



petratherm

citi smith barney Client Seminar

“Building a portfolio of quality geothermal energy projects – Australia and Overseas”

Presented by:
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Managing Director
Petratherm Limited

Italian Centre Adelaide, 23 October 2007

Explorer and Developer of Geothermal Energy

Presentation Outline

- Key Messages
- Corporate Overview
- Petratherm’s Exploration and HEWI Models
- Key Projects – Australia, Spain & China
- Geothermal Energy and Electricity Markets
- SA Electricity Market and Geothermal Projects
- Geothermal Project Economics and Development
- Paralana short/long term Commercialization Plans
- Key Challenges for Australian EGS Projects
- Summary



Key Messages

- Petratherm's key strength lies in its approach to "exploration for heat" and its commercial assessment of projects - "location, location, location".
- The approach has resulted in a portfolio of quality projects in Australia and Overseas – first mover in Spain for "Hot Rocks".
- Petratherm's unique HEWI model has the potential to concurrently and substantially reduce costs and risks – also reducing the time for delivery
- Petratherm has, in its Paralana Project, clear commercial and competitive advantages with a willing potential customer at "off grid" prices and a realistic long term commercialization path – unique path to commercialization
- Petratherm's business focus is to increase shareholder value through a clear combination of strategies that reduce cost, reduce risk and optimize revenue



Corporate Overview

- Established in 2003 and listed on the ASX in July 2004
- Major shareholder is Minotaur Exploration – 34%
- Recent successful capital raising - Placement & SPP, \$6.3 M
- Shares on Issue - 57,750,000 – Current Price of \$0.74
- Market Capitalization of \$ 42.7 million
- \$8M in cash as at end June 2007, \$5M grant and up to \$ 30 M JV with Beach Petroleum
- Mission – *"to explore and develop, emission free, geothermal energy projects that are commercially sustainable"*
- Strategy – *"shallow hot rocks close to market"* – deeply buried granites (5-6 kms) with good insulating cover (2-3 kms)



Board & Management



*Derek Carter
Chairman*



*Simon O'loughlin
Director*



*Prof. Richard Hillis
Director*



*Dr Lloyd Taylor
Director*



*Richard Bonython
Director*



*Terry Kallis
Managing Director*



*Donald Stephens
Company Secretary*



*Peter Reid
Operations Manager*

Corporate Overview

- Portfolio of Quality Projects – four in Australia, three in Spain, China under examination – portfolio under continual expansion – expect 7 to 8 projects in Spain
- Projects include Enhanced Geothermal Systems (EGS) and Conventional Projects – products include electricity and direct use heat
- Combined skills and experience of the Board, Management, Partners and Consultants capable of delivering successful geothermal energy projects – from underground resource through to market
- Focus on continually increasing Shareholder Value through a combination of cost reduction, risk reduction and revenue optimization

Petratherm's Exploration Model

"Shallow Hot Rocks close to Market"

"Hot Rocks" are EGS, i.e.
Enhanced Geothermal Systems

Prime Cost Drivers

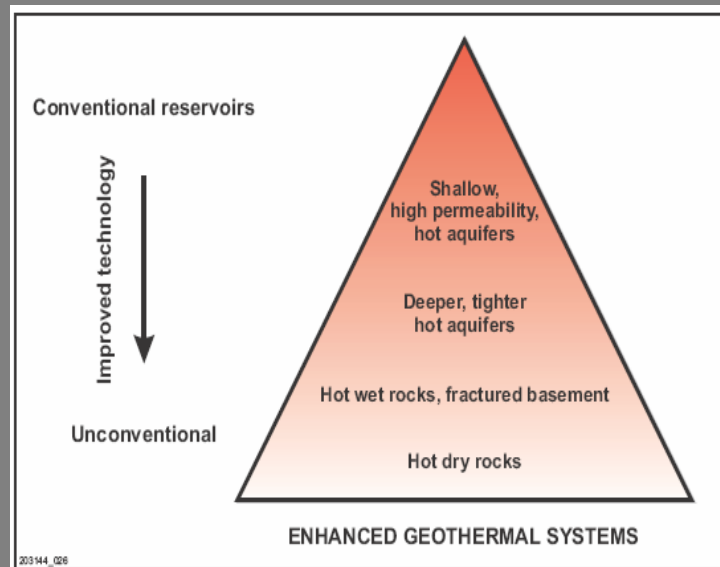
- Temperature Differential
- Drilling Depth
- Flow Rate
- Network Connection
- Generation Plant



Petratherm is seeking to optimize the key drivers to achieve the lowest long run average cost electricity delivered while minimizing project risks.



