HOT ROCK LIMITED
Geothermal Projects in South America

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The information in this Statement that relates to Geothermal Resources has been compiled by Peter Barnett, an employee of Hot Rock Limited. Mr Barnett has over 30 years’ experience in the determination of crustal temperatures and stored heat for the style relevant to the style of geothermal play outlined in this release. He is a member of the Geothermal Resources Council and the International Geothermal Association, a current board member of the New Zealand Geothermal Association, a past board member of the Auckland University Geothermal Institute Board of Studies and a current member of the Economics Sub Committee of the Australian Geothermal Association.

Mr Barnett qualifies as a Competent Person as defined by the Australian Code of Reporting of Exploration Results, Geothermal Resources and Geothermal Reserves (2010 2nd Edition). Mr Barnett consents to the public release of this report in the form and context in which it appears. Neither Mr Barnett nor Hot Rock Limited takes any responsibility for selective quotation of this Statement or if quotations are made out of context.

- All amounts are in American Dollars (USD) unless otherwise stated.
Introduction to Hot Rock Limited (HRL)

- Hot Rock is a public company, listed in 2007 on the Australian Securities Exchange (ASX code HRL)
- HRL mission is to pursue exploration and development of geothermal resources in countries that:
  - Have quality conventional geothermal resources
  - Provide a secure commercial environment for exploration, development and electricity generation
  - Have ready access to power markets with a growing demand for electricity
  - Place value on electricity from renewable sources
- The company blends:
  - Australia commercial expertise in large scale development of natural resources
  - New Zealand expertise in geothermal technology
  - Strong local technical and operational capabilities
- HRL is able to:
  - Secure quality projects
  - Raise exploration funds from capital markets in Australia and elsewhere
  - Partner with larger energy companies for advancing projects to commercial scale beyond feasibility stage in the exploration and resource proving process
HRL geothermal resource targets

Targeting conventional, geothermal resources:
- Volcanic systems at Pacific Rim convergent tectonic plate margins
- Hot Sedimentary aquifer targets (HSA) in Australia

These are much lower risk and cost than ‘unconventional’ plays, due to large global installed capacity and long operational history.
Chile / Peru - numerous, high quality volcanic geothermal prospects

- More than 200 Pleistocene & Holocene aged volcanoes (of which 100 are in Chile) located along western margin of South America, in four segments

- High geothermal development potential in Peru and Chile within the Central and Southern Volcanic Zone segments
  - **Southern Peru**: Six geothermal regions identified with the major one in central Andes of SE Peru where 300 geothermal areas with a wide range of surface activity occur
  - **Northern Chile**: approximately 90 geothermal areas, largely of chloride type, frequently solfataric, located along the high Andes and Altiplano
  - **Southern Chile**: more than 200 sites with acidic-sulphate, bicarbonate and chloride type springs, restricted to 4° volcanics in the Andean Cordillera

- Geothermal potential of Chile alone estimated at 3000 to 16,000 MWe for 50 years*

* Lahsen, WGC - 2010
HRL has a strong commercial & technical focus

- Volcanic geothermal systems have the best potential for technical success

- Essential pre-requisites for commercial success include:
  - Low sovereign risk country
  - Growing stable economy
  - High growth power demands
  - Large pipeline of new mining projects
  - Geothermal projects with access to transmission grids
Reasons why HRL has come to Chile and Peru

Chile & Peru tick all of the commercial and technical boxes:

- Democratic governments
- Strong economies growing at circa +5% pa
- Power demand expected to double over next 6 to 10 years
- Chile is #1 and Peru #2 copper producers in the world
  - Santiago has now become the world's de facto mining capital
- Robust geothermal legislation and renewable energy laws
- Numerous, high quality volcanic geothermal prospects

- HRL established geothermal offices in Chile in 2008 and Peru in 2009
- Has given HRL significant earlier mover market advantage
HRL has become one of the largest holders of geothermal projects in Chile and Peru combined

- Early mover advantage in the two of the four emerging geothermal “hotspots” in Latin America

