



New Zealand Country Update 2015



Brian Carey
NZ Geothermal Association President
20 April – Session 2A
WGC 2015 Paper 01052

Take all the photos you like





Today

- **Taonga**
- **Legends**
- **Prowess**
- **Observations**
- **Point You Forward**

Co-authors



Anya



Spence



Brian



Katherine



Mike



Bridget



Greg



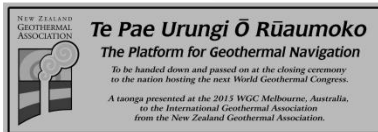
Brian Carey

- Geothermal Resource Management Specialist
- GNS Science
- President of NZGA
- Chair Geothermal Heat Pump Association of NZ
- 30 + years in Geothermal
- 20 + years – resource operations
- Trained
 - Mechanical Engineer



Taonga

- Gift / Treasure
 - Cherish
 - Nurture
 - Care for





Geothermal Energy

- **Gift to our nation**
- **Taonga**
- **Features in**
 - **Maori legend**
 - **Development legend**



Ngatoro-i-rangi





1951 Geothermal Drillers

Bob McMillan



1962 Equation

$$\frac{G h_o^{1.102}}{P_c^{0.96}} = 11,400$$

1962 Equation

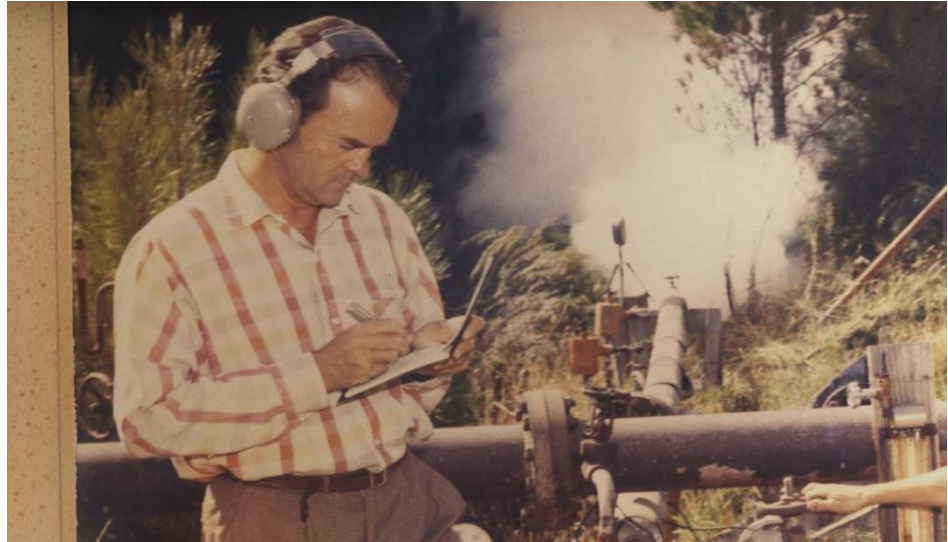
$$\frac{G H_t^{1.102}}{P_l^{0.96}} = 1680$$



Russell James

**James Lip Pressure
Bore Output Measurements**

1962 Equation



Life Member of the NZGA – Passed on on 21 December 2014

Wairakei – 15 Nov 1958



Photo courtesy Alexander Turnbull Library



NZ Prowess



- **Impressive**
- **Geothermal Electricity**
 - **4th Generated Energy (GWH)**
 - **Greatest energy increase 2200 GWH / annum**
WGC 2010 to 2015
 - **5th Capacity (MWe)**
 - **Capacity Increase \approx 410 MWe**
23% of the worldwide increase
WGC 2010 to 2015



Four Significant Additions

- **Since WGC 2010**
- **The Glorious Geothermal Energy Field Trip**
 - Visit all four

In Date Order



Nga Awa Puru - 140 MWe



15 May 2010 – Official opening by Hon John Key Prime Minister of New Zealand

TOPP 1

Norske Skog Tasman



Kawerau - 23 MWe

Binary Power Plant – Operational January 2013



Largest Binary



MIGHTY RIVER POWER

Ngatamariki 82 MWe

3 October 2013 – Official opening by Hon John Key Prime Minister of New Zealand

Most Recent

Contact[®]

Te Mihi
166 MWe



14 August 2014 – Official opening by Hon Bill English Deputy Prime Minister of New Zealand



Country Effectiveness

• Overall Electricity Production Factor
= Energy / (Capacity*hours in a year)

