Valuation of Geothermal Projects

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ABSTRACT

Investors are generally risk-averse towards geothermal development. Generally, the earlier the stage of development, the fewer the number of willing investors. In order to maximize project value, developers need to advance a project as far as possible through the development stages before approaching investors. Investors will not take on greater risk than their tolerance for higher returns. A new tool is available to standardize the measurement of risk and the range of returns associated with that risk - the Geothermal Reporting Code.

Geothermal Development Stages

If all goes well, geothermal development will take seven years to commissioning from the time of securing resource rights (Exhibit 1). Activities that can increase that time frame are permitting, drilling and financing. By the time the necessary work has been done to confidently begin a production well drilling program, 10% of the total project budget has been spent. In the exploration stage (secure rights, obtain permits, non-invasive testing), financing is usually from friends and family, angels and occasionally venture capital. Venture capital typically does not like long term, capital intensive projects such as power generation. Public and private equity markets sometimes invest at the gradient and slim-hole stage, but this comes and goes and, currently, it is rare. Industry JV partners at the gradient and slim hole stage are more common in today's markets.

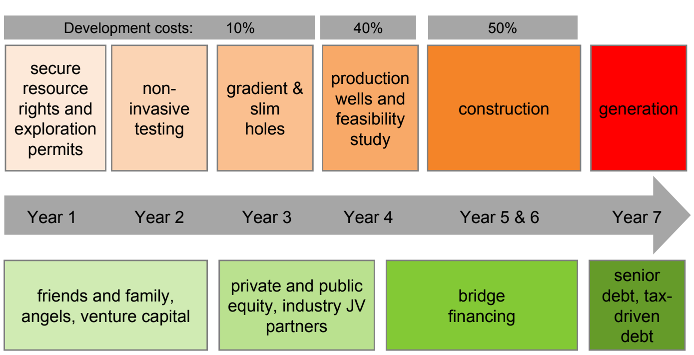

Exhibit 1. Geothermal Development Stages (Source: Jacob Securities).

It takes four years and 50% of the project budget to complete the production well drilling stage. In the current market, public and private equity typically waits until 40% of the production wells are successfully flow tested before investing. At the 40% production well drilled stage, knowledgeable and vested interests (turbine supplier, EPC contractor, JV partner) may advance bridge loans secured by ITC grants or a take-out debt structure of either senior loans or tax-driven equity-loans. Once the production well program is complete, construction finance is usually available from the eventual senior debt provider.

Thus, there is a scarcity of funding (sources and $size) for the earlier stages of development. As a project moves through the stages, and achieves milestones, the number of sources increases and with the increase, the expected return of the investor declines. In most cases it is not a matter of increasing the return to entice investors – until the project reaches the investor's risk tolerance, they are simply not interested.

The stages of risk that define the willing entry point by various sources of capital are best viewed in the context of the Canadian Geothermal Code for Public Reporting (http://www.cangea.ca/ccpr/). P90 estimates do not define the risk level - it says nothing about the work performed or even if a slim hole has been drilled. Without defining the risk level, a P90 report cannot lend itself to valuing a geothermal project as return is a function of risk.

The Canadian Geothermal Code for Public Reporting is modelled on the success of the mining National Instrument 43-101 code and the O&G National Instrument 53-101 code, both of which were designed to standardize terminology, testing methods, and the interpretation of results – the goal being to ensure that misleading, erroneous or fraudulent information relating to resource properties is not published and promoted to investors on the Toronto Stock Exchange. The use of reporting codes in mining and O&G are mandatory for public companies. Every jurisdiction has their own version of a reporting code (in the US it is called the SME Guide for Reporting Exploration Results) and the similarities are enough that many jurisdictions accept another's code in lieu of their own. The Geothermal Reporting Code was initiated in Canada because most of the independent geothermal companies developing sites in the US are listed on the Toronto Stock Exchange. Australia has more geothermal listings than Canada and so has a geothermal reporting code. Most jurisdictions's reporting codes were adopted in the 1990s.