- Chile, HRL holding:
  - 13 exploration concessions granted, comprising 7 projects
  - 6 further applications in process

- Peru, HRL holding:
  - 4 exploration authorisations granted
  - 6 further applications in process
High level of exploration activity underway in Chile

Major geothermal pegging rush has occurred over the past three years in Chile and Peru:

- In Chile largely through two government tender rounds
- In Peru through direct application

A geothermal industry is rapidly developing in Chile:

- Exploration drilling has been undertaken on at least 7 exploration projects
- Exploitation authorisations have been issued at 6 projects
- First commercial geothermal generation could be by 2014?
Current players in geothermal exploration in Chile and Peru - domestic and international companies

Chile:
- 49 geothermal concessions granted through direct application with 20 still under process
- 33 concessions awarded through two rounds of competitive bidding, in 2009 and 2010, raising $106m + $251m in committed work programs

Peru:
- 20 geothermal authorisations forming 11 projects have been granted to 4 companies
- Main players (with % of project granted) are – Hot Rock (36%), Magma Energy(27%), Eco Energy (27%) and Andes Power (9%)
- Detailed surface exploration is only just now commencing in Peru

Geothermal concession ownership in Chile, (% of number of concessions granted - 82 total). These are unofficial estimates made by HRL from publically available information to November 2011
HRL portfolio of geothermal projects in Chile

- HRL holds 13 granted tenements which comprise 7 dedicated projects
- Four of these have been explored and two of these are close to ready for drilling:
  - Longavi
  - Calerias
- Conceptual hydro geological models have been developed for both resources and “Inferred Geothermal Resources” in conformance with the Australia Geothermal Resource Reporting Code (2010), as follows:
  - Calerias = 185 MWe of generation potential for 30 years
  - Longavi = 135MWe for 30 years
- Discussions are continuing with potential Joint Venture partners to co-fund with HRL the resource proving and subsequent development stages
Examples of surface geothermal activity at Calerias

Banos Calerias hot springs

High flow rate spring discharges from Don Rolando Spring

Extensive acidic hydrothermal alteration and associated spring seepages at higher elevations in the Calerias system - Los Caballos springs
Examples of surface geothermal activity at Longavi

Clockwise from top left:

• Nevado de Longavi – a large Quaternary aged volcano at the northern end of the project
• La Turbia spring on SW flank of Nevado de Longavi
• Longavi-1 spring, with a large flow of approx. 20 l/sec of sub boiling geothermal water, set in area of extensive silica sinter terraces. The area has a surface thermal heat flux of some $17\text{MW}_{\text{thermal}}$
Peru power sector

- Generation capacity of 7,200 MWe with mix similar to Chile – 60% hydro, 40% thermal
- Forward demand for a further 4,500 MWe of generation by 2017
  - $56 billion to be spent on mining developments over next decade
- Future renewable energy development capacities are estimated at:
  - Hydro: 59 GWe
  - Wind: 22 GWe
  - Geothermal: 3 GWe
- In spite of large gas reserves and the very large hydro potential, there is strong support for non-hydro renewable power through the Renewable Energy Law 1002 (2008), which offers:
  - 20 year, inflation indexed, “take or pay” power sales contracts awarded through bidding against “same type” renewable projects
  - (e.g. recent 80MW PV Solar project awarded 20yr contract at US$224/MWh)
  - priority connection for renewables to grid
HRL work completed to date in Peru

- Community engagement and land access programs successfully completed at Quellaapacheta and Chocopata projects
- Currently pursuing similar programs at the Turu project
- Commencing land access and community engagement at Achumani in anticipation of imminent tenement grant
- Environmental Authority granted for non invasive (non drilling) exploration field surveys at Quellaapacheta, Chocopata and Turu
  - Undertaken in association with other geothermal companies in Peru
  - Has led directly to the formation of the “Geothermal Association of Peru”
- Reconnaissnace field work undertaken and preliminary assessments made for the Quellaapacheta, Chocopata and Turu projects
Community engagement

- Hot Rock is very focused on community consultation, stakeholder engagement and carries out all aspects of its geothermal developments in an environmentally sensitive manner in keeping with the quality of the surrounding countryside and with the support of the community.

