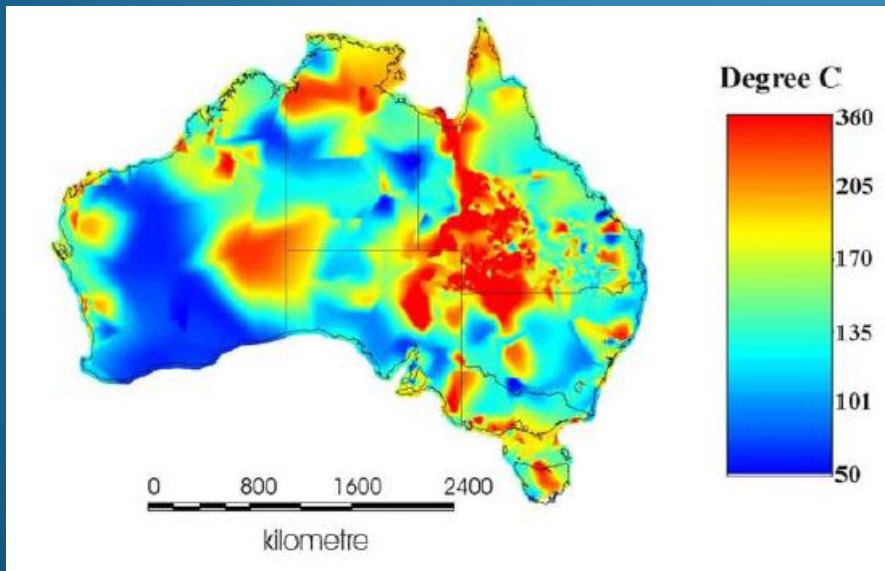


Geothermal Energy in Australia



Presented by:
Howard McLaughlin
Torrens Energy/
Tristream Resources

Australian Geothermal Initiatives

Metrics	31 December 2007	31 May-2011	
Geothermal Licences	232 in Australia (198,000 km ²)	411 in Australia (474,097 km ²)	77% ↑
	190 in South Australia (90,000 km ²)	241 in South Australia (127,918 km ²)	27% ↑
Companies	31 Australia-wide	56 Australia-wide	81% ↑
	21 in South Australia	27 in South Australia	29% ↑
Geothermal Licence holders listed on ASX	9 Australia-wide	24 Australia-wide (more expected)	167% ↑
	6 in South Australian Licences	14 in South Australian Licences	133% ↑
Aus\$ Invested	\$209 Mln in Australia (to YE 07)	\$670.7 Mln in Australia (to YE 10)	221% ↑
	\$207 Mln (99%) in South Australia	\$582.6 Mln in South Australia	181% ↑
F'cast Aus\$ 2002-15	\$851 Mln Australia-wide	\$3,198 Mln Australia-wide	276% ↑
	\$681 Mln in South Australia	\$1,355 Mln in South Australia	99% ↑
Government Grants	\$46.4 Mln Australia-wide	\$297 Mln Australia-wide	625% ↑
	\$27.3 Mln in South Australia	\$204 Mln in South Australia	649% ↑
Federal Grants	\$30.3 Mln Australia-wide	\$235 Mln Australia-wide Projects	676% ↑
	\$20.5 Mln for South Australian projects	\$200 Mln for South Australian Projects	876% ↑

Download AGEG-AGEA Geothermal Reserve & Resource Code:

http://www.pir.sa.gov.au/geothermal/ageg/geothermal_reporting_code

Geothermal Exploration Licences

- 411 licences
- 56 companies

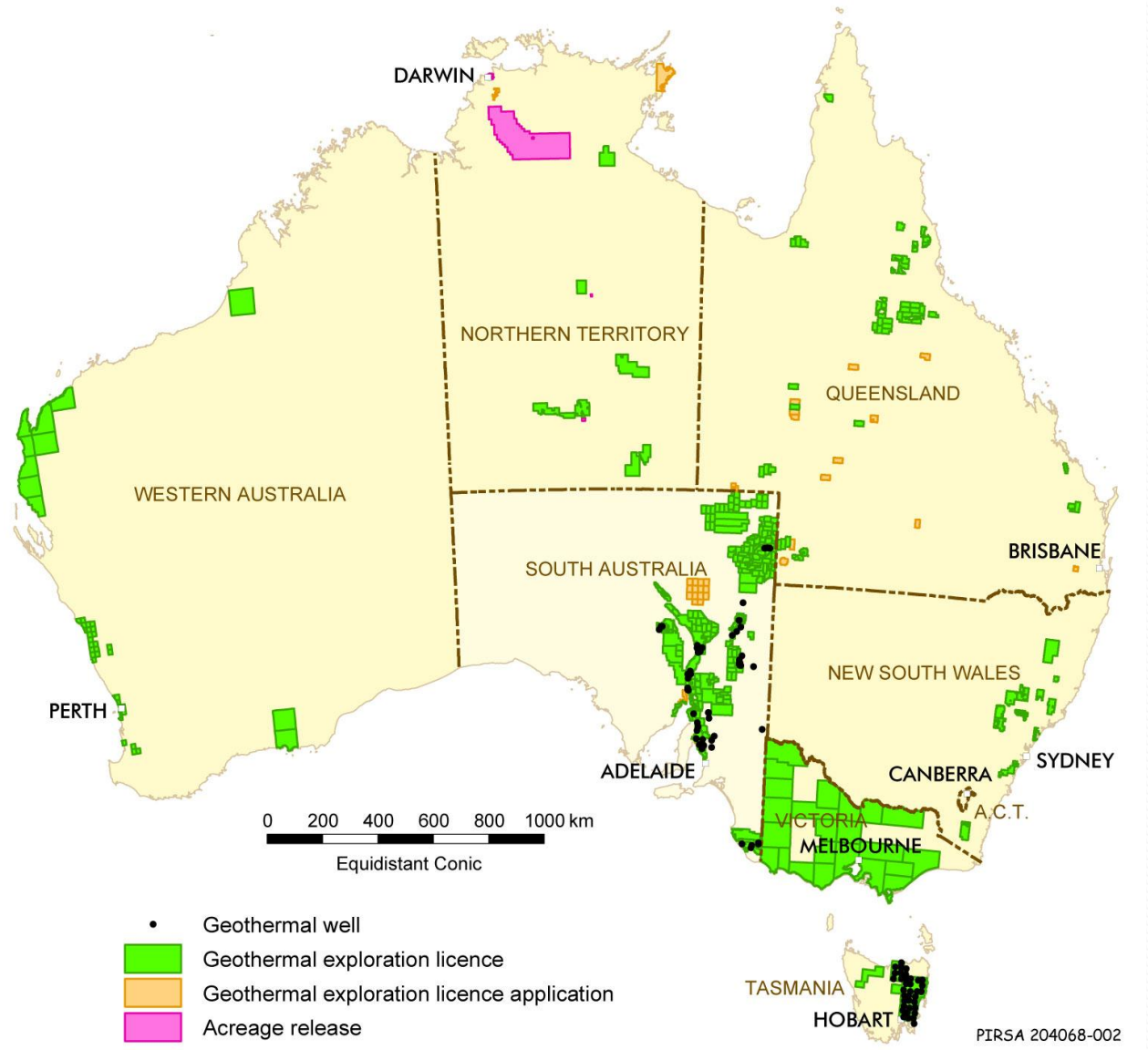
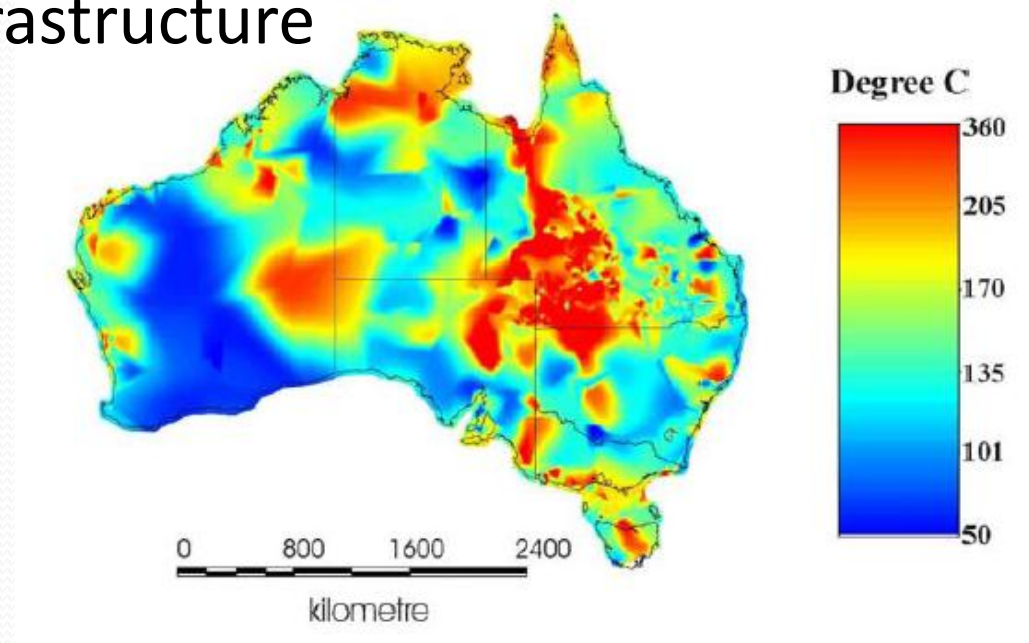


