

# RECENT GEOTHERMAL ACTIVITY



Industry Update for Thorndon Cook – NZGW 2015

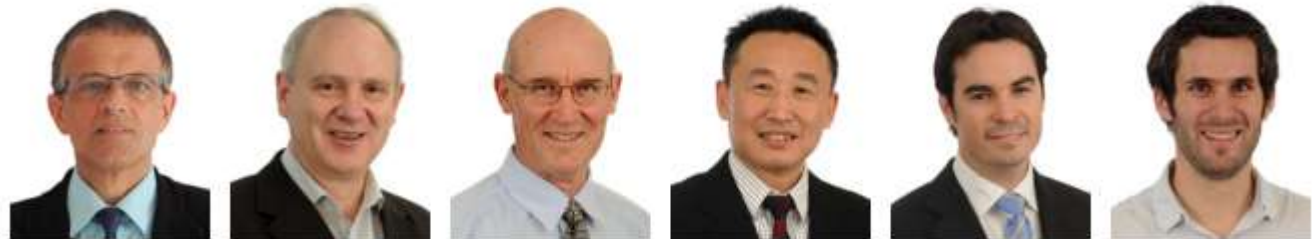
# Thorndon Cook Power

- NZ based Power Consultancy – significant geothermal.
- Formed in January 2015 from the Thermal Power team of PB Power's Auckland and Wellington offices.

## Directors

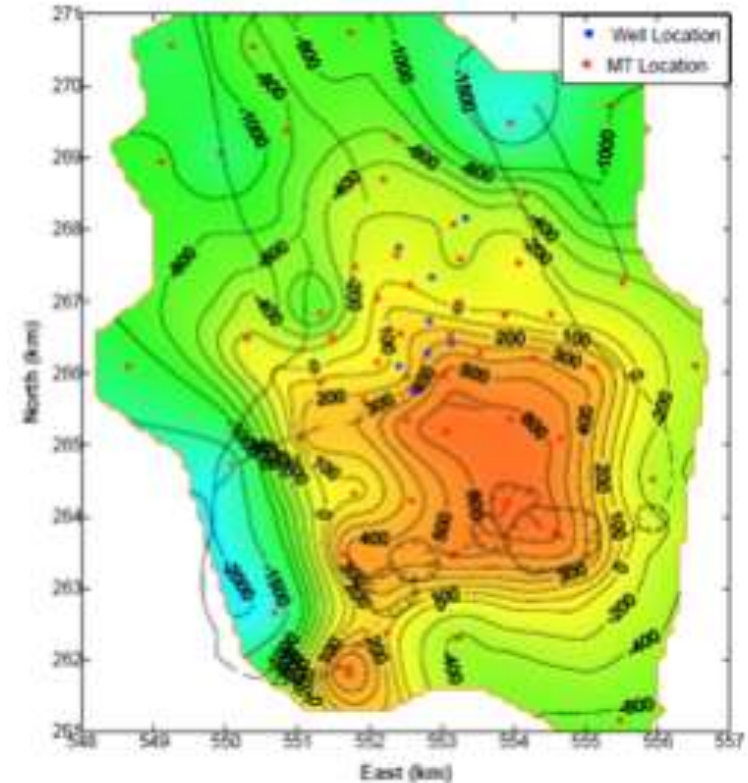


## Key Team Members



# Hitay Feasibility Study, Indonesia

- Engaged by a Turkish Development Company to undertake an independent third party due diligence / review of the results of the scientific exploration work conducted over 5 geothermal prospect areas in Sumatra and East Java, Indonesia.





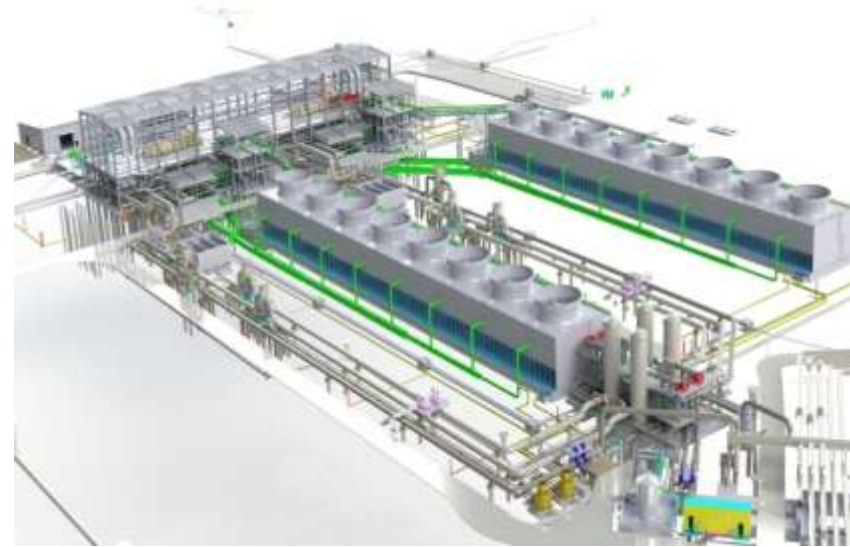
# MakBan Tiwi Due Diligence, Philippines

- Undertook the power plant scope of a due diligence for refinancing of the MakBan and Tiwi geothermal power plants owned by Aboitiz Power Renewables Inc.
- Ultimate client was the ADB, with Thorndon Cook subcontracted through Mott Macdonald and Middle Earth Geoscience.



# Te Mihi Geothermal Power Plant, NZ

- Thorndon Cook staff were extensively involved with the EPC design for the Te Mihi project, including the role of Engineering Manager for the JV and Lead Engineers for the Mechanical, Electrical and C&I design. All of the balance of the Thorndon Cook staff have also been extensively involved with the project.
- Thorndon Cook staff have continued to support the project with resolution of Warranty period issues under subcontract to the JV.



## Akiira Due Diligence, Kenya

- Engaged by the financiers for the proposed 2x 35MW Akiira geothermal project in Kenya to undertake a technical DD of the proposed project. Thorndon cook reviewed:
  - The Akiira geothermal resource.
  - The Akiira drilling plans and schedule.
  - The project schedule.
  - The project concept design.
  - The project capital cost.
- Reported on likely project risks and how these could be mitigated.
- Recently engaged as Lenders Technical Advisor for the exploration drilling phase of the project.



# Tawau Due Diligence, Malaysia

- Undertook the Power Plant, PPA and Permitting Due Diligence scope for the Tawau 36MW geothermal project.
- Head contract was with Mott MacDonald, with Thorndon Cook subcontracted through Middle Earth Geoscience.



# Valuation of Wayang Windu Geothermal Project, Indonesia

- Engaged by EGCO Thailand to undertake an Asset Valuation of power station and steamfield facilities for establishing the Replacement value and Tangible Asset value (depreciated book value) for the project.