- We adhere closely to the following principles:
  - “It cannot be assumed that being “green” bestows upon a developer an automatic social licence to operate.
  - It is important therefore that community consultation and stakeholder engagement be conducted in a proactive, open and transparent and meaningful way.
  - Adopting this approach not only builds the confidence of the community in the project but can potentially enlist the community as active participants and partners in the project.
  - Historically, projects that have adopted this approach have achieved outstanding commercial, environmental and social outcomes.”
Quellaapacheta project – granted
Chocopata Project - granted
Achumani – in application
Achuco - in application
Ocururane - in application
Funding issues for HRL (and other smaller developers)

- HRL’s geothermal portfolio in Chile and Peru has great potential for large scale power development
- But, the challenge for HRL is to raise sufficient funds to complete the resource exploration and proving stage, before approaching development banks for plant finance for the development phase
- Risk appetite for geothermal projects has fallen significantly after the global financial crisis and western stock markets are no longer a welcoming place for geothermal explorers
- In the absence of commercial lenders, multilateral agencies have become crucial for the sector and asset finance continues to account for the bulk of geothermal developments globally
- In this environment, Joint Ventures are a growing trend with larger companies taking equity in the exploration stage to push projects through to the development stage, similar to the oil industry.
- Hot Rock is pursuing this strategy, farming out projects to major energy companies
HRL Joint Venture Approach

- HRL has a JV with EDC from the Philippines which removes many of the funding hurdles faced by smaller exploration companies

- Under the terms of the JV, EDC is to secure a 70% interest in a JV for which it will sole fund exploration up to $12m per project and commit a further $38m for resource development drilling on a project on a pro rata basis through to financial closure

- Continuation of the Joint Venture is contingent on exploration successes

- EDC brings into the Joint Venture considerable development expertise and geothermal resources (e.g. skilled personnel, drilling rigs etc):
  - Is currently the largest geothermal company in the world
  - Has 35 years of geothermal exploration and development experience
  - Owns and operates 5 geothermal projects with 1130 MWe capacity

- HRL hold a significant number of high quality Tier 1 projects that will be available for JV to grow renewable energy generation in south America
Concluding “Tips”

- **# 1 – Make sure you understand what your geothermal resource data is telling you:**
  - Do not be seduced by the classical high temperate volcanic geothermal system model. Andean systems show greater variation and complexity.

- **# 2 – Make sure you understand your local communities, respect their needs and actively engage them in the geothermal exploration and development process from the very beginning of the project:**
  - even before reconnaissance field exploration activities commence

- **# 3 – Identify and engage with development partners and funders early in the exploration and development process:**
  - make sure you clearly understand their requirements in order to avoid future surprises
Part of Tip #1 - Typical volcanic model for volcanic geothermal systems in the western Pacific Rim

- After 40 years of exploration and development and 30 years of operation, these are well understood geothermal systems with a form and structure that consistently conforms to a predictable model in terms of:
  - geological setting
  - consistent lateral and vertical variations in the types of surface thermal manifestations (“leakage” from the underlying geothermal system)
  - distinctive geochemical and electrical resistivity signatures

(Source of Graphic: SKM)
Part of Tip # 1 - Andean model for volcanic geothermal systems in the eastern Pacific Rim?

- While similar in many respects to the standard volcanic geothermal model, Andean geothermal systems, nonetheless, display a number of significant differences.

- Probably due to the influences of:
  - Very thick continental crust above the subduction zones along the western margin of South America
  - Extensive overlying ground water caps of ice melt and precipitation (in Southern Chile)
  - A likely lack of extensive ground water circulation systems (in northern Chile)
  - Severe terrain contrasts

- An Andean geothermal hydro geological model, when developed, will likely prove to be a continuum between the standard volcanic geothermal model and the mineral industry model describing the formation of porphyry copper deposits, which are particularly widespread and well documented throughout Chile and Peru.