

# ASX Release

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**PETRATHERM LIMITED**  
**ABN 17 106 806 884**

## **MD presentation to the Australian Geothermal Energy Conference**

Petratherm's Managing Director, Terry Kallis will today present to the annual Australian Geothermal Energy Conference in Melbourne.

The attached presentation provides a company overview and focuses on the latest update on Petratherm's flagship Paralana geothermal energy project.

The presentation includes an embedded video of the Paralana project with coverage of the successful fracture stimulation and flow test work recently undertaken. The video will be available for review on the Petratherm website later today.

The presentation outlines the key points that support why Petratherm considers itself to be a standout amongst companies in the Australian geothermal sector, including;

- Unique approach to exploration to identify hot spots and an innovative approach to exploiting heat resources;
- Portfolio of projects covering the spectrum of geothermal technologies, a clear business model and a multi-disciplinary board with the skills and capabilities needed for success;
- Two strong joint venture partners in the Paralana project, including Beach Energy and TRUenergy complemented by two major federal government grants totaling \$69.8 million;
- Successful drilling of the 4 kilometre Paralana deep well, confirmation of economic temperatures which have been followed by the successful fracture stimulation and flow testing of the well;
- Paralana project is considered to be well positioned with a clear path to market at various stages of development – from small scale supply to the local market to large scale deployment to the National Electricity Market.

The presentation also covers the recent carbon pricing initiatives and their expected positive impacts for the geothermal sector and the Paralana project.

## **Director recognized by prestigious Australian Academy**

The Company is delighted to advise that Petratherm Director, Professor Richard Hillis has been admitted as a Fellow of the Australian Academy of Technological Sciences and Engineering (ATSE).

Professor Hillis is the CEO of the Cooperative Research Centre for Deep Exploration Technologies. ASTE recently announced in its media release that;



*Prof. Richard Hillis*

***“Professor Hillis is nationally and internationally recognized as one of the world’s leading researchers in tectonics and geo-mechanics, his work contributing significantly to the understanding of stresses in the Earth’s crust, which has been applied to petroleum exploration, carbon dioxide geo-sequestration and geothermal energy”***

Yours faithfully

A handwritten signature in black ink, appearing to read 'T. Kallis'.

**Terry Kallis**  
Managing Director

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Kieran Hall / Tim Hughes

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# Australian Geothermal Energy Conference

## Company and projects update

Managing Director Terry Kallis

November 2011

**CLEAN  
ENERGY  
FOR  
FUTURE  
GENERATIONS**

# Disclaimer and competent persons statement

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All amounts in Australian dollars (AUD) unless stated otherwise.

The information in this report that relates to Exploration Results, Geothermal Resources or Geothermal Reserves is based on information compiled by Peter Reid, who appears on the Register of Practicing Geothermal Professionals maintained by the Australian Geothermal Energy Group Incorporated at the time of the publication of this report. Peter Reid is a full time employee of the Company. Peter Reid has sufficient experience which is relevant to the style and type of geothermal play under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the Second Edition (2010) of the Australian Code for Reporting Exploration Results, Geothermal Resources and Geothermal Reserves. Peter Reid has consented in writing to the inclusion in the report of the matters based on his information in the form and context in which it appears.

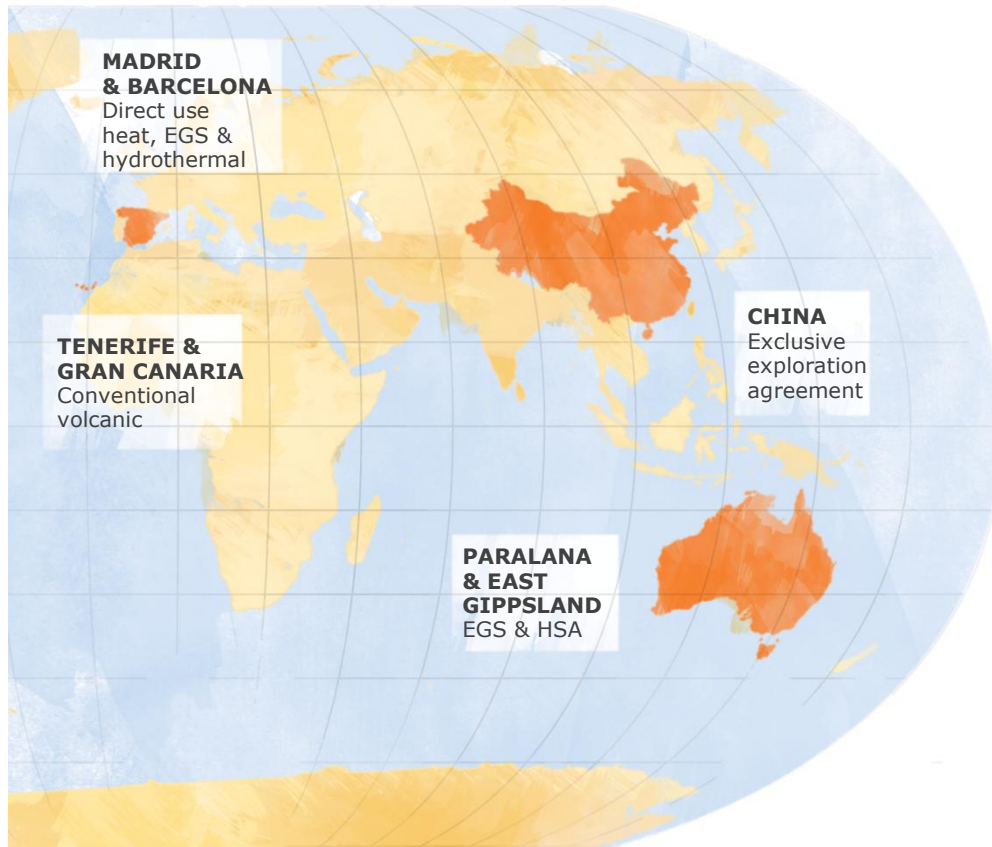
# Presentation Outline

- > Corporate and financial overview
- > Paralana JV Project overview – economic and technical
- > Project latest update: fracture stimulation and flow test
- > Paralana & market/regulatory framework looking forward
- > Video – “The Paralana story so far”

*Carbon pricing presentation (SKM/MMA independent analysis) – available at PTR booth*

*Peter Reid’s technical presentation on Paralana - Friday 18 Nov. at 11:10 am*

# Petratherm overview and project portfolio



## Our company & projects

- > Leading Australian geothermal exploration and development company
- > Projects spanning Australia, Spain and China
- > Projects across the spectrum of geothermal technology
- > Flagship project – Paralana in SA's northern Flinders Ranges

# Petratherm - Corporate and financial latest snapshot

## Listed ASX : PTR

- > Shares on Issue: 148.8 million
- > Share Price: \$0.095 (9 Nov.)
- > Market Cap: \$14.13 million
- > Cash Position: \$3.274 million (30 Sept.)
- > Shareholders: 3,864 shareholders
  - > Minotaur Exploration 13.78%
  - > Australian Ethical Investments 7.13%

## Paralana JV Funding and Grants

- > JV Funding: up to \$85 million plus equity share of project costs
- > Government grants of \$69.8 million toward drilling and commercial demonstration



