling and Completion Technology [85]
David Stephen Pye	Consultant, [USA]	21. Drilling and Completion Technology [85]
Umran Serpen	NTU Geothermal, [Turkey]	21. Drilling and Completion Technology [85]
Paul Siratovich	Upflow, [New Zealand]	21. Drilling and Completion Technology [85]
Niyazi Aksoy	Dokuz Eylul University - Geothermal Energy Research, [Turkey]	22. Reservoir Engineering [109]
Jonathon Clearwater	Flow State Solutions Ltd, [New Zealand]	22. Reservoir Engineering [109]
Geoffrey Garrison	AltaRock Energy, Inc., [USA]	22. Reservoir Engineering [109]
Diana Margarita Hernandez-baez	University of Louisiana at Lafayette, [USA]	22. Reservoir Engineering [109]
Roland Horne	Stanford University, [USA]	22. Reservoir Engineering [109]
Roland Horne	Stanford University, [USA]	22. Reservoir Engineering [109]
Ramonchito Cedric Malate	KDA Consulting Limited, [New Zealand]	22. Reservoir Engineering [109]

Anthony Menzies	Philippine Geothermal Production Company, [Philippines]	22. Reservoir Engineering [109]
Mustafa Onur	The University of Tulsa,, [USA]	22. Reservoir Engineering [109]
Thomas Ratouis	Reykjavik Energy, [Iceland]	22. Reservoir Engineering [109]
Abdurrahman Satman	Istanbul Technical University, [Turkey]	22. Reservoir Engineering [109]
Freysteinn Sigmundsson	University of Iceland, [Iceland]	22. Reservoir Engineering [109]
Mario-Cesar Suarez-Arriaga	Mexican Geothermal Association, [Mexico]	22. Reservoir Egineering [109]
Hiroyuki Tokita	West Japan Engineering Consultants. Inc., [Japan]	22. Reservoir Engineering [109]
Tingting Zheng	UNU-GTP and University of Iceland, [Iceland]	22. Reservoir Engineering [109]
Jiri Muller	IFE, [Norway]	23. Injection Technology [14]
Benedikt Steingrímsson	Iceland GeoSurvey (ISOR), [Iceland]	23. Injection Technology [14]
Dick Benoit	Sustainable Solutions, [USA]	24. Field Management [24]
Trenton Cladouhos	Cyrq Energy, Inc., [USA]	24. Field Management [24]
Mineyuki Hanano	Japan Metals and Chemicals Co., Ltd., [Japan]	24. Field Management [24]
Morgane Le Brun	Le Brun, [France]	24. Field Management [24]
James Lovekin	GeothermEx, [USA]	24. Field Management [24]
Paul Moya	West Japan Engineering Consultants, Inc., [Costa Rica]	24. Field Management [24]
Khasani Jaelani	Gadjah Mada University, [Indonesia]	25. Production Engineering [39]
Saeid Jalilinasrabady	Kyushu University, [Japan]	25. Production Engineering [39]
Magnus Jonsson	University of Iceland, [Iceland]	25. Production Engineering [39]
James Lovekin	GeothermEx, [USA]	25. Production Engineering [39]
Halldor Palsson	University of Iceland, [Iceland]	25. Production Engineering [39]
Abbie Dean	Contact, [New Zealand]	26. Power Generation [68]
Ronald DiPippo	Renewable Energy Consultant, [USA]	26. Power Generation [68]
Matthew Fishman	POWER Engineers, [USA]	26. Power Generation [68]
Hal Gurgenci	The University of Queensland, [Australia]	26. Power Generation [68]
Noa Haberman	Ormat, [Israel]	26. Power Generation [68]
Tom McAuliffe	Power Engineers, [USA]	26. Power Generation [68]
T A Fauzi Soelaiman	MS-FTMD, Institut Teknologi Bandung, [Indonesia]	26. Power Generation [68]
Kevin Wallace	POWER Engineers, Inc., [USA]	26. Power Generation [68]
Shigeto Yamada	Fuji Electric Co., Ltd., [Japan]	26. Power Generation [68]
Sigrún Karlsdóttir	University of Iceland, [Iceland]	27. Corrosion and Scaling [72]
Keith Lichti	Quest Integrity (NZL) Ltd, [New Zealand]	27. Corrosion and Scaling [72]
William Osborn	Geothermal Resource Group, [USA]	27. Corrosion and Scaling [72]
Andri Isak Thorhallsson	University of Iceland, [Iceland]	27. Corrosion and Scaling [72]
Oleh Weres	PowerChem a division of ChemTreat, [USA]	27. Corrosion and Scaling [72]
Norio Yanagisawa	AIST, [Japan]	27. Corrosion and Scaling [72]
Dornadula Chandrasekharam	Indian Institute of Technology Hyderabad, [India]	28. Direct Use [50]
Emine Didem Korkmaz Basel	Istanbul Technical University, [Turkey]	28. Direct Use [50]
Nagasree Garapati	West Virginia University, [USA]	28. Direct Use [50]
Maria Richards	SMU Geothermal Laboratory, [USA]	28. Direct Use [50]
Omer Inanc Tureyen	Istanbul Technical University, [Turkey]	28. Direct Use [50]
Marita Berndt	Aurecon, [Australia]	29. Geothermal Heat Pumps [63]
Hikari Fujii	Akita University, [Japan]	29. Geothermal Heat Pumps [63]