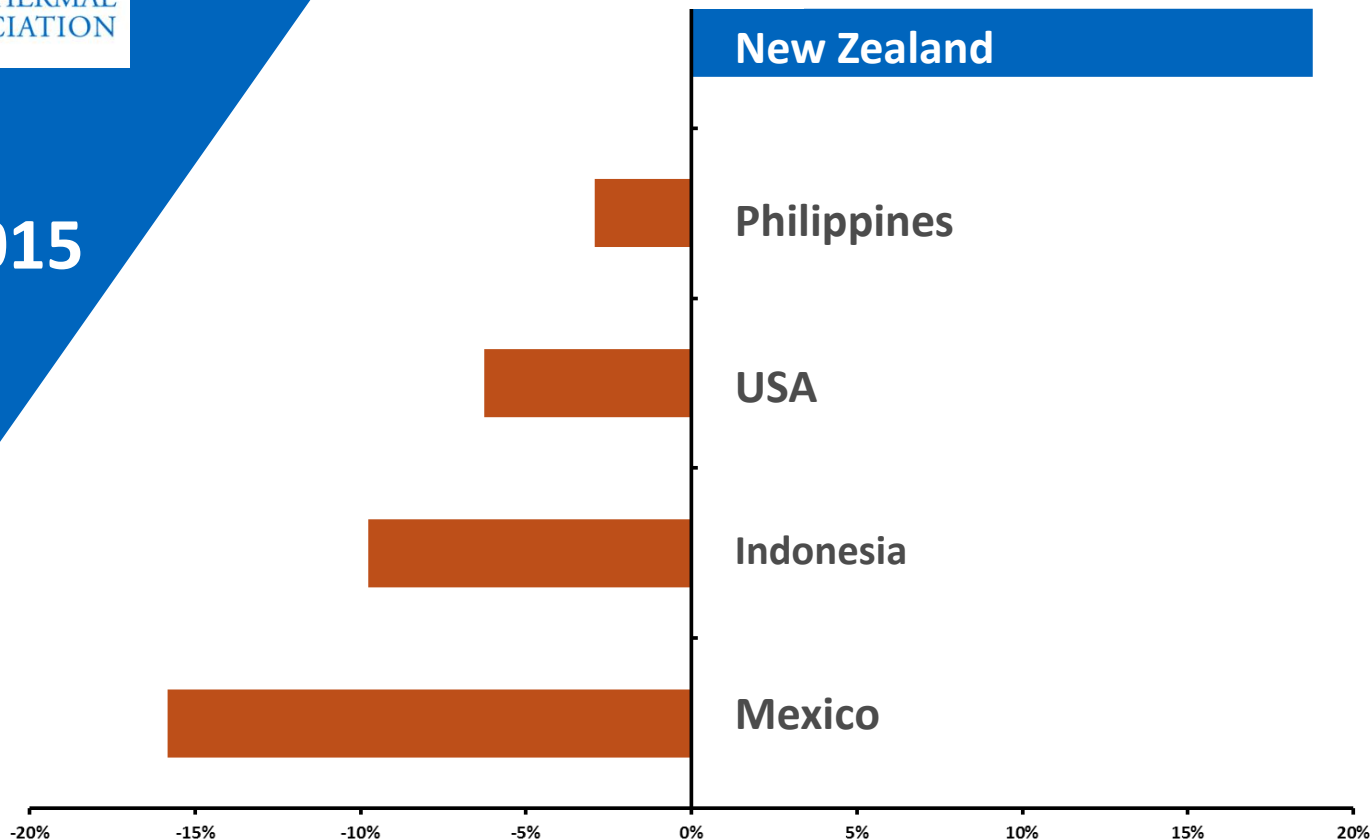
- NZ \approx 80%
- Most improved nation
last five years
(Bertini 2015 paper 1001)





