



Addis Ababa, Ethiopia – June 13th-14th, 2018

Best Practices in Geothermal Drilling

The Role of the African Union Code of Practice for Geothermal Drilling in Minimizing Risk, Maximizing Benefits and Improving Drilling Success.

A Short Course for Regulatory Compliance Agency Staff, Drilling Engineers, Cementing Engineers, Civil Engineers, O & M Teams, Production Teams, Health, Safety & Environment Teams, and Data Management Staff of Public and Private Developers currently operating in Ethiopia.

Context and Justification

The African Union Code of Practice for Geothermal Drilling brings together over 50 years of international experience in drilling, completion and testing of geothermal wells. It is designed as a guide to “**best practices**” in all aspects of geothermal drilling and if the recommendations provided are closely adhered to, will help ensure that geothermal wells are drilled in a manner that protects the environment and at the same time provides for the health and safety of personnel, regulatory staff, visitors and nearby inhabitants of the area. In addition, the Code sets out clear guidance as to data that should be acquired during drilling, logging and testing operations in order to ensure that such data becomes a key to making decisions relative to future drilling operations as well as contributes to the national geothermal data base of the country where the drilling takes place. Data obtained during and immediately after drilling, through well testing, provides critical understanding of the initial conditions of the system, and if not captured during drilling and testing operations is lost forever. Finally the Code provides guidance that should greatly improve drilling success thus significantly reducing the risks of ‘dry holes’ or unsuccessfully completed wells.

Course Objectives

The two-day course will cover the reasons that regulation of drilling operations is not only necessary from an environmental perspective as well as from the perspective of health and safety, but also extremely beneficial to public and private sector developers and will ultimately

lead to a better understanding of geothermal resources and how to best pursue geothermal development throughout the East African Rift region.

Risks associated with geothermal drilling will be covered in detail as will measures available to minimize such risks, improve drilling efficiency and operational HSE compliance.

Planning of data gathering programs, data acquisition requirements, and techniques and tools for data acquisition and data management will be covered together with the use of such data in the development and management of conceptual models that help guide subsequent drilling by providing critical information necessary for siting and targeting wells.

Finally, the development of a comprehensive and robust regulatory system for geothermal development will be outlined with an emphasis upon the provisions and use of the African Union Code of Practice for Drilling Geothermal Wells as a key to ensuring that best practices in geothermal drilling are employed. This will be done in the context of a regulatory framework that addresses all aspects of geothermal exploration, drilling, development and operation, and will include a discussion of a range of issues that should be considered in developing a regulatory framework for geothermal development.

Participants

The course is designed to meet the needs of those responsible for planning, carrying out drilling operations or regulating geothermal drilling activities. This includes, Directors of Geological Surveys, senior decision makers of Ministry of Energy, private as well as public sector developers, project managers, and drilling supervisors whom must comply with the provisions of national geothermal rules and regulations and *The African Union Code of Practice for Geothermal Drilling* as well as those responsible for ensuring that geothermal wells are drilled, completed and tested in a responsible manner. The course is also well designed to meet the needs of those providing legal and regulatory advice related to the development of regulatory frameworks in East African Rift countries.

Attendees will receive a certificate of attendance at the completion of the course.

Course Outline

- An introduction to the regulation of geothermal drilling and testing activities-minimizing risks and maximizing benefits through the employment of best practices.
- The role of BGR in the development of *The African Union Code of Practice for Geothermal Drilling*.
- Risks associated with geothermal drilling, testing and well operation.
- Data collection and best practices in data management as a key to achieving drilling success.

- How incorporation of drilling and testing data leads to better decision making relative to the siting, targeting and drilling of geothermal wells.
- The *Code of Practice* and how recommendations found therein contribute to minimizing risks during drilling and testing and maximizing the potential for successful well completion and operation.
- Development of a robust regulatory system for geothermal drilling and issues that must be considered in development of a comprehensive regulatory framework for all aspects of geothermal development.
- Why a sound geothermal regulatory framework serves to facilitate private sector involvement in geothermal development.