Enhanced Geothermal Systems

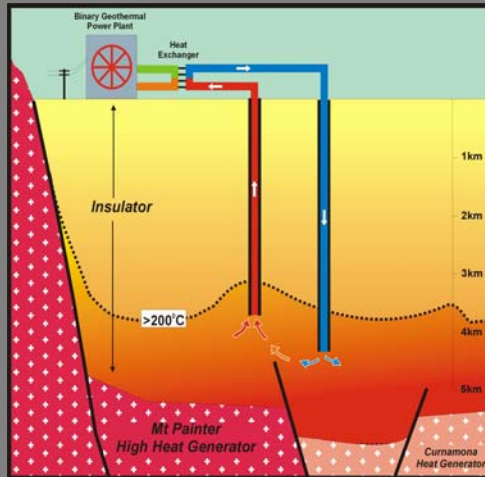


Heat Exchanger Within Insulator (HEWI) Model

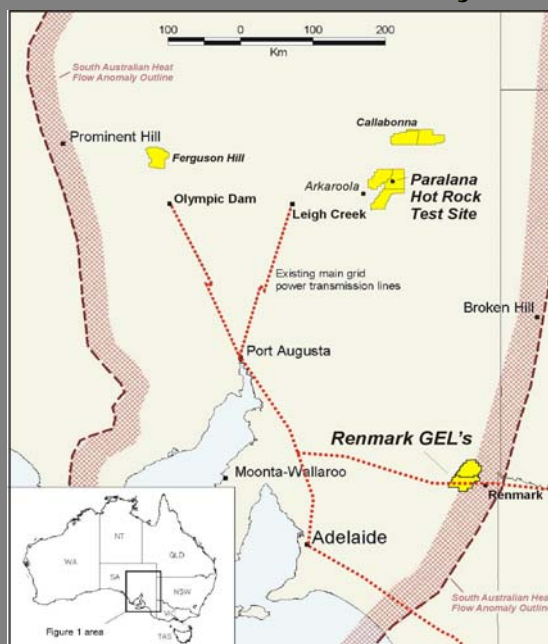
EGS -
enhance/engineer
the geothermal
system that is
underground heat
exchanger

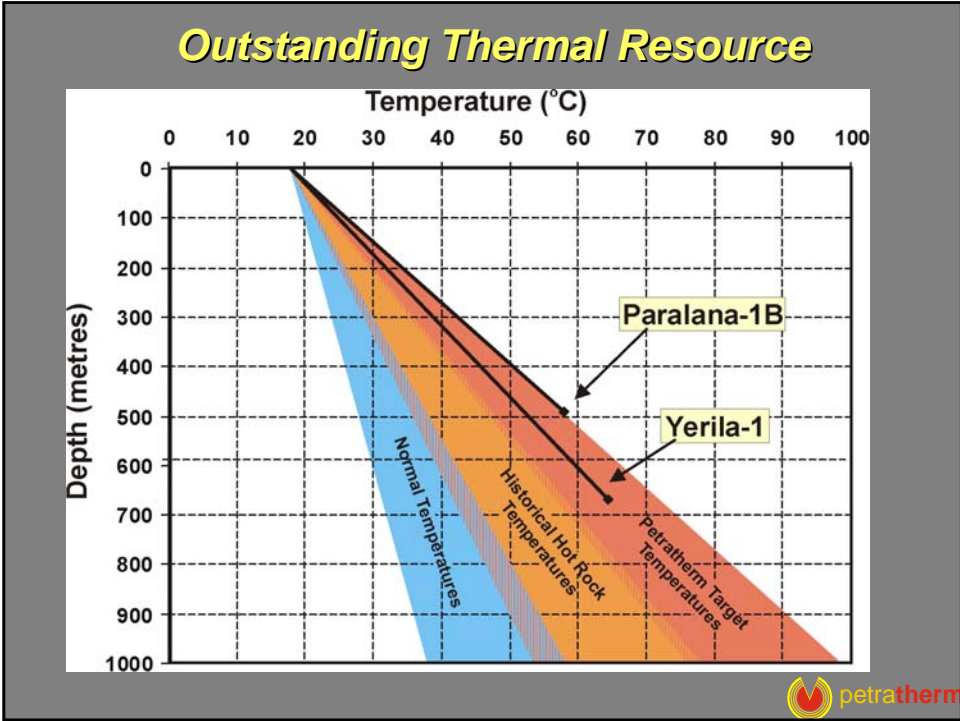
- Higher Permeability
- Chemically Stable
- No Potential Radon build up
- Lower Risk

