



THINK GEOENERGY

M A G A Z I N E



2

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COUNTRY FOCUS:
ICELAND

A

AFFAIRS

Associations and industry clusters, the World Geothermal Congress and the Mexican Geothermal Center

B

BUSINESS

Blue Lagoon as successful model for geothermal spas, and binary plants as reliable power solutions

C

COUNTRY FOCUS

Focus on Iceland, a role model for the utilization of geothermal energy beyond power generation

D

DEVELOPMENT

Kick-starting geothermal development in Latin America through new policies and risk mitigation efforts

E

ENGINEERING

Improving exploration to reduce risk, geothermal education, wellhead power plants, and database projects in the U.S.

F

FINANCE

Merger and acquisition trends within the geothermal industry

F

Geothermal M&A Trends

Baseload Power Generation via the Junior Resource Development Model

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While geothermal power plants ultimately function as sources of baseload electricity generation, the development of the resource and corresponding investment requirements have more in common with the junior mining and oil & gas sectors than traditional power development. Does merger and acquisition activity in the geothermal sector share a similar resemblance?

Geothermal power plants generate sustainable, baseload electricity, yet the investment required to develop these projects is fundamentally different from that required for other power generation projects. Unlike nuclear, coal, natural gas, or biomass, geothermal plants do not rely on fuel or feedstocks to power their turbines. And unlike hydro, the resource is not always visible to the naked eye.

Power generation investment decisions typically consider up-front construction costs, operating costs (e.g. fuel inputs), and overall feasibility, including proximity to transmission and distribution. While power developers and owners may seek to vertically integrate fuel supply with operation (via supply ownership, contract or hedge), the relationship between resource extraction and power generation is normally disaggregated.

Geothermal development is strikingly different from traditional utility development. While proximity to power consumption remains a key factor, proximity to an underlying resource with the right mix of heat, permeability and fluid characteristics is the driving force. The nature and timing of risk during the development cycle is also different. Assuming off-take is fully contracted at a fixed price, the key profit driver for most traditional power developers is fuel supply cost, which is ultimately determined many years following development. Even in high fuel price environments, investors are able to recoup a portion of their investment – the project is not a zero-sum risk.

With geothermal development, a project's greatest risks and return drivers tend to be concentrated in the early exploration stages. Significant effort, expenditure and expertise are required to determine



whether a targeted geothermal resource exists and possesses the characteristics to support a commercially viable power generation operation. If a resource turns out to be uneconomical, initial investment expenditures may be unrecoverable. But once a geothermal resource is established as viable, the costs and risks involved with building and operating a geothermal power plant become more predictable, and early-stage investors are rewarded with higher equity returns commensurate with the risk incurred.

The geothermal exploration stage shares many characteristics with other resource extraction industries, namely mining and oil & gas. The task of identifying and exploring potential resource deposits is expensive, time consuming and lacks certainty. Financing at these early stages is typically sourced from high-cost risk equity. Once the resource and feasibility of the project are

01 Ryan Libbey on project site in Central America (source: Adage Ventures)

proven, the production drilling, plant construction and operations can be financed at a lower cost of capital.

In the junior extraction industries, these characteristics have aligned investor risk profiles with project phase, and have created a common pattern of investment, partnership and acquisition. During the early stages of development, a junior developer, backed by risk capital, identifies and explores an extraction opportunity. Once project potential is proven, a senior, well-capitalized firm will invest to acquire a significant portion or all of the project, leveraging its size, expertise and balance sheet to bring the project to completion. This ecosystem aligns investors' risk tolerance and time horizons with project

phase; early stage investors can earn outsized returns over a moderate time horizon while patient investors can earn stable returns in exchange for a lower assumption of risk.

While the geothermal sector historically has provided a smaller pool of transactions relative to the mining or oil & gas sectors, a study of recent M&A activity has indicated that a similar pattern is emerging. A study of 16 geothermal M&A transactions - all but one of which occurred within the last four years - identifies three initial trends:

Early-Stage Investment - 10 of the 16 transactions occurred during the preliminary assessment and exploration drilling phases, before the project was considered “bankable.”