WGC
2010 - 2015

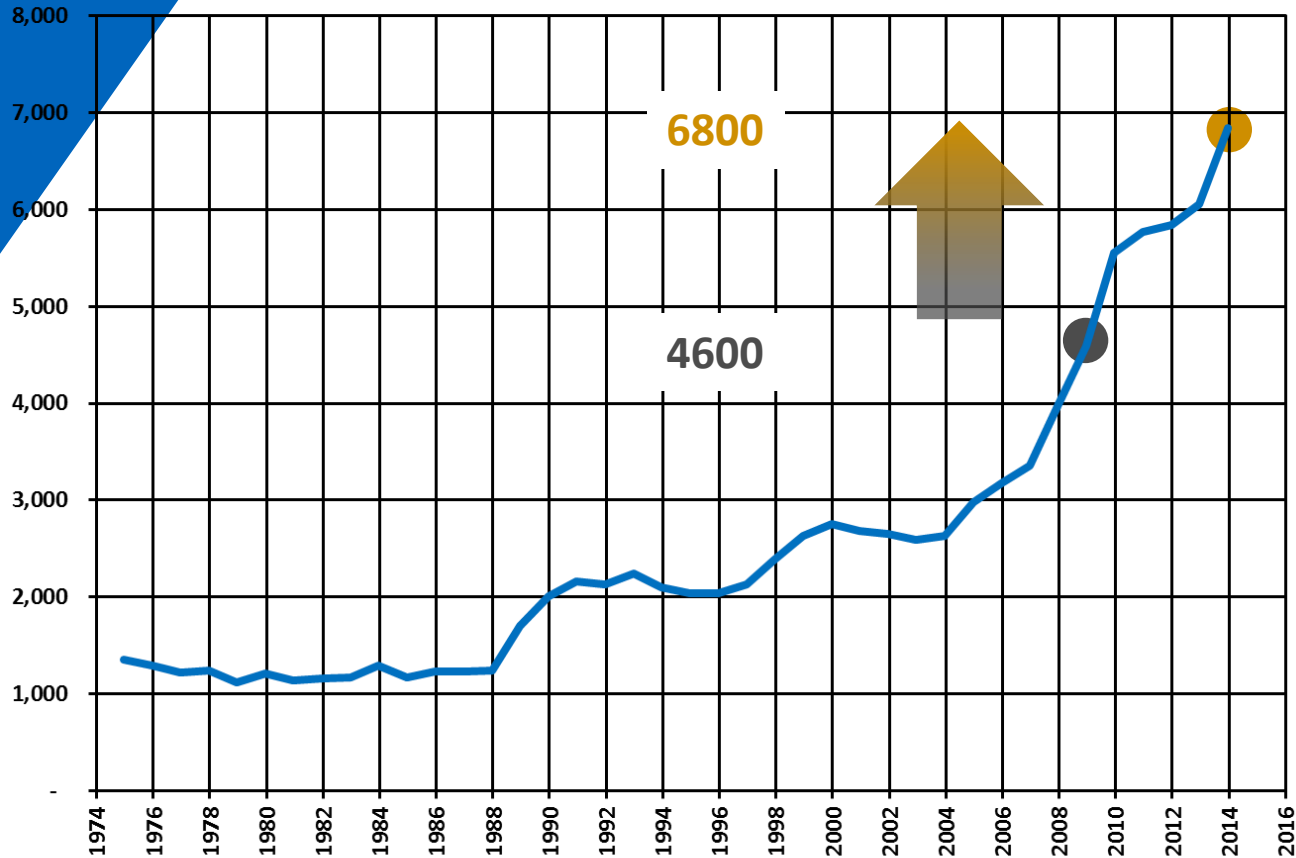
Change in Effectiveness





Geothermal Electrical Energy

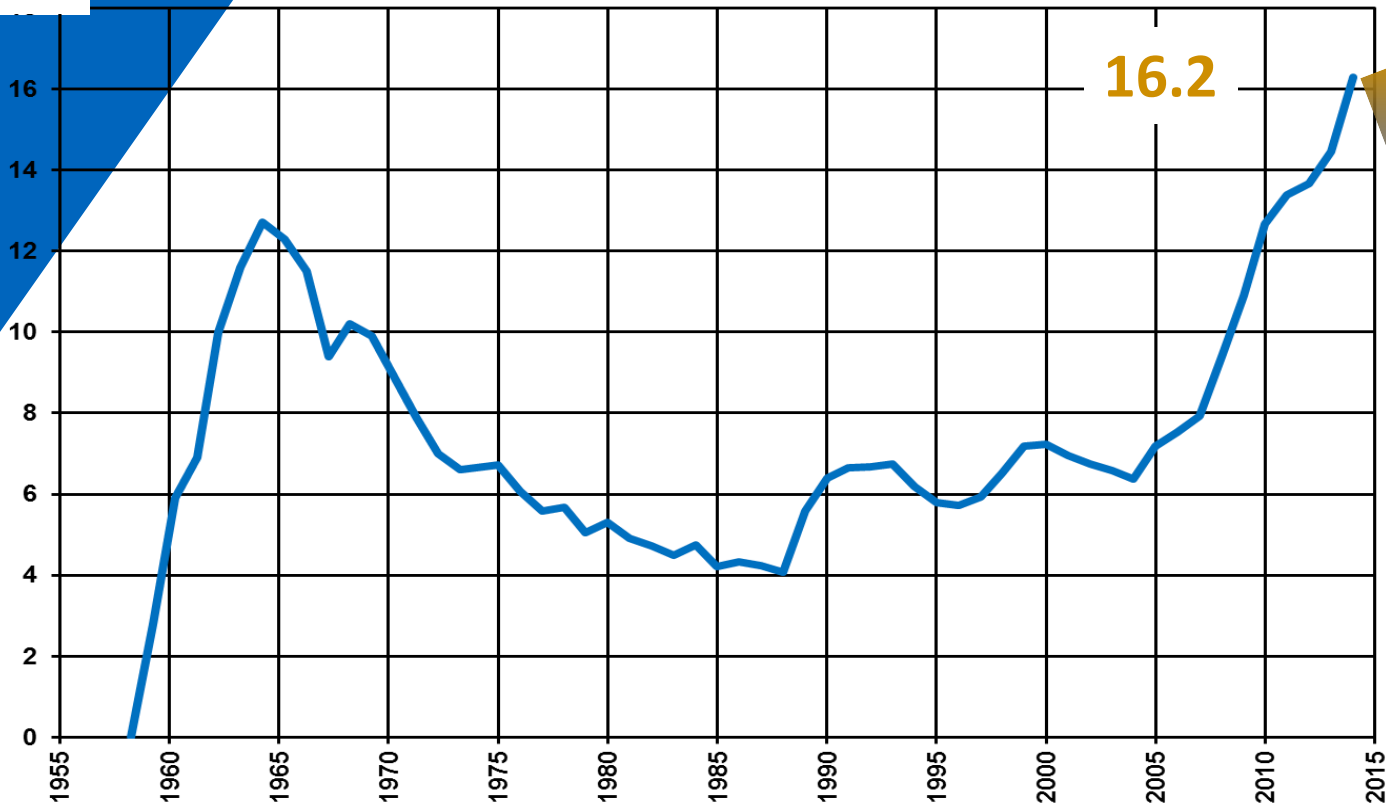
Increase in Annual GWh





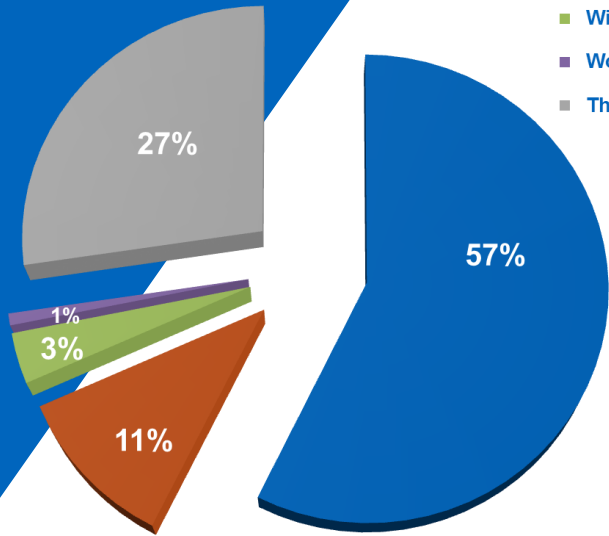