# Our business model

***"To explore for and develop emission free geothermal energy projects that are commercially sustainable"***

- > To develop a portfolio of quality geothermal energy projects
- > Explore both conventional and engineered geothermal systems – for power and heat
- > Find a favorable combination of geology and market conditions - *"shallow hot rocks close to market"*
- > Introduce joint venture partners with common interests, the right skills/knowledge, risk appetite & funding ability



# Our board



Derek Carter  
Chairman



Simon O'Loughlin  
Director



Richard Hillis  
Director



Richard Bonython  
Director



Lewis Owens  
Director



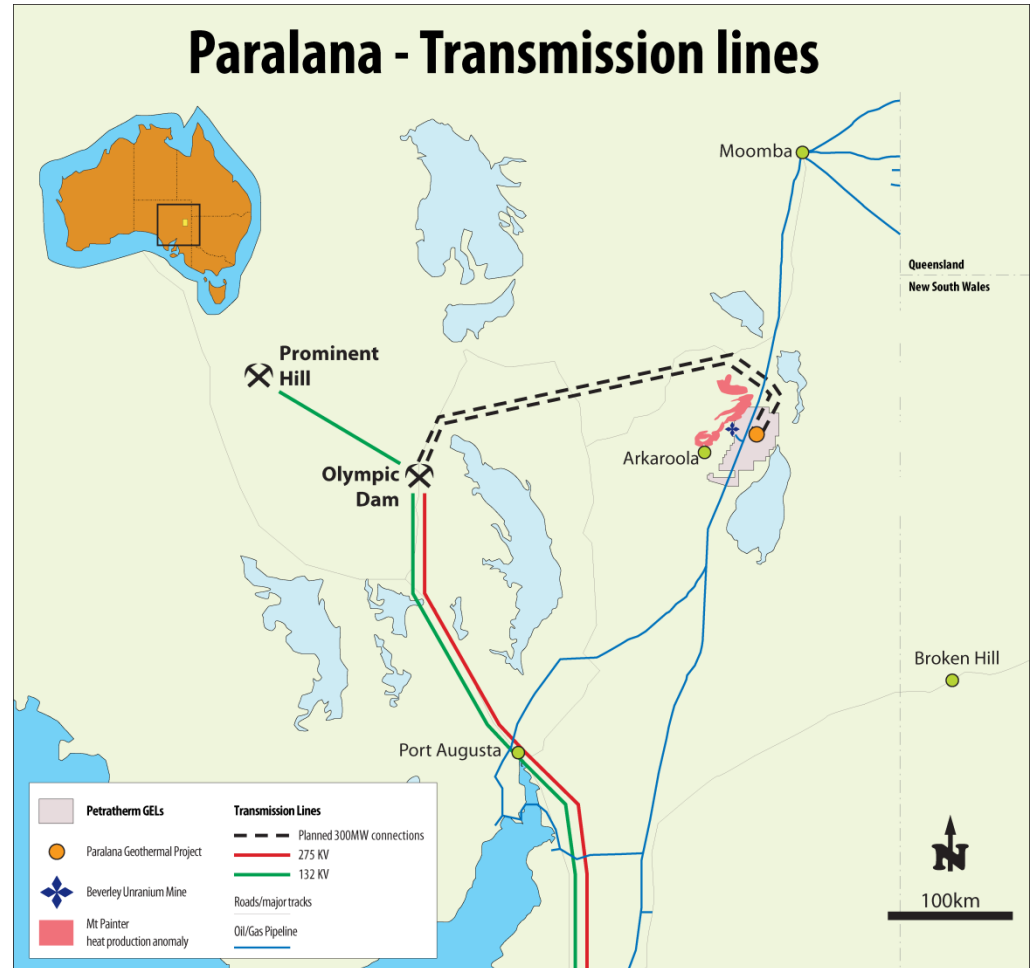
Terry Kallis  
Managing Director

## Skills and capabilities

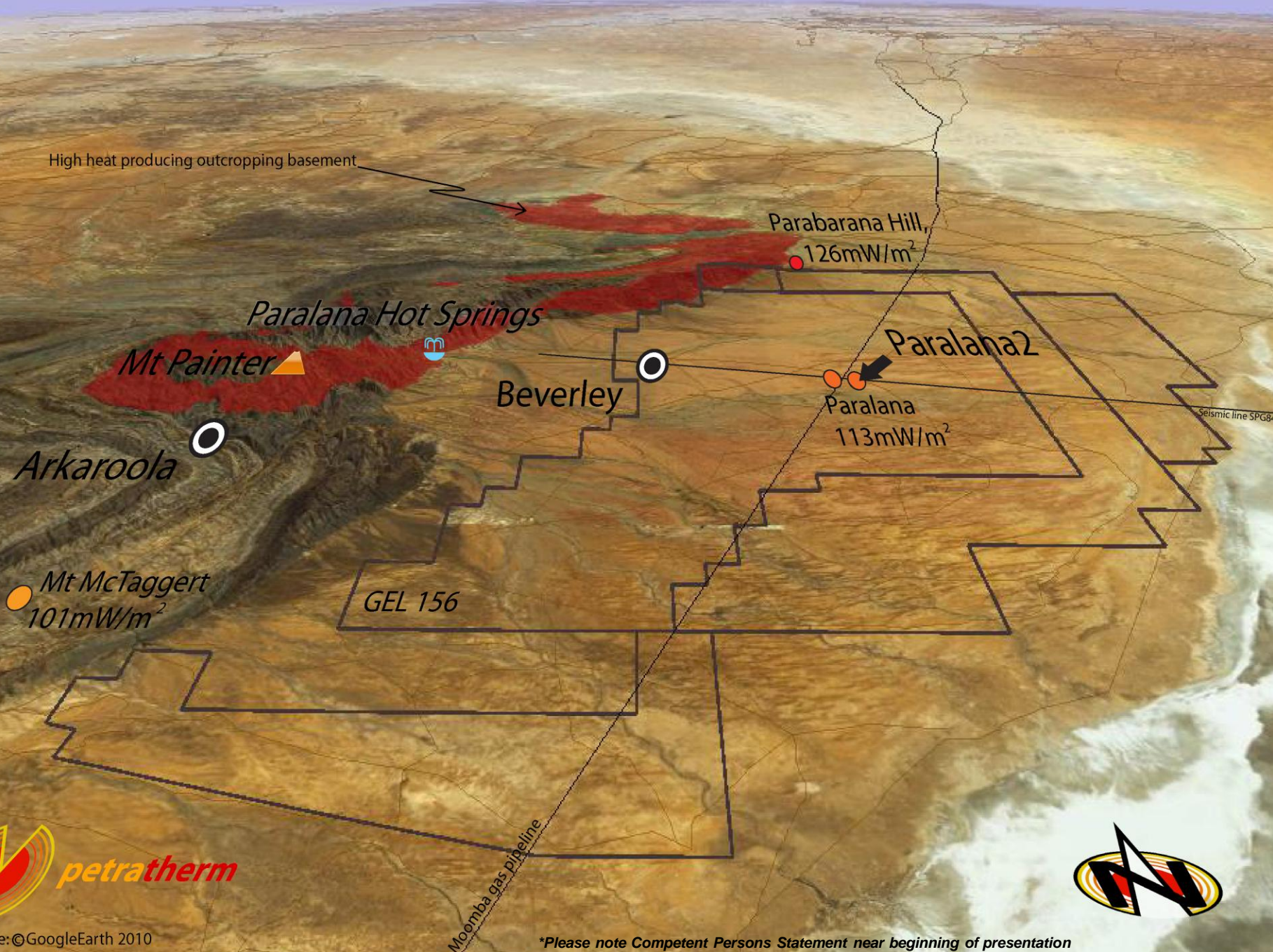
- > Financial Management
- > Legal
- > Marketing
- > Project Management
- > Corporate Governance
- > Exploration and Development
- > Geology and Geophysics
- > Resources and Energy
- > Government and Stakeholder relations

