



GEOHERMAL THE NEXT GENERATION

**MBIE Endeavour Research
Programme**

*Ngatamariki Power Station, Taupo,
Photo credit: Chris Sisarich*



+ 2 PHD
+ 1 post doc
+ 2 MSC



Explore
for future
geothermal
resources

understand
thermochemistry
of supercritical
resources

Integrate
And translate
knowledge



KO TŌ AOTEAROA WHAKATUPURANGA HOU O TE PŪNGAO Ā-NUKU
WHAKAMŌHOUHOU

NGĀWHĀ TUAWHITIWHITI

Ka **TOROTORO** ka **MŌHIO** mātou i ngā rawa tuawhitiwhiti o Aotearoa, ā, hei reira whakauruuru ai aua mātauranga hei tauwehe i te waro ahumahi, hei ā hoki i te tupuranga o ngā whāinga ohaoaha.



- 5-year Programme - Completion October 2024
- Published outputs along the way - Knowledge section



Explore – Defining target locations

- **3 targets combining conditions necessary for supercritical:**
 - Potential shallow magma reservoir (MT plume)
 - Connected structures
 - High temperature fields
- Rotokawa, Tauhara
- Ohaaki
- Okataina Makatiti dome



Understand – Configuring a One-of-a-Kind Supercritical Flow-Through Reactor

• <https://www.geothermalnextgeneration.com/updates/configuring-a-one-of-a-kind-supercritical-flow-through-reactor>





Understand – New quartz solubility data

Rendel and Mountain, in prep

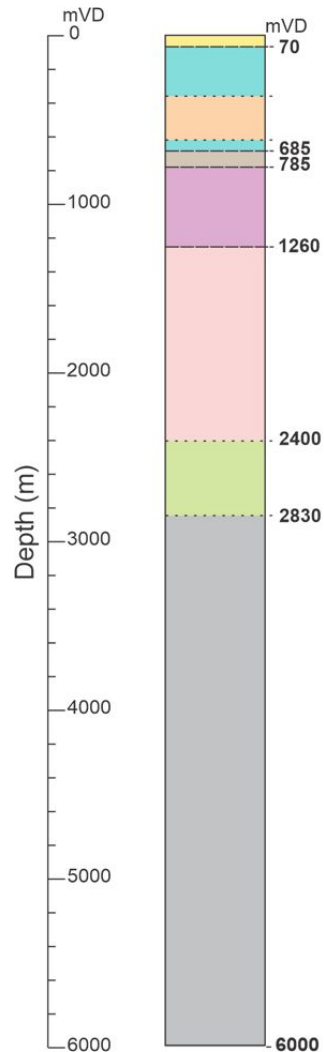


Integrate – A supercritical geothermal Strategy for Aotearoa

- Developing a strategic approach to understanding NZ's supercritical geothermal opportunity
- Preparatory and pre-planning work for drilling a supercritical exploration well
 - Well prognoses for two wells (discussed later in this presentation)
 - Preliminary Well design
- Regulatory Planning Aspects / Consents for exploratory drilling