Percentage Total Electricity

Percentage
Geothermal



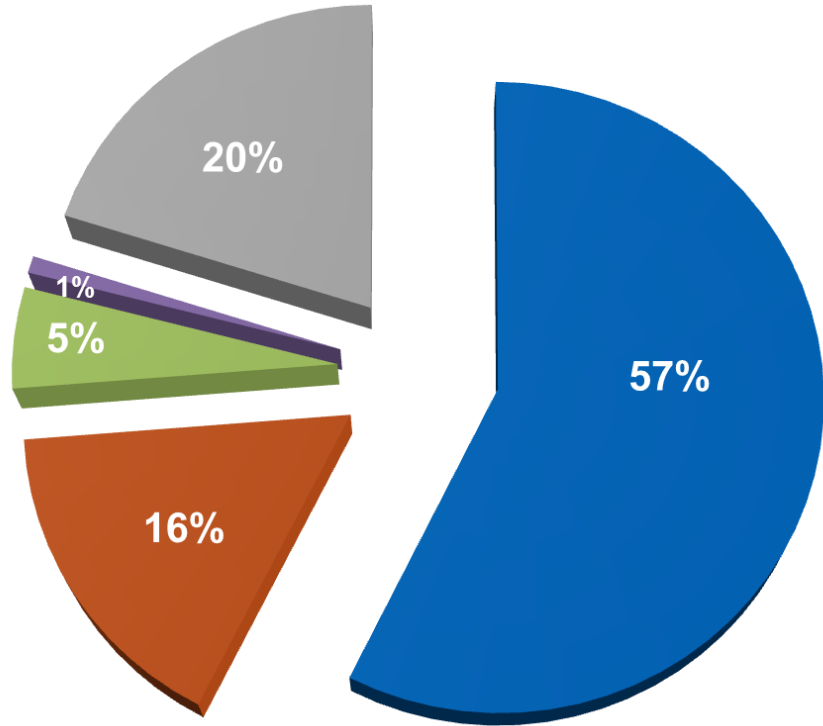


2009 & 2014



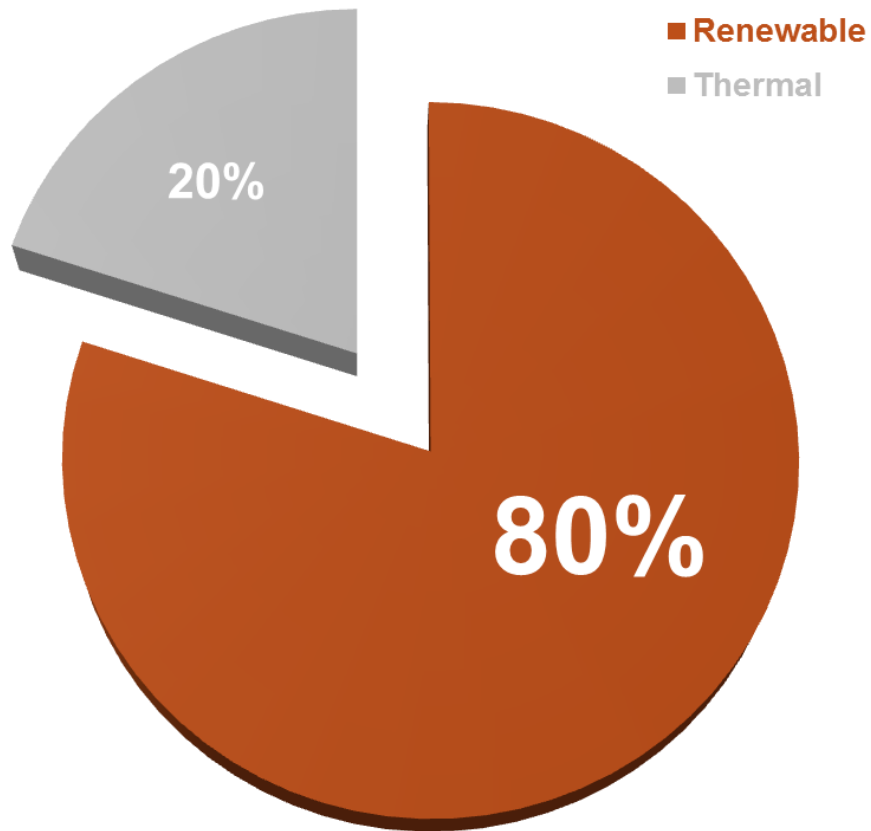
- Hydro
- Geothermal
- Wind
- Wood
- Thermal