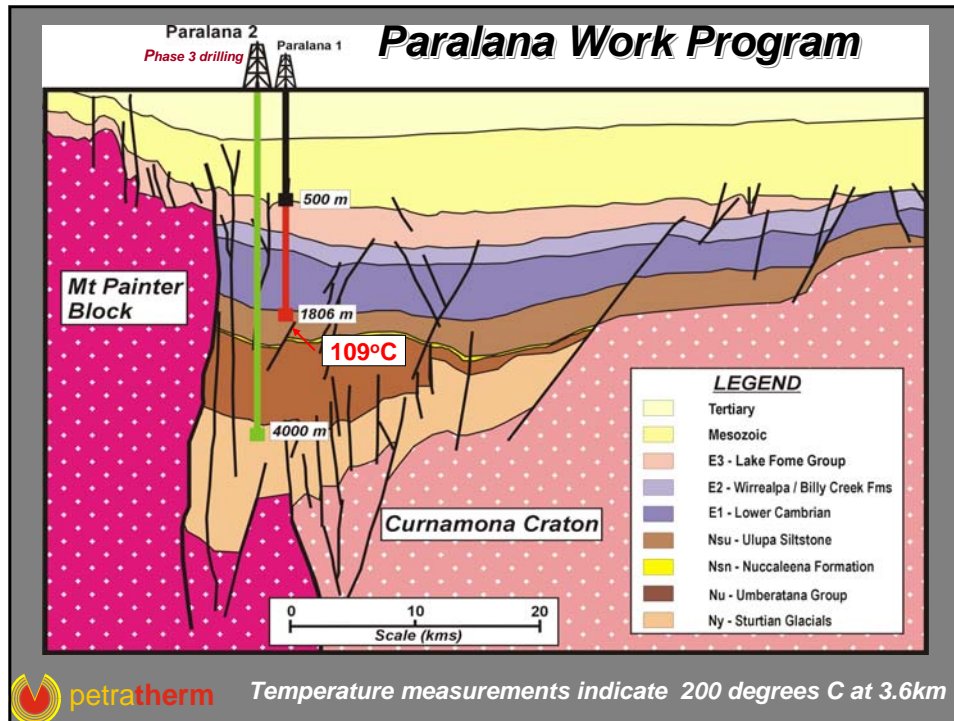
= Cheaper Power!



Petratherm's SA Projects







Paralana Geothermal Energy JV Project

- **Paralana Geothermal Energy JV Project** exhibits the **key ingredients for success**
 - Excellent thermal resource at shallow depths with stable geological formation - expect good drilling conditions
 - Proximity to the “off-grid” Beverley Uranium Mine
 - \$30 M JV with Beach Petroleum and \$5 M Federal Grant
 - A unique and realistic, long term commercialization plan
- **Paralana Project Next Steps**
 - Deep well design and drilling rig selection – underway
 - Drilling first well – subject to rig availability – mid 2008
 - Drilling second well – late 2008
 - Long term circulation tests late 2008/early 2009
 - Produce first power to Beverley – end 2009/early 2010