# Paralana Project – commercial / market overview

- > Potentially commercially viable at all stages of development
- > Close (10kms) off grid local customer (5-30MW) – then expand to on grid development (300 MW)
- > Transmission options for connection to market – potential growth areas
- > Long term price to NEM of 300 MW lower cost than with wind – inclusive of transmission cost
- > Independent energy/economic consultants\* estimate power price at less than \$100/MWh delivered to Olympic Dam (\*MMA)

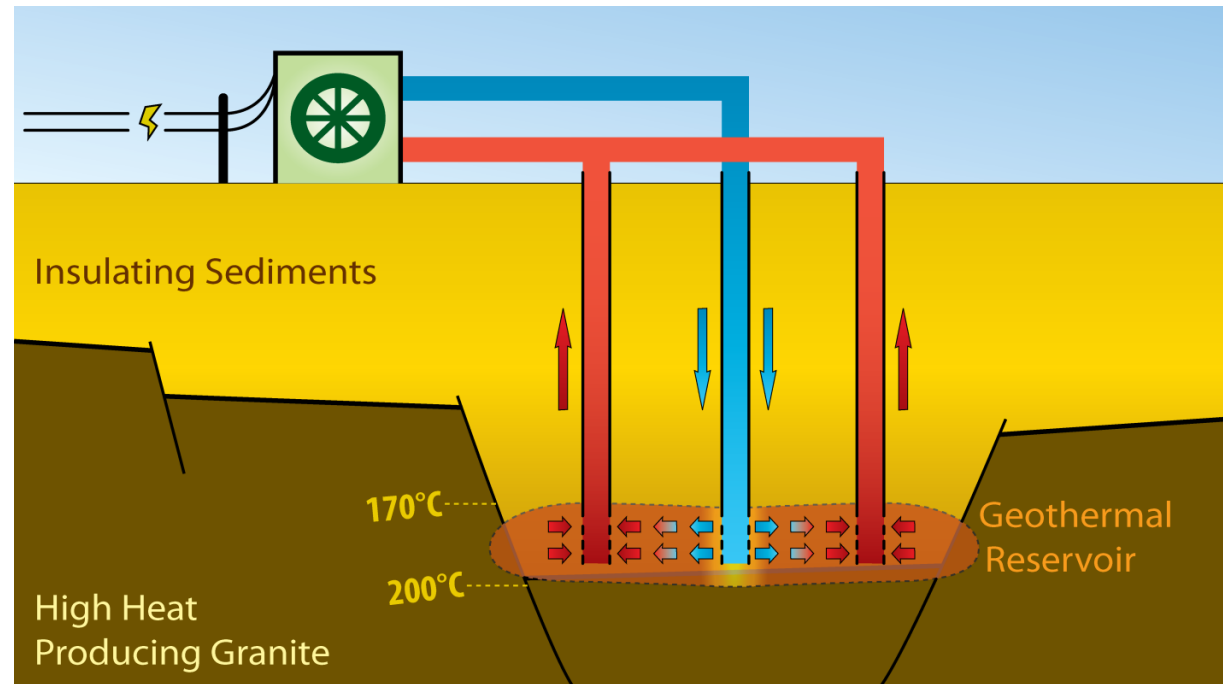


# Paralana Project – Regional Picture



# Development Model – Heat Exchanger Within Insulator

- > Higher Permeability
- > Chemically Stable
- > Lower Fracc Challenge?
- > Mesoproterozoic metasediments – bedding / joint surfaces



= Cheaper Power!

## HEWI Model at Paralana

The required heat exchanger is created in the insulating layers above the granite heat source. This may reduce risk, cost and time.

## Track record of achievement

- > Paralana 1B – recorded a high heat flow of 113 mW/m<sup>2</sup> and high temperature gradient to 1800m depth
- > Paralana 2 well - 4,003m deep injector well successfully drilled
- > Temperatures of 176°C at 3,672m measured and 190°C modeled at 4,000m
- > Strong government support for Paralana JV project - awarded \$69.8 million in grants
- > Successful fracture stimulation – reservoir creation – and flow testing of well



## Hydraulic fracture stimulation at interval 3679-3685m

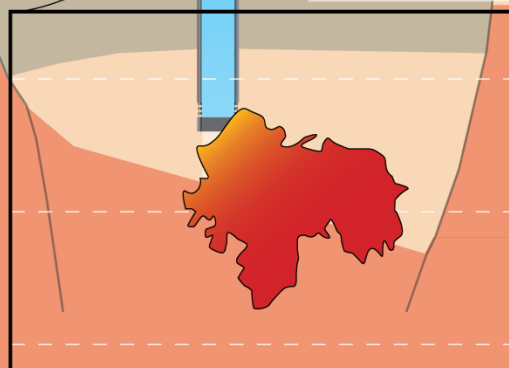
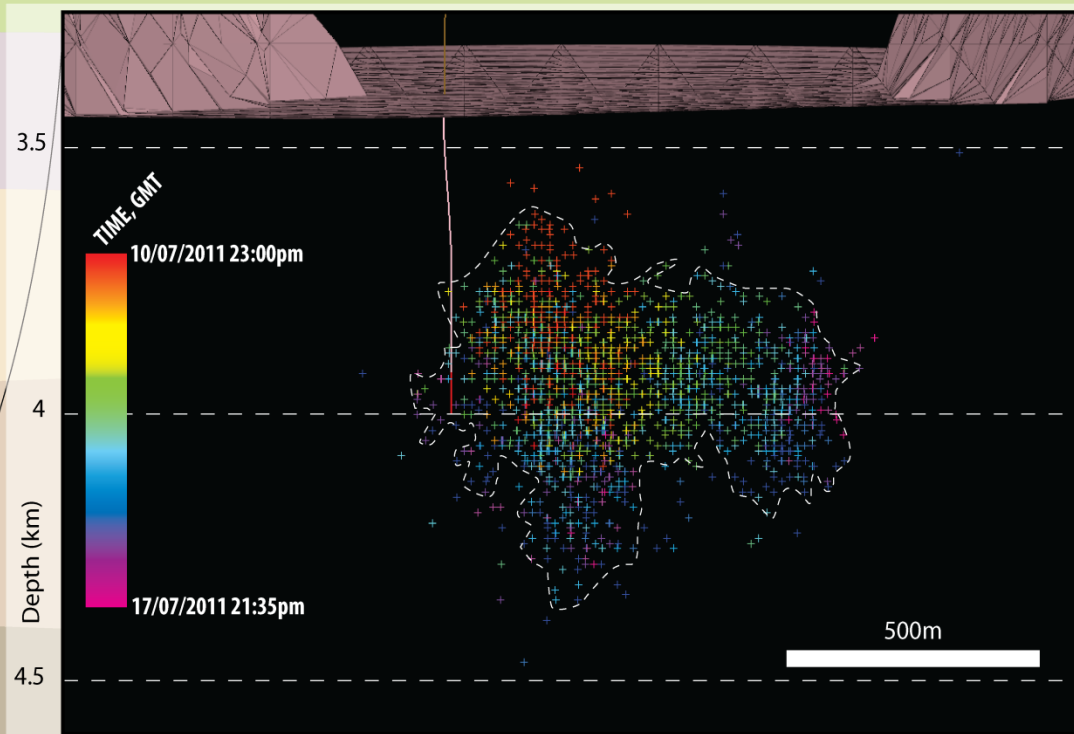
- > **Fracture stimulation, July 2011 - completed successfully**
  - > Inject larger volume of water at higher rates, up to 27 litres/sec ✓
  - > Array capable of recording and locating micro-seismic events with very small magnitudes on the Richter scale ✓
    - > Over 7000 micro-seismic events triggered
    - > 98 % of events below magnitude 1.0 / maximum magnitude 2.6
  - > Activate natural fracture network & connected to deep fractures below injection point ✓
  - > Succeeded to generate microseismic events beyond the target distance of 500m from the well: events detected 900m away from the well ✓