Integrate – 6 km Deep Well - accessing $> 400\text{ }^{\circ}\text{C}$



- **Taupō Volcanic Zone Geology**

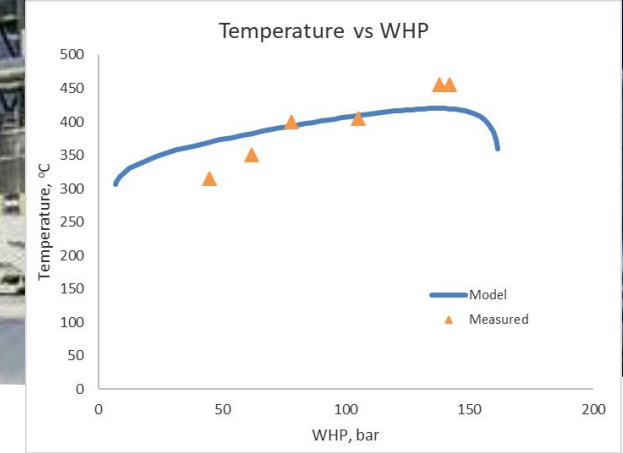
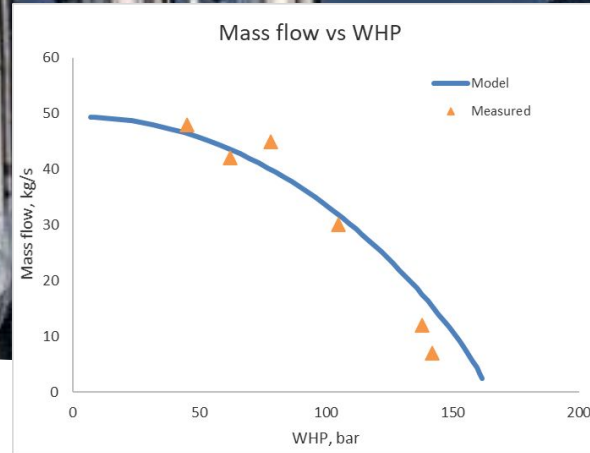
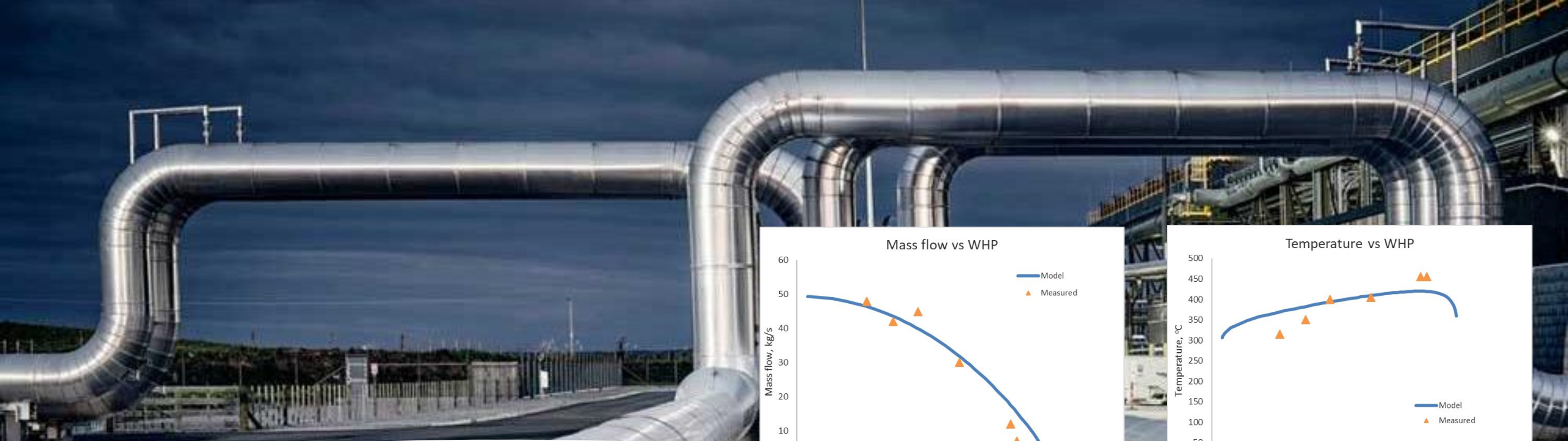
- 2000 – 3000 m of volcanic sequence
- Metasedimentary beneath

- **Fluid Geochemistry**

- Likely less mineralised than currently encountered at lower temperatures ($<350\text{C}$)
- Species solubility changes with Phase change
- Chemistry and phase change issues important to understand for plant longevity and process reliability

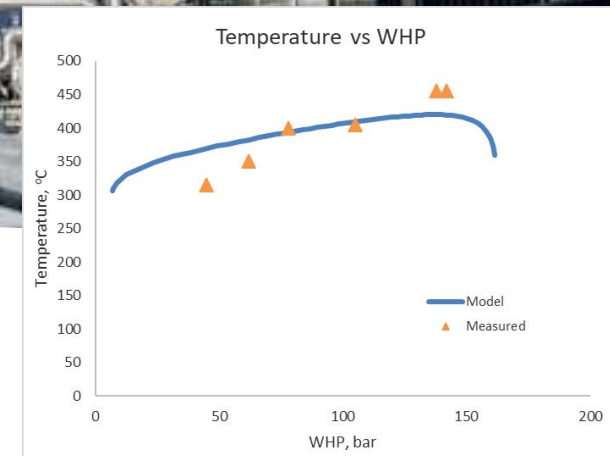
- **Reservoir Engineering**

- A range of challenges
- Temperatures and pressures require tool development



Well testing

- At
 - WHP of 150 bar (plus)
 - and temperatures of 450 C
- What equipment is needed ?
- What residual fluids need to be managed ?
 - Probably the discharge is superheated vapour at the wellhead and discharged to the atmosphere



Surface Plant

- What does this look like
- How best to make use of the higher pressures and temperatures
- What about shut pressures – 300 bar



Participative Opportunities

- Geoscientific Research
- Financing / investment
- Well Drilling
- Reservoir Engineering
- Down Hole tools
- Surface Plant



Participate

Supercritical and Subcritical Geothermal Steam Chemistry

IAPWS – Rotorua - 30th November / 1st December

<https://na.eventscloud.com/ehome/iapws22/Symposium/>

IAVCEI – session

Rotorua – 30 Jan – 3 Feb 2023

2 sessions – open for abstract

Characterizing geothermal activities in volcanic settings – A. Seward

Harvesting energy from magma – the future of supercritical geothermal resources – I. Chambefort





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