Australia

- Birdsville $15M replacement of 85kW to 200kW ORC plant.
- Challenged integration of the new geothermal plant with diesel generation
- Enable ~70% of generated electricity to be sourced from geothermal energy for off grid town
- Displacing up to 80% of the current diesel usage (500,000 litres per year currently).

Australia

Commissioning of Winton 2 X 150 Kw geothermal plant in Queensland in December 2017
Papua New Guinea
Papua New Guinea

Photo: Rabaul Volcano, East New Britain Credit: Simon Heyes, Simons JamJar
Papua New Guinea

- Volunteer Service Abroad (VSA) NZ assist geothermal exploration and training starting 2018
- Japanese consortium looking at a pilot project
- Seeking funding to continue geothermal data collection
Feeding Methane to Cows

- $1.15M over 3 years MBIE Smart Idea Fund
- Convert stranded gas emissions from industrial waste gas streams into niche protein and carbohydrate biofeedstocks using New Zealand indigenous naturally sourced non-GM microorganisms
- Using oil/gas and geothermal industrial gas streams as model substrates
- Demonstrate that the biomass produced suits the nutritional requirements of livestock and other animals (e.g. aquaculture)
- Avoids scalability issues that have previously depressed the use of lignocellulosic biomass by using extremophilic microorganisms
- Demonstrate the technical feasibility and adaptability of this process
Feeding Methane to Cows

- Near complete capture and conversion of methane (CH4), short chain hydrocarbons (SCHs) and CO2 into protein and glycogen
- The ability to alter the nutritional output of the biomass, via adjusting the gaseous feed composition and light availability
- An ability to operate under extreme conditions to preclude contamination by unwanted microorganisms
- No inhibition by ammonia (NH3) nor carbon dioxide (CO2) production, which are common obstacles that usually restrict SCHs/CH4 conversion to protein-rich biomass.

**Figure 2.** Diagrammatic representation of proposed research. Following batch enrichment and preliminary characterisation of extremophilic consortiums, candidate cultures will be transferred into bioreactors for process optimisation and nutritional characterisation.
Empowering Geothermal

- $7.2M over 5 years
- Increased Utilisation of Geothermal Energy Through New Integrated Geoscience Methods
- Reduce the risk associated with developing the next 500MW within the next 10 years, down to 3km depth, by improving the predictive capabilities of geothermal resource assessment models

**Exploration Theme.** Focussed on the pre-drilling phase of a geothermal development. Understanding of structural features together with estimates of permeability, temperature and reservoir size will improve predictions of resource potential.
Empowering Geothermal

The research will be based around three themes:

• **Exploration** - We will reduce risk for greenfield developments by coupling datasets and models from geology and geophysics; reservoir modelling and geochemistry. The goal is to couple measurements that can be made at the surface with models to constrain estimates of the reservoir permeability, temperature and size.

• **Sustainability** - We will develop new approaches for assessing sustainable development sizes for fields with a development history. We will couple reservoir models and geophysical datasets, develop new approaches for conducting and analysing tracer tests, and couple borehole data with reservoir models to improve estimates of reservoir permeabilities and temperatures.

• **Optimisation** - We will advance development strategies to optimise resource use. New approaches for inverse modelling will provide estimates and uncertainties of reservoir permeability and size. Optimisation methods coupled with reservoir models will be applied to optimise above-ground operations.
Ngawha

- Existing 25MW plant, produces ~70% of electricity consumed in the Far North
- 2 * 25MW expansion consented
- Commissioning planned 2020
- Additional 200 jobs in Kaikohe
- Parahirahi C1 Trust kaitiaki of the geothermal field and pools at Ngawha
- Focus on maintaining Ngawha Pools
Te Ahi A Maui

- Partnership between Eastland Generation Ltd and Kawerau A8D Ahu Whenua Trust
- 25MW project due for completion in 2018
- Consented take of 15,000 tonnes of fluid per day for 35 years
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Target by 2030:
• 7.5 PJ/year additional geothermal direct use
• 500 new jobs in geothermal related businesses
Co-location of Resources

- Asaleo Tissue
- Norske Skog
- Sequel Lumber
- CHH Wood Products
- Tenon
- Natures Flame
Direct Use Innovation: Miraka

- Established 2011
- 60,000 cows from 100 farms within 85km of plant
- 300ML of milk processed annually
- Exports milk powder and UHT products
- Waste solids go to worm farm and fluids are used for irrigation
- Product development: Whai Ora smoothies
Summary

• PNG: Waiting for government approval of geothermal policy
• Australia: Small geothermal plant developments in Queensland
• New Zealand: Research for next 500MW and extremophiles; Ngawha expansion; Te Ahi A Maui development; Operational and economic efficiency improvements, and sustainable management; Optimising fluid use through cascade direct use operations
Kia Ora