New Zealand and Australia

Brian Carey
New Concepts Workshop
Penthes  Geneva
30th October 2015
Where are Australia and New Zealand?

- Giant Jump
Giant Jump

Geneva

Australia

New Zealand
Quite Different

• New Zealand
  – High temperature geothermal resources
  – Amongst the world leaders
  – Much more opportunity
    • Direct Use
    • Lower temperature use

• Australia
  – Create higher temperature reservoirs
  – Sedimentary aquifers
  – Using lower temperature
  – More can be done
Australia

- Australian Renewable Energy Agency (ARENA)
- Expert group commissioned 2014
  - Options to realise the potential of geothermal
- Time frame
  - Over coming decades
Expert Report

• Structured approach

# Readiness Matrix

5.2.1 Commercial Readiness Index – Shallow Direct Use (Type A)

<table>
<thead>
<tr>
<th>STATUS SUMMARY</th>
<th>REGULATORY ENVIRONMENT</th>
<th>STAKEHOLDER ACCEPTANCE</th>
<th>TECHNICAL PERFORMANCE</th>
<th>FINANCIAL PROPOSITION - COSTS</th>
<th>FINANCIAL PROPOSITION - REVENUE</th>
<th>INDUSTRY SUPPLY CHAIN AND SKILLS</th>
<th>PATHWAYS TO MARKET</th>
<th>COMPANY MATURITY</th>
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<tbody>
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<td>‘Bankable’ Grade asset class</td>
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- ○ shows overall status
- ⬇️ band indicates status varies according to location
- ■ shows the key barrier

- Regulatory environment
- Stakeholder acceptance
- Technical performance
- Financial proposition - costs
- Financial proposition - revenue
- Industry supply chain and skills
- Pathways to market
- Company maturity
Report

• **Findings**
  - Shallow – ready
  - Deep natural – commercial trial / hypothetical
  - EGS – hypothetical / commercial trial

• **Roadmap**
  - for developing the potential of geothermal energy in Australia
  - 2030 and beyond
Roadmap

- Data collection
- International collaboration
- Collaboration with the oil and gas sector
Australian Innovation

• Geothermal for heating and cooling in Victoria
• Melbourne University
• Professor Ian Johnston and Guillermo Narsilio
New Zealand

- Direct geothermal use is well established
- Raising Awareness
- Being purposeful to develop further
Kawerau

- Largest direct geothermal use site in world
- Timber, pulp, paper, tissue processing
- > 4 PJ per annum
Innovative

- Clean Steam from Geothermal Steam
Integrating Geothermal Activities

- Tuaropaki at Mokai
- Farms
- Power Plant
  - 110 MWe
- Green houses
- Milk Processing facility
- Worm farm

www.tuaropaki.com
Geothermal Heat Pumps

• New Zealand is a technology adopter
• Unaware
• Raising Awareness
  – Heat Pump Association
Geothermal Heat Pumps in Christchurch

- Post 2011 earthquake
- City energy nodes being established
Christchurch Central City GHP Locations

At least 10 systems

= Confirmed
= Potential
Direct Geothermal Case studies

Tenon’s Earth Energy Solution
By Lisa Lind (GNS Science), Libby O’Brien and Jo Bell

Harnessing a naturally occurring energy source has proved a big plus for Tenon’s wood processing plant on the Tauparikaka Geothermal Field near Taupo. The move to eco-friendly and renewable geothermal energy for heating their nine timber-drying kilns has proved beneficial in terms of economics as well as productivity, says Daryl Robinson.

“Previously we burned natural gas to generate the heat required for the kilns. The geothermal steam is passed through the heat exchanger which boils the water. The steam passes through the kilns to dry the wood.”

Daryl says an injection of geothermal steam encourages Tenon to look for alternative ways to heat the kilns.

With a natural resource right under its feet, Tenon moved to geothermal energy in 2005 after discussions with GNS Earth Energy. Tenon is a plant that processes wood chips to make fibrous wood products, such as paper and cardboards.

The Huka Power Park, new Taupo, was built in 1982. Current managing partner, Richard Klein, took over the project in 1987 and began to turn the park into an economic walk-in tourist attraction. “Geothermal energy warms the Waste Heat Power Station, and power has been able to make an arrangement to reuse some of the discharge water from the station. The discharge from the Energy Heat Plant site between 85°C to 120°C with a few cases of 140°C minus spent energy from the generator. The steam is then fed into the Huka Power Station to generate electricity.”

The project design was carried out by Debbie Engineers of Auckland.

Key Benefits:
• Reduced running costs
• Increased productivity
• Renewable and eco-friendly
• Easy to operate
• Reliable

Key Features:
• 1.5MkW geothermal plant with an installed capacity of 23 MW to heat 9 timber drying kilns
• Commissioned in 2006

Geothermal Energy Helps to Grow Prawns
By Lisa Lind (GNS Science), Libby O’Brien and Jo Bell

The only geothermally heated prawn farm in the world is right here in New Zealand and it harnesses renewable earth energy as a secret to its success.

The Huka Power Park, new Taupo, was built in 1982. Current managing partner, Richard Klein, took over the project in 1987. The geothermal field is passed through a heat exchanger to heat water for geothermal ponds and tanks in the hatchery and nursery as part of the process of growing prawns for this site. The site produces 10,000 prawns and the prawn institute looks after 40,000 prawns. The prawns are grown by the National Institute for Water and Atmospheric Research.

Prawn is an eco-friendly food produced from 2.2 hectares of ponds to the park restaurant.

Key Benefits:
• Easy to meet required temperature
• Controlled optimal growth temperature
• Economically viable

Key Features:
• Founded in 1987
• Aquaculture business uses geothermal waste heat from adjacent geothermal power station

Geothermal Hot House for Gerberas
By Lisa Lind (GNS Science), Libby O’Brien and Jo Bell

For Rotorua gerbera growers, Herold and Connie Esendem of PlentyFlora, making use of the area’s geothermal energy is key to offsetting the harsh winter conditions.

“Grow gerbera successfully in a commercial operation a main requirement is to avoid too much or too hot. Fluctuations in temperatures, gerbera is a sub-tropical plant from South Africa so creating a smaller climate in the greenhouse is vital.”

“The site has four commercial glasshouses and one which is used for training and research. The glasshouse is used for training but also has a heating system to help gerberas grow.”

PlentyFlora’s greenhouse is heated by geothermal energy to two subterranean geothermal sources.

Key Benefits:
• Geothermal energy provides heat to keep the temperature above the minimum essential temperature of 25°C
• Reduced cost for heating requirements

Key Features:
• More than 600,000 gerberas are raised annually at PlentyFlora
• Two geothermal bore is the main heat source for greenhouse at year round

www.gns.cri.nz/Home/Learning/Science-Topics/Earth-Energy/Case-Studies
Direct Use - GeoHeat Strategy

- Increased Use of Geothermal Resources
- Market
- Technology
- Policy
- Geothermal Resource Info.
- Funding
- Awareness
- Expertise

kaitiaki
Direct Use Strategy

- **Sponsor - New Zealand Geothermal Association**
  - Overarching National Strategy
  - Developed consultatively
  - 25 year plus horizon
  - Draft expected to be released end Qtr 1 2016

- **Being purposeful**

**Growing Direct Geothermal**
Kia Ora