

---

## ANN ROBERTSON-TAIT

---

### **PRESENT POSITION**

Business Development Manager / Senior Geologist

### **EXPERTISE**

- Integration of geoscientific and engineering analyses to solve resource development and management problems
- Development of conceptual hydrogeologic models of geothermal systems from multi-disciplinary data
- Estimation of resource capacity
- Interpretation of downhole data from geothermal wells
- Technical advisory services to geothermal developers
- Geothermal resource due diligence for project financing
- Risk analysis and mitigation
- Evaluation and development of Enhanced Geothermal Systems
- Evaluation and resolution of mission-critical issues in geothermal resource development
- Marketing and Business Development for a growing industry
- Integrated solutions packages for geothermal resource development

### **EDUCATION**

M.Sc. in Geology, University of Auckland (New Zealand), 1984 (Fulbright Scholar)

B.S. in Geology (Honors), Florida Atlantic University, 1981

Speaks and reads Spanish and French

### **EXPERIENCE**

#### ***GeothermEx, Inc., 1985-present***

Ann began her career at GeothermEx in the position of Geologist, then became Senior Geologist in 1992 and Business Development Manager in 2001.

In her technical work, she specializes in the integration of geological, geochemical, geophysical and well test data to develop conceptual models and estimate production capacities for numerous geothermal fields around the world. Examples include:

Olkaria, Kenya	Takigami, Japan
Menengai, Kenya	Tiwi and MakBan, Philippines
Krafla and Bjarnarflag, Iceland	Karaha - Telaga Bodas, Indonesia
Wairakei-Tauhara, New Zealand	Patuha and Dieng, Indonesia
Kawerau, New Zealand	Sorik Merapi, Indonesia
Amatitlán, Guatemala	Wilbur Hot Springs, California, USA
Zunil, Guatemala	Clear Lake / Sulphur Bank, California, USA
Cerro Prieto, Mexico	Raft River, Idaho, USA
Several geothermal fields in Nicaragua	Puna, Hawaii, USA
Chinameca, El Salvador	Mammoth (Long Valley), California, USA
Las Pailas – Borriquen, Costa Rica	Steamboat, Nevada, USA
Latera, Italy	Dixie Valley, Nevada, USA
Germencik, Turkey	The Geysers, California, USA
Kızıldere, Turkey	Desert Peak, Nevada, USA
Yanaizu-Nishiyama, Japan	Bradys Hot Springs, Nevada, USA
Uenotai, Japan	Roosevelt Hot Springs, Utah, USA

Risk analysis is another area of Ann’s expertise, and the reduction of risk is a critical element for expanding geothermal power production worldwide. In geothermal projects, the main risks are related to uncertainties about the resource, something that Ann has grappled with throughout her geothermal career. She has participated in several important analyses of geothermal resource risks, their impacts, and the methods and costs of risk mitigation, including:

- Geothermal risk mitigation projects in Turkey and Africa involving the application of Geothermal Well Productivity Insurance
- A geothermal risk mitigation project in Chile involving drilling support for early exploration wells (by the Interamerican Development Bank)
- A detailed analysis of the efficacy of different support mechanisms and incentives to catalyze and/or accelerate the pace of geothermal development in different countries to demonstrate how, when and why different strategies have been effective, thus providing options for “new” geothermal countries to develop and implement risk mitigation strategies of their own (for World Bank)

Other pertinent experience includes:

- As an elected Board Member of the Geothermal Energy Association (the Washington, DC-based organization representing the US geothermal industry), guidance on research

initiatives and State and National policy decisions affecting geothermal development in the United States

- Advisory services to several geothermal developers on general and specific issues that they face, including exploration, resource supply, environmental compliance and business development
- Technical due diligence of geothermal resources for numerous investors and financiers
- Lead investigator and manager of technical investigations for Enhanced Geothermal Systems (EGS) projects in Nevada, Alaska, New Mexico, Arizona and the United Kingdom, including specialized logging programs, geological and geophysical evaluations, well stimulation programs and management of associated research projects
- Co-author of a protocol for induced seismicity in EGS projects
- Evaluation of induced seismicity, productivity decline trends and assessment of injection benefits at The Geysers steam field, California
- Provision of expert witness testimony for resource consenting in New Zealand
- Evaluation of historical production and drilling data from various geothermal fields in Indonesia, The Philippines and the United States
- Resource-related support to firms preparing environmental evaluations of specific geothermal projects and to government agencies undertaking general or regional analyses of environmental impacts associated with geothermal development (*e.g.*, the Programmatic EIS for geothermal development on public lands in the western United States)