Takao Katsura	Hokkaido University, [Japan]	29. Geothermal Heat Pumps [63]
Xiaobing Liu	Oak Ridge National Lab, [USA]	29. Geothermal Heat Pumps [63]
Kirsti Midttomme	Norce, [Norway]	29. Geothermal Heat Pumps [63]
Katsunori Nagano	Hokkaido University, [Japan]	29. Geothermal Heat Pumps [63]
Tomoyuki Ohtani	Dept. Civil Engineering, Gifu University, [Japan]	29. Geothermal Heat Pumps [63]
Angela Prieto	Sigma Prima Geoengineering, [New Zealand]	29. Geothermal Heat Pumps [63]
Jasmin Raymond	INRS, [Canada]	29. Geothermal Heat Pumps [63]
Vladimir Soldo	University of Zagreb - Faculty of Mech Engineering, [Croatia]	29. Geothermal Heat Pumps [63]
Graeme Beardsmore	University of Melbourne, [Australia]	31. EGS - Enhanced Geothermal Systems [95]
Francois Cornet	Strasbourg Univertsity, [France]	31. EGS - Enhanced Geothermal Systems [95]
Ahmad Ghassemi	University of Oklahoma, [USA]	31. EGS - Enhanced Geothermal Systems [95]
Peter Ledingham	GeoScience Limited, [United Kingdom]	31. EGS - Enhanced Geothermal Systems [95]
Isao Matsunaga	AIST, [Japan]	31. EGS - Enhanced Geothermal Systems [95]
Yusuke Mukuhira	Institute of Fluid Science, Tohoku University, [Japan]	31. EGS - Enhanced Geothermal Systems [95]
Bjorn Paulsson	Paulsson, Inc., [USA]	31. EGS - Enhanced Geothermal Systems [95]
Robert Podgorney	INL, [USA]	31. EGS - Enhanced Geothermal Systems [95]
Ann Robertson-Tait	GeothermEx, Inc., [USA]	31. EGS - Enhanced Geothermal Systems [95]
Peter Rose	EGI/University of Utah, [USA]	31. EGS - Enhanced Geothermal Systems [95]
Kazuhiko Tezuka	Geophysical Surveying Co., Ltd., [Japan]	31. EGS - Enhanced Geothermal Systems [95]
Noriyoshi Tsuchiya	Tohoku University, [Japan]	31. EGS - Enhanced Geothermal Systems [95]
Egill Juliusson	Landsvirkjun, [Iceland]	32. Big Data and Data Analytics [12]
Whitney Trainor-Guitton	Colorado School of Mines, [USA]	32. Big Data and Data Analytics [12]
Ryuichi Itoi	Kyushu University, [Japan]	33. Software for Geothermal Applications [39]
Michael O'Sullivan	University of Auckland, [New Zealand]	33. Software for Geothermal Applications [39]
Robert Podgorney	INL, [USA]	33. Software for Geothermal Applications [39]
Topo Sutopo	Institut Teknologi Bandung (ITB), [Indonesia]	33. Software for Geothermal Applications [39]
Brian Carey	GNS Science, [New Zealand]	34. Health, Tourism and Balneology [8]
Fida Libdeh	geoSilica Iceland, [Iceland]	34. Health, Tourism and Balneology [8]
Emine Didem Korkmaz Basel	Istanbul Technical University, [Turkey]	35. District Heating [27]
Halldor Palsson	University of Iceland, [Iceland]	35. District Heating [27]
Olafur Petur Palsson	University of Iceland, [Iceland]	35. District Heating [27]
Gunnar Skulason Kaldal	University of Iceland, [Iceland]	35. District Heating [27]
Pall Valdimarsson	Pvald Ehf, [Iceland]	35. District Heating [27]
Bernd Frieg	Nagra, [Switzerland]	36. Agriculture [4]
Hiroshi Asanuma	FREA, AIST, [Japan]	37. Advanced Technology [24]
Gudmundur Omar Fridleifsson	HS Orka, [Iceland]	37. Advanced Technology [24]
Sanja Popovska-Vasilevska	University ST.Kliment Ohridski, Faculty of Technic, [Macedonia]	38. Integrated Energy Systems [13]
Sayogi Sudarman	University of Indonesia, [Indonesia]	38. Integrated Energy Systems [13]