Image Courtesy of
Betina Bendall
Primary Industries
& Resources SA

Many difficulties since the GFC:

- Erosion of investor confidence in Geothermal
- Ineffective Government support – GDP grants
- Drying up of available risk capital
- Technical setbacks
- National Carbon Price???
- – uncertain
- High development costs

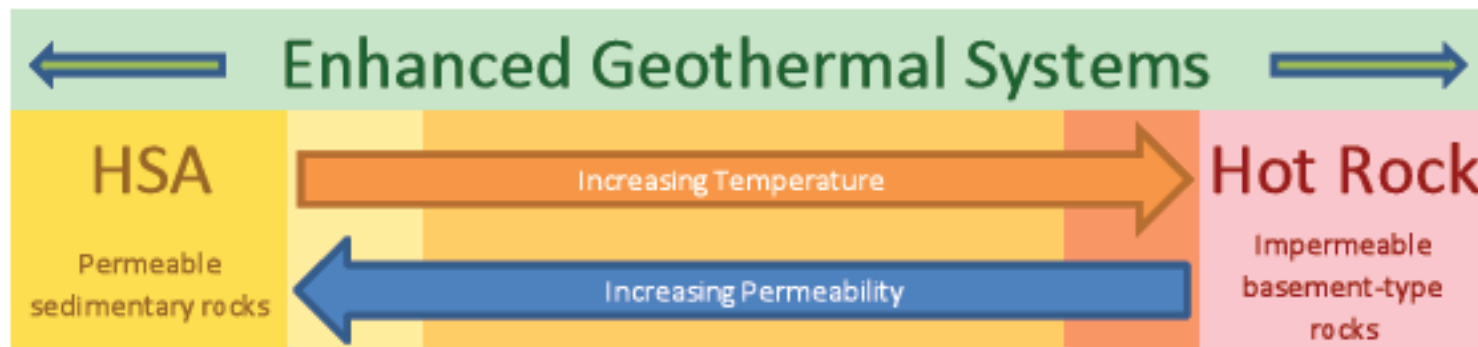
- Australia has areas where the rocks are very hot:
- Commercially challenging however:
 - Remote from population centres
 - Limited transmission infrastructure
 - High drilling costs
 - EGS has technical risks



Investors are losing patience...

Company	Code	Peak Share Price 2008	Current Share Price (June 2011)	Current Market CapMM	Share Price Decline
Geodynamics	GDY	\$2.17	\$0.19	\$64	-91%
Petratherm	PRT	\$1.25	\$0.11	\$14	-91%
Panax	PAX	\$0.23	\$0.023	\$11.3	-90%
GreenRock	GRK	\$0.098	\$0.018	\$10.2	-81%
Hot Rock Ltd	HRL	\$0.16	\$0.04	\$6.7	-75%
GreenEarth	GER	\$0.23	\$0.07	\$5.66	-70%
Kuth	KEN	\$0.31	\$0.072	\$ 4.71	-77%
Torrens	TEY	\$0.54	\$0.05	\$ 3.18	-91%

