



National Geothermal Update – Latest Developments and Future Direction

(Energising Geothermal 2011)

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New Zealand Geothermal Association Inc

- An independent non-profit industry association with a focus on geothermal
- Objective is to encourage, facilitate and promote research, development and application of geothermal resources
- Established in 1990
- Affiliated to the International Geothermal Association and to the Royal Society of New Zealand
- Currently has about 300 individual members
- Individual subs \$100/year
- Corporate subs \$1,500-\$11,000/year



NZGA Corporate Members



Some Geothermal Options



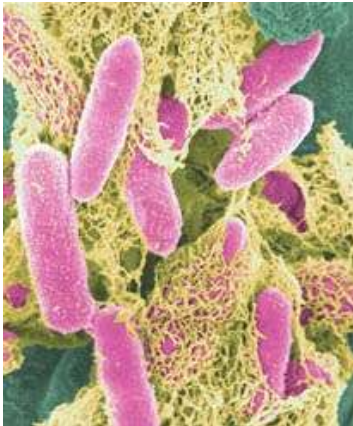
Tourism



Heat for horticulture



Heat for industry/
commerce/domestic

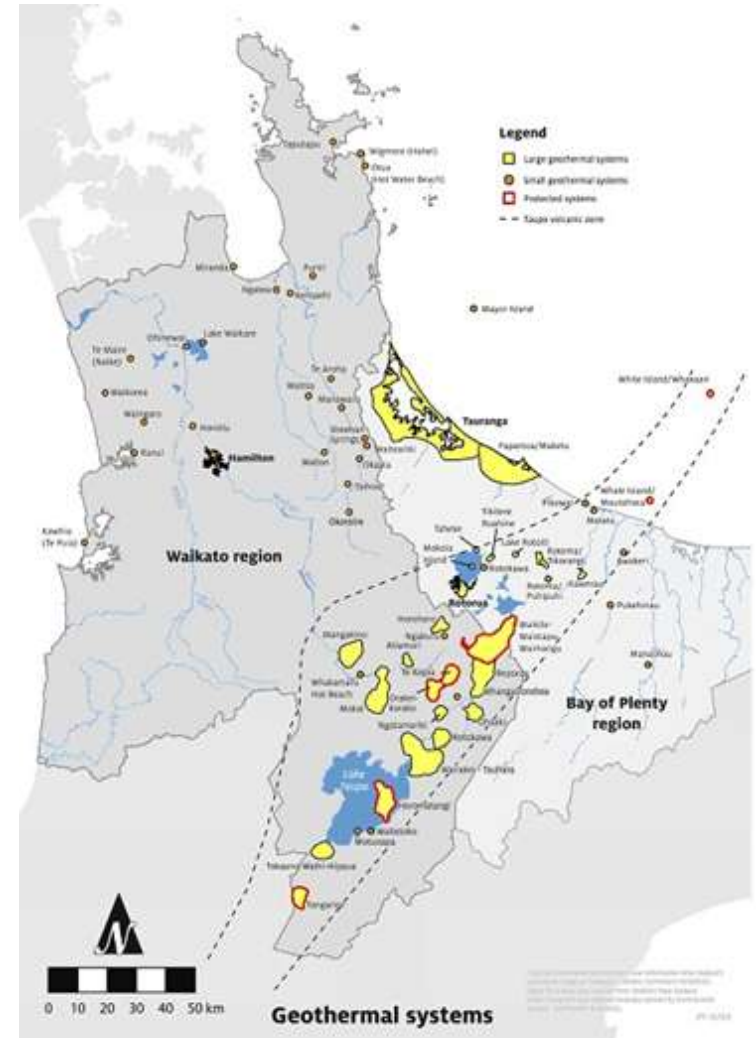
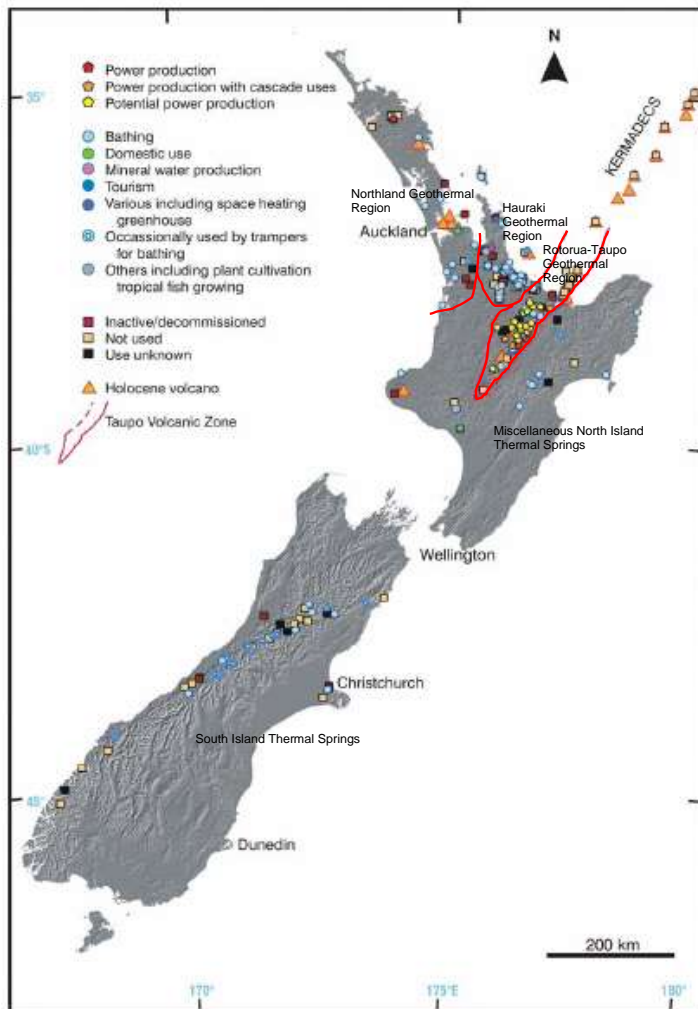