Anna Suzuki	Tohoku University, [Japan]	38. Integrated Energy Systems [13]
Kevin McCabe	National Renewable Energy Laboratory, [USA]	39. Minerals Extraction and Processing [7]
Kewen Li	Stanford University, [USA]	40. Other [7]
Kewen Li	Stanford University, [USA]	41. Heat from Oil/Gas/Coal Fields [13]

Table 5: Editors for English correction and reformatting.

Reviewer	University	Format	English	Units
Ayaka Abe	Stanford University, [USA]	94	16	42
Edgardo Alvarado	INRS, [Canada]	12	12	12
Arthurton Bellot	Reykjavik University, [Iceland]	0	3	2
Elvar Bjarkason	Institute of Fluid Science,Tohoku University, [Japan]	28	28	28
Mun Chi Choi	University of Auckland, [New Zealand]	32	0	10
Emmanuel Decena	University of Auckland, [New Zealand]	2	0	0
Nicholas Fry	Reykjavik University, [Iceland]	7	34	25
Clarisa Garcia	University of Auckland, [New Zealand]	3	33	23
Jackson Grimes	Reykjavik University, [Iceland]	6	6	4
Halldora Gudmundsdottir	Stanford University, [USA]	63	24	37
Evelyn Gunawan	Reykjavik University, [Iceland]	30	35	33
Adam Hawkins	Cornell University-Energy Institute, [USA]	54	0	18
Roland Horne	Stanford University, [USA]	358	57	157
Saurab Lama	University of Auckland, [New Zealand]	52	56	54
Suarni Landuma	University of Auckland, [New Zealand]	9	0	3
Victoria Lee	Reykjavik University, [Iceland]	23	26	25
Kewen Li	Stanford University, [USA]	50	32	38
Changwei Liu	China Univerisity of Geosciences (Beijing), [China]	111	0	37
Madison Mackenzie	Reykjavik University, [Iceland]	28	24	25
Abigail Pascal	University of Auckland, [New Zealand]	1	6	4
Agla Sol Petursdottir	Reykjavik University, [Iceland]	2	6	4
Miora Mirah Rajaobelison	Institut National de la Recherche Scientifique, [Canada]	8	4	5
Nandadwi Mario Bernardi Richir	University of Auckland, [New Zealand]	8	0	2
Grecia Ro	Stanford University, [USA]	25	0	8
Axel Sinhuber	University Of Auckland, [New Zealand]	31	12	18
Benjamin Smith	[Iceland]	16	30	25
Jared Smith	University of Virginia, [USA]	25	25	25
Ali Sohrabi	[New Zealand]	10	1	4
Anna Suzuki	Tohoku University, [Japan]	302	31	121
Liam Van Der Putten	[New Zealand]	38	25	29
Brandon Velasquez	Reykjavik University, [Iceland]	17	29	25
	TOTALS	**1439**	**549**	**839**

Table 6: Arrangement of sessions over the five virtual days of the Congress. There are 184 virtual sessions.