W

E

## Main Fracture Stimulation greatly exceeded Target

- Over 7000 micro-seismic events triggered
- Fractured reservoir target exceeded, with micro-seismic events located 900m away from the well
- Connection to deep fractures/faults below the injection point
- Reservoir continued to grow for several weeks



interpreted outline of fracc cloud

1km

# Flow test completed in October 2011

## Flow test

A flow test was completed in October with the aim of collecting further information on:

- > Pressure
- > Temperature
- > Flow data
- > Geothermal brine chemistry



# Market and Regulatory framework looking forward

In the long term Australia needs clear and **stable** policy and regulatory framework for renewable & geothermal energy

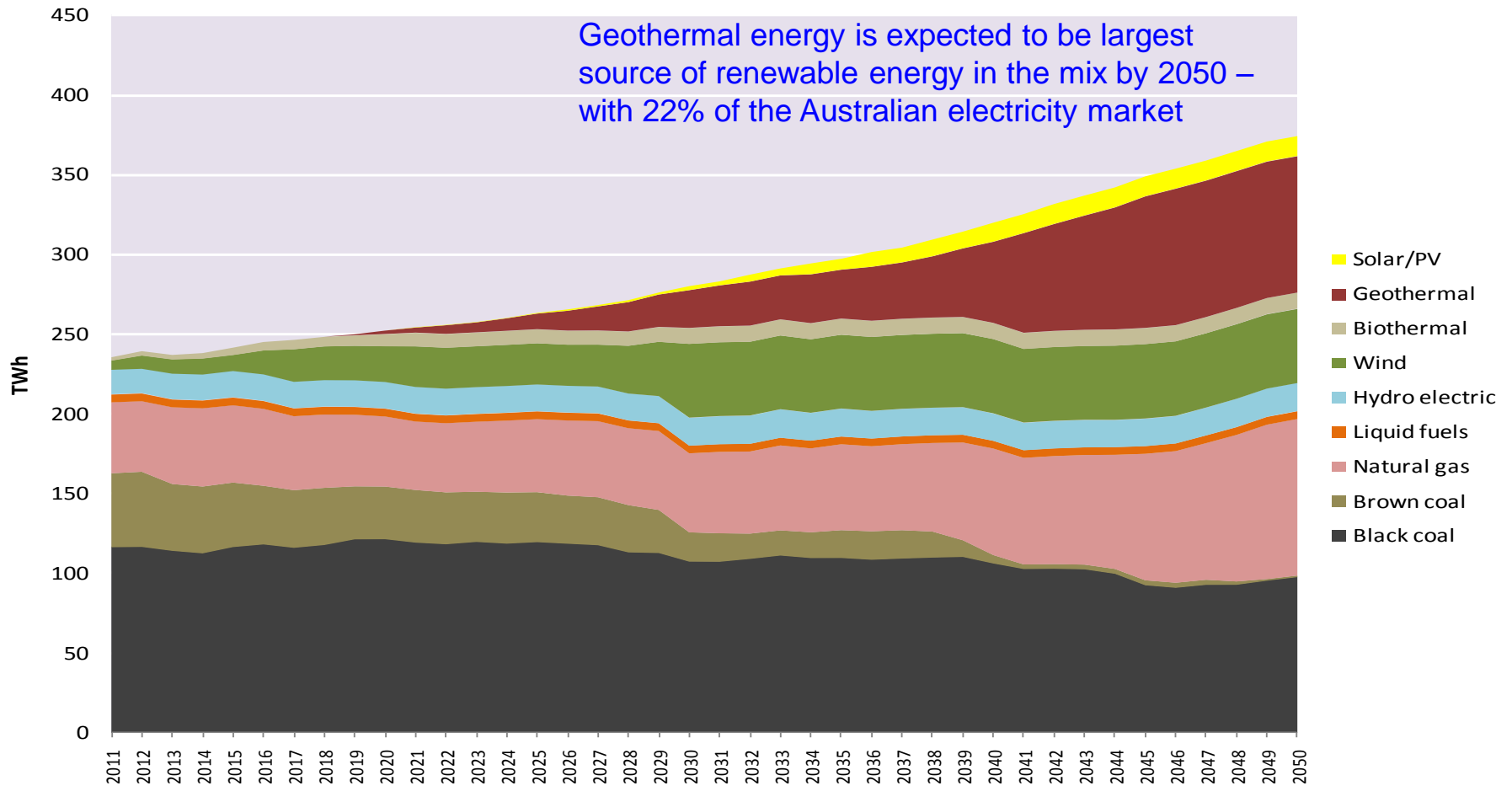
- > Price on carbon
- > Capital funding of projects
- > Investment in network connection

Federal Government's new "Securing a Clean Energy Future" – Climate Change Plan is expected to drive investment in geothermal companies and projects

SKM/MMA carbon policy modeling shows geothermal with a major role in Australia's future energy mix, in particular in SA