**Renewable
Energy
Country
Attractiveness
Indices**

- *Tariffs*
- *Resource Potential*
- *Growth*
- *Grid Capacity*

Source : Ernst & Young 2006



Ranking	Country	All Renewables Index	Renewables Infrastructure Index
1	Spain	69	80
2	USA	67	70
3	Germany	62	56
4	India	61	66
5	UK	60	61
6	Italy	58	63
7	France	57	55
8	Portugal	56	63
9	China	56	59
10	Canada	55	63
11	Netherlands	54	56
12	Ireland	54	61
13	Greece	53	56
14	Sweden	52	53
15	Australia	50	51
16	Denmark	49	58
17	Norway	49	56
18	Belgium	48	53
19	Finland	38	39
20	Austria	33	49

**Wholesale Renewable Power Price's
cents per KWh (Aus)**

Spain	11.4 – 14.5
USA	10 – 11.5
China	8.6 – 9.5
India	7.8 – 10.1
Australia	7.5 – 8.5



Petratherm Espana

- *Expanding Project Portfolio*
- *Strong Corporate Interest*
- *High Electricity Prices*
- *Leading Policy Development*
- *Conventional geothermal and direct use options*
- **= Lower Risk!**

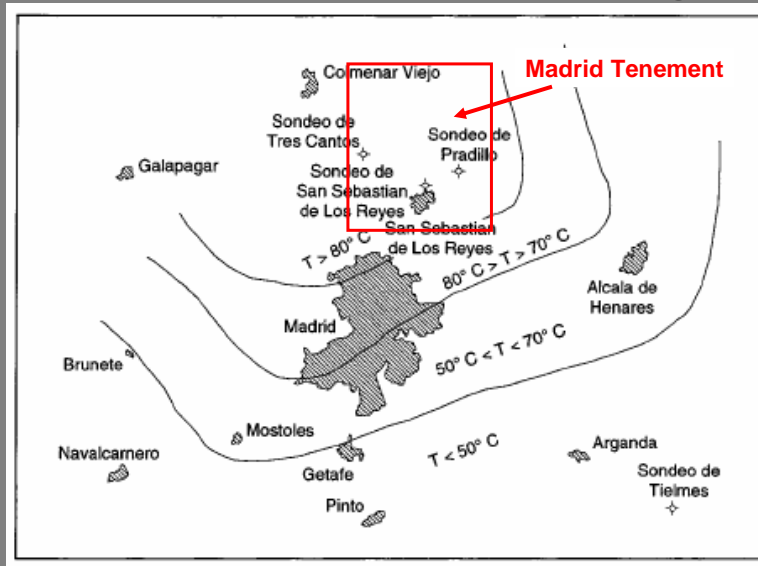


Madrid Project – Madrid Basin

- **Tenement Area 300 km²**
- **Location 25KM NNE of Madrid**
- **Major electricity and water infrastructure**
- **Pradillo Well records a bottom hole temperature of 156°C at 3400m**
- **Known low enthalpy aquifer (85°C) resource at 1500m. Very high flow rates.**
- **High heat production granites outcropping in the range and likely to underpin the basin**
- **Basin thickness approximately 4000 metres**



Madrid Basin – Direct Heating



Temperature at 1100m (Cuchi et al., En.Geol. 2000)

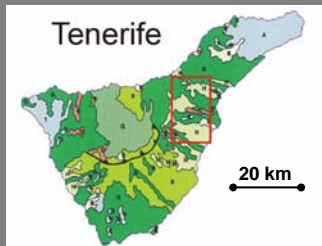


Barcelona Project – Valles Basin

- Adjoining Tenements located 30 kms NNE of Barcelona
- Central to major electricity infrastructure, >2000 MW of capacity
- Area of known high heat flow
- Local hot aquifer sourcing a 115-130°C shallow reservoir at around 1000 metres
- High heat production granites underpin the basin & outcrop in adjacent ranges
- Basin thickness approximately 3500 metres