Tuesday 13th April	Tuesday 11th May	Wednesday 12th May	Monday 14th June	Tuesday 6th July
Technical Sessions 1	Technical Sessions 10	Technical Sessions 19	Technical Sessions 28	Technical Sessions 37
1A: Country Updates 1	10A: Exploration 1	19A: Exploration 10	28A: Drilling and Completion 1	37A: Geothermal Heat Pumps 1
1B: Environmental and Societal Aspects 1	10B: Geology 1	19B: Geology 10	28B: Reservoir Engineering 1	37B: Enhanced Geothermal Systems 1
1C: Legal and Regulatory Aspects 1	10C: Geophysics 1	19C: Geophysics 10	28C: Corrosion and Scaling 1	37C: Direct Use 1
1D: Case Histories 1	10D: Geochemistry 1	19D: Geochemistry 10	28D: Power Generation 1	37D: Health, Tourism and Balneology 1
Technical Sessions 2	Technical Sessions 11	Technical Sessions 20	Technical Sessions 29	Technical Sessions 38
2A: Country Updates 2	11A: Exploration 2	20A: Exploration 11	29A: Drilling and Completion 2	38A: Geothermal Heat Pumps 2
2B: Environmental and Societal Aspects 2	11B: Geology 2	20B: Geology 11	29B: Reservoir Engineering 2	38B: Enhanced Geothermal Systems 2
2C: Legal and Regulatory Aspects 2	11C: Geophysics 2	20C: Geophysics 11	29C: Corrosion and Scaling 2	38C: Direct Use 2
2D: Case Histories 2	11D: Geochemistry 2	20D: Geochemistry 11	29D: Power Generation 2	38D: Drilling and Completion 10
Technical Sessions 3	Technical Sessions 12	Technical Sessions 21	Technical Sessions 30	Technical Sessions 39
3A: Country Updates 3	12A: Exploration 3	21A: Exploration 12	30A: Drilling and Completion 3	39A: Geothermal Heat Pumps 3
3B: Environmental and Societal Aspects 3	12B: Geology 3	21B: Geology 12	30B: Reservoir Engineering 3	39B: Enhanced Geothermal Systems 3
3C: Legal and Regulatory Aspects 3	12C: Geophysics 3	21C: Geophysics 12	30C: Corrosion and Scaling 3	39C: Direct Use 3
3D: Case Histories 3	12D: Geochemistry 3	21D: Resource Assessment 1	30D: Power Generation 3	39D: Heat from Oil/Gas/Coal Fields
Technical Sessions 4	Technical Sessions 13	Technical Sessions 22	Technical Sessions 31	Technical Sessions 40
4A: Country Updates 4	13A: Exploration 4	22A: Resource Assessment 2	31A: Drilling and Completion 4	40A: Geothermal Heat Pumps 4
4B: Environmental and Societal Aspects 4	13B: Geology 4	22B: Geology 13	31B: Reservoir Engineering 4	40B: Enhanced Geothermal Systems 4
4C: Economics and Financing 1	13C: Geophysics 4	22C: Geophysics 13	31C: Corrosion and Scaling 4	40C: Direct Use 4
4D: Case Histories 4	13D: Geochemistry 4	22D: Hydrogeology 1	31D: Power Generation 4	40D: Reservoir Engineering 10
Technical Sessions 5	Technical Sessions 14	Technical Sessions 23	Technical Sessions 32	Technical Sessions 41
5A: Country Updates 5	14A: Exploration 5	23A: Resource Assessment 3	32A: Drilling and Completion 5	41A: Geothermal Heat Pumps 5
5B: Environmental and Societal Aspects 5	14B: Geology 5	23B: Hydrogeology 2	32B: Reservoir Engineering 5	41B: Enhanced Geothermal Systems 5
5C: Economics and Financing 2	14C: Geophysics 5	23C: Big Data and Data Analytics 1	32C: Corrosion and Scaling 5	41C: Direct Use 5
5D: Societal and Cultural Aspects 3	14D: Geochemistry 5	23D: Integrated Energy Systems 1	32D: Power Generation 5	41D: District Heating 1
Technical Sessions 6	Technical Sessions 15	Technical Sessions 24	Technical Sessions 33	Technical Sessions 42
6A: Country Updates 6	15A: Exploration 6	24A: Resource Assessment 4	33A: Drilling and Completion 6	42A: Geothermal Heat Pumps 6
6B: Geothermal Education 1	15B: Geology 6	24B: Hydrogeology 3	33B: Reservoir Engineering 6	42B: Enhanced Geothermal Systems 6
6C: Economics and Financing 3	15C: Geophysics 6	24C: Big Data and Data Analytics 2	33C: Corrosion and Scaling 6	42C: Advanced Technology 1
6D: Societal and Cultural Aspects 2	15D: Geochemistry 6	24D: Software for Geothermal Applications 1	33D: Power Generation 6	42D: District Heating 2
Technical Sessions 7	Technical Sessions 16	Technical Sessions 25	Technical Sessions 34	Technical Sessions 43
7A: Country Updates 7	16A: Exploration 7	25A: Resource Assessment 5	34A: Drilling and Completion 7	43B: Enhanced Geothermal Systems 7
7B: Sustainability and Climate Change 1	16B: Geology 7	25B: Field Management 1	34B: Reservoir Engineering 7	43C: Advanced Technology 2
7C: Business Strategies 1	16C: Geophysics 7	25C: Integrated Energy Systems 2	34C: Corrosion and Scaling 7	43D: District Heating and Agriculture 3
7D: Societal and Cultural Aspects 1	16D: Geochemistry 7	25D: Software for Geothermal Applications 2	34D: Production Engineering 1	
Technical Sessions 8	Technical Sessions 17	Technical Sessions 26	Technical Sessions 35	Technical Sessions 44
8A: Country Updates 8	17A: Exploration 8	26A: Resource Assessment 6	35A: Drilling and Completion 8	44A: District Heating 4