Fuel Percentage





Renewable Electricity



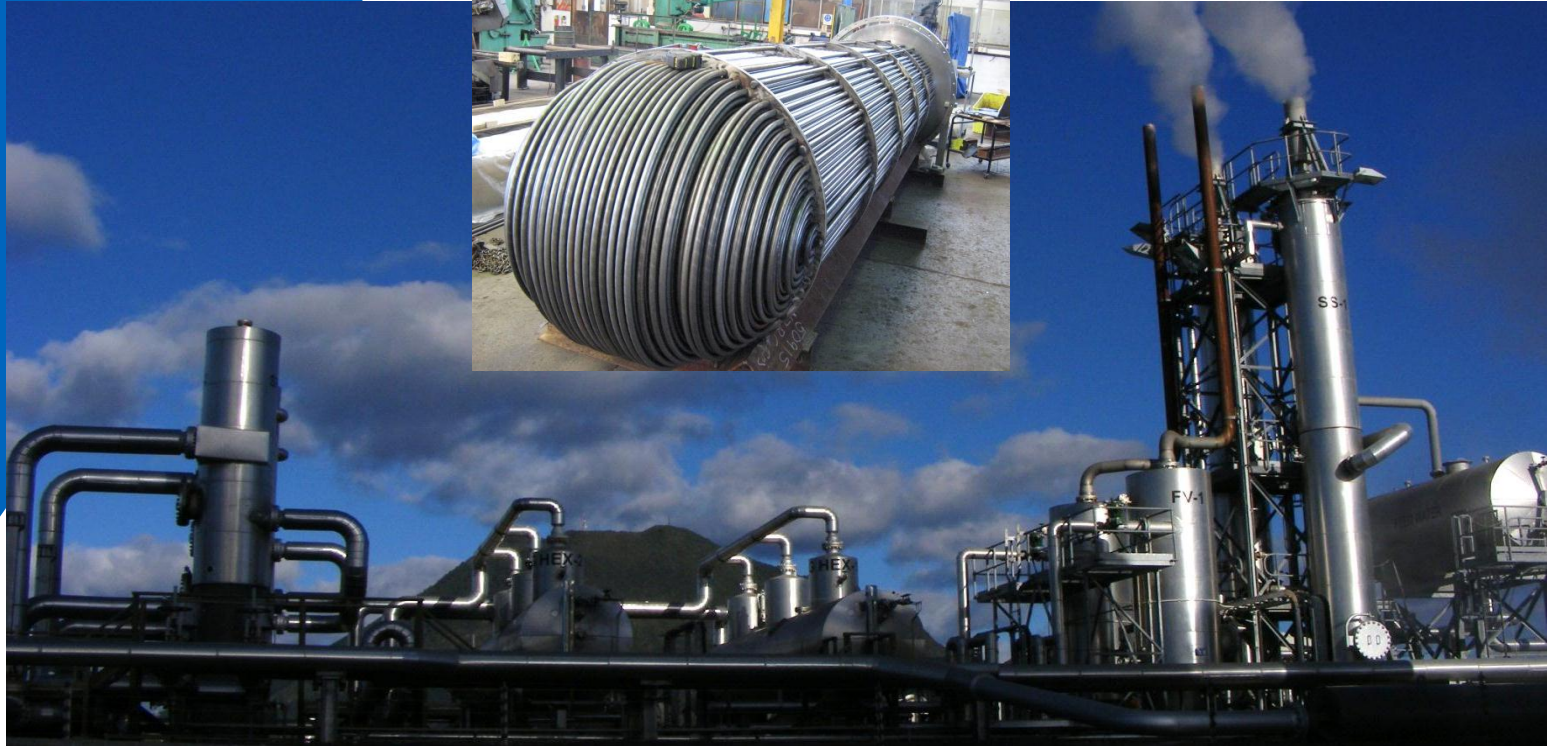
2014



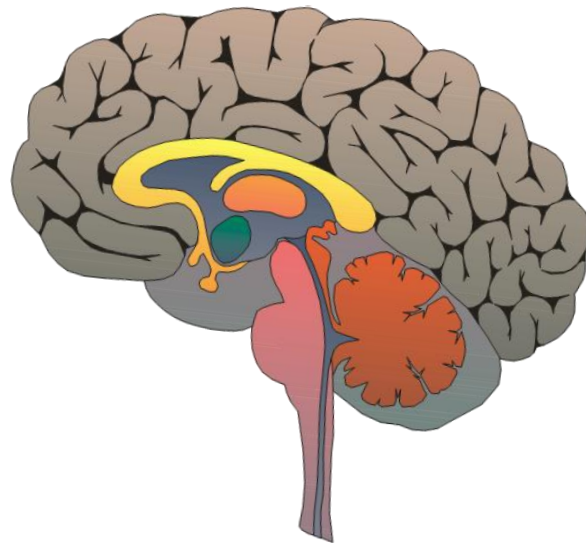
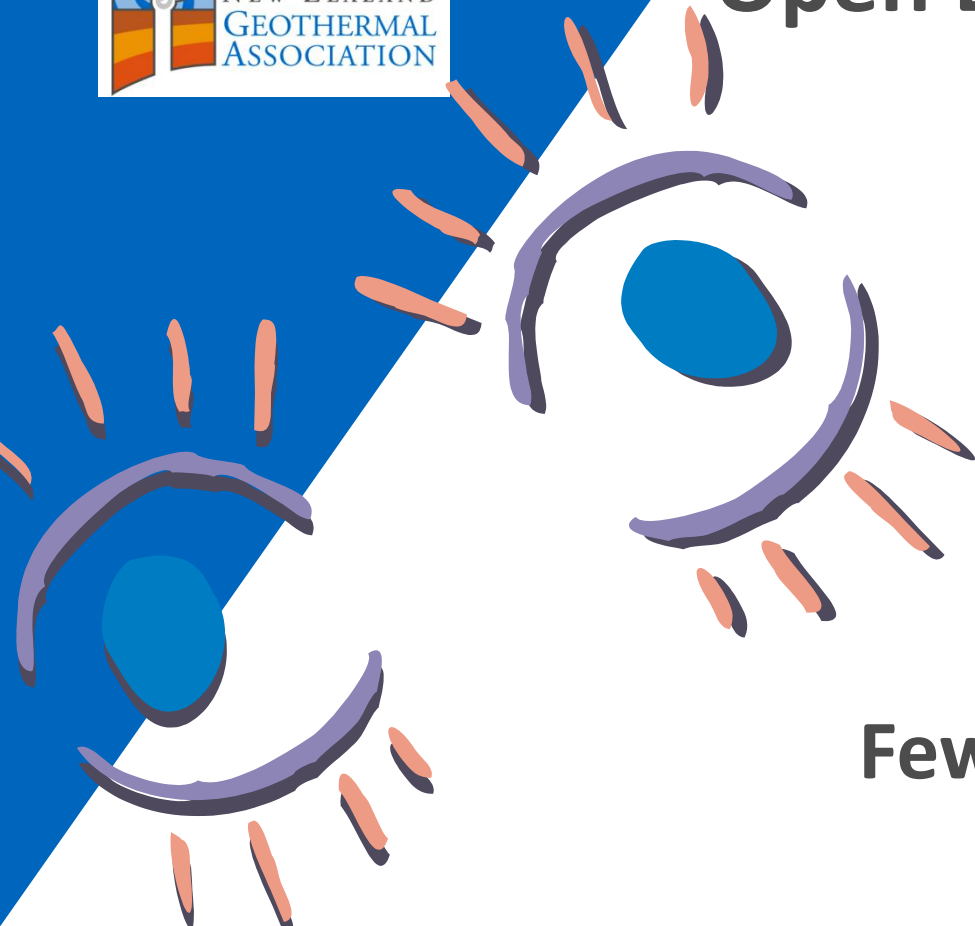
Direct Heat Prowess