Tenerife Project

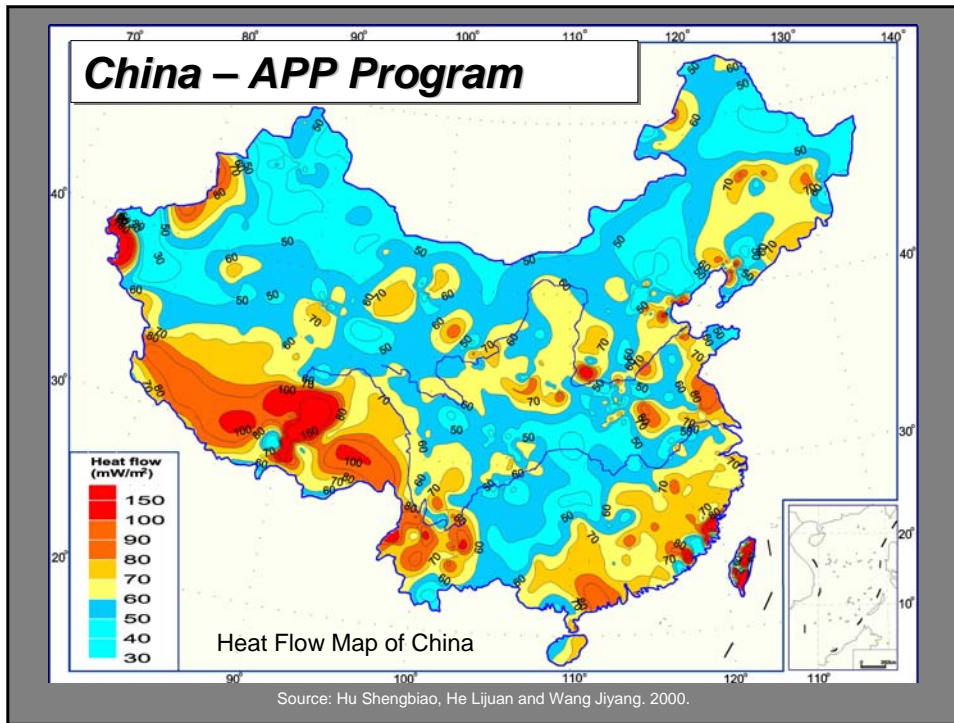
- Active Volcanic System
- Magma Chamber 3-4 km below surface
- Large geochemical data base (ITER)
- Off-grid pricing (currently Diesel)
- Large load > 800 MW



China – APP Program

- **Asia Pacific Partnership Approved Project (APP) with the support of the Chinese and Australian Governments**
- **Over 240 recorded geothermal sites**
- **Conventional Geothermal Potential ~1400 MW**
- **Enormous EGS (Hot Dry Rock) Potential**
- **Hot Water and Electricity Plays in a number of provinces**
- **Agreement with Chinese Geology and Geothermal groups**
- **Joint Venture discussions under way with interested parties**

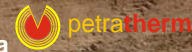
Ningzhong - Tibet



Petratherm - Key Achievements

- Discovery of world-class heat resource at Paralana, South Australia.
- Established an MOU with Heathgate Resources to provide their Beverley Uranium Mine with electricity to meet their growing needs.
- Secured approval to investigate China's Hot Rock potential through Asia Pacific Partnership on Climate and Clean Development (AP6)
- Up to \$30 million Joint Venture with Beach Petroleum to test and build Phase-1 commercial plant at the Paralana Hot Rock Resource (\$10 M for 21% equity and option for additional 15% equity for a further \$20 M)
- \$5 million Federal Government grant to support development of a new lower risk heat extraction process (HEWI Model)
- New Spanish Hot Rock Projects announced near Madrid & Barcelona - Conventional Geothermal in Tenerife and Gran Canaria, Canary Islands (more to come)