We expect the Code to become mandatory for Toronto-listed companies. It is already used by regulatory bodies to review the issue of new shares on the Toronto Stock Exchange and companies are beginning to report their results in accordance with the Code's guidelines. The first company to report utilizing the Code is Magma Energy (now Alterra Power).

Staging of projects according to the Code is determined by a "Qualified Person" issuing an independent report. However, in the absence of an independent report we use rules of thumb: 1) a project does not have a Reserve until a feasibility study is issued which usually requires 40% of the production wells to be completed, 2) a project does not have a Resource until at least the gradient well program is complete, and 3) prior to gradient drilling the project is merely an exploration site and is neither a Reserve or Resource.

Exhibit 2 breaks our rules of thumb down further. The completion of the gradient program marks the status of Inferred Resource, completion of the slim-hole program is an Indicated Resource and the successful flow test of a production well is a Measured Resource. The MWs can vary by stage (and usually do) on the same project. Upon a feasibility study, a Resource becomes a Probable Reserve and when the project is commissioned it becomes a Proved Reserve. Each stage post-exploration represents a milestone of decreasing risk.

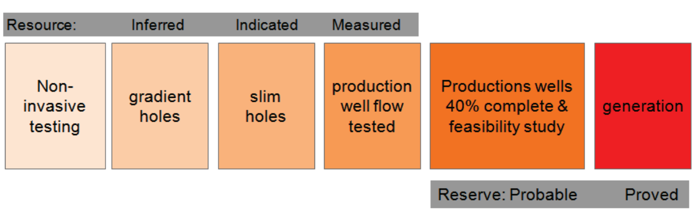

Exhibit 2. Geothermal Stages versus the Geothermal Reporting Code (Source: Jacob Securities).

Exhibit 3 depicts the investor risk-return relationship. If a project has an estimated IRR of 20% in the exploration stage, the investor will want a return of almost 20% because they are taking on as much risk as the developer. Simply securing rights and getting exploration permits is not creating very much value. If the developer managed to take the project to the commissioned stage a large utility may accept an IRR of 7% - this is still accretive to a utility with a cost of capital of 5% and the project has been de-risked of development issues leaving only operational issues. As the developer creates value by advancing the project through

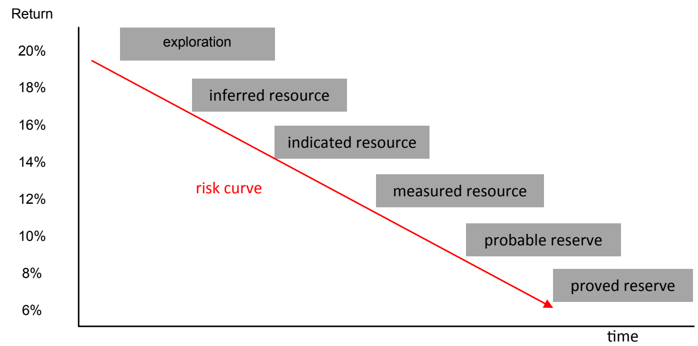

Exhibit 3. Risk & Return by Geothermal Reporting Code Stages (Source: Jacob Securities).

the progressive stages of the Geothermal Reporting Code, the risk declines and the investor is willing to accept a lower return (depicted below by a two point decline in IRR by stage).

Three Examples

There are three examples available to illustrate the risk-return relationship with the Geothermal Reporting Code. The examples are all project-level investments into developments owned by public companies. Unfortunately private companies usually do not disclose the structure of investments made by third parties into their projects. Further, public equity does not often invest at the project level instead preferring the liquidity of publicly listed paper. Private equity does not usually invest in geothermal projects until the project has been considerably de-risked to at least the Measured Resource stage (at least one production well flow tested).As such, our investment examples are from the emerging market of willing players including strategic JV partners (Ormat Technologies, Enbridge) and suppliers (TAS, SAIC).