- **Kawerau**
- **As a nation New Zealand**
 - Uses clean steam generation technology the most
 - Smart technology
- **Growing interest in developing geothermal heat parks**

Clean Steam Generation



Open Eyes Open Minds



Few Observations



Iwi / Maori Trust Investment



Significant and growing part of the
NZ geothermal sector



Materials and Chemistry

- **Pushing the geothermal envelope**
- **Increased use**
 - Alloy materials in steamfield plant
 - Chemical control

State of your Colloids

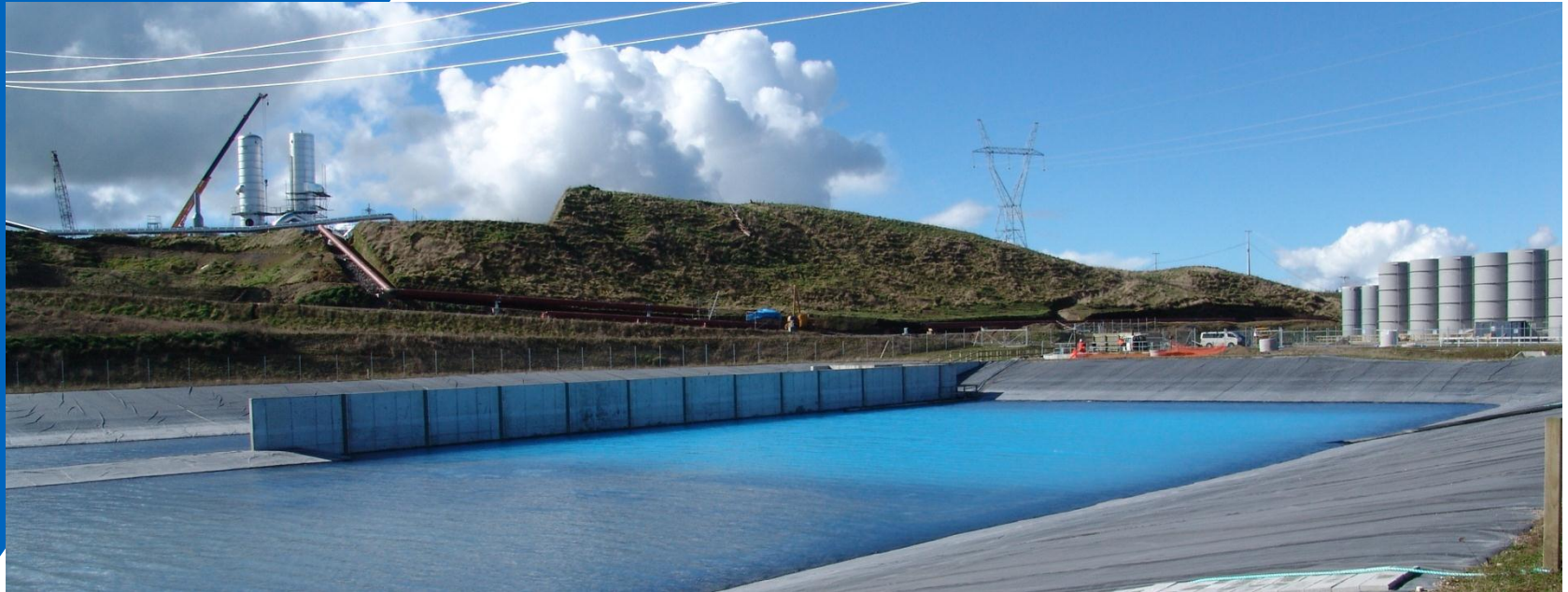
- Agglomerated
- Retarded



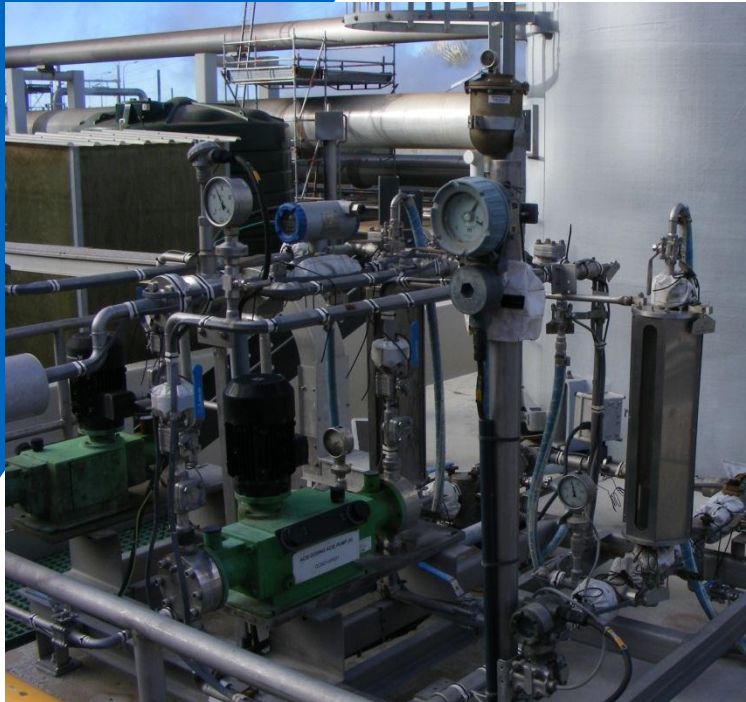
Silica Colloids

- **Drop them out**
 - Control polymerisation
- **Slow up polymer formation**
 - Acid
- **Hold your breath**