Photo: Callabonna Project Area, South Australia

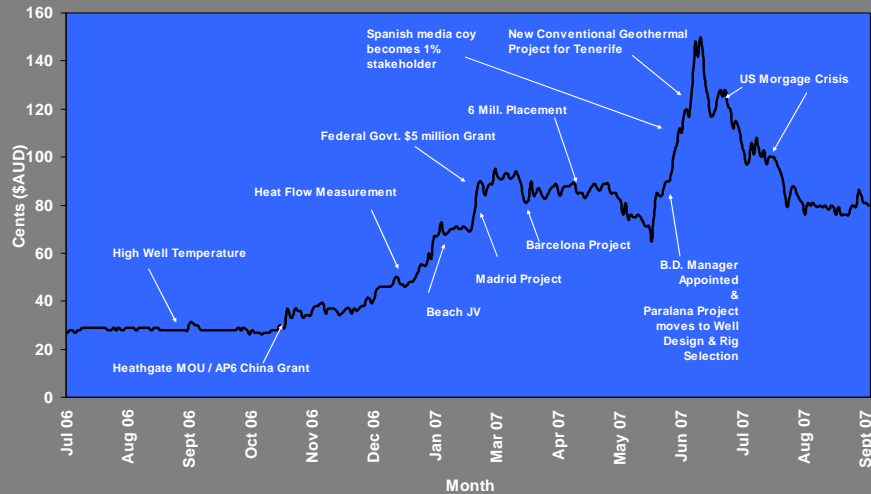


Increasing Shareholder Value

- **Cost Reduction**
 - HEWI Model - shallower wells reducing drilling costs
 - Competitive sourcing of plant and equipment – “no ties” to a plant manufacturer – “fit for purpose” – conventional, lower cost plant
- **Risk Reduction**
 - Initial project selection – targeting lowest cost to relevant market
 - HEWI Model – shallower wells, less drilling, greater permeability
 - Several quality projects and a continuous pipeline of projects
 - Project portfolio spread across jurisdictions – local and overseas
 - Partner selection – key skills and capabilities – Beach Petroleum
 - EGS and lower risk conventional geothermal projects
- **Revenue Optimization**
 - Target local “off grid” opportunities – nearby mines
 - Exploit multiple products – electricity and direct use heat
 - Focus on attractive jurisdictions price and growth – Spain/China



Petratherm - Share Price History



Geothermal Energy and Electricity Markets

International

- The global renewable energy market (all forms) represents only 4% of electricity production but is growing at 25% per annum.
- Geothermal energy has largest technical potential of all renewable SOURCES (source: World Energy Assessment UNPD 2000).
- MIT Report suggests that EGS can provide 10% of US power by 2050
- Renewable energy policies with favourable targets and “in-feed tariffs” some over \$140 per MWh
 - European Union target of 20% by 2020
 - China target of 10% by 2020
 - India target of 10% by 2020
 - California target of 20% by 2017



Geothermal Energy and Electricity Markets

Australia

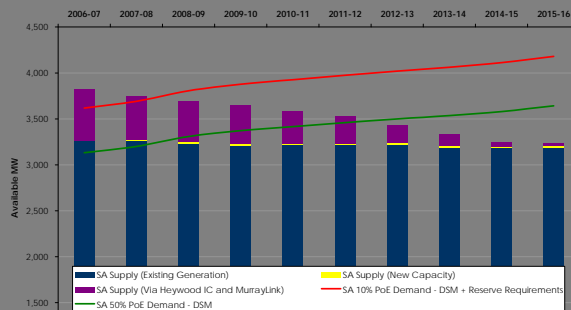
- Review of the Energy White Paper and current policy on renewable and low emission energy technologies – Emissions Trading and Renewable Energy
- Strong support for geothermal energy due to competitive, large scale, base load potential –SA Govt. PACE initiative, AGEG and Federal Govt. Geothermal Energy Industry Development Framework, REDI & LETDF and Labor Party Policy and Program announcements (\$ 50 million for drilling – 5 projects and MLET?)
- Geothermal Energy potential is vast and could meet Australia's electricity needs for many centuries. The Paralana thermal resource potential alone is estimated at 13,000 MW
- ESAA estimates that 8% (around 3500 MW) of national demand could be met by 2030. Geothermal Energy Industry formulating a bold, yet realistic Vision with objectives for 2010, 2020 and 2030.
- The interconnected NEM in Australia is projected to require 5,000 MW of new capacity over the next 10 years (source: NEMMCO Statement of