# Impact of Carbon pricing – Australian power generation mix (source SKM/MMA)

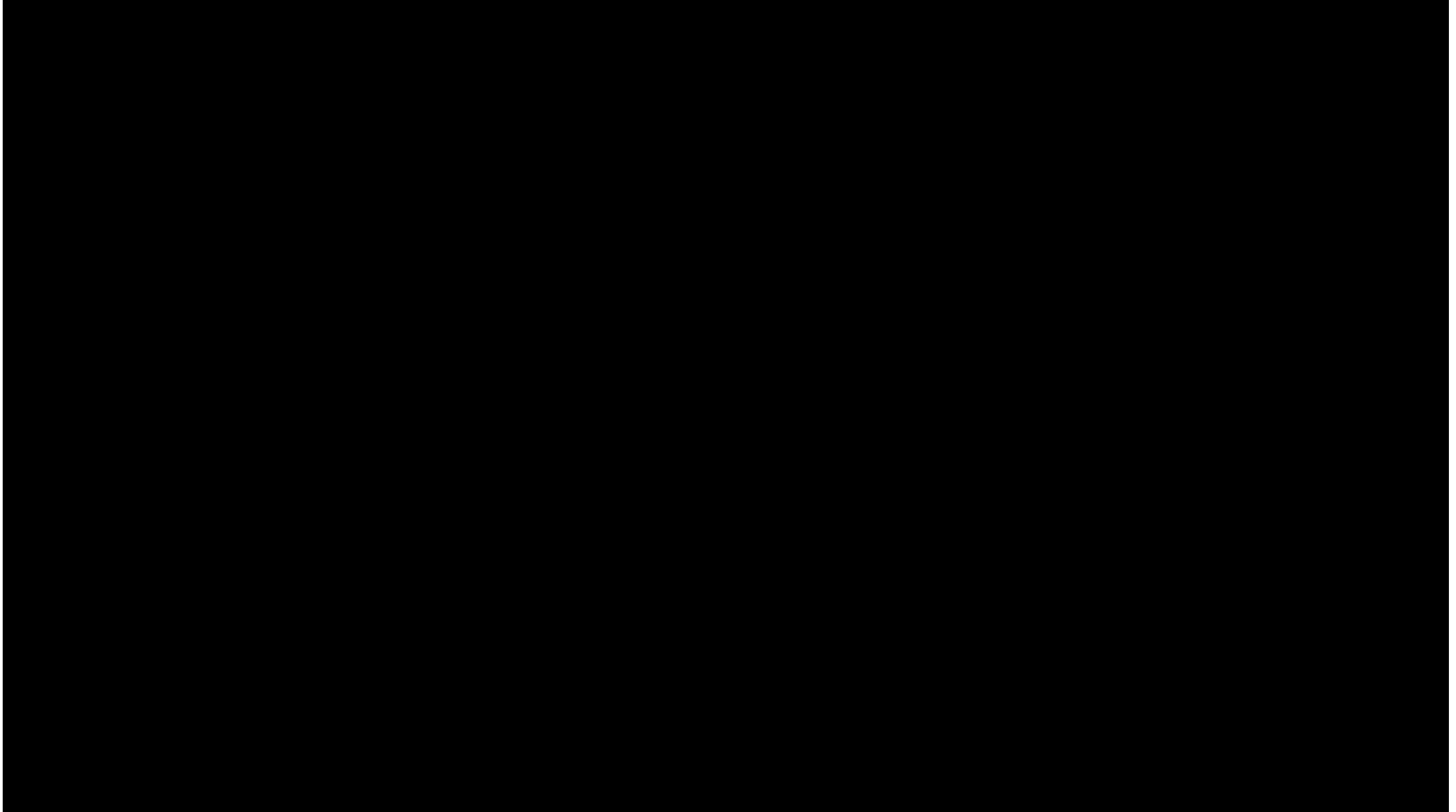


# Paralana Project looking forward

- > next milestone: drill production well to tap into the enhanced fractured reservoir
- > excellent leverage in terms of JV and government grants
- > “hot rock” geothermal firmly on radar of utilities and energy players
- > nearby off-grid customer & existing RET\* framework enables viability at early stages of power generation without a need for a carbon price
- > new carbon price and new grant sources provide significant upside potential
- > clear path for commercial demonstration and large scale deployment

(\*RET – renewable energy target framework provides for market based mechanism that underpins current larger scale renewable energy projects – such as wind – out to 2030)