Silica Management



Silica Management





Cooling Water Treatment

Wairakei Bioreactor

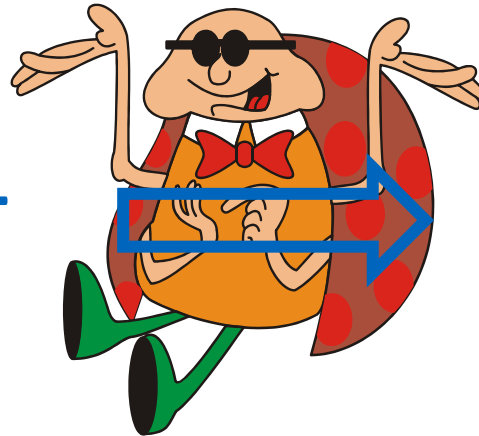
13 m³ per second



Lew Bacon



Mike Timperley





Wairakei Bioreactor



**Wednesday 22nd 10:40 am - Session 10D - Room 212
Paper 2048**



Modelling

- **Improve forecasting**
- **Increasingly sophisticated formulations**
 - Need quality data to work off
- **Development of new code**
- **Visualisation tools**
 - 3 and 4 Dimensions



Open as a Nation

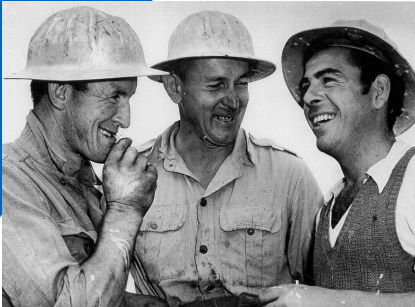
- **Willing to share**
- **Benefit of your nation**
- **Benefit of geothermal**





Drilling Practice

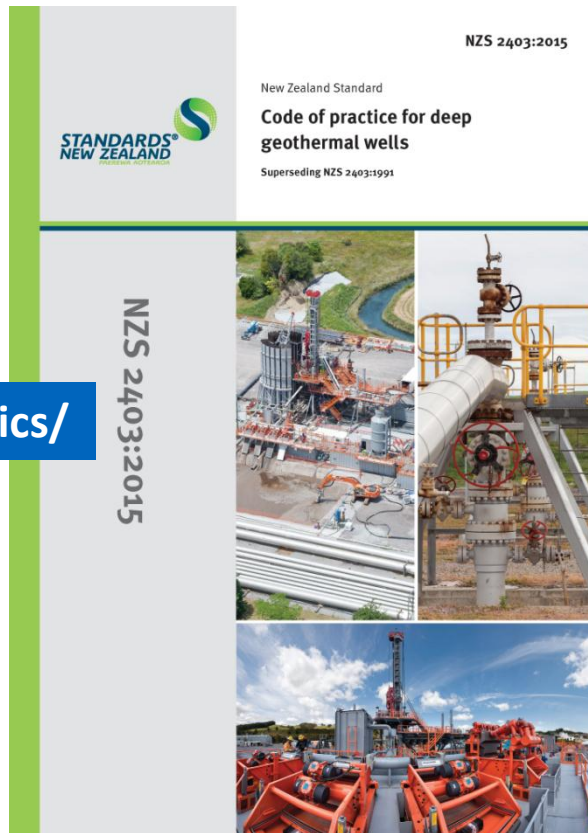
- **NZ 2403 : 2015**
- **Best in the world**
- **Essential guidance**
- **65 years of NZ geothermal drilling experience**





<http://shop.standards.co.nz/catalog/ics/>

NZ 2403:2015



NZS 2403:2015

New Zealand Standard

**Code of practice for deep
geothermal wells**

Superseding NZS 2403:1991

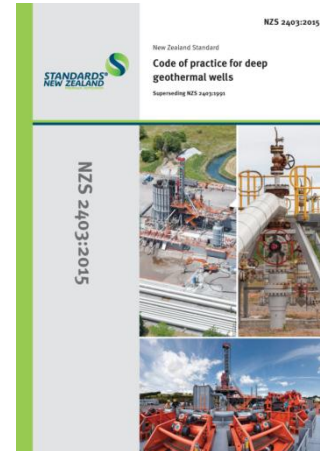
NZS 2403:2015



Hagen Hole

Drilling Standard Forum

- **Introduction to 2403:2015**
Code of Practice for Drilling Deep Geothermal Wells
- **5:15 – 6:30 pm Wednesday 22nd**
- **Room 216**





Training

- Auckland University
- GNS Science





Start to Steam

- Explains the phases and processes
- In moving a geothermal prospect through:
 - Exploration,
 - Development,
 - Installation, and
 - Operation of a geothermal energy production facility
- 3 day course

geothermal@gns.cri.nz



Regulatory Setting

- **Enabler for wise use of your geothermal resources**
 - **Robust framework**
mid to longer term
 - **Process clarity**



Sharing our regulatory experience

- **Engaging with a number of nations**
 - PNG
 - Vanuatu
- **Papers 2045 and 2023**
 - Session 9D – Wednesday 22nd 8:30am
 - Room 212
- **NZ short course after this congress**
 - Taupo New Zealand



NZ Short Course

- **26th to 28th April**
- **Still places**
- **Get your air tickets booked**
- **Connect with Noel Kortright**
– or Brian Carey