Chemicals and
thermophyles



Electricity generation
– small or large scale

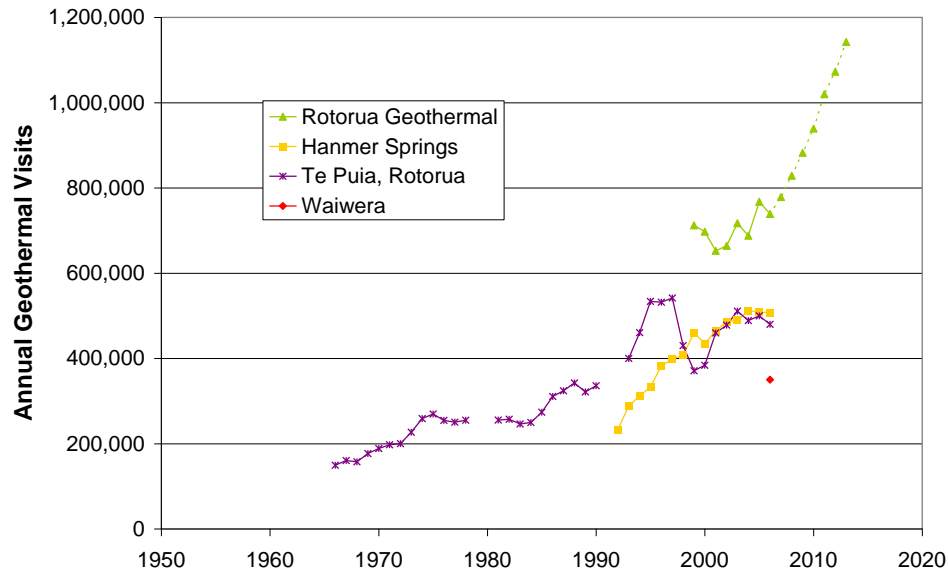
Our Geothermal Resources around New Zealand