8B: Sustainability and Climate Change 2	17B: Geology 8	26B: Field Management 2	35B: Reservoir Engineering 8	44B: Enhanced Geothermal Systems 8
8C: Business Strategies 2	17C: Geophysics 8	26C: Enhanced Geothermal Systems 9	35C: Corrosion and Scaling 8	44C: Advanced Technology 3
8D: Geothermal Education 2	17D: Geochemistry 8	26D: Software for Geothermal Applications 3	35D: Production Engineering 2	44D: Minerals Extraction and Processing
Technical Sessions 9	Technical Sessions 18	Technical Sessions 27	Technical Sessions 36	
9A: Geothermal Education 3	18A: Exploration 9	27A: Resource Assessment 7	36A: Drilling and Completion 9	
9B: Sustainability and Climate Change 3	18B: Geology 9	27B: Field Management 3	36B: Reservoir Engineering 9	
9C: Business Strategies 3	18C: Geophysics 9	27C: Enhanced Geothermal Systems 10	36C: Injection Technology	
9D: Environmental and Societal Aspects 6	18D: Geochemistry 9	27D: Software for Geothermal Applications 4	36D: Production Engineering 3	
4P: Poster 1	8P: Poster 2		12P: Poster 3	16P: Poster 4

Table 7: Arrangement of sessions over the three in-person days of the Congress. There are 43 sessions in-person.

Monday 25th October	Tuesday 26th October	Wednesday 27th October
46A: Opening Ceremony - Iceland	Technical Sessions 50	Technical Sessions 54
	50A: Keynote 1	54A: Keynote 2
		54C: Panel 2
Technical Sessions 47	Technical Sessions 51	Technical Sessions 55
47A: International Collaboration R1	51A: Exploration R1	55A: Environmental and Societal Aspects R1
47B: Country Updates R1	51B: Legal and Regulatory Aspects R1	55B: Geochemistry R1
47C: Geology R1	51C: Drilling and Completion R1	55C: Resource Assessment R1
47D: Geothermal Education R1	51D: Enhanced Geothermal Systems R1	55D: Reservoir Engineering R1
Technical Sessions 48	Technical Sessions 52	Technical Sessions 56
48A: Sustainability and Climate Change R1	52A: Exploration R2	56A: Geology R2
48B: Business Strategies R1	52B: Power Generation R1	56B: Geochemistry R2
48C: Direct Use R1	52C: Case Histories R1	56C: Corrosion and Scaling R1
48D: Geophysics R1	52D: Software for Geothermal Applications R1	56D: Reservoir Engineering R2
Technical Sessions 49		57A: Closing Ceremony
49A: Societal and Cultural Aspects R1	Field Trips	
49B: Production Engineering R1		
49C: Geothermal Heat Pumps R1		
49D: Geophysics R2		

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A very special thank-you is due to John Lund, Aniko Toth and Gerry Huttrer, who undertook the large and difficult task of managing the Country Update papers. Anna Suzuki served as deputy chair of the Technical Program, and checked thousands of pages of papers, including reformatting hundreds of them. Special thanks too to Adam Hawkins, who was "pinch hitter" reviewer – reviewing dozens of papers left from other reviewers.

Working with all of you has been a very positive experience. Thank you for your participation. Let's enjoy the program we've made!

REFERENCES

Huttrer, G.: "Geothermal Power Generation in the World 2014-2019 Report," Proceedings of the World Geothermal Congress 2020+1, Reykjavik, March-October 2021.

Lund, J.W., and Toth, A.: "Direct Utilization of Geothermal Energy 2020 Worldwide Review," Proceedings of the World Geothermal Congress 2020+1, Reykjavik, March-October 2021.