## The Paralana Geothermal Energy Project story to date - video

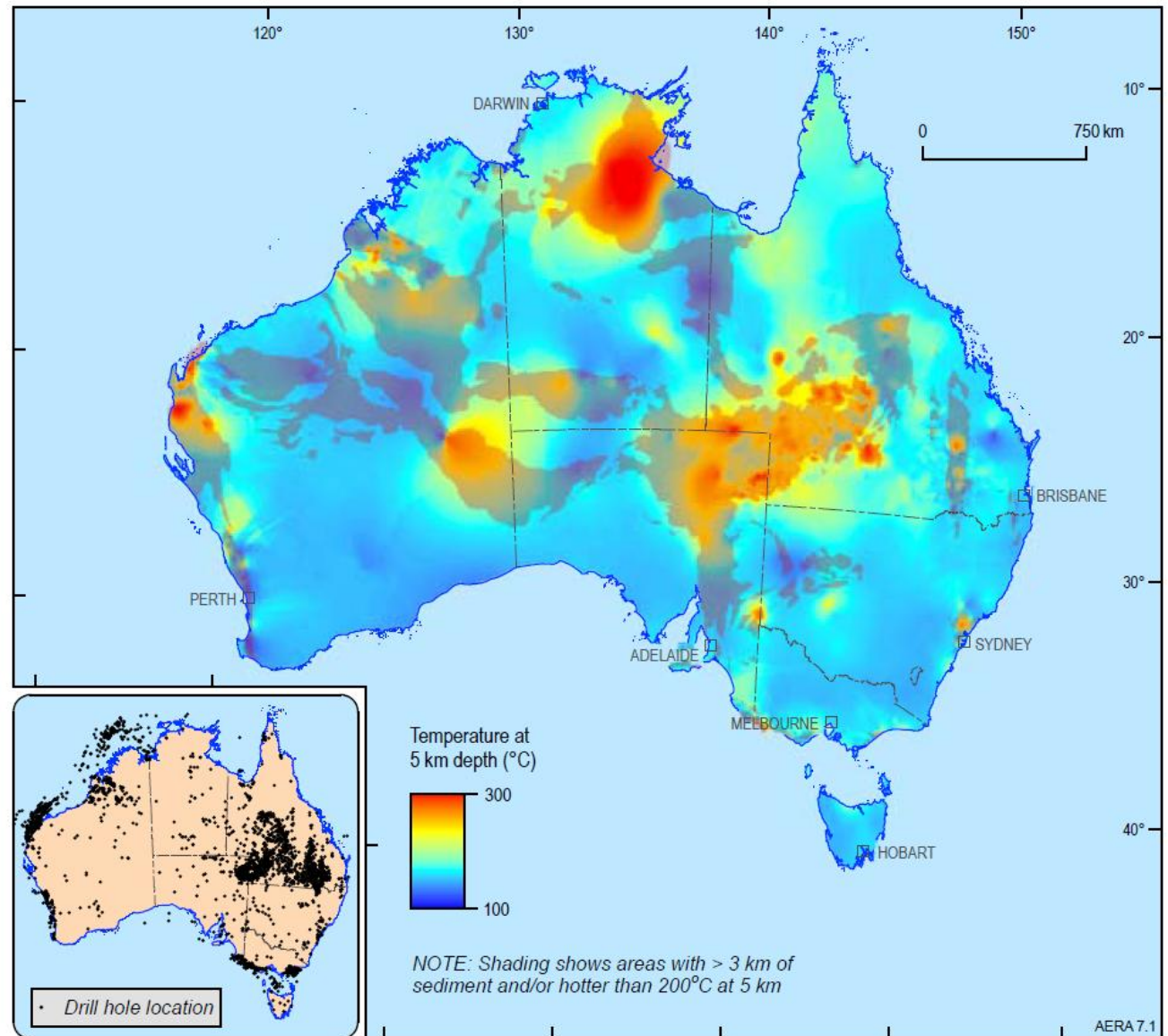


BE PART OF  
**PETRATHERM'S**  
**BLUE SKY**  
**FUTURE**

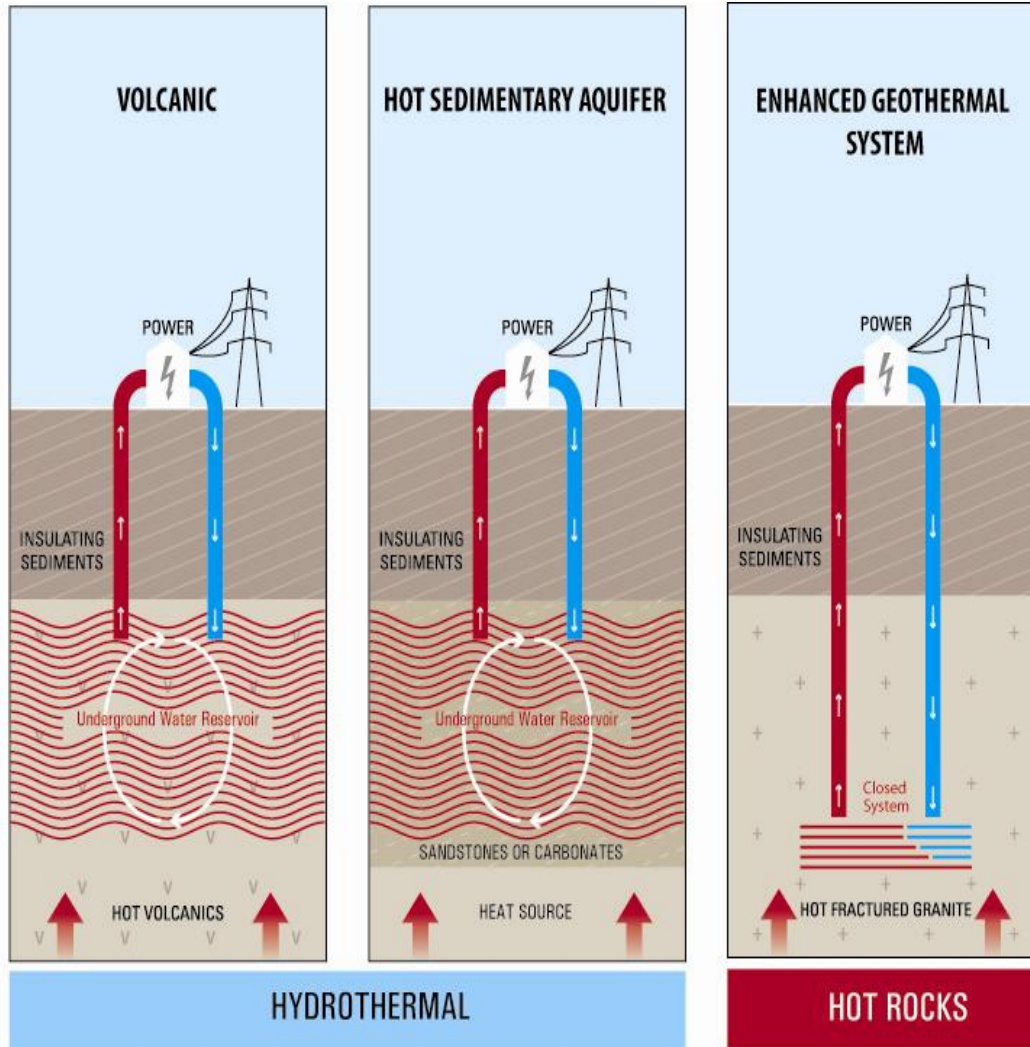
[www.petratherm.com.au](http://www.petratherm.com.au)

# Geothermal energy overview

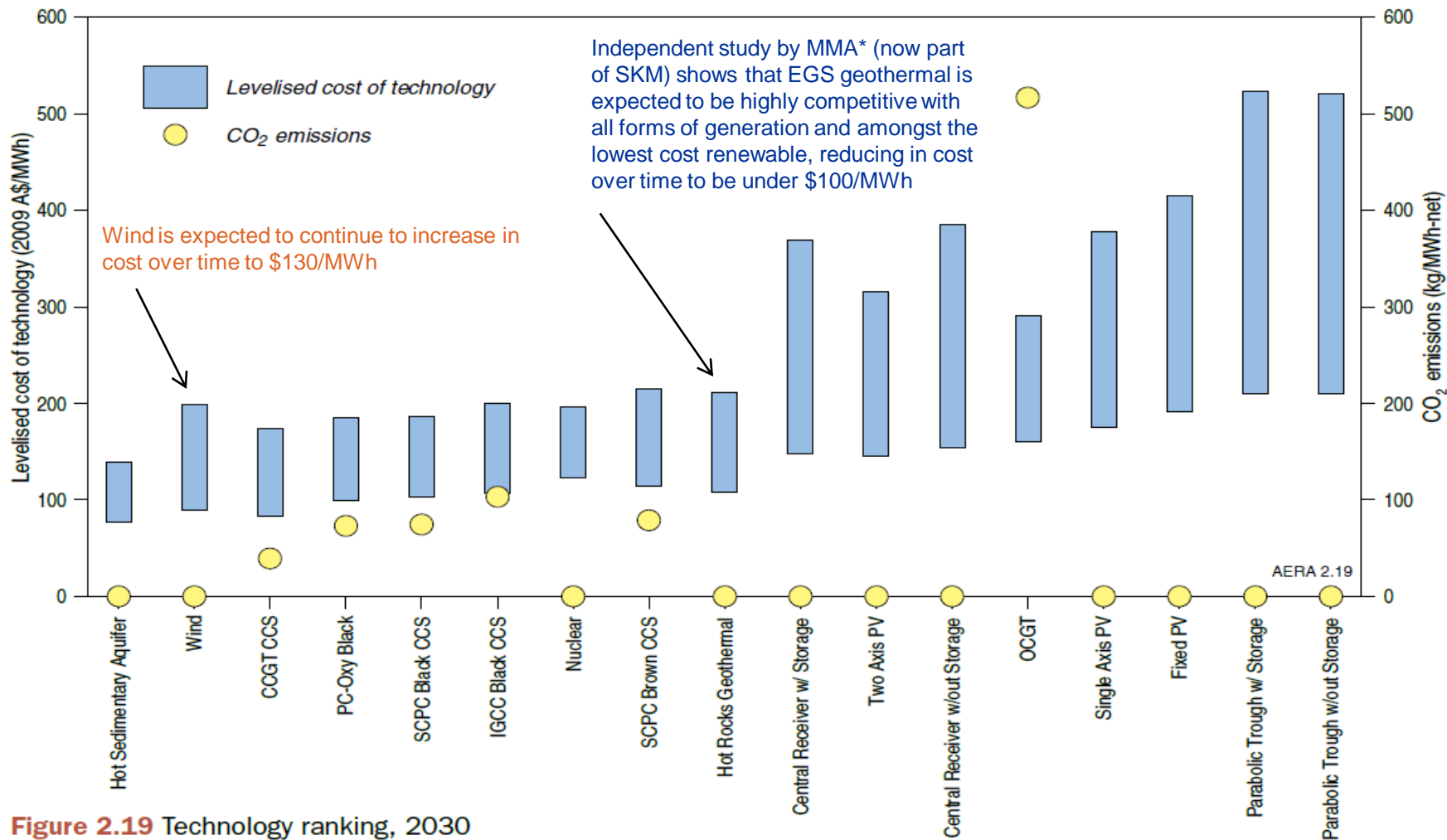
Geoscience Australia has estimated that the potential geothermal resource is equivalent to 26,000 times Australia's annual electricity energy consumption