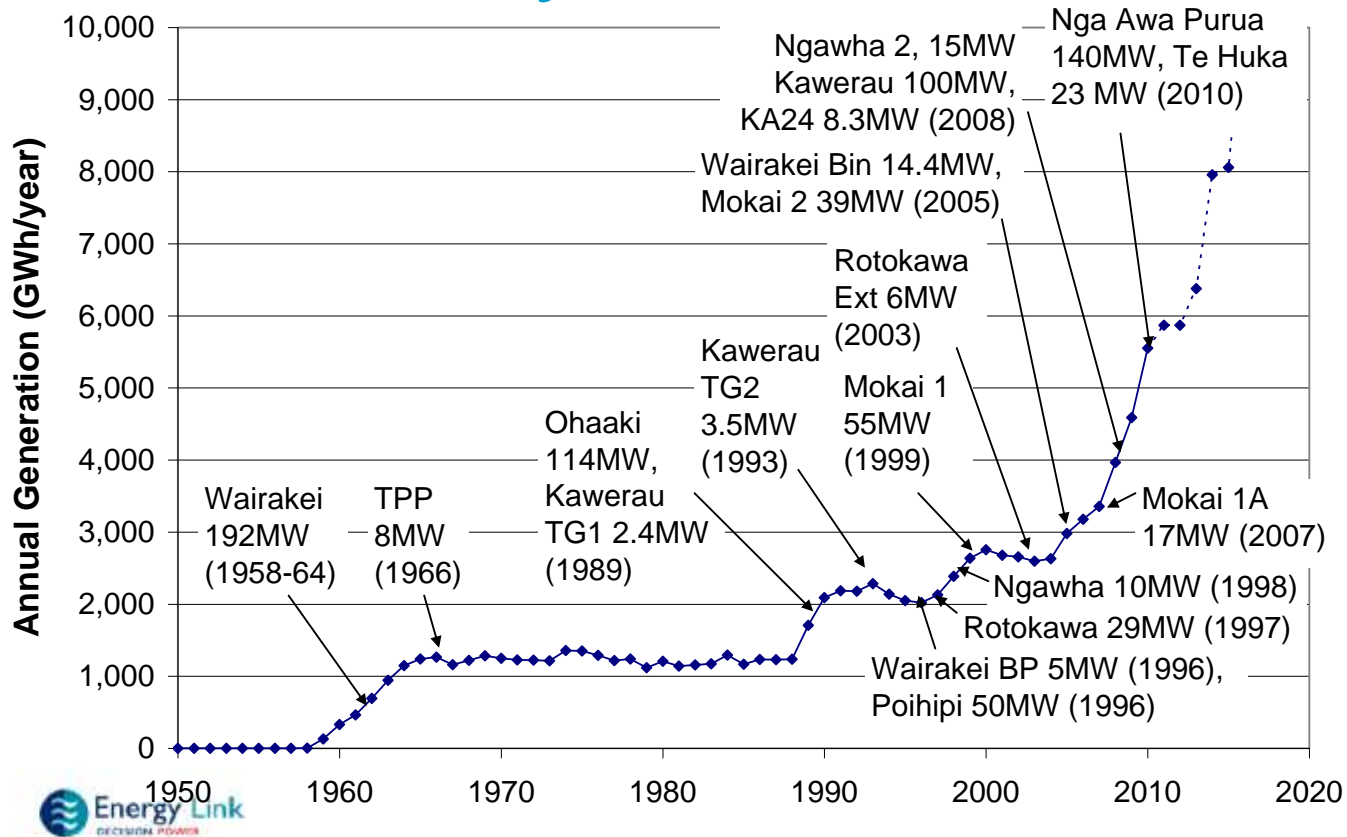
Assessment of Restricted Geothermal Potential

Field	Generating Capacity (P50) (MW)	Capacity Minus Environmental Limitations (MW)	Existing Generation or Use (MW)	Equivalent Period of Past Use (years)	Calculated Available Additional Capacity (MW)
Atiamuri	6	0	0	0	0
Horohoro	5	5	0	0	5
Kawerau	450	225	130	9	58
Ketetahi	100	0	0	0	0
Mangakino	47	47	0	0	47
Mokai	140	140	111	7	4
Ngatamariki	120	120	0	0	120
Ngawha	75	38	25	5	9
Ohaaki	130	130	60	17	37
Orakei Korako	110	0	0	0	0
Reporoa	42	0	0	0	0
Rotokawa	300	300	35	11	252
Rotoma	35	35	0	0	35
Rotorua	35	18	6	45	2
Tauhara	320	160	2	3	158
Te Kopia	96	0	0	0	0
Tikitere-Taheke	240	240	0	0	240
Tokaanu	200	100	0	45	99
Waimangu	280	0	0	0	0
Waiotapu	340	0	0	0	0
Wairakei	510	510	230	30	47
Total					1115