***Research Associate, Ministry of Works and Development, Taupo, New Zealand, 1984***

- Compilation, conversion and analysis of 25 years of leveling survey data from the Wairakei field to develop an accessible, organized database
- Use of geodetic computer programs for coordinate transformation and survey network adjustment

***Associate Hydrogeologist, South Florida Water Management District, 1982 – 1983***

- Pump test analysis for water wells
- Water sampling and mapping for salt water intrusion monitoring program
- Compilation and analysis of long term water-use data from agricultural, municipal and industrial users

**AFFILIATIONS**

Geothermal Energy Association (Board Member)

Geothermal Resources Council

International Geothermal Association

## **CITIZENSHIP**

USA

## **PUBLICATIONS**

An Evaluation of Risk Mitigation Approaches for Geothermal Development. Proceedings, World Geothermal Congress, 2015 (lead author).

Protocol for Addressing Induced Seismicity Associated with Enhanced Geothermal Systems. U.S Department of Energy publication No. DOE/EE-0662, January 2012 (co-author). This report can be downloaded here:

[http://esd.lbl.gov/FILES/research/projects/induced\\_seismicity/egs/EGS-IS-Protocol-Final-Draft-20120124.PDF](http://esd.lbl.gov/FILES/research/projects/induced_seismicity/egs/EGS-IS-Protocol-Final-Draft-20120124.PDF)

The US Geothermal Industry – Status, Drivers and Technology. Proceedings, 4th African Rift Geothermal Conference (ARGeo-C4), Nairobi, Kenya, 2012 (co-author).

Hydraulic Stimulation of Well 27-15, Desert Peak Geothermal Field, Nevada, USA. The 37th Stanford Geothermal Workshop, Stanford University, California, February 2012 (co-author).

Lithologies, Hydrothermal Alteration and Rock Mechanical Properties in Wells 15-12 and BCH-3, Bradys Hot Springs Geothermal Field, Nevada. Transactions, Geothermal Resources Council, 2011 (co-author).

EGS Stimulation of Well 27-15, Desert Peak Geothermal Field, Nevada. Transactions, Geothermal Resources Council, 2010 (co-author).

Feasibility Evaluation of an “In-Field” EGS Project at Desert Peak, Nevada, USA. Proceedings, World Geothermal Congress, Bali, Indonesia, 2010 (co-author).

Rock Mechanical Testing and Petrologic Analysis in Support of Well Stimulation Activities at the Desert Peak Geothermal Field, Nevada. The 35th Stanford Geothermal Workshop, Stanford University, California, February 2010 (co-author).

Tracer Testing at the Desert Peak EGS Project. Transactions, Geothermal Resources Council, 2009 (co-author).

Borehole Image Analysis and Geological Interpretation of Selected Features in Well DP 27-15 at Desert Peak, Nevada: Pre-Stimulation Evaluation of an Enhanced Geothermal System. The 34th Stanford Geothermal Workshop, Stanford University, January 2009 (co-author).

Stratigraphic and Structural Relationships in the Desert Peak Geothermal Reservoir, Nevada: Pre-Stimulation Characterization of EGS Reservoir Rocks. The 34th Stanford Geothermal Workshop, Stanford University, January 2009 (co-author).

Managing Geothermal Resource Risk – Experience from the United States. Workshop on Geological Risk Insurance, World Bank Geofund Program, Karlsruhe, Germany, November 2008 (lead author).

Cost of Electricity from Enhanced Geothermal Systems. The 32nd Stanford Geothermal Workshop, Stanford University, California, January 2007 (co-author).

Is EGS Commercially Feasible? Transactions, Geothermal Resources Council, 2007 (co-author).

Evaluation of Oil-Industry Stimulation Practices for Enhanced Geothermal Systems: Lessons Learned from the Barnett Shale. Transactions, Geothermal Resources Council, 2005 (co-author).

The Desert Peak East EGS Project: A Progress Report. Proceedings, World Geothermal Congress, 2005 (lead author).