# Geothermal technologies



# Energy technologies - Australian Resource Assessment - GA



**Figure 2.19** Technology ranking, 2030

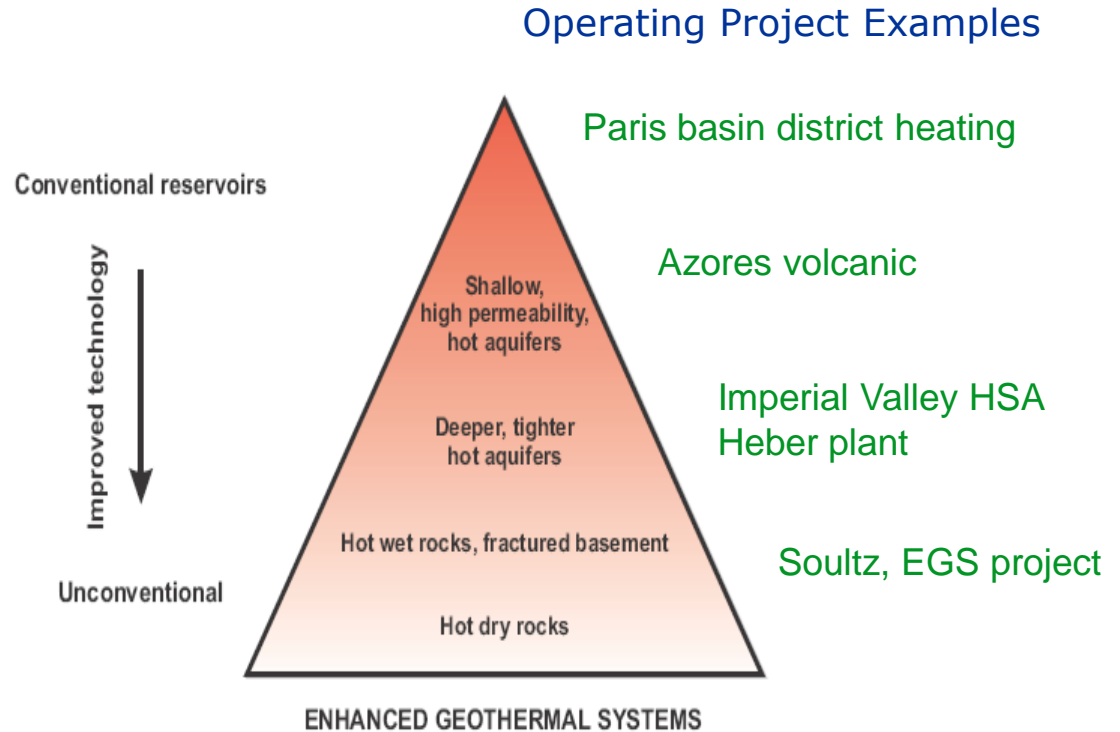
**Source:** EPRI technology status data, 2010

**Note for 2.18 and 2.19:** EPRI levelised cost of technology estimates based on simplified pro-forma costs, individual projects may lie outside this. Levelised cost of technologies: includes weighted cost of capital (8.4% real before tax); excludes financial support mechanisms; excludes grid connection, transmission, and firming (standing reserve requirements); and includes a notional allowance of 7.5% for site-specific costs.

# Geothermal energy overview

## Key Project Parameters

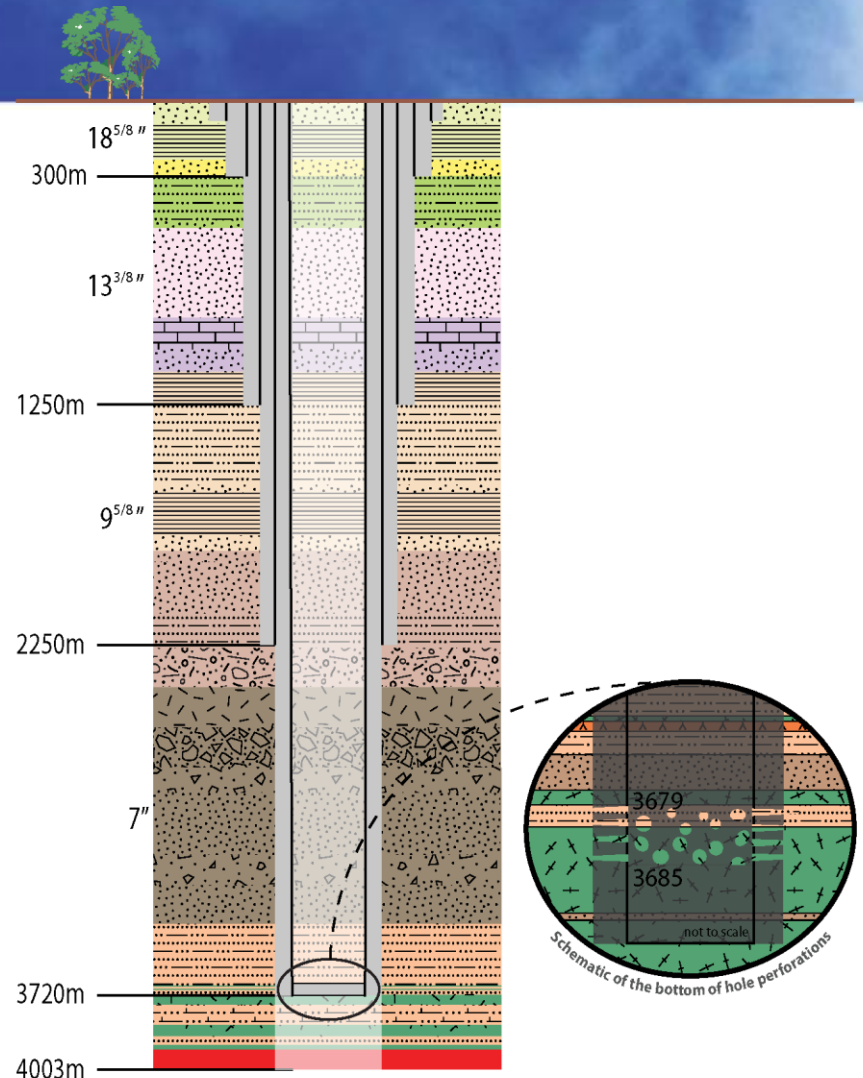
- > Temperature
- > Drilling depth
- > Flow rate
- > Network connection
- > Generation plant type
- > Market/Customer
- > **Optimization of parameters** to achieve commercial return against competitive alternatives in target market (heat or power)