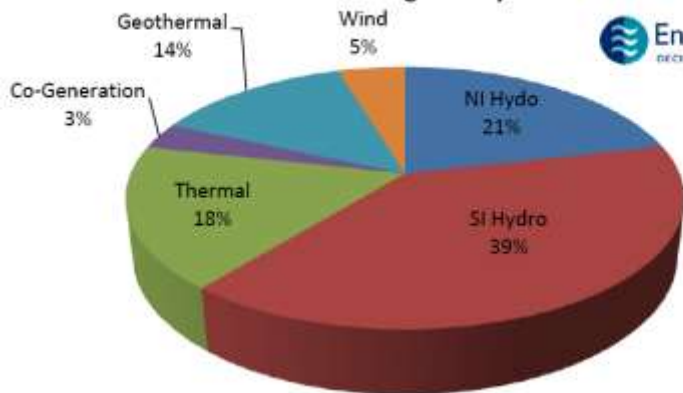
Geothermal Tourism



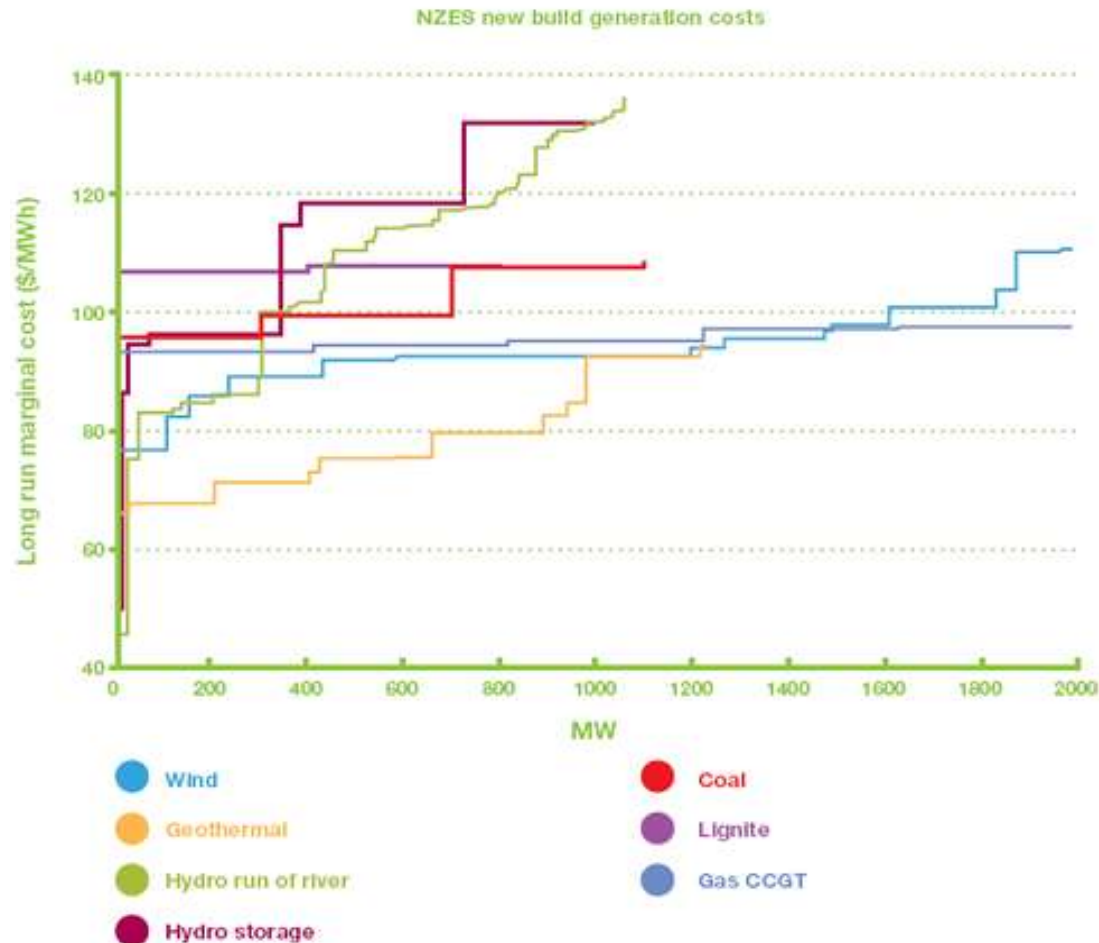
Geothermal Electricity Growth in NZ



New Zealand Generation Week Ending 22 May 11



Cost of Upcoming NZ Geothermal Electricity Developments



Source: Ministry of Economic Development

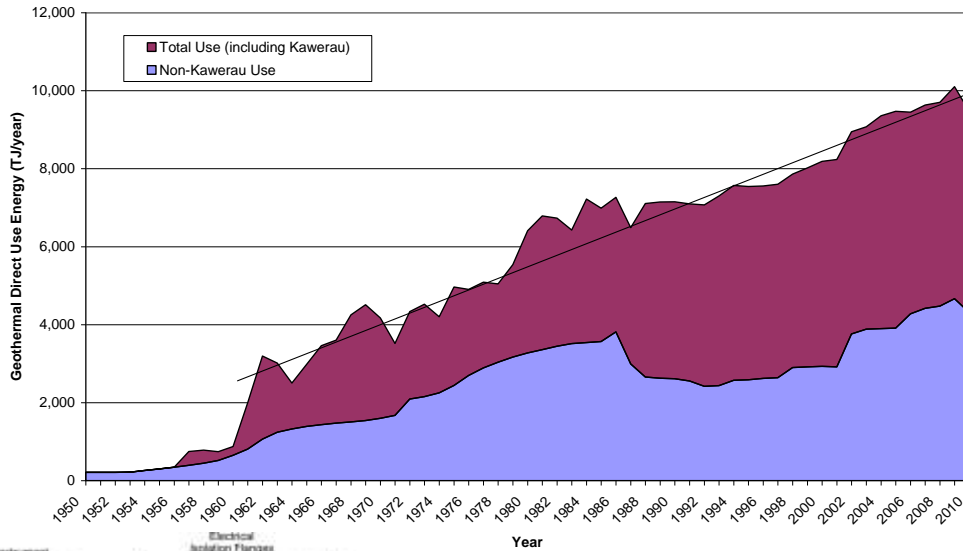
Upcoming Developments

- Kawerau 25 MW – Ormat development with NST – to be commissioned 2012
- Te Mihi 240MW (166MW initially) (Wairakei replacement with a 114MW generation gain) – Contact – Toshiba plant
 - Consented
 - Announcement of EPC contract signing made February 2011 – concrete pours now
 - To be commissioned by mid-2013
- Ngatamariki 82MW – MRP/Tauhara North No2 JV – Ormat plant
 - Consented
 - Announcement of EPC contract signing made June 2011
 - Development drilling underway – advanced drill rig from Iceland
 - To be commissioned by mid-2013
- Tauhara 250MW – Contact