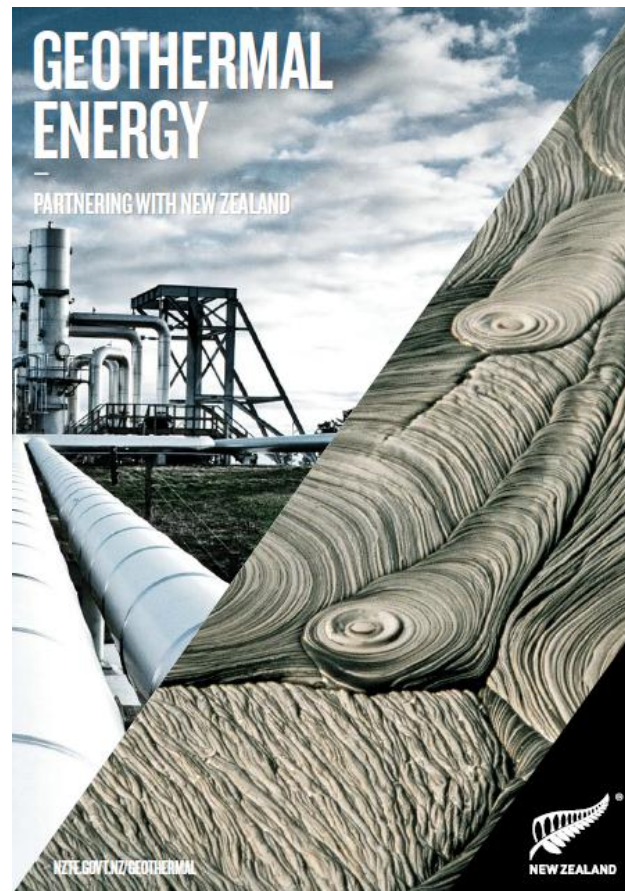
noel.kortright@emslimited.co.nz



Geothermal NZ

www.nzte.govt.nz/geothermal

Geothermal Energy
Partnering with New Zealand





Geothermal NZ

To connect



b.hill@hawkins.co.nz



mike.allen@xtra.co.nz



GNS Science Poster Sessions

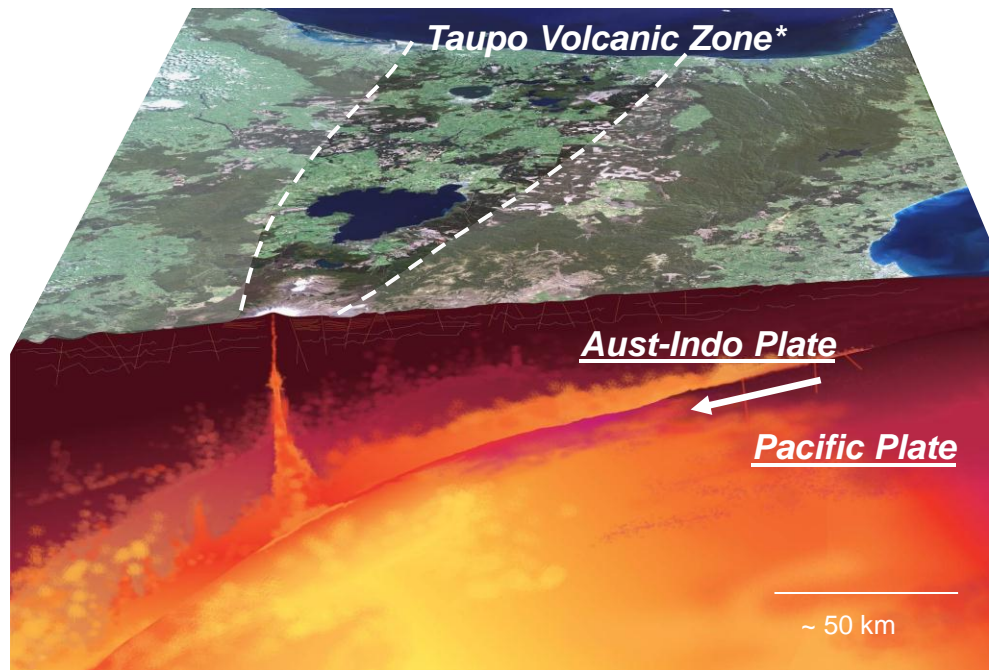
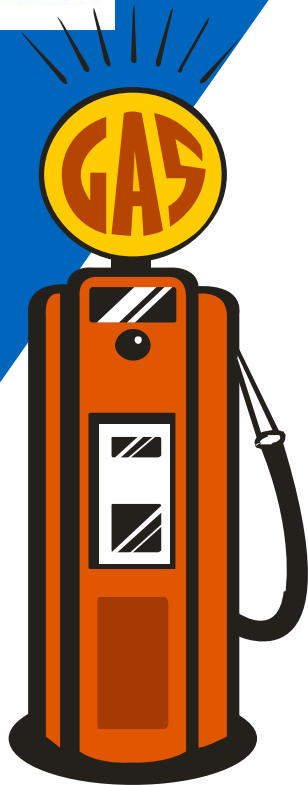
- **Tuesday 3:30pm**
– Session 8
- **Thursday 3:30pm**
– Session 16



Mike McWilliams Warmly Welcomes You
Seek out the One Liners

<http://www.gns.cri.nz/Home/News-and-Events/Events/World-Geothermal-Congress-2015>

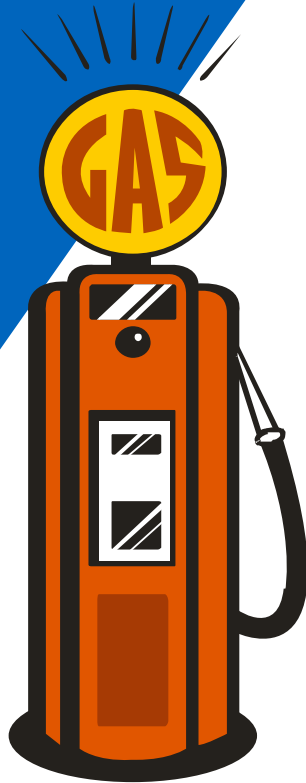
More Heat in the NZ Tank





Your nations tank

Get Into It





Ready to Assist

- **Got questions**
- **Looking for some direction**
- **Want to chat geothermal**
- **Here for YOU**

VISIT THE PAVILION
STAND #14-16



NEW ZEALAND

www.nzte.govt.nz/geothermal



The NZ Story

- **Coming up next**
- **Stay Put**

Kia Ora