Progress is being made



Panax

- Salamander-1

Origin Energy

- Celcius-1

- Total 8 deep wells by 4 companies.
- 6 EGS (4 frac'd)
- 2 HSA to date

Geodynamics

- Habanero 1,2,3
- Jolokia-1
- Savina-1

Petratherm

- Paralana-2

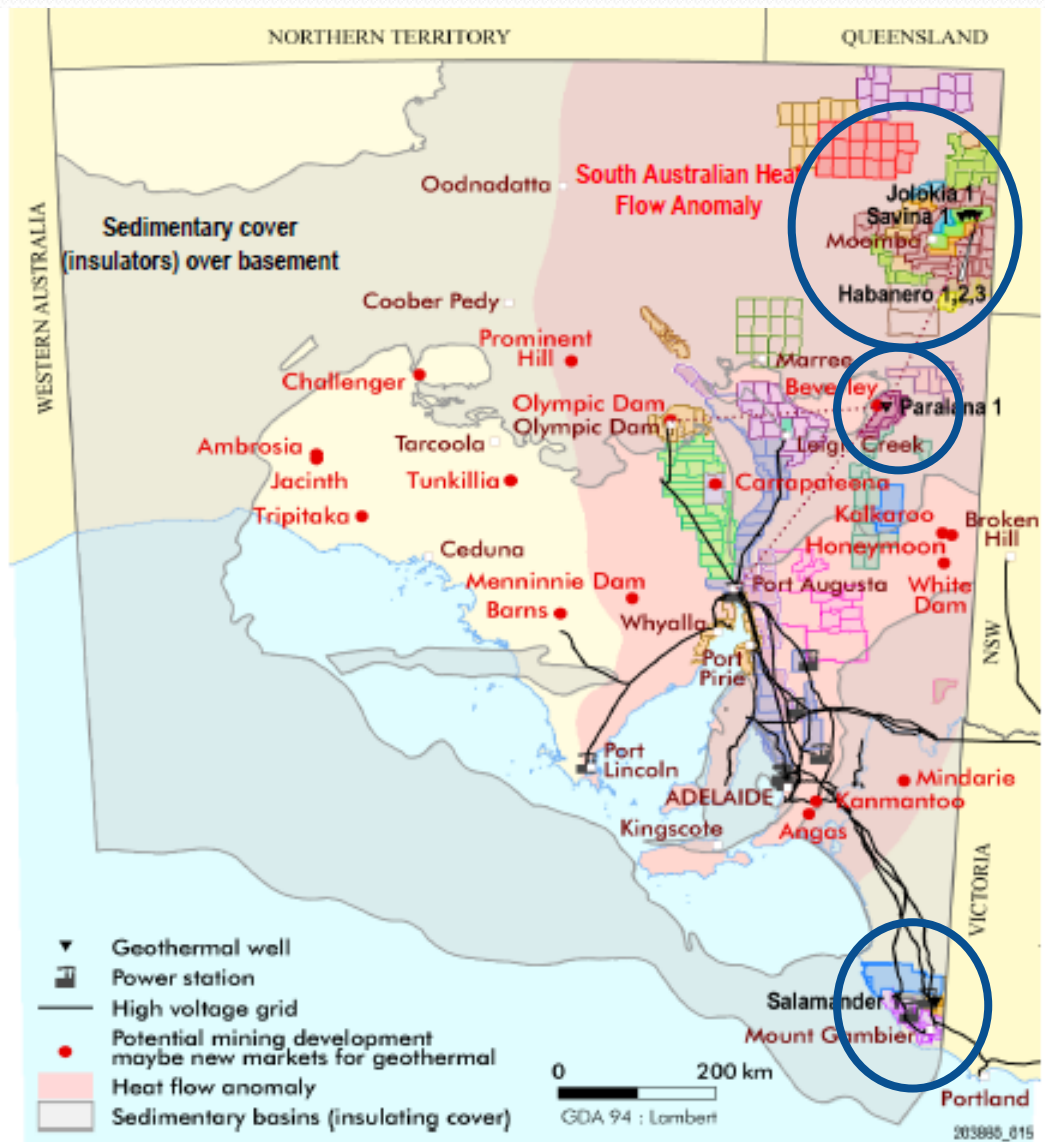
Geothermal Energy Plays & Projects in South Australia

Play ingredients:

- Amagmatic conductive heat source
- Sub-horizontally fractured Hot Rocks and/or Hot Sedimentary Aquifer reservoir(s)
- Insulating cover

Investment

- 27 companies in 248 licences covering 131,343 km²
- 87% of investment (\$584Mln) to YE '10
- SA projects attracted 85% (\$200 Mln) of Fed. Grants to date



Geodynamics/Origin/Tata Cooper Basin South Australia



Habanero EGS Field

- 3 wells >4500m into >250°C fractured, over pressured granite reservoir
- Granite reservoir stimulated
- Connection between HAB1 & 3 proven.

Jolokia & Savina EGS Fields

- 1 well in each field
- Jolokia hotter than Habanero
- Jolokia stimulated in 2010

1MW demonstration plant constructed to power Innamincka town.

•~AU\$120m in grants

“Shallows” (HSA) play to be drilled in 2011 (Celsius 1 & 2)

Origin Energy - \$205 million Impairment on Geothermal EGS

Origin is pursuing the development of geothermal technologies

- Origin's Australian geothermal interests include:
 - 30% non-operated interest in Innamincka Deeps Joint Venture
 - 50% operated interest in Innamincka Shallows Joint Venture
 - 100% interest in a large geothermal exploration tenement (GEL 185) adjacent to the Innamincka Joint Venture
 - Approximately 6% equity interest in Geodynamics ASX listed securities
- Progress on the Deeps JV has taken longer than planned and has not met Origin's expectations to date, reducing the prospects of a timely development of the resource
- As a result, impairment charges of \$196 million and \$9 million have been made against Origin's interest in the Innamincka Deeps JV and Origin's shareholding in Geodynamics Ltd respectively
- Origin will focus in the near term on evaluating the geothermal potential of the shallower Cooper and Eromanga basin sections within the same permit areas through the Shallows JV
- Over the next six months the Shallows JV will drill and test two exploration wells with the first well, Celcius 1, likely to commence drilling during the March Quarter 2011
- Origin also expects to drill one well in GEL 185 over the next six months