Our first example is the investment made by Ormat into Crump Geyser Nevada, a project owned by Nevada Geothermal Power (Exhibit 4). Crump Geyser has undergone pre-production drilling and recorded high temperatures and permeability, including a prolific and active geyser.

The Deal: Ormat invests the next $15 million in drilling and thereafter the drilling cost is split 50/50. Nevada Geothermal can borrow up to $15 million from Ormat to fund its share. Ormat gets the turbine supply and EPC contract. Ormat gets 50% of the project. Nevada Geothermal had invested $1.7 million prior to the Ormat JV.

The Crump Geyser resource can be classified as either an Inferred Resource or Indicated Resource as it had no production wells prior to the JV. As Ormat enters in at an early stage we would expect Ormat to want close to the total project IRR. Assuming Ormat can drill exploratory wells and six production wells for $30 million, Ormat's share would be $22.5 million (the next $15 million plus half of the next $15 million) and Nevada Geothermal $7.5 million. A full share for Ormat would then be 75% (22.5/30); however, Ormat accepts 50% for two reasons: 1) legacy exploratory work has moved the project at least into the Inferred Resource stage thus slightly de-risked and 2) the turbine and EPC contracts are an incentive in an increasingly competitive market.

Our second example is the JV between US Geothermal and Enbridge. Enbridge is a $24 billion market cap energy distributor.

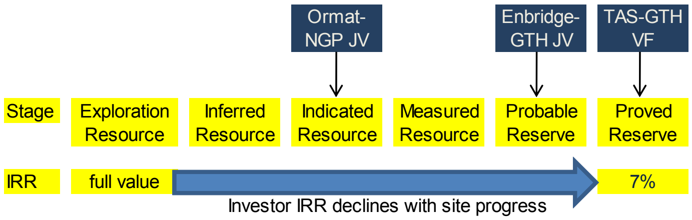

Exhibit 4. Three Examples (Source: Jocob Securities).

This is Enbridge's first foray into geothermal, although it owns over 800 MW of other renewable. The site is Neal Hot Springs in Oregon.

The Deal: Enbridge gets 20% of the project and 24% of the ITC grant for spending the next $24 million (up to). US Geothermal had spent $13m before the deal in completing two production wells.

With production wells, Neal Hot Springs can be considered a Measured Resource and possibly a Probable Reserve. Assuming the 35 MW project can complete drilling with the combined spend of $37 million, Enbridge's share would be 65%. However, Enbridge accepted 20% with a little extra on the ITC grant share. This is because US Geothermal had taken the greater risk proving up two production wells so Enbridge's risk is reduced considerably and hence its willingness to accept less return than US Geothermal. Enbridge likely backed into a low to mid teens IRR in settling on its 20% stake.

Our third example is again US Geothermal but with TAS Energy and SAIC (Science Applications International Corporation) as the partner. The project is San Emidio, Nevada.

The Deal: TAS and SAIC provide a $27m bridge loan to construct a new power plant. TAS supplies the turbine and SAIC is the EPC contractor. The interest rate on the bridge is 9.5% and the bridge will be repaid with senior debt after commissioning.

San Emidio is a Proved Reserve. The site currently operates at less than 4 MW on an aged turbine. The turbine will be replaced and increase the site's output to 11.5 MW without additional drilling. As a Proved Reserve, TAS and SAIC are willing to accept a low-end return for a de-risked asset. There is an inherent equity component to the deal as TAS warranties performance of a modular turbine in early commercialization stage and the loan amount is $2 million more than the installed turbine cost.

Conclusion

The IRR required by an investor is a function of the remaining project risk. Geothermal drilling has considerable risk. The risk is quantified by the stages of the Geothermal Reporting Code. An investor is unlikely to be enticed by an IRR that is commensurately higher than the risk taken on – the project either meets the investor's risk profile or it does not. In order to maximize their value, developers need to add as much value as they can by moving the project through the stages of the Code before approaching investors.