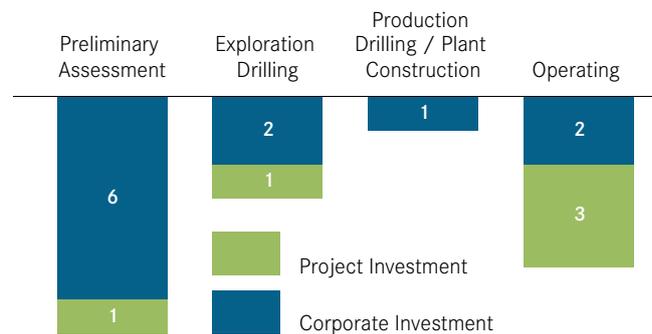
Strategic Investment - 13 of the transactions were initiated by established geothermal operators buying into projects developed by smaller companies with comparatively less utility-scale development and operational experience. All transactions in the preliminary assessment and exploration drilling phases fell into this category. The remaining three transactions involved institutional investors buying into established operators to access stable, long-term cash flows generated by their portfolio of projects.

Project Finance - All of the 11 most recent transactions were project-finance-based, with acquirers securing part or all of specific subsidiaries or concessions. Prior to 2011, several corporate level acquisitions took place, with transactions occurring at the parent company level.

While the sample size is small, the trend towards early-stage strategic investment closely parallels the “junior resource” model. In the geothermal context, junior and intermediate firms such as Alterra, Sierra Geothermal and Hot Rock have invested in early-stage activities to prove that a viable project exists. Senior firms like Enel, Ormat and Energy Development Corporation are then able to provide the capital, experience and credibility to take the project to bankability, secure debt financing and bring the project to operation. The junior firms are able to secure a development partner/acquirer; and the senior firms are able to leverage their scale and obtain further diversification of geography, resource type and development stage through a balanced portfolio approach.

Looking to the future, it is realistic to expect this “junior geothermal” trend to continue, increasing overall activity levels in the space. Moreover, ex-

GEOHERMAL M&A TRANSACTIONS BY PROJECT STAGE 1

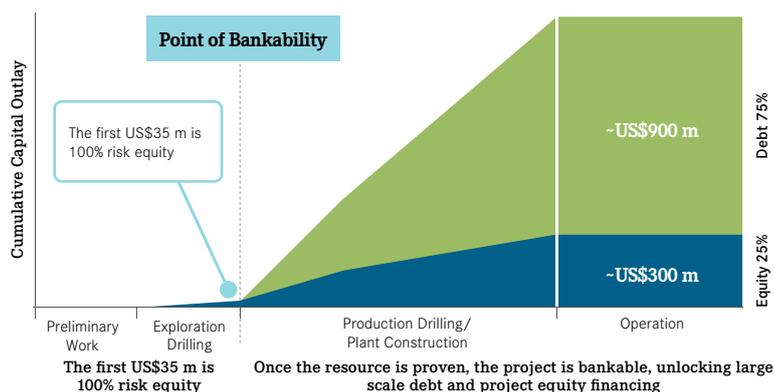


PLICITLY embracing this business model could reinvigorate risk capital investment in the geothermal sector. The geothermal industry is rife with pessimism over the scarcity of early-stage exploration financing. Despite the positive economic returns that geothermal projects generate, it is difficult to attract early-stage investors because of the zero-sum risk and long timelines. The “junior geothermal” model offers an enticing way to frame early-stage investment opportunities. Rather than asking investors to fund the high-risk components of a geothermal project and endure long development timelines, the “junior geothermal” model seeks risk capital to fund exploration, with the intent of pursuing profitable near-term returns for investors via project sale or partnership.

With much of the global geothermal resource low-hanging fruit already in development,

many future projects will target lower-enthalpy or blind resources. Proving these requires significant exploration efforts, which investors often perceive as higher risk, making capital more expensive. Meanwhile, global energy superpowers such as Chevron, EDF and Mitsubishi are solidifying their position in the sector, bringing their balance sheets with them. For smaller players, the “junior geothermal” opportunity is clear. Companies that can communicate this opportunity to risk capital investors and efficiently navigate the early stages of project development - acquiring land concessions, conducting effective resource exploration and evaluations, securing regulatory approval and local support, and negotiating off-take agreements - are positioned to create significant value for investors and catalyze new opportunities and investment across the entire value chain.

OVERVIEW OF GEOHERMAL PROJECT FINANCING STAGES 2



01 Geothermal M&A transactions by Project State (Chart: Adage Ventures)
 02 Overview of geothermal project financing stages (Sithe Global at Iceland Geothermal Conference 2013)

About Adage Ventures

Adage Ventures is a geothermal energy developer, accelerator and consulting firm focused on applying a dynamic and interdisciplinary approach to project assessment and execution. Adage is based in Toronto, Canada and consists of technical and business specialists with expertise across geothermal exploration, energy development, finance, strategy and international markets. - AL & DR ♦