An Analysis of Power Generation Prospects from Enhanced Geothermal Systems. Proceedings, World Geothermal Congress, 2005 (co-author).

Fracture Permeability Evolution in Rock from the Desert Peak EGS Site. Transactions, Geothermal Resources Council, 2004 (co-author).

A Numerical Simulation Study of the Performance of Enhanced Geothermal Systems. The 29<sup>th</sup> Stanford Geothermal Workshop, Stanford University, California, January 2004 (co-author).

Geothermal Energy Resource Assessment on Military Lands. The 29<sup>th</sup> Stanford Geothermal Workshop, Stanford University, California, January 2004 (co-author).

Selection of an Interval for Massive Hydraulic Stimulation in Well DP 23-1, Desert Peak East EGS Project, Nevada. The 29<sup>th</sup> Stanford Geothermal Workshop, Stanford University, California, January 2004 (lead author).

Stratigraphic Relationships in Mesozoic Basement Rocks at the Desert Peak East EGS Area, Nevada. The 29<sup>th</sup> Stanford Geothermal Workshop, Stanford University, California, January 2004 (co-author).

Progress and Future Plans at the Desert Peak East EGS Project. Transactions, Geothermal Resources Council, 2003 (lead author).

Geologic Characterization of Pre-Tertiary Rocks at the Desert Peak East EGS Project Site, Churchill County, Nevada. Transactions, Geothermal Resources Council, 2003 (co-author).

Injection Testing for an Enhanced Geothermal System Project at Desert Peak, Nevada. Transactions, Geothermal Resources Council, 2003 (co-author).

Desert Peak East, Nevada: a Step Toward EGS Commercialization in the Basin and Range. Transactions, Geothermal Resources Council, 2002 (lead author).

Mitigation of Cyclic Production Behavior in a Geothermal Well at the Uenotai Geothermal Field, Japan. Transactions, Geothermal Resources Council, 2002 (co-author).

A New Geothermal Resource Map of Nicaragua. Transactions, Geothermal Resources Council, 2001 (co-author).

A Case History of Numerical Modeling of a Fault- Controlled Geothermal System at Beowawe, Nevada. Proceedings of the 26th Stanford Geothermal Workshop, Stanford University, California, January 2001 (co-author),

Assessment of Steam Supply for the Expansion of Generation Capacity from 140 to 200 MW, Kamojang Geothermal Field, West Java, Indonesia. Transactions, Geothermal Resources Council, 2000 (co-author).

Potential Sites and Experiments for Enhanced Geothermal Systems in the Western United States. Proceedings of the World Geothermal Congress, 2000 (co-author).

Utility of the Data Gathered from the Fenton Hill Project for Development of Enhanced Geothermal Systems. Proceedings of the World Geothermal Congress, 2000 (lead author).

Recovering More Geothermal Energy: DOE's Enhanced Geothermal Systems Initiative. Transactions, Geothermal Resources Council, 1999 (co-author).

Potential for "Enhanced Geothermal Systems" in the Western United States. Proceedings of the 4<sup>th</sup> International Hot Dry Rock Forum, 1998 (lead author).

A Hydrogeological and Geochemical Model of the High-Temperature Geothermal System of Amatitlan, Guatemala. Transactions, Geothermal Resources Council, 1996 (co-author).

The Nature and Occurrence of Geopressured Resource Areas in the State of California. Proceedings of the World Geothermal Congress, 1995 (co-author).

A Survey of Potential Geopressured Resource Areas in California. Stanford Geothermal Workshop, Stanford University, California, January 1993 (co-author).

Heat Source and Fluid Migration Concepts at the Uenotai Geothermal Field, Akita Prefecture, Japan. Transactions, Geothermal Resources Council, Volume 14, 1990.

Stratigraphic and Structural Controls of the Occurrence of Steam at The Geysers. Transactions, Geothermal Resource Council, Volume 13, 1989 (co-author).

An Integrated Approach to Conceptual Modeling of Geothermal Reservoirs. Japan International Geothermal Symposium, 1998 (co-author).

Development of Low-Temperature Geothermal Reservoirs for Commercial Power – the US Experience. Japan International Geothermal Symposium, 1998 (co-author).

Analysis of Subsurface Compaction and Subsidence at Wairakei Geothermal Field. Proceedings of the 6th New Zealand Geothermal Workshop, University of Auckland, 1984 (sole author).