 - Consented
 - Exploration drilling completed
- Rotoma, Taheke, Tikitere (45MW BOOT with Ormat), Te Ahi O Maui (KA22) (10-15MW), Ngapuna – all examples of Maori JVs at various stages of development
- Mokai, Rotokawa, Kawerau, Ngawha – existing developments with the possible extensions
- Horohoro, Mangakino – fields available for development where some drilling has been done
- Tokaanu – significant potential
- Note: stalled demand growth but impending retirement of Huntly

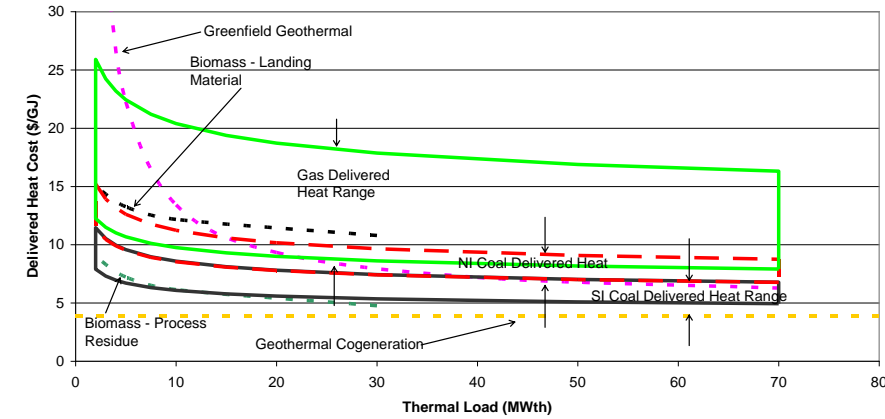
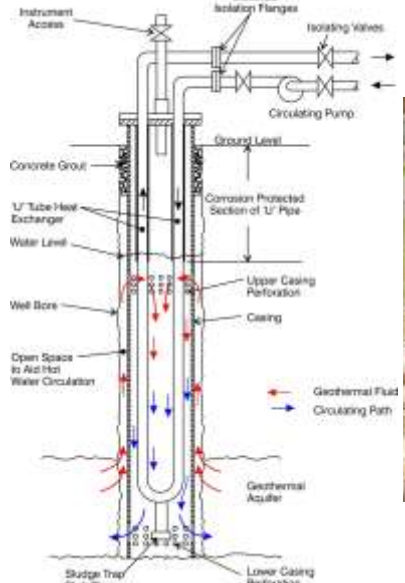


Growth in Direct Use

Growth of Geothermal Direct Use in New Zealand



2005 Heating Cost \$15/t Carbon Dioxide Charge



- Greenfield Geothermal
- Biomass - Landing Material
- Gas Delivered Heat Range
- NI Coal Delivered Heat
- SI Coal Delivered Heat Range
- Biomass - Process Residue
- Geothermal Cogeneration
- South Island Coal
- North Island Coal



Recent and Future Growth in Direct Use



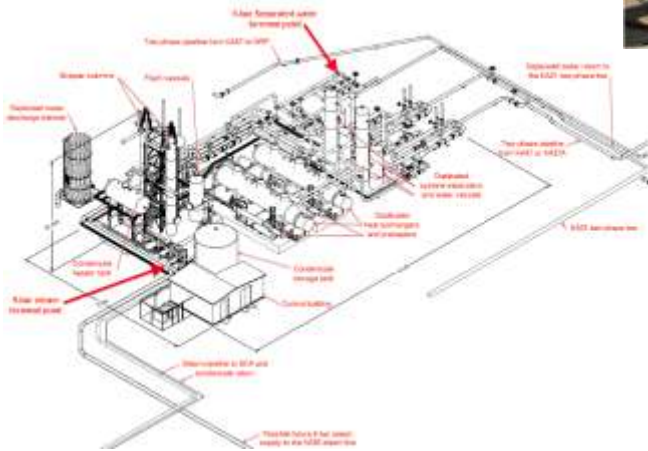
Mokai Glasshouse 2003/2008
314TJ/y



Tenon Kilns 2006 440TJ/y



Dunedin Airport Heat Pump 2006
3TJ/y



SCA Mill 2010
300TJ/y

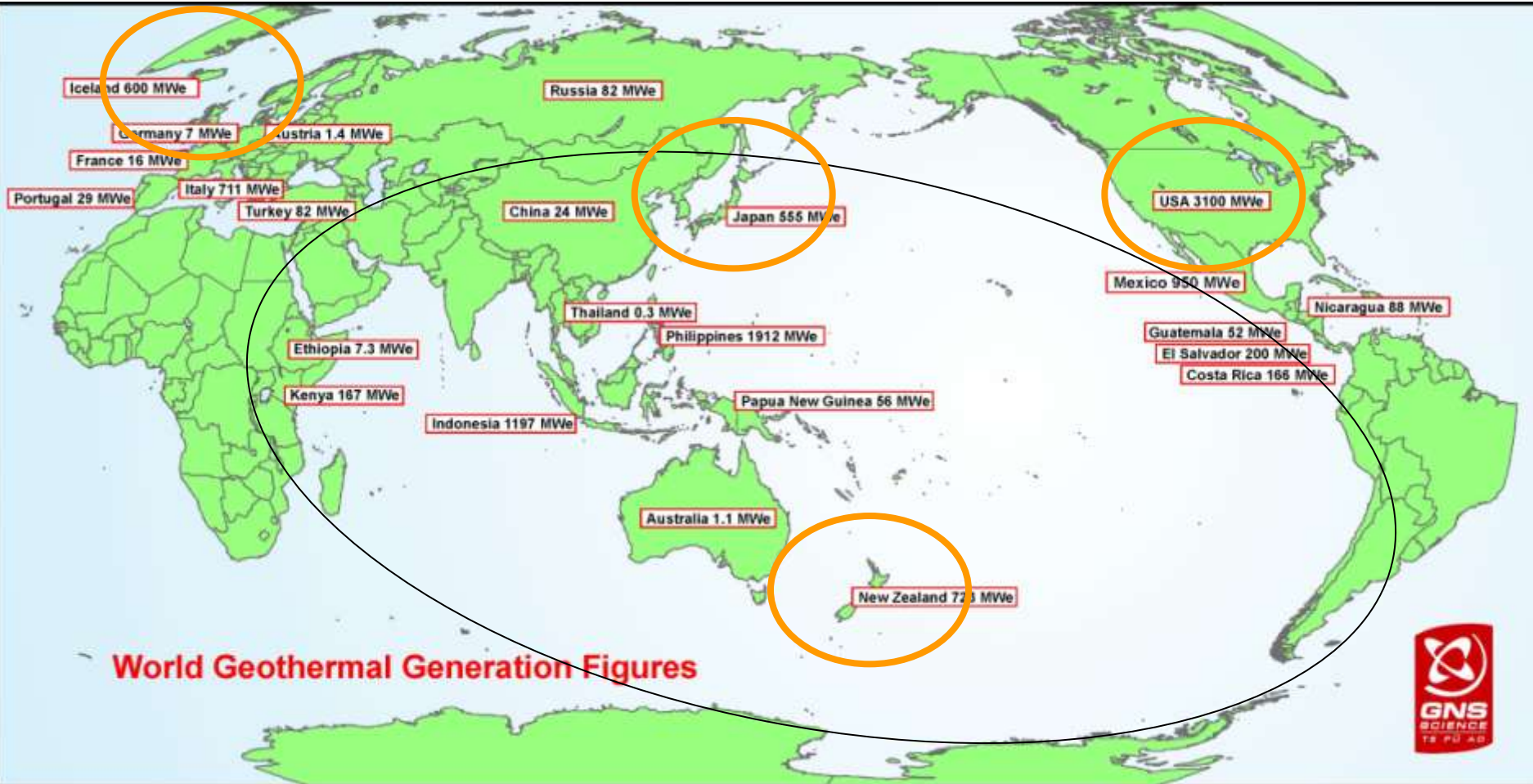
Future – more of the same



Miraka Milk Drying plant 2011
270TJ/y

NZ Geothermal on the World Scene

(currently 6th largest for generation - rapid expansion underway)

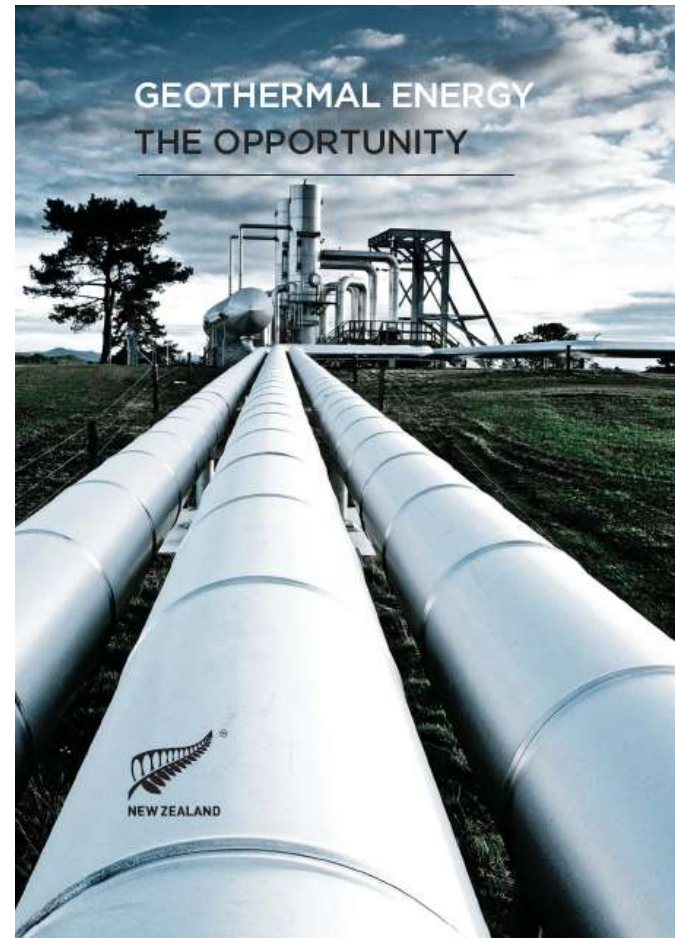


World Geothermal Generation Figures



NZ Geothermal Inc

- We have world-leading respected expertise with international experience
- NZ developers are investing offshore too
- Now looking to maximise benefits through a cooperative approach with the help of NZTE
- Will help to maintain a pipeline of projects
- Announcements pending



Geothermal Training

- Want young blood to move up through the industry – and we are seeing that now
- Various training courses at universities and through polytechs for some specialist areas
- Restoration of the Geothermal Institute (UofA) with strong government funding
- Opportunity for international marketing



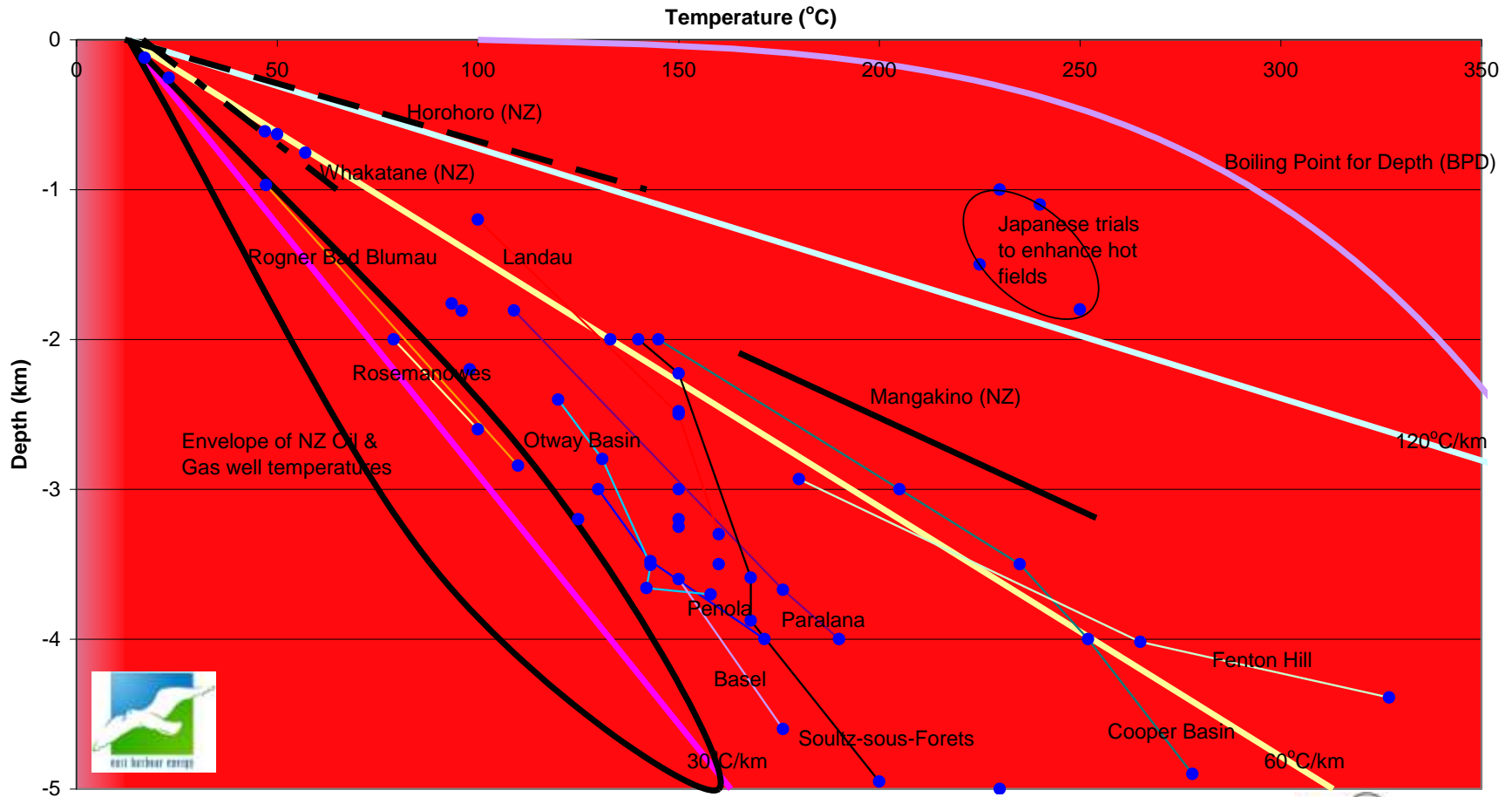
Research and Development

- Total value ~ \$8million/year
- Heavily led by GNS Science and University of Auckland in partnership with industry
- “**Hotter and Deeper**” research and resource delineation in the TVZ
- Development of tools and interpretation skills for “hotter and deeper” research
- Research into alternative drilling techniques and methodologies to lower drilling costs
- Developing cements for extreme environments
- Investigation into induced seismicity and collection, processing and interpretation of micro-seismic events
- Determination of rock properties and associated testing
- Fracture characterisation
- Review of fluid-rock interactions
- Developing a programme for increased uptake of **low enthalpy geothermal** energy e.g. heat pumps, direct heat, low temperature electricity generators
- “Low enthalpy heat to electrical energy conversion” project – HERA/UoC
- Development of improved reservoir modelling programmes
- Development of improved methods of visualising 3D formations
- International R&D alignment through:
 - International Energy Agency – Geothermal Implementing Agreement
 - Now seeking to join the International Partnership for Geothermal Technology



Some Thoughts on EGS/HSA

Alternative Geothermal Projects



Regulatory

- Recent and ongoing streamlining of the RMA
 - Now includes an EPA process option
- National Policy Statements:
 - Transmission (2008)
 - Renewable Electricity Generation (2011)
 - Biodiversity (in consultation)
- Current review of Regional Policy Statements
 - Waikato Regional Council (similar to agreed RPS)
 - Bay of Plenty Regional Council (aligning with WRC)
 - Northland Regional Council (review process soon)

World Geothermal Congress 2015

- Prime international geothermal conference held every five years
- To be jointly hosted by New Zealand and Australia
- Venue for conference will be Melbourne but field trips will be in New Zealand and Australia
- Event will take place over a period spanning ANZAC weekend in the year of the ANZAC centenary
- Eventually we would like some government support/involvement to strengthen NZ's position

Conclusions

- Geothermal energy will be a significant part of the future mix and new build – for electricity and heat – a valuable resource
- Geothermal industry participants are active around the world
 - Often taking a lead
 - Facing competing interests
- Valuable heritage

www.nzgeothermal.org.nz