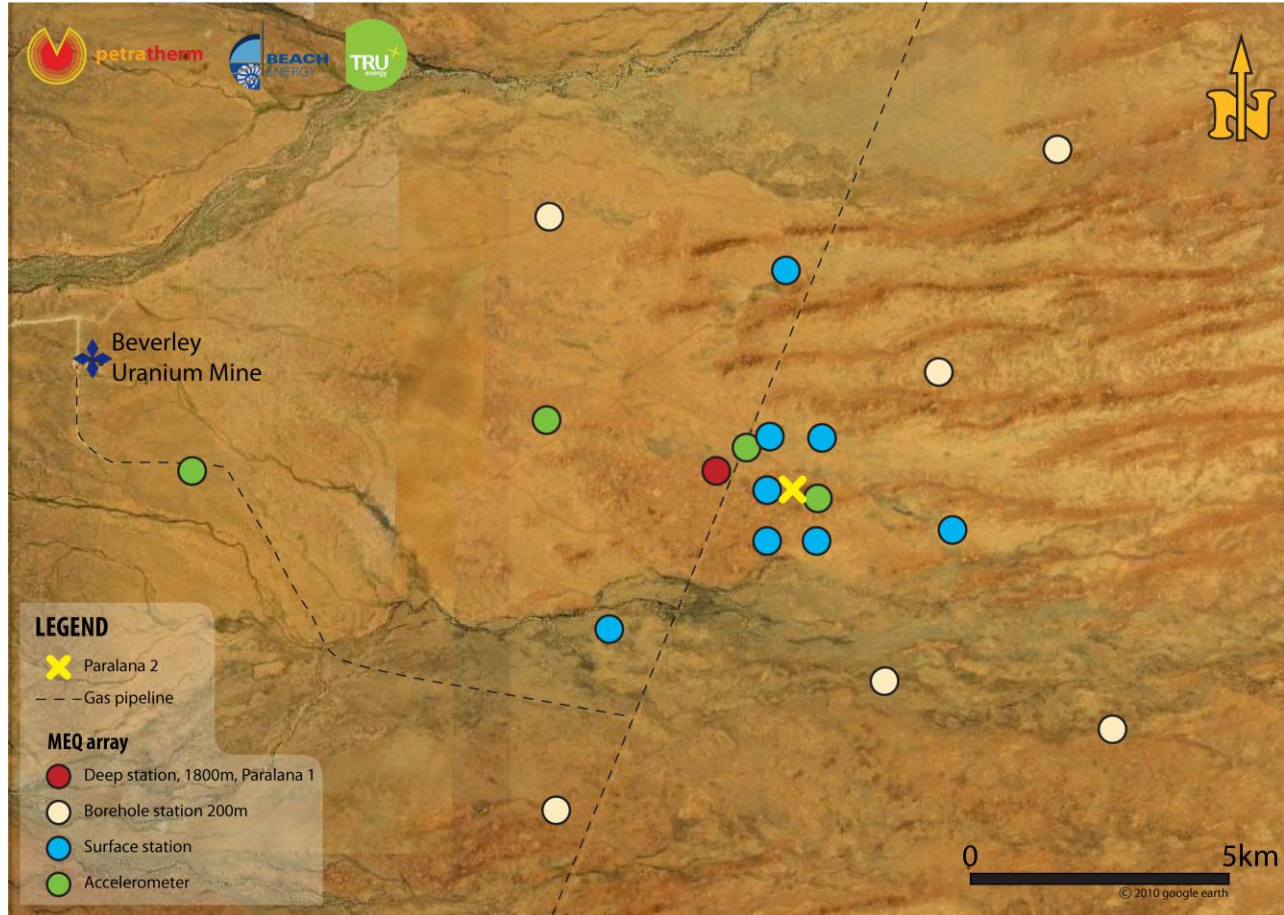
Each project has specific project parameters that when optimized enable viable operation

# Paralana 2 well summary

- > Depth 4003m (G.L. A.H.D.)
- > Well cased and cemented to 3725m
- > Extrapolated bottom hole temperature ~ 190°C
- > High pressure geothermal brines intersected from 3680m
- > Zircon dating confirms 1585 ± 11 Ma Reservoir Sequence
- > Contains numerous fractures and faults
- > 2D Seismic suggests fractured reservoir sequence may be regionally extensive
- > 6m perforated interval between 3679 and 3685m



# Passive seismic array



- IESE (Institute of Earth Science and Engineering NZ)
- one deep borehole sonde at 1790m in Paralana 1b well
- six borehole sondes between 150m and 200m
- eight surface seismometers
- four accelerometers

MEQ - Array Managed by IESE



# Paralana Project - Joint venture partners

## > Beach Energy

- > Top four Australian ASX listed oil and gas company located in Adelaide and with interests in Australia, Europe and Africa



## > TRUenergy

- > Wholly owned subsidiary of CLP\* group – listed on the Hong Kong stock exchange – and the largest utility in the Asia Pacific region



(\*CLP – formerly China Light & Power)

# Paralana joint venture arrangements

- > Beach Energy Farm-in (Jan 2007) for up to \$28m for 36% plus equity share of project costs at every stage
  - > First \$5m for first well and \$2.7m for stimulation – earns 21%
  - > Contributes at 21% for second well and stimulation
  - > After demonstrated geothermal flows – Option to earn a further 15% for \$20M
  
- > TRUenergy Farm-in (Aug 2008) for up to \$57m for 30% plus equity share of project costs at every stage
  - > \$3m first well and stimulation
  - > \$3m second well and stimulation – earns 10%
  - > After demonstrated geothermal flows – Option to earn a further 5% for \$7m
  - > After 7.5 MW pilot plant – Option to earn a further 15% for \$44m



**Under the Paralana Joint Venture post demonstration of flows and with REDP grant of \$62.8m**, for a \$200m, 30 MW demonstration project with JV options taken up, Petratherm would require minimal investment and would retain 34% of resource

# Project joint venture – cost estimates (assumes JV earn-in options exercised)

> Demonstrate flows (stages)	<i>Project JV costs</i>	<i>PTR cost</i>
> Fracture stimulate – Paralana 2 ✓ (completed)	\$ 1.0m	\$ 0.4m <sup>1</sup>
> Drill producer well – Paralana 3*	\$18.0m	\$ 8.5m <sup>2</sup>
> Fracture stimulate/circulate	\$ 1.5m	\$ 1.0m <sup>3</sup>
	<b>\$20.5m</b>	<b>\$9.9m</b>
Potential 45% R & D rebate*	<b>\$9.2m</b>	<b>\$4.4m</b>
Net Cost (after rebate)	<b>\$11.3m</b>	<b>\$5.5m</b>
> Produce power – up to 7.5 MW**	<b>\$45.0 m</b>	<b>\$0.4m</b>
> 3.75 MW plant		
> Substation & transmission line		
> 2 <sup>nd</sup> producer well & 3.75 MW plant		
> Upscale to 30 MW demonstration**	<b>\$162m</b>	<b>\$0.0m</b>
> additional wells and generation plant		

(\* \$2.8 million in funds available from GDP grant for Paralana 3 well)

(\*\* \$62.8 million REDP grant provides one third payment of capital costs)

(\* potential for 45% R & D rebate of expenditures in 2011/12, excludes grant)

(1 – Q3 2011)

(2 – First half 2012)

(3 – Second half 2012)

# Paralana project – Modelled Economic assumptions

## Key Economic Assumptions:

- Temperature of 190°C modeled at depth of 4,000m
- Flow rate of 75 litres per sec – considered most conservative in sector
- Net output per production well of 3.75 MW based on flow, inclusive of parasitic loads
- 20 year project life, includes all costs with 12 wells for a 30 MW development and connection to customer and results in a LRMC\* of \$107/MWh (delivered), comparable with independently assessed industry LRMC ranges
- Bundled price for sale of output black and RECs expected to be > \$140/MWh due to current high off grid price at Beverley mine
- JV retains the full value of black and RECs - no predetermined price - retain full upside
- Potential for commercial viability at small scale 3.75 MW, 7.5 MW and 30 MW

*(\*Long Run Marginal Cost calculation over 20 years, includes all costs, consistent with energy industry comparisons made by the Electricity Supply Association of Australia, McLennan, Magasanik and Associates and the AGEA Economics Committee)*

# Paralana geothermal energy JV project - snapshot



Paralana project 600km north of Adelaide in S.A.

- > High heat flow and high temperature measured
- > Natural fracture permeability at optimal depth – below 3670m, presence of in situ geothermal brine
- > No hydrocarbons evident in the basin
- > Promising fracking results with large fractured reservoir developed
- > Customer for initial 3.75MW plant at nearby Beverley Mine
- > Potential commercial viability at all stages - scale up plan to 30MW and beyond