ESMAP
Energy Sector Management Assistance Program

Global Geothermal Development Plan:
Roundtable 3

HARPA CONFERENCE CENTER | REYKJAVIK, ICELAND | APRIL 25–26, 2016

HOSTED BY THE MINISTRY OF FOREIGN AFFAIRS, ICELAND

WORLD BANK GROUP

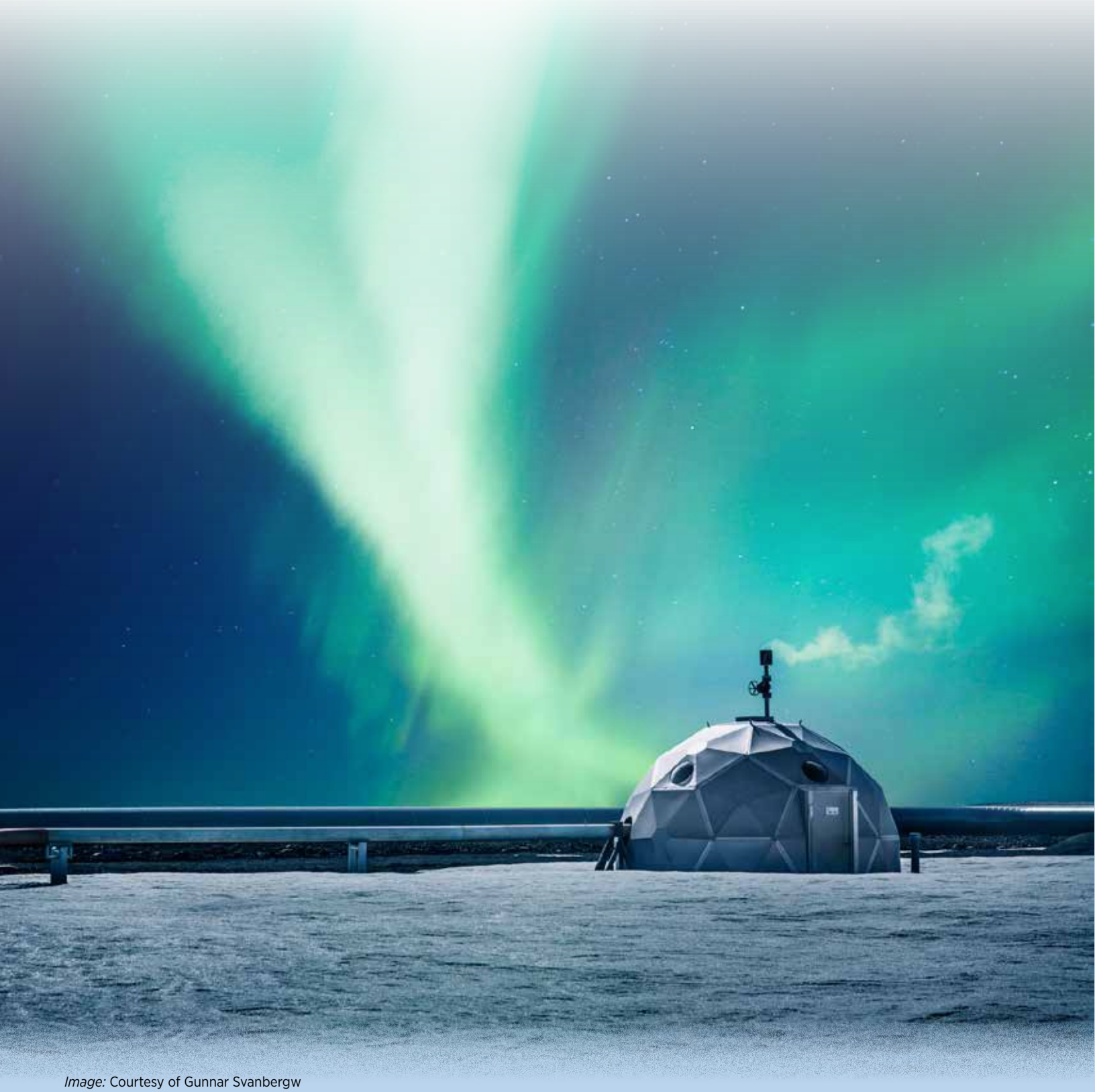

Image: Courtesy of Gunnar Svanbergw

ESMAP MISSION

The Energy Sector Management Assistance Program (ESMAP) is a global knowledge and technical assistance program administered by the World Bank. It provides analytical and advisory services to low- and middle-income countries to increase their know-how and institutional capacity to achieve environmentally sustainable energy solutions for poverty reduction and economic growth. ESMAP is funded by Australia, Austria, Denmark, Finland, France, Germany, Iceland, Japan, Lithuania, the Netherlands, Norway, Sweden, Switzerland and the United Kingdom, as well as the World Bank.

Global Geothermal Development Plan: Roundtable 3

APRIL 25–26, 2016 | HARPA CONFERENCE CENTER | SILFURBERG B | REYKJAVIK, ICELAND

On behalf of the World Bank Group Energy Sector Management Assistance Program (ESMAP), we welcome you to Reykjavik and to the 3rd ESMAP Global Geothermal Development Plan Roundtable. The event is organized by ESMAP, in partnership with the Iceland Ministry of Foreign Affairs.

A lot has happened since the launch of the Global Geothermal Development in Reykjavik in March 2013.

Donors have responded positively to the global acknowledgement of the importance of public funding in geothermal development, especially exploration and confirmation drilling. Specifically, US$235 million have been raised from the Clean Technology Fund for funding geothermal exploratory investments. These funds are expected to leverage about US$1.5 billion of public and private capital. In addition, the share of multilateral financing to geothermal projects focusing on the early project development stages has increased from 6 percent to 17 percent in just three years, from 2012 to 2015.

Furthermore, 11 countries have benefited from technical assistance deployed by ESMAP. Currently, ESMAP is supporting identification, preparation, and supervision of several geothermal investment operations, including in Djibouti, Nicaragua, Dominica, Armenia, Turkey, and Indonesia.

ESMAP has also built strong partnerships with key bilateral institutions, such as KfW and ICEIDA. Knowledge dissemination and capacity building have also taken central stage thanks to two GGDP Roundtables (The Hague, November 2013; Copenhagen, October 2014) and to the partnership with the International Geothermal Association (IGA) to develop of Global Standards for Classification of Geothermal Resources.

The 3rd GGDP Roundtable will provide a platform for donors, multilateral financing institutions, government officials, industry experts, and practitioners to take stock of progress and exchange knowledge on different aspects of geothermal projects: from the role of governments to specific technical industry issues.

Day 1 has been organized around three panels to discuss how governments have explored different ways to help mobilize public and private capital towards geothermal exploration and development. Day 2 consists of three technical sessions where industry experts will present and respond to participants' requests for information on practical issues.

The 3rd GGDP Roundtable takes place right before the Iceland Geothermal Conference (IGC 2016), scheduled for April 26–29, 2016, providing even more opportunities for participants to interact with international geothermal developers and equipment and service providers.

We are pleased that you have chosen to join us and encourage you to let us know if we can be of further assistance during your participation.

GGDP Roundtable 3

HARPA CONFERENCE CENTER | ROOM SILFURBER B | REYKJAVIK, ICELAND

TIME	DAY 1 | MONDAY APRIL 25
08:00	**Registration and Coffee**
08:30	**Welcome Address** • **Ms. Lilja Dögg Alfredsdóttir,** Icelandic Minister for Foreign Affairs
08:45	**Opening and Update on the GGDP** • **Mr. Pierre Audinet,** Clean Energy Program Team Leader, ESMAP, The World Bank
09:00	**Lecture:Geothermal Markets, Financing and Technology Trends** • **Ms. Juliet Newson,** President, Board of Directors, International Geothermal Association
09:30	**Lecture: Evolution of Public Support Models for Geothermal Development in Iceland** • **Mr. Gudni A. Jóhannesson,** Director General, Orkustofnun—The Icelandic National Energy Authority
10:15	**Coffee Break**
10:30	**Session 1 | Panel Discussion** **The Government as a Guarantor In Early Project Development** **Moderator: Mr. Migara Jayawardena, Sr. Energy Specialist, The World Bank**
	1.1 Turkey • **Mr. Turgut Olemez and Ms. Saniye Keser,** Assistant Renewable Energy Experts, Ministry of Energy and Natural Resources • **Mr. Hasan Hepkaya,** Head of Project Finance Department, Turkish Industrial Development Bank
	1.2 Indonesia • **Mr. Heri Setiawan,** Head Sub Directorate of Risk Management for State Assets and Liabilities, Ministry of Finance
	1.3 Mexico • **Mr. Enrique Nieto,** Director of Sustainable Projects, NAFIN
	Discussants: **Ms. Laurencia Karimi Njagi,** Sr. Energy Specialist, The World Bank **Mr. Adonai Herrera-Martinez,** Sr. Manager, European Bank for Reconstruction and Development

12:00	**Lunch**
14:00	**Session 2 | Panel Discussion** **The Government as a Geothermal Project Developer** Moderator: Mr. Gevorg Sargsyan, Global Lead for Clean Energy, The World Bank
	2.1 Armenia • **Mr. Hayk Harutyunyan,** Deputy Minister, Ministry of Energy and Natural Resources
	2.2 Djibouti • **Dr. Jalludin Mohamed,** Technical Advisor, Geothermal Power Generation Project • **Mr. Mohamed Chaari, Director,** Geothermal Power Generation Project
	2.3 El Salvador • **Arq. David Lopez Villafuerte,** President, Grupo CEL
	2.4 Ethiopia • **Mr. Sahele Tamiru,** Acting Director, Ministry of Electricity, Water and Irrigation
	Discussants: **Mr. John Lagat**, Chief Geologist, Geothermal Development Corporation, Kenya **Ms. Amanda Lonsdale**, Sr. Geothermal Advisor, DFID-East Africa Geothermal Energy Facility
15:30	**Coffee Break**
15:45	**Session 3 | Panel Discussion** **The Government as a Co-Financier of Geothermal Projects** Moderator: Mr. Jens Wirth, Senior Project Manager, KfW
	3.1 Dominica • **Amb. Vince Henderson,** Permanent Representative to the United Nations and the Chairman of the Geothermal Deal Team
	3.2 Nicaragua • **Mr. Ernesto Martinez-Tiffer,** Minister and Executive President, ENEL
	3.3 Kenya • **Mr. Cyrus Karingithi,** Assistant Manager Resource Development, KenGen
	Discussants: **Mr. Mariano Gonzalez Serrano**, Sr. Energy Specialist , The World Bank **Mr. Daniel Shepherd**, Sr. Operations Officer, International Finance Corporation
17:30	**Update on the Geothermal Development Fund for Latin America** • **Mr. Jens Wirth,** Senior Project Manager, KfW
17:45	**Wrap-up and Program of Day 2** • **Mr. Pierre Audinet,** Clean Energy Program Team Leader, ESMAP, The World Bank

TIME	DAY 2 | MONDAY APRIL 26
08:00	**Coffee**
08:20	**Introduction to Day 2** • **Mr. Thráinn Fridriksson,** Geothermal Specialist, ESMAP, The World Bank
08:35	**Lecture: Development of Standards for Geothermal Resource Classification—An Update** • **Mr. Horst Rüter,** Managing Director, IGA Service GmbH
9:00	**Session 1 | Clinic** **Increasing the Value of Geothermal Resources** Moderator: Mr. Efstratios Tavoulareas, Senior Energy Advisor, International Finance Corporation
	1.1 Overview of Direct Geothermal Applications and Uses Worldwide • **Mr. Árni Ragnarsson,** Engineer, Iceland GeoSurvey
	1.2 Heating, Cooling and Drying Using Geothermal Energy • **Mr. Thorleikur Jóhannesson,** Mechanical Engineer, Verkís
	1.3 HS Orka Resource Park, Society without Waste • **Ms. Kristín Vala Matthíasdóttir,** Vice President Resource Park, HS Orka
	1.4 Geothermal Well Head Units • **Ms. Elín Hallgrímsdóttir,** Mechanical Engineer, Mannvit
	1.5 First Results of GeoCap Studies of the Potential of Geothermal Direct Use in Western Java and of Low Enthalpy Geothermal Electricity to Replace Diesel Fired Generators • **Mr. Guus Willemsen,** Manager Business Development, IF Technologies
11:00	**Coffee Break**
11:30	**Session 2 | Clinic** **Management of Geothermal Gases** Moderator: Adonai Herrera-Martinez, Senior Manager, European Bank for Reconstruction and Development
	2.1 Gases in Geothermal Fluids and Emissions from Geothermal Power Plants • **Mr. Thráinn Fridriksson,** Geothermal Specialist, The World Bank
	2.2 Commercial Gas from Geothermal • **J. Rúnar Magnússon,** Mechanical Energy Engineer, EFLA
	2.3 Geothermal Gas Management at Hellisheidi Power Plant • **Ms. Hólmfrídur Sigurdardóttir,** Head of Environmental Affairs, Reykjavik Energy
	2.4 Academic Studies Related to Carbfix and Sulfix • **Dr. Sigurdur Reynir Gíslason,** Research Professor of Geochemistry, Institute of Earth Sciences, University of Iceland
12:45	**Lunch**

14:00	**Session 3 | Clinic** **Geothermal Drilling—Contract Structure, Project Management and Financing** Moderator: Raihan Elahi, Sr. Energy Specialist, the World Bank Group
	3.1 Overview of Geothermal Drilling • **Mr. Ari Stefánsson,** Project Manager Deep Drilling, HS Orka
	3.2 Planning and Management of Geothermal Drilling at Theistareykir, NE Iceland • **Mr. Bjarni Pálsson,** Project Manager, Landsvirkjun
	3.3 Drilling Contractor as a Source of Equity Stake • **Mr. Vilhjálmur Gudmundsson,** Director Business Development Latin America & Caribbean, Iceland Drilling
	3.4 Technical and Market Barriers to Cost Effective Geothermal Drilling—Case Study of Chile • **Mr. Lilja Tryggvadóttir and Carlos Jorquera,** Mannvit Engineering
16:00	**Conclusion and Next Steps** • **Mr. Pierre Audinet,** Clean Energy Team Leader, ESMAP, The World Bank

	ICELAND GEOTHERMAL CONFERENCE (IGC) | HARPA CONFERENCE CENTER REYKJAVIK, ICELAND
18:00	**Welcome Reception FOR REGISTERED PARTICIPANTS ONLY** **Brand Awareness Exhibition** • **Contact:** Ms. Rósbjörg Jónsdóttir, IGC

The Third Iceland Geothermal Conference (IGC)

For those of you staying for the IGC, the Iceland Geothermal Cluster Initiative welcomes you to its third edition of the Iceland Geothermal Conference—IGC2016 at the Harpa Conference Centre in Reykjavík, between the 26th and 29th of April 2016.

This year, the focus is on the advantages of utilizing geothermal energy and how they will benefit us. In collaboration with our sponsors, speakers and guests, we want to drill deep into three main topics: Operability, Feasibility, and Practicality.

Upon registration, you will have received an email asking you to choose one of four optional Field Trips.

The field trips are being offered on day two and will be connected to the agenda. The objective of these field trips is to maximize the participant's opportunities for understanding geothermal resource utilization in Iceland, and offer the experience to directly interact with geothermal technology and professionals behind its operation.

The following field trips are scheduled within the IGC 2016 agenda and participants are able to choose one of four, the last one is only "upon request."

Option 1 | Hellisheiði Power Plant

Option 2 | Hveragerði Geothermal Village

Option 3 | Reykjanes Resource Park

Option 4 | Reykjavik District Heating

Upon Request | Theistareykir—optional trip on 29th of April 2016

SPEAKERS AND MODERATORS' BIOS

WELCOMING ADDRESS

Ms. Lilja Dögg Alfredsdóttir, Minister of Foreign Affairs, Iceland

Before becoming Minister of Foreign Affairs, she also worked in the Prime Minister's Office as a Special Liaison 2014–2015. Here main responsibilities were capital control liberalization strategy, economic affairs, budget issues, and rural policy.

She also worked for the Central Bank of Iceland, as Ms. Deputy-Director, General Secretariat and International Affairs 2013–2014. Mrs. Alfredsdóttir worked at the International Monetary Fund as an Advisor in Washington, DC from 2010–2013. Where her main responsibilities were: Iceland's Standby Arrangement with the IMF 2008 and analytical work related to small states and international capital movements. She served as Deputy Director at the Central Bank of Iceland in International Affairs and Market Operations from 2001–2010.

Ms. Alfredsdóttir graduated from Columbia University, New York, with a MIA in International Economic Policy 1999–2001. She attended the University of Iceland, Reykjavík and earned an Undergraduate degree in Political Science 1994–1998. She attended Minnesota University in Minneapolis as an exchange student (macroeconomics and philosophy) in 1998. Finally, she attended Ewha University in Seoul, S-Korea as an exchange student (East Asian political history) 1993–1994.

OPENING REMARKS AND UPDATE ON THE GGDP

Mr. Pierre Audinet
Clean Energy Program Team Leader, ESMAP, The World Bank

Pierre has been leading the Clean Energy Program Team of the Energy Sector Management Assistance Program at the World Bank (ESMAP) since 2011. He joined the World Bank in 2004 and has led the design and implementation of transformational projects that scaled up clean energy investments at global, regional and country levels.

Pierre has advised a range of governments operating in high, middle and low income countries—including fragile states. His experience goes from launching and leading the Global Geothermal Development Plan, structuring the Middle East and North Africa Concentrated Solar Power Scale-up Investment Plan, to helping set up renewable and energy efficiency legislation in Morocco or reforming energy prices subsidies in Yemen.

Prior to joining the World Bank, Pierre was with the International Energy Agency (IEA). He holds a PhD in Economics from the School of Advanced Social Science Studies (Paris, France), a MPhil and a MSc in Economics from Paris University.

LECTURE | GEOTHERMAL MARKETS, FINANCING AND TECHNOLOGY TRENDS

Dr. Juliet Newson, President, International Geothermal Association

Juliet graduated as Senior Scholar in Geology in 1989, then moved to the Department of Engineering Science to complete a Master degree, followed by a PhD, on geothermal reservoir simulation. Juliet has 15 years' experience in geothermal energy training, research, and consulting. She specializes in geothermal reservoir engineering and modeling, with a special interest in geothermal surface features and their connection to the deeper reservoir. Juliet was instrumental in reinstatement of postgraduate geothermal training at the University of Auckland, co-organizing the inaugural Postgraduate Certificate in Geothermal Energy Technology in 2007. She continued her involvement in the course, both as an organizer and lecturer until 2011 when she joined Contact Energy Ltd at Wairakei as a Reservoir Modeling Engineer.

Juliet was on the Board of the New Zealand Geothermal Association for six years, and was elected to the Board of the International Geothermal Association in 2010, taking the post of Chair of the Education Committee, and becoming President in 2013. She is an Honorary Staff member of the Department of Engineering Science at the University of Auckland, and a member of the NZ Institute of Directors.

LECTURE | EVOLUTION OF PUBLIC SUPPORT MODELS FOR GEOTHERMAL DEVELOPMENT IN ICELAND

Mr. Gudni A. Jóhannesson,
Director General, Orkustofnun—The Icelandic National Energy Authority

Gudni earned his MSc in Engineering physics in 1976. He did his PhD thesis on thermal models for buildings in 1981. He was appointed associate professor at Lund University in 1982. He was awarded the title of doctor honoris causae from the University of Debrecen in 2008 and the Swedish Concrete Award in 2011. Gudni was Professor in Building Technology at KTH in Stockholm 1990-2008. Since the beginning of 2008 he has been the Director General of Orkustofnun, the Icelandic National Energy Authority which is responsible for public adminstration of energy research, energy utilization, regulation and oil and gas exploration. He was a steering group member and former chair of the International Partnership for Geothermal Technologies. Presently, he is the coordinator of the Geothermal ERANET, a European project on cooperation on research funding and knowledge base for geothermal utilization.

SESSION 1 | PANEL DISCUSSION THE GOVERNMENT AS A GUARANTOR IN EARLY PROJECT DEVELOPMENT

Moderator: Mr. Migara Jayawardena,
Sr. Energy Specialist, The World Bank

Migara has worked throughout the world on issues related to infrastructure reform and development finance. His work in the energy sector has focused mostly on power sector and utility reform, renewable energy, rural electrification, and climate change related matters. In his current position, he works mainly on business development, policy advice, and investment lending challenges in the Latin America and Caribbean region.

Previously, Migara worked in the East Asia region of the World Bank where he led work on climate change and support to a globally unprecedented geothermal renewable energy development program; institutional reform of utilities; power transmission and distributional system strengthening; hydropower development; rural energy access; and oil and gas sector issues. He has also worked in Europe and Central Asia and Africa regions of the World Bank, in addition to holding the position of Special Assistant to the Vice President of Human Resources. Prior to joining The World Bank, Migara was the Assistant Program Director and a Faculty Member for the Program on Investment Appraisal and Management at Harvard University's Institute for International Development (HIID). He also helped establish Cambridge Resources International (CRI), an investment and risk advisory consultancy. Migara holds a B.Sc. in Economics from Towson State University and his Masters in Public Policy from Harvard University.

1.1 TURKEY

Mr. Turgut Ölemez,
Assistant Renewable Energy Expert, Ministry of Energy and Natural Resources

Turgut is a geological engineer with a bachelor degree from Istanbul University. For the past three years, he has been working for the Ministry of Energy and Natural Resources (MENR) as an assistant expert in the General Directorate of Renewable Energy (GDRE). His expertise is in geothermal energy power plants as well as unlicensed solar/wind energy in the Department of Renewable Energy Sources.

Ms. Saniye Keser,
Assistant Renewable Energy Expert, Ministry of Energy and Natural Resources

Saniye is an environmental engineer with a master's degree from the Middle East Technical University. She is currently pursuing her doctoral degree at the same department. She worked as a planning expert in a regional development agency in Turkey. Saniye is now an assistant energy and natural resources expert in DG Foreign Relations and EU, Ministry of Energy and Natural Resources of Turkey. Her main responsibilities are mainly in design and implementation of energy sector projects financed by IFIs.

Mr. Hasan Hepkaya,
Head of Project Finance Department, Turkish Industrial Development Bank

Hasan is the Department Head of Project Finance at Industrial Development Bank of Turkey (TSKB). Turkey's first private development and investment bank where he began his career in 2005.

He previously worked in the Corporate Loans Department before moving to the Project Finance Department in 2009. His practice focuses on project finance, public-private partnerships, infrastructure development, secured lending and structured finance.

He has participated in numerous energy, infrastructure, real estate development and acquisition finance endevours. He is also a Board Member of TSKB Real Estate Appraisal Company. Mr. Hepkaya graduated from Hacettepe University, Faculty of Business Administration and began his professional career as a specialist in Garanti Leasing.

1.2 INDONESIA

Mr. Heri Setiawan,
Head Sub Directorate of Risk Management for State Assets and Liabilities, Ministry of Finance

Heri joined the Ministry of Finance of Indonesia as junior staf in 1996, and promoted to the logistic bureau as junior manager in 2006. In 2007, he moved to the Indonesia Debt Management Office as a junior financial risk manager. In 2009, Heri was promoted to Deputy Director for debt strategy and portfolio until 2015. Since then, Mr. Setiawan has been the Deputy Director in State Financial Risk Managent Directorate managing sovereign ALM.

In his current position, Heri is responsible for managing sovereign balance sheet risk mitigation, fiscal risk from contingent liability including guarantee, and coordinate with SOE in the Ministry of Finance under the mandate of developing infrastructure and energy.

Mr. Setiawan graduated from the University of Lampung Indonesia in 1993 with bachelor degree in economic and from The George Washington University USA with Master of Science in Finance (MSF) degree graduated in 2002.

1.3 MEXICO

Mr. Enrique Nieto,
Director of Sustainable Projects, NAFIN

Enrique has worked for Nacional Financiera (Mexico's governmental development bank) for more than 25 years.

During this time, Mr. Nieto has accumulated a wealth of experience in the areas of international corporate and project finance, specializing in environmental, infrastructure and venture capital. From 2007, Mr. Nieto held the position of International Director of the Investment & International Banking Division and is currently Director for Sustainable Projects specializing in finance for renewable energy projects and has participated in financing projects for more than 2.0 GW in Mexico.

In 1994 Enrique was posted to London, England where he collaborated in establishing Nacional Financiera's London branch, heading up the team for treasury operations, developing money market, investment and funding activities and took over as General Manager from 1999-2005.

Mr. Nieto graduated in Industrial and Systems Engineering from ITESM, Mexico. He holds the U.K.'s Securities and Futures Authority's certificates in Securities and Futures and Options Representative, as well as a diploma from the London Business School's Investment Management Program.

DISCUSSANTS

Ms. Laurencia Karimi Njagi,
Sr. Energy Specialist, The World Bank Group

Laurencia is a seasoned energy sector expert with extensive experience in power sector reforms, utility governance and management and in public and private sector investments in sector development. She is a senior energy specialist with the World Bank based in Nairobi. Laurencia co-leads the Kenya energy program that includes policy dialogue, and investments in generation, transmission, distribution supply and access. Before joining the World Bank in 2013, she worked with the power utility, the Kenya Power & Lighting Company Limited for close to 20 years. She was KPLC's Company Secretary and part of the Company's top management team. She was responsible for among others, structuring, procuring and negotiating PPAs for generation capacity investments with the public and private investors.

Laurencia has contributed significantly to the development of Kenya's energy sector, and has been closely involved, policy, institutional and legislative reforms from 1997. She studied law at the University of Nairobi and at the Kenya School of Law.

Mr. Adonai Herrera-Martinez,
Sr. Manager, European Bank for Reconstruction and Development

Adonai has been the Energy Efficiency and Climate Change Senior Manager at the European Bank for Reconstruction and Development in Turkey since 2009.

His work includes the coordination of the sustainable energy activities of the Bank in Turkey, covering private sector investments, technical assistance to clients and policy dialogue to support the mainstreaming of resource efficiency and renewable energy. He co-led the development of the National Renewable Energy Action Plan (NREAP) for Turkey in collaboration with the Ministry of Energy and Natural Resources, and is currently leading EBRD's Early Stage Geothermal Development Support (PLUTO) and the Near Zero Waste (NØW) Programmes.

Adonai previously worked at UNDP in New York and Dakar and at the Emerging Energy Technologies group at the European Laboratory for Nuclear Research (CERN). He earned his Ph.D. in Nuclear Engineering from the University of Cambridge (UK) in 2004, in the topic of Transmutation of Nuclear Waste in Accelerator-Driven Systems. His interests focus on strategic and technical solutions to develop sustainable energy systems for emerging and developing countries. He also holds a MBA degree from INSEAD.

SESSION 2 | PANEL DISCUSSION THE GOVERNMENT AS A GEOTHERMAL PROJECT DEVELOPER

Moderator: Mr. Gevorg Sargsyan,
Global Lead for Clean Energy, The World Bank

Gevorg is the Global Lead for Clean Energy at the World Bank Group. He is responsible for renewable energy, energy efficiency and carbon capture and storage business lines. Mr. Sargsyan is also overseeing clean energy investments financed by various climate funds. During his 15 years of experience at the World Bank he has led energy and infrastructure programs in India, Russia, Sri-Lanka, Maldives, Armenia, and Georgia, and worked in a number of other countries in Europe, Asia and Africa.

Prior to joining The World Bank, he worked as a manager in various private and public sector organizations. He has been the author and co-author of a number of publications and papers in the area of clean energy and infrastructure finance. He has MS in applied math, and PhD (abd) in economics.

2.1 ARMENIA

Mr. Hayk Harutyunyan,
Deputy Minister, Ministry of Energy and Natural Resources

Hayk currently holds the position of Deputy Minister for Energy and Natural Resources of Armenia. Previously, he worked as the project leader for the new nuclear power unit project in Armenia.

He has an Executive MBA Degree from Skolkovo School of Management (Russia); a Masters Degree in International Relations from Cambridge University (UK); a Bachelors Degree in Politics and International Relations from Lancaster University (UK) and IB Diploma from the Regent's School (Thailand).

He co-founded the Armenian British Business Chamber and served as chairman for 3 years. Hayk also served in the Armed Forces in various postings all the way up to the rank of Captain. He has authored a number of successful and failed start-ups in various sectors of economy. He strongly believes that the key to Armenia's development is the energy independence and that true independence can only be achieved through local and renewable resources and energy efficient economy.

2.2 DJIBOUTI

Dr. Jalludin Mohamed,
Technical Advisor, Geothermal Power Generation Project

Jalludin completed his PhD in Hydrogeology in 1993 at the University of Poitiers (France). He was recruited at ISERST since 1986 as hydrogeologist at the Earth Sciences Section. He became the head of the department of hydrogeology and hydrology in 1994. He is occupying the position of the General Director at CERD, Center for Studies and Research of Djibouti (ex ISERST), since 2002 under the authority of the Ministry of Higher Education and Research. Since 2014 he is designated cumulatively as Geothermal Expert for the multi-financiers Asal Rift geothermal project led by EDD, Electricity of Djibouti.

During his career he addressed various research topics: volcanic aquifers geometry and hydrodynamic properties, groundwater systems modeling, climate change impacts on groundwater, GIS applications for water well locations, groundwater recharges under arid climate, geothermal reservoir engineering...etc. He also addressed issues as water resources management and planning, water resources atlas, national scientific research planning...etc. Several surface studies of geothermal prospects in Lake Abhé, North-Goubhet and Obock were conducted under his supervision.

His work is published in more than twenty papers and international communications. He contributed widely as consultant in numerous projects at the national and regional levels dealing with water resources, environmental issues, capacity building, and, policy making and management.

Mr. Mohamed Chaari,
Director, Geothermal Power Generation Project

Mohamed became Director of Electricity of Djibouti in 2015. He is in charge of international project exploration geothermal Rift Asal in Djibouti and for carrying out the drilling deep wells for electricity production.

In 2013 he was appointed President Director General of the oil refinery responsible for the supply of all the Tunisian market in oil crude and finished products by local production and import. In 2006, Mohamed was Director of all the network high voltage of Tunisia (operation and maintenance). He later served as production manager and transportation of all the network gas Tunisia (treatment, development and purchase).

During his career he was responsible for several development projects infrastructures of electricity, gas and oil. He was also president and active member of several national and international organizations in the various fields of energy (electricity, gas and oil).

Mohamed earned his engineering degree in electricity and instrumentation in 1982. He has since worked to integrate the Tunisian society to electricity and gas, responsible for network production and electricity transmission (Dispatching).

2.3 EL SALVADOR

Arq. David Lopez Villanfuerte,
President, Grupo CEL

David is President of CEL Group of El Salvador since 2014. CEL´s generation branch produces 60% of the country's energy supply, of which 25% is geothermal energy.

He has been involved in geothermal development in El Salvador and Central America since the 80s, and actively participated in the development of five geothermal fields. This experience, coupled with his strategic leadership brought him to the position of Director of the Projects Division at LaGeo.

Mr. Lopez is well known in his native El Salvador as responsible for accelerating the development of new geothermal fields in the country, prioritizing geothermal energy in the National Energy Policy, in his role of President of the CEL Group. Thanks to this effort, the government has given him a strategic role in the economic and productive development of the country, and the energy sector.

2.4 ETHIOPIA

Mr. Sahele Tamiru Fekede,
Acting Director for Energy Study and Development, Ministry of Water, Irrigation and Electricity

Sahele is the focal person for major national initiatives concerning energy sector and sub-sector policy and strategy formulation and program review, as well as, monitoring developments in the sector, initiatives shaped by the country's commitments to a climate-resilient green economic development and access to sustainable energy for all.

Mr. Fekede is currently leading and coordinating the development of new legal and institutional frameworks for Ethiopia's geothermal energy sector. These works are expected to bring about the transformation of the geothermal energy sector into becoming one of the major renewable energy sources for power production in Ethiopia in the near future. He had previously served at the national electricity regulator, the Ethiopian Electricity Agency, as head of the Department of Electrical Works Control, responsible for the technical regulation of the electric power sector, including carrying out technical inspections of power plants and network components for compliance with safety and technical standards. Sahel began his career as a distribution engineer at the national electricity utility, the Ethiopian Electric Power Corporation. He holds an MSc degree in power engineering.

DISCUSSANTS

Mr. John Lagat,
Chief Geologist, Geothermal Development Corporation, Kenya

John has in depth and extensive knowledge spanning 23 years in Geothermal Energy Technology. He holds a BSc Degree in Geology from the University of Nairobi, and a MSc degree in Geology from the University of Iceland. John holds a post graduate Diploma in Geothermal Technology from the United Nation University, Geothermal Training Programme in Iceland. John has worked as an Exploration Geologist as both, Lead and Assisting Geologist in Kenya. He has coordinated and/or executed geological logging at the rig during exploration, appraisal and production drilling of geothermal wells in both, Olkaria and Menengai geothermal fields. Currently, John is the head of the Geothermal Resource Assessment Department responsible for exploration.

Mr. Lagat has authored and co-authored several papers presented in International Conferences

Ms. Amanda Lonsdale,
Sr. Geothermal Advisor, DFID-East Africa Geothermal Energy Facility

Amanda has over 15 years of experience in international development, project finance, private equity, and strategic advisory in US, Europe, and emerging markets. She has worked in geothermal for nearly a decade, initially with a geothermal developer/fund, GeoGlobal Energy, where she was responsible for deal sourcing and due diligence, project finance, and asset management. Amanda was the author of the Multi-Donor Strategy for Geothermal Development, sponsored by Power Africa. Currently, she is serving as a Geothermal Advisor for the East Africa Geothermal Reform (EAGER) project, sponsored by DFID, as well as a technical advisor to PLN (Indonesia) on geothermal PPA renegotiation.

Amanda holds an MBA in Finance and Entrepreneurship from The Wharton School, and an MA in Southeast Asia Studies from the Johns Hopkins School of Advanced International Studies (SAIS). She is a frequent guest lecturer in energy project development and finance at Georgetown University and the International Law Institute.

SESSION 3 | PANEL DISCUSSION THE GOVERNMENT AS A CO-FINANCIER OF GEOTHERMAL PROJECTS

Moderator: Mr. Jens Wirth,
Sr. Project Manager, KfW

Jens is KfW's Energy Sector Lead for South America and has among else lead the structuring of the Geothermal Development Facility (GDF) for Latin America as the first multi-donor initiative to promote geothermal energy on a continental level.

He has worked on a variety of Geothermal, Wind, Solar PV and Concentrated Solar Thermal (CSP) projects across Latin America, South Africa, India and the MENA region. His previous work experience includes working for the World Bank's Global CSP Program and as a Consultant for the energy sector in the Inter-American Development Bank's Mexico office. Jens holds a Masters Degree in Economics and Finance from Johns-Hopkins University SAIS in Washington, D.C. and a Masters Degree in Politics and Economics from Freie Universität Berlin.

3.1 DOMINICA

Amb. Vince Henderson, Permanent Representative to the United Nations and the Chairman of the Geothermal Deal Team

His Excellency Dr. Vince Henderson is the Permanent Representative and Ambassador of the Commonwealth of Dominica to the United Nations in New York.

Dr. Vince Henderson has been the Permanent Representative and Ambassador of the Commonwealth of Dominica to the United Nations in New York since March 2010. He is the chairman of SIDS Dock, a sustainable energy initiative for Small Island Developing States (SIDS), since 2011. SIDS DOCK has a membership of 31 Small Island Developing States (SIDS). Dr. Henderson is also the chairman of the Government of Dominica Geothermal Energy Development and Negotiations Team.

Dr. Henderson was elected to the Parliament of the Commonwealth of Dominica for two consecutive terms in 2000 and 2005. During that time he also served as Minister of Housing and Physical Planning; Agriculture and the Environment; Education, Human Resource Development, Sports and Youth Affairs; and Foreign Affairs, Immigration and Labour.

Dr. Henderson holds a Doctor of Law and Policy degree from Northeastern University in Boston, Massachusetts, USA. He also holds a LLM (master of laws) degree, an LLB (Hons) (Bachelor of Laws), a Bachelor of Science degree in Computer Science and a Diploma of Education.

3.2 NICARAGUA

Mr. Ernesto Martinez-Tiffer, Minister and Executive President, ENEL

Ernesto has been the Minister-President of the Nicaraguan Electricity Company (ENEL), since 2007. He graduated as a chemical engineer at the Jesuit University of Guadalajara, Jalisco, Mexico ITESO (Institute of Higher Studies of the West Technology) in 1971 .Since 1974 assumed responsibility for the geothermal development of Nicaragua.

In 1975 he specialized in geothermal energy in Italy and has been responsible for research, drilling, construction and development of Momotombo geothermal field where there are currently 2 units of 35 MW each and a plant binary cycle 7 MW. Ernesto also initiated investigations and drilling geothermal field San Jacinto Tizate, where there are currently 2 units of 36 MW each. He has also worked on geothermal development in Nicaragua and has done work for international financial institutions such as The World Bank, and in Costa Rica and Djibouti in alternative energy sources.

3.3 KENYA

Mr. Cyrus Karingithi, Assistant Manager Resource Development, KenGen

Cyrus is Acting Manager, Infrastructure and Resource Development at Kenya Electricity Generating Company Ltd (KenGen). He works at the Olkaria Geothermal field, Africa's first & largest geothermal project. He has extensive experience in geothermal systems having worked in Olkaria for twenty eight (28) years rising through the ranks from Graduate Geochemist to Ag. Manager Infrastructure and Resource Development. Cyrus has contributed immensely to the growth of geothermal power in Kenya, from 45 MW to 612MW present and near additional future projects of up to 350MW.

Mr. Karingithi earned his MSc (Geology) from the University of Iceland, Iceland; a BSc (Chemistry) from University of Nairobi, Kenya; a Post Graduate Diploma in Geothermal Technology from University of Auckland, New Zealand and is a United Nations University – Geothermal Training Programme Fellow (2000). He has published widely and his works can be reviewed in the www.geothermal.org, www.unugtp.is and other websites.

DISCUSSANTS

Mr. Mariano Gonzalez Serrano, Sr. Energy Specialist, The World Bank

Mariano's expertise spans from integration of Conventional and Non-Conventional technologies in Power Systems, System Planning, Renewable Energy and Energy Efficiency to Legal and Regulatory Reforms, M&A, and Reorganization Processes. Prior to joining the World Bank, he developed his professional career in the private sector working for a major international power utility and a relevant Renewable Energy developer before shifting to the banking sector at the European Investment Bank.

Mariano has lead the development and implementation of renewable energy projects and M&A operations in the power sector; origination activities and due diligence processes in the banking sector; and advised on reorganization processes and produced sector-analysis papers. He has participated and lead operations in Europe, Latin America, Asia and Africa. Mariano holds a Masters´ Degree in Energy Engineering from Universidad Carlos III de Madrid, a Master´s Degree in Business Administration from Universidad de Educación a Distancia de Madrid, and an Executive MBA from IE Business School.

Mr. Daniel Shepherd, Sr. Operations Officer, International Finance Corporation

Daniel (Dan) is the Energy & Resource Efficiency Lead in IFC's Advisory Services in Africa. Dan joined IFC in May 2010 and has worked across the Latin America and the Caribbean (LAC) and the Sub-Saharan African (SSA) regions. His expertise includes energy efficiency, renewable energy, energy access, and broader energy and climate change engagements, with a particular emphasis on finance. Dan has more than 20 years of experience including leading the development of clean technology investment funds and clean energy projects.

Current work includes direct support for resource efficiency and renewable energy solutions for companies in a variety of sectors. Prior to that, he led IFC's Advisory Services work related to Sustainable Energy Finance (SEF) in the LAC region. Work included programmatic approaches to support the development of sustainable energy markets in different countries and direct advisory support to financial institution clients. Developed specific initiative focused on access to clean energy in low-income communities and led the green buildings work in the LAC region. Dan has Masters Degrees in Environmental Studies and in International and Development Economics from Yale University.

WRAP-UP AND PROGRAM OF DAY 2

Mr. Pierre Audinet
Clean Energy Program Team Leader, ESMAP, The World Bank

INTRODUCTION TO DAY 2

Mr. Thráinn Fridriksson, Geothermal Specialist, ESMAP, The World Bank

Thráinn is a geothermal geochemist by training. Before joining ESMAP/World Bank, Thrainn worked at Iceland GeoSurvey (ÍSOR) for 11 years. At ÍSOR his tasks included conventional geothermal geochemistry applied to production monitoring and exploration. During this time he led research projects on natural CO_2 emission geothermal fields in Iceland. He was also responsible for project management, training and technical coordination of projects for the Icelandic Agency for International Development (ICEIDA).

Soon after joining ESMAP, Thráinn became the first author of an Interim Guidance Note addressing Greenhouse Gases from Geothermal Power Production for World Bank projects. He also provides technical support to other Task Teams working on geothermal projects at the World Bank, such as in Turkey, Armenia, Ethiopia, Kenya and Fiji. Thráinn holds a BS degree in geology from the University of Iceland and a Ph.D. degree in geochemistry and mineralogy from Stanford University.

LECTURE | DEVELOPMENT OF STANDARDS FOR GEOTHERMAL RESOURCE CLASSIFICATION—AN UPDATE

Mr. Horst Rüter,
Managing Director, IGA Service GmbH

Horst is the principal of HarbourDom GmbH, a geophysical research and consulting company in Dortmund, Germany. He is retired from DMT, the leading German geophysical contractor where he headed the geosciences department and introduced professional exploration in the German coal industry.

Rüter has published more than 50 scientific papers including text books. He is vice-president of the German Geothermal Association and director of the IGA Service Company. He has received several international awards including SEG's Special Commendation Award and EAEG's Schlumberger Award for his contribution to the development of 3D seismic methods. Mr. Rüter is a part time lecturer at the Ruhr University and the University of Applied Science in Bochum, Germany.

SESSION 1 | CLINIC INCREASING THE VALUE OF GEOTHERMAL RESOURCES

Moderator: Mr. Efstratios Tavoulareas,
Sr. Energy Advisor, International Finance Corporation

Stratos is a Sr. Energy Advisor for the International Finance Corp (IFC) with 35 years of experience in the power sector worldwide. He is the Thematic Lead on Power Technologies including generation, transmission and distribution; generation includes: conventional, renewables and hydro. Stratos has worked as a design engineer in power generation, as well as development and commercialization of new technologies. He has extensive experience in project assessment, planning, financing and implementation. On the power sector, Stratos has extensive experience in power system planning, policy formulation and investment strategy, as well as environmental policies, environmental-social assessments and carbon financing. He has worked worldwide, especially in Eastern Europe, Former Soviet Union countries, Asia, Africa and North America.

Stratos has a BA in mechanical and electrical engineering from the National Technical University of Athens, Greece; an MS in mechanical engineering from New York University (NYU-Poly); and MS in management from Rensselaer Polytechnic Institute.

1.1 OVERVIEW OF DIRECT GEOTHERMAL APPLICATIONS AND USES WORLDWIDE

Mr. Árni Ragnarsson,
Engineer, Iceland GeoSurvey

Árni is a Senior Engineer at ISOR (Iceland GeoSurvey). He has a Ph.D. degree in Mechanical Engineering from the Norwegian Institute of Technology and has been working in the geothermal industry since 1987. His main expertise is geothermal utilization and engineering technologies, both electricity generation and direct heat applications.

Prior to his work at ISOR he was Head of the Energy Statistics and Analysis Division of Orkustofnun (National Energy Authority of Iceland) 1997–2005 and the Executive Director of IGA (International Geothermal Association) 2006–2010. This included international cooperation as well as management of a GeoFund program that IGA implemented for the World Bank. He has been a member of the IGA Board of Directors since 2010 and is now serving as the Secretary of IGA. Árni has been an instructor at the UNU Geothermal Training Programme in Iceland since 1991, and lecturer on direct utilization of geothermal energy at the University of Iceland and Reykjavik University.

1.2 HEATING, COOLING AND DRYING USING GEOTHERMAL ENERGY

Mr. Thorleikur Jóhannesson,
Mechanical Engineer, Verkís

Thorleikur is a geothermal expert with over 20 years of experience as a mechanical engineer and project manager. He has extensive experience in geothermal district heating, and multiple use of low temperature geothermal energy and, over the last decade, he worked as an expert in steam field and power plant equipment. He started his career at Verkís with the design of the Nesjavellir heat main focused on optimized utilization of geothermal resources and has since been involved as a geothermal expert and project manager on projects, both in Iceland and in Kenya, USA, China, Turkey, Indonesia, Ethiopia and Portugal.

Thorleikur has in-depth experience in preparation of feasibility studies, process design, preliminary and detailed design, design review, technical assistance during procurement, technical reviews and tender evaluation, site supervision, support during commissioning and testing as well as support to operators for the operation of geothermal power plants and district heating systems. Thorleikur is also a part time lecturer in the post-graduate program at the University of Iceland and in the United Nations University Geothermal Training Program. He graduated with a Mechanical Engineering degree M.Sc. from the Technical University of Copenhagen (DTH).

DAY 2 *(continued)*

1.3 HS ORKA RESOURCE PARK, SOCIETY WITHOUT WASTE

Ms. Kristín Vala Matthíasdóttir,
Vice President Resource Park, HS Orka

Kristin Matthíasdóttir is the Vice-President of Resource Park at HS Orka, the third largest power company in Iceland. She is also the chairman of the Iceland Geothermal Association. Vala earned a M.Sc. degree in Chemical Engineering from University of Lund, Sweden, and B.Sc degree in Chemical Engineering from University of Iceland. Prior joining HS Orka Kristín, Vala worked for Magma Energy Iceland, Geysir Green Energy and Enex.

1.4 GEOTHERMAL WELL HEAD UNITS

Ms. Elín Hallgrímsdóttir,
Mechanical Engineer, Mannvit

Elín is an engineer specialized in the mechanical engineering of geothermal power plants. She is a Professional Engineer and member of VFÍ the Association of Chartered Engineers in Iceland. Mrs. Hallgrímsdóttir has extensive experience in that field and has for the past several years been the project manager at Hellisheidi power plant. In addition, she has 10 years of experience in process design and process description, preparation of international tender documents, evaluation of tenders and Client´s engineer support, i.e. civil contractor selection and contract negotiations for mechanical equipment.

Ms. Hallgrímsdóttir has recently been part of the engineering consulting team for the 4x45 MW geothermal power project in the North-East of Iceland being developed by Landsvirkjun. Her fields of specialization include planning, designing, supervision of mechanical systems (including steamfield and power plant), process equipment and district heating systems based on geothermal energy. She has extensive experience in geothermal projects in Iceland and internationally, including projects in Kenya and Chile.

1.5 FIRST RESULTS OF GEOCAP STUDIES OF THE POTENTIAL OF GEOTHERMAL DIRECT USE IN WESTERN JAVA AND OF LOW ENTHALPY GEOTHERMAL ELECTRICITY TO REPLACE DIESEL FIRED GENERATORS

Mr. Guus Willemsen,
Manager Business Development, IF Technologies

Guus is one of the founders of IF Technology. IF is a geothermal consulting and engineering company employing 65 people with a long track record in geothermal energy in The Netherlands, and internationally. Guus is also one of the initiators of the GeoCap program.

The Geothermal Capacity Building Program—Indonesia-Netherlands (GEOCAP) is an international collaboration between Indonesian and Dutch entities with the goal to develop intimately linked geothermal programs for education and training, research and subsurface databases.

SESSION 2 | CLINIC MANAGEMENT OF GEOTHERMAL GASES

Moderator: Mr. Adonai Herrera-Martinez,
Sr. Manager, European Bank for Reconstruction and Development

2.1 GASES IN GEOTHERMAL FLUIDS AND EMISSIONS FROM GEOTHERMAL POWER PLANTS

Mr. Thráinn Fridriksson,
Energy Specialist, ESMAP, The World Bank

2.2 GEOTHERMAL GAS MANAGEMENT AT HELLISHEIDI POWER PLANT

Ms. Hólmfrídur Sigurdardóttir,
Head of Environmental Affairs, Reykjavik Energy

Holmfridur joined Reykjavik Energy in 2007 as a project manager for the innovative Hellisheidi natural laboratory project on mineral carbon dioxide storage into basalts.

Holmfridur is currently the head of environmental affairs of Reykjavik Energy and subsidiaries. Reykjavik Energy is a public utility company providing electricity, geothermal water for heating, and cold water for consumption. The service area extends to 20 communities, covering 67% of the Icelandic population. Holmfridur is currently a board member of ON Power.

Before joining the field of geothermal energy and innovation, Holmfridur had a career in environmental topics management through various positions in the public sector. She was, among others director of the environmental division at the Icelandic Planning Agency, responsible for the administration and implementation of the Environmental Impact Assessment Act (EIA). Holmfridur holds a master's degree in biology and an MBA from the Reykjavik University.

2.3 ACADEMIC STUDIES RELATED TO CARBFIX AND SULFIX

Dr. Sigurdur Reynir Gíslason,
Research Professor of Geochemistry, Institute of Earth Sciences, University of Iceland

Sigurdur is a research professor at the University of Iceland's Institute of Earth Sciences. His main scientific contributions are: 1) measuring the chemical and physical erosion rates of basaltic terrains and their role in the global carbon cycle; 2) quantifying the carbon storage potential of basaltic rocks; 3) measurement of the dissolution rates and dissolution mechanisms of volcanic glasses and minerals as a function of glass composition, aqueous solution composition and temperature; and 4) assessing the environmental pressure from volcanic eruptions.

Sigurdur earned his PhD in 1985 from the Johns Hopkins University, USA. Currently he serves on the board of directors of the European Association of Geochemistry and he is the chairman of the Scientific Steering Committee of CarbFix (carbfix.com), an international initative to store carbon in basaltic rocks. He has published a book on the global carbon cycle in Icelandic and he has published over 100 scientific articles in peer-reviewed international scientific journals.

SESSION 3 | CLINIC GEOTHERMAL DRILLING—CONTRACT STRUCTURE, PROJECT MANAGEMENT AND FINANCING

Moderator: Mr. Raihan Elahi,
Sr. Energy Specialist, The World Bank

Raihan is a Sr. Energy Specialist in the energy practice of the World Bank Africa Region covering several countries in eastern and southern Africa. He works closely with his clients to design projects considering country specific strengths. He has been involved with electricity generation projects using energy resources such as geothermal, solar, hydro and natural gas.

Raihan has worked in transmission projects interconnecting neighboring countries to promote regional integration and power trade. On general power systems, he has worked on renovation of existing power systems, efficiency improvements, access expansion, and others. Raihan has designed projects using Bank Guarantee and line of credits to promote private sector participation in the energy sector. He has effectively contributed in developing markets for off grid solar PV products to promote electricity access in rural areas through private sector.

3.1 OVERVIEW OF GEOTHERMAL DRILLING

Mr. Ari Stefánsson,
Project Manager Deep Drilling, HS Orka

Ari has eighteen years of experience in geothermal and mechanical engineering, design, and construction management. He has a worked as a project leader in tendering work for large geothermal projects and procurement for geothermal drilling operation. He wrote tender documents for geothermal drilling projects as well as negotiating geothermal drilling tenders and contracts. Mr. Stefansson has also supervised buying and selling drilling rigs and equipment for high temperature geothermal drilling. He has extensive experience as project manager and executive manager on different projects, geothermal drilling operations and geothermal development. He has knowledge of issues regarding environmental consideration and sustainability of geothermal sites.

Mr. Stefansson has experience working all over the world in geothermal areas like Iceland, Azores Islands, Menengai in Africa and Lighting Dock project in New Mexico USA.

He was previously with ID from 2004–2011. Started as project manager first year, 2005 I was Executive project manager and COO from 2007 to 2011. He was the CEO at GeoDrilling Iceland during 2011–2015.

Mr. Stefansson is currently a project leader for drilling operation for DEEPEGS Deployment of Deep Enhanced Geothermal System for Sustainable Energy Business. The DEEPEGS project is a four year project led by HS Orka, Iceland, in cooperation with other partners from Iceland, France, Germany and Italy.

3.2 PLANNING AND MANAGEMENT OF GEOTHERMAL DRILLING AT THEISTAREYKIR, NE ICELAND

Mr. Bjarni Pálsson,
Project Manager, Landsvirkjun

Bjarni is the manager of the Geothermal Department of the R&D Division of Landsvirkjun, the national power company of Iceland. As such, he is responsible for the geothermal power project portfolio of Landsvirkjun and exploration and drilling activity for the corporation. Landsvirkjun operates two power plants in Northeast Iceland and the 90 MW Theistareykir power plant is currently under construction, expected online in 2017.

Dr. Palsson has a PhD in petroleum engineering from Heriot-Watt University in Edinburgh. He has been involved in geothermal projects since 1996 and has been employed within the Landsvirkjun group since 2002. He has lectured internationally on various geothermal topics, such as preparation of bankable documents. Dr. Palsson is the past president of the Geothermal Association of Iceland and a board member of the International Geothermal Association (IGA) since 2010.

3.3 DRILLING CONTRACTOR AS A SOURCE OF EQUITY STAKE

Mr. Vilhjálmur Gudmundsson,
Director Business Development Latin America & Caribbean, Iceland Drilling

Vilhjalmur has spent over 10 years being engaged in geothermal developments internationally, mostly for Iceland Drilling Company (IDC). Being responsible of IDC international project marketing and sales for 8 years, until December 2012, he rejoined the company in February 2016.

Vilhjalmur has further been occupied as director in business development for Green Energy Geothermal (GEG) promoting Geothermal Wellhead Power Plants in the Caribbean and Latin America regions in the last three years. Vilhjalmur will continue working for GEG, promoting the power plants parallel to his work for IDC.

Concentrating on business development for both geothermal drilling projects and small geothermal power plants around the world, being responsible not only in marketing and sales, but also in tendering work and contract negotiation gives him a valuable overview of the service needed in geothermal development.

Prior to his work in the geothermal sector, Mr. Gudmundsson was a director of business development at the Trade Council of Iceland, having years of experience in international marketing projects, being responsible for marketing actions in Central and East European countries, Asian countries, Russia and in Chile.

Vilhjalmur has Cand Oecon Degree from University of Iceland and Master's Degree in International Business from Lund University in Sweden.

3.4 TECHNICAL AND MARKET BARRIERS TO COST EFFECTIVE GEOTHERMAL DRILLING_ CASE STUDY OF CHILE

Ms. Lilja Tryggvadóttir and Mr. Carlos Jorquera,
Mannvit Engineering

Lilja is a Mechanical Engineer, MSc, from KTH Royal Institute of Technology in year 2004. Since year 2004 Lilja has solely worked within the geothermal energy industry.

Lilja is experienced within feasibility studies, project management and preparation of bids and grant applications in geothermal energy. Prior to joining Mannvit Lilja worked with Enex as CTO and managed feasibility studies in Slovakia, Hungary and Germany in addition to other evaluations of and studies for projects at various stages. Lilja has in Mannvit participated as project manager, project coordinator and mechanical engineer in feasibility studies, technical due diligences and concept reports in e.g. Serbia, Iceland and Kenya. Lilja was the Project Coordinator for Mannvit in the EC funded GEOELEC project. Lilja currently holds the position of Technical Project Manager for the GRMF fund that is active in 11 countries at the East African rift and is the Mannvit Coordinator for the World Bank project named Technical Assistance for Geothermal Development in Chile.

Carlos is an Expert in the Energy Sector, with more than 10 years of experience in Chile, Europe and Latin America. Carlos has worked in the Geothermal Energy Industry since year 2007 starting his geothermal carrier in Iceland.

Background: MBA in Energy Economics from the University of Offenburg, Germany, and Industrial engineer from the Technical University Santa María in Chile.

In Chile, Carlos has dedicated the last 7 years to the geothermal business, managing the Icelandic company Geothermhydro, as Director of Planning and Development of Energía Andina (geothermal developer) and now as independent consultant representing the Chilean Geothermal Council in the technical working groups discussing the new Electricity Act that was presented to the senate at the end of year 2015 and as Sub Consultant for Mannvit in the World Bank project named Technical Assistance for Geothermal Development in Chile, among others activities in the Renewable Energy Sector.

CONCLUSION AND NEXT STEPS

Mr. Pierre Audinet,
Clean Energy Team Leader, ESMAP, The World Bank

LIST OF PARTICIPANTS

The final list of participants will be made available after the event has concluded.

Please visit our webpage at:
http://www.esmap.org/node/56664

CLEAN ENERGY PROGRAM

With global investment in clean energy experiencing rapid growth since 2004, developing countries are increasingly putting renewable energy (RE) and other low carbon energy sources center stage in their efforts to support economic growth and poverty reduction. Clean energy sources are attractive for many reasons, including supply diversification, increased energy independence, fostering new industries, reducing air and water pollution, and contributing to global efforts to reduce greenhouse gas emissions.

This has led to a surge in World Bank Group lending to low carbon energy projects, which was US$5.5 billion in 2012, and a corresponding increase in demand for the analytical work and technical assistance that ESMAP helps provide to support policy development and investment preparation in our client countries.

ESMAP is helping client countries to scale up clean energy investment by building consensus on priorities, supporting the development of a conducive policy environment, and facilitating the consideration of technical, financial and cross-sectoral options that go well beyond "business as usual."

Innovative features of the Clean Energy program:

- Energy and Climate Adaptation
- Global Geothermal Development Plan
- Low Carbon Development
- Renewable Energy Resource Mapping
- Renewable Energy Training Program
- Variable Renewable Energy Grid Integration Support Program

For learn more about the ESMAP Clean Energy Program, visit us at:
http://www.esmap.org/Clean_Energy

WORLD BANK GROUP

MINISTRY FOR FOREIGN AFFAIRS OF ICELAND

ESMAP
Energy Sector Management Assistance Program

AGENDA AT A GLANCE APRIL 25–26
HARPA CONFERENCE CENTER | ROOM SILFURBER B | REYKJAVIK, ICELAND

DAY 1 | MONDAY APRIL 25

08:00	**Registration and Coffee**
08:30	**Welcome Address**
08:45	**Opening and Update on the GGDP**
09:00	**Lecture:** Geothermal Markets, Financing and Technology Trends
09:30	**Lecture:** Evolution of Public Support Models for Geothermal Development in Iceland
10:15	**Coffee Break**
10:30	**Session 1 | Panel Discussion | The Government as a Guarantor In Early Project Development**
12:00	**Lunch**
14:00	**Session 2 | Panel Discussion | The Government as a Geothermal Project Developer**
15:30	**Coffee Break**
15:45	**Session 3 | Panel Discussion | The Government as a Co-Financier of Geothermal Projects**
17:30	Update on the Geothermal Development Fund for Latin America
17:45	**Wrap-up and Program of Day 2**

DAY 2 | TUESDAY APRIL 26

08:00	**Coffee**
08:20	**Introduction to Day 2**
08:35	**Lecture: Development of Standards for Geothermal Resource Classification—An Update**
09:00	**Session 1 | Clinic | Increasing the Value of Geothermal Resources**
11:00	**Coffee Break**
11:30	**Session 2 | Clinic | Management of Geothermal Gases**
12:45	**Lunch**
14:00	**Session 3 | Clinic | Geothermal Drilling—Contract Structure, Project Management and Financing**
16:00	**Conclusion and Next Steps**

ICELAND GEOTHERMAL CONFERENCE (IGC) | HARPA CONFERENCE CENTER | REYKJAVIK, ICELAND

18:00	**Welcome Reception FOR REGISTERED PARTICIPANTS ONLY** **Brand Awareness Exhibition** Contact: Ms. Rósbjörg Jónsdóttir, IGC