Instructors

Gordon Bloomquist, Ph.D. – Geothermal Specialist and Course Convener

Gordon is an internationally recognized geothermal expert who has been involved in education throughout his 40-year career in the geothermal industry. He retired from Washington State University in 2008 and since that time he has done extensive consulting for the World Bank, the German Development Bank (KfW), the African Union Commission (AUC), the United States Agency for



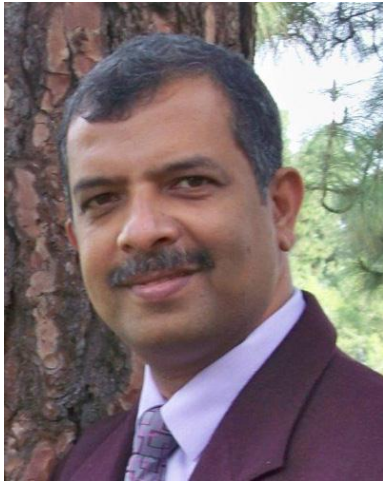
International Development (USAID) and the United States Energy Association (USEA). He has worked to facilitate the implementation of geothermal risk mitigation facilities including the GeoFund, ARGeo and GRMF. He has provided consulting services on implementing geothermal drilling programs, legislative and regulatory issues, power generation, power purchase agreements and project planning and financing. Most recently Dr. Bloomquist participated in the drafting of a new Geothermal Law for Ethiopia (Geothermal Proclamation) and the implementing rules and regulations required by that law. Dr. Bloomquist convened and conducted two workshops on the need for comprehensive rules and regulations related to drilling of geothermal wells. He was then responsible for the revisions to the New Zealand Code of Practice that resulted in *The African Union*

Code of Practice for Geothermal Drilling. He has continued to emphasize the need for comprehensive adherence to the Code and has organized workshops at the 2016 ARGeo C-6 conference on the topic and workshops in Kenya and Djibouti to further provide guidance in Code adoption and adherence.

Dr. Bloomquist has convened numerous courses on regulation of geothermal drilling, geothermal financing, policy implementation, geothermal project development and management, mineral extraction from geothermal brines and direct uses of geothermal energy.

Dr. Bloomquist is a member of the International Geothermal Association, the Geothermal Resources Council and the International District Energy Association. He is a recipient of the GRC *Joseph W. Aidlin Award* and the *IDEA Public Service Leadership Award*.

Sam Abraham, M.Sc. – Petroleum Technology and M.S. - Engineering Management; Drilling Consultant



Sam has over 25 years of experience in the geothermal and oil and gas drilling industry, worked on drilling, exploration and appraisal wells in difficult circumstances such as shallow high pressure wells, underbalanced drilling, deep directional high pressure high temperature wells in Indonesia, New Zealand, Turkey, Hawaii, Caribbean Islands, Kenya and Ethiopia.

Sam has an in-depth understanding of well design, preparing drilling programs, preparing well cost budgets and EFE, permitting and logistics, drill on paper exercises, preparing end of well reports, lessons learnt and cost analysis exercises. He understands the risks associated with geothermal drilling projects, risk mitigation, improving drilling efficiencies and reducing non-productive or down time.

He brings a sound understanding of the safety practices and governmental regulations pertaining to drilling, and working as the project coordinator on-site during the drilling project. He has solidified his ability to be a valuable team leader and monitoring specialist of drilling systems, gas analysis and geological sample collection.

Sam performed drilling assessment reviews for the drilling projects in Kenya and also worked as the drilling instructor for the drilling engineering training module with USAID/EAGP training program. He has conducted OSHA drilling rig audits in Kenya for the Akira Geothermal Project in October and November 2015. He works as a short-term technical consultant for the World Bank and UNEP.

Sam was a key proponent of the need for a comprehensive Code of practice for geothermal drilling for East Africa. He participated in two workshops organized and convened by Dr. Bloomquist and was instrumental in seeing that the Code was made part of the AUC GRMF program. Sam introduced the *“The African Union Code of Practice for Geothermal Drilling”* at the African Union GRMF meeting on June 13, 2016 and has subsequently been an instructor at workshops held in conjunction with the ARGeo C-6 Conference and workshops organized to promote the adoption of the Code in Kenya and a workshop to be held in Djibouti in July of 2017.