Rig 100

Due to disappointing results Origin has impaired its investment in the Deeps JV. Drilling in the shallows is scheduled to commence in March 2011



Celsius-1 Hot Shallow Aquifer Well

Celsius-1 geothermal well have disappointed the Innamincka Shallows joint venture. Target temperatures in excess of 145 degrees Celsius were obtained, establishing one critical element. However preliminary results indicate reservoir permeability (a key contributor to commercially required flow rates) is below target at this location.

Celsius-1 in GER 8, near Innamincka in South Australia, has been cased and suspended, with the JV to move onto either Boyle-1 in GEL 185 or Fahrenheit-1 in GRL 21.

Press release: Origin Energy 20 May 2011

Petratherm's Paralana EGS Project Adjacent to the N. Flinders Ranges South Australia



- Very high heat flow
~120mW/m²
- Paralana 2 drilled June 2009, 3672 m TD into 176°C basement.
- Estimated reservoir temperature at 4000m is 190°C
- Stimulation operations on reservoir started in 2011.
- 3.75 MW plant is planned to supply geothermal power to Beverley Mine 10 km west of Paralana.
- ~AU\$72m in grants

Paralana Geothermal Project

Petratherm/Beach/TRU

- 600km from Adelaide
- Well costs \$15-20 million/well
- Injectivity test on Paralana-2 completed January 2011
 - Injection rates ranged between 0.5 and 2 barrels per minute
 - On completion of the injection work, the measured well head pressure was more than 4,000 psi. Low permeability?
- Full Fracture test scheduled for July 2011
- 3.75 MW demonstration plant proposed

Panax's Limestone Coast HSA Project, Otway Basin, South Australia

- HSA play in an oil & gas province.
- Targeting a known permeable sandstone.
- Salamander 1 drilled January 2010 4025 m TD into 171°C Cretaceous Pretty Hill Formation.
- First Australian explorer to drill a deep HSA resource.
- ~1000m of target formation intersected.
- Well flowed steam
- Au \$7m Geothermal Drilling Fund grant.





PANAX GEOTHERMAL

Salamander-1 Drilling Progress

- **Cost: ~ \$15 million (\$7 million GDP grant);**
- **Spudded 31 January, 2010, reached TD of 4,025m on 15 March, 2010; zero LTIs;**
- **Drilled with only six drill bits;**
- **Political & community support.**





Salamander-1 Well Testing Results

- Four discharge and one injection test (completed on 1 July, 2010);
- Indications of “skin factor” led to acid treatment using CTU after the 4th discharge test (acetic acid);
- Test results show:
 - Transmissivity decreased with each successive production/discharge test;
 - Final test result $1/_{10}$ of 1st test;
 - Decrease in “payzone” thickness after acid treatment;
 - Not in line with petrophysical logs interpretation (i.e. preferred transmissivity 6.7 Dm)

Salamander-1 Well Test Results (from SKM report, 28/09/10)							
	PBU* 30 March	PBU 31 March	PBU 12 May	PBU 15 May	Acid Treatment	PBU 12 June	PFO** 1 July
Transmissivity kh (Dm) ***	1.3 to 3.1	1.4 to 2.6	0.89	0.57		0.29	0.29
Payzone Thickness (m)	450	450	400	400		250	250

* PBU = Pressure Build-up following discharge test;

** PFO = Pressure Fall-off following injection test;

*** Transmissivity = capacity to flow, also known as Darcy Metres or Dm or as kh (permeability thickness).

Lesson learned

- Australia remains a difficult place for commercialising geothermal energy
 - \$670 million spent to date without producing a commercial project
 - Investor patience is being tested...
- Requires a national carbon price to stimulate further investment
- Requires a longer term government incentive program with fewer strings attached
- Australia needs a successful demonstration plant

Comparison with Gulf Coast Geothermal

Hot sandy aquifer vs. geo-pressured geothermal

	Texas	Australia
Style	GPGT	HSA
Proximity to electricity demand	✓	✗
Grid Infrastructure	✓	✗
Legal framework in place	✗	✓
Technically proven	✓	✗
Commercially viable	✓	?
Risk Capital availability	?	✓