SA Electricity Market

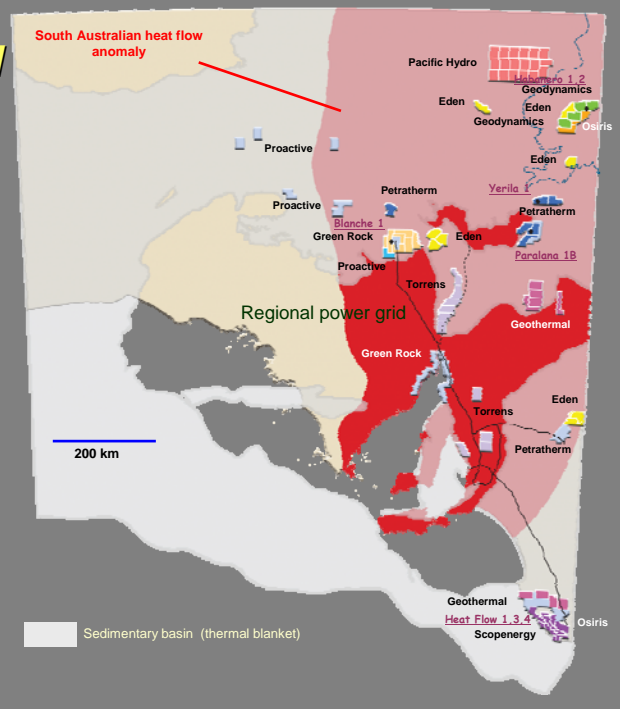
- SA NEM region electricity demand to require at least 600MW of new capacity
- Does not include potential increase of over 400MW from Olympic Dam.
- Nor the effect of depleting Leigh Creek coal.
- Demand requirements will be between 600 – 1,500MW.

Forecast Supply Demand Balance for South Australia (source SA ESIPC APR 2006)



SA Geothermal Projects

- Many players
- Large resources
- Exploiting different geothermal resources
 - Hot Rock plays
 - “Hot Water” plays
- Different market / connection plays



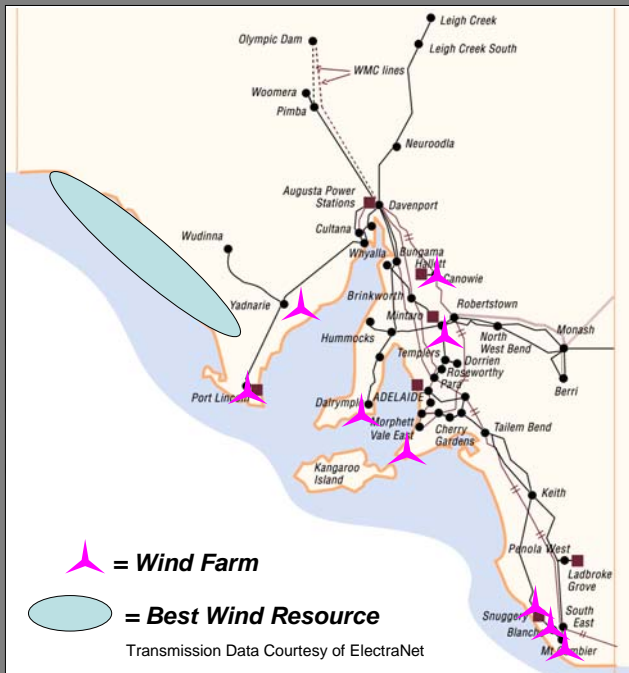
Geothermal Energy Project Economics

- Temperature (differential, quality and type of resource)
- Drilling Costs (depth, size, geological formation)
- Energy Flow Rates (volume, energy transfer)
- Plant Capital Costs and related efficiencies
- Connection and Access to markets
- Operating Costs
- Economies of Scale/Production
- Revenue/Product Pricing in a Competitive Market
- Regulatory Regime – carbon pricing
- **Critical Project Parameters are Revenue, Capital Costs (drilling, plant, connection) and Thermal Resource (temperature differential, volume and flow)**



Network Access & Connection

- Transmission Costs
- Transportation losses
- Margin Loss Factor
- System Stability
- Development Approvals, Licensing, Easements and Permits
- Network Capacity at connection point



Electricity Market & Network Issues

- Proximity to market – network connection costs – 132kV or 275kV for large scale and/or distant locations
- Network Capital Costs – target around 10% to 15% of total project capital costs.
- Market constraints – local, regional, interstate transmission and market operations
- Marginal Loss Factors and Revenue
- Market – on-grid or off-grid pricing
- Development & Scaling Up
- New Entrant Pricing – SA combined cycle gas

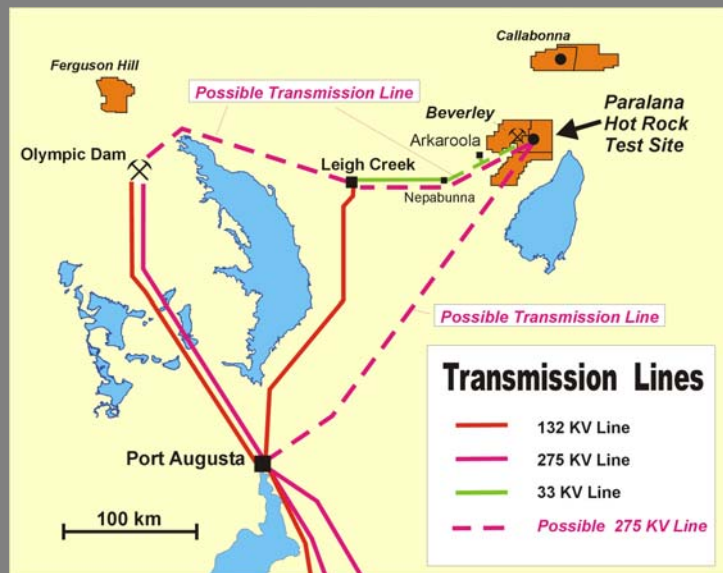


Summary – Geothermal Energy Economics

- Geothermal Energy Projects have the potential to provide very cost competitive electricity generation
- The Australian NEM is competitive market but it is characterized by loosely interconnected regional markets – many constraints
- Economics of Geothermal can be clearly assessed but are very project specific – resource and location
- Project optimization process needed to deliver competitively priced product to market – LRAC c.f. New Entrant Price
- Costs include the cost of production, delivery (transmission) and sale to competitive market – “need to understand the market”
- Near term horizon – Geothermal requires a form of carbon pricing mechanism to be viable.



Paralana Commercialization Plan



Paralana Commercialization Plans

- Staged local expansion from 7.5 MW to 30.0 MW (from end 2009/early 2010) – network capital costs range between 8% and 10% of total capital costs – uniquely positioned with a willing potential customer at “off grid” prices
- Realistic large-scale, long term plans over 15 years for 520 MW of power generation, incorporating market digestion, competition from geothermal/traditional sources and the cost of delivery to market (transmission costs) to the “on grid” market (NEM)
- Connection to the SA power system at Port Augusta and/or Olympic Dam, via a “meshed” 275 kV transmission network or individual double circuit 275 kV transmission lines - unique opportunity for meshed network community benefits leading to lower project costs.
- Competitive network capital connection costs range between 10% and 13% of total project costs (potentially as low as 5%)



Challenges for Australian EGS Projects

- Securing a quality site – the three locations – optimizing economics in a competitive market.
- Confirming the quality of the potential resource – temperature differential, stress regime / permeability.
- Deep drilling of wells – well design, drilling rig availability and costs.
- Establishing long-term circulation between injection and production wells - permeability, fracturing, flow rate.
- Integration of above-ground generation plant with below-ground thermal resource, achieving reliable power plant output – then followed by up scaling of generation capacity.
- Electrical connection (transmission) to the National Electricity Market.
- Water quality, usage, net losses, rights, obligations, accessibility, environmental impacts – short and long term – small and large scale.



Summary

- Petratherm's key strength lies in its approach to "exploration for heat" and its commercial assessment of projects – understanding the "three locations".
- The approach has resulted in a portfolio of quality projects in Australia and Overseas – first mover in Spain for "Hot Rocks".
- Petratherm's unique HEWI model has the potential to concurrently and substantially reduce costs and risks – also reducing the time for delivery
- Petratherm has, in its Paralana Project, clear commercial and competitive advantages with a willing potential customer at "off grid" prices and a realistic long term commercialization path – unique path to commercialization
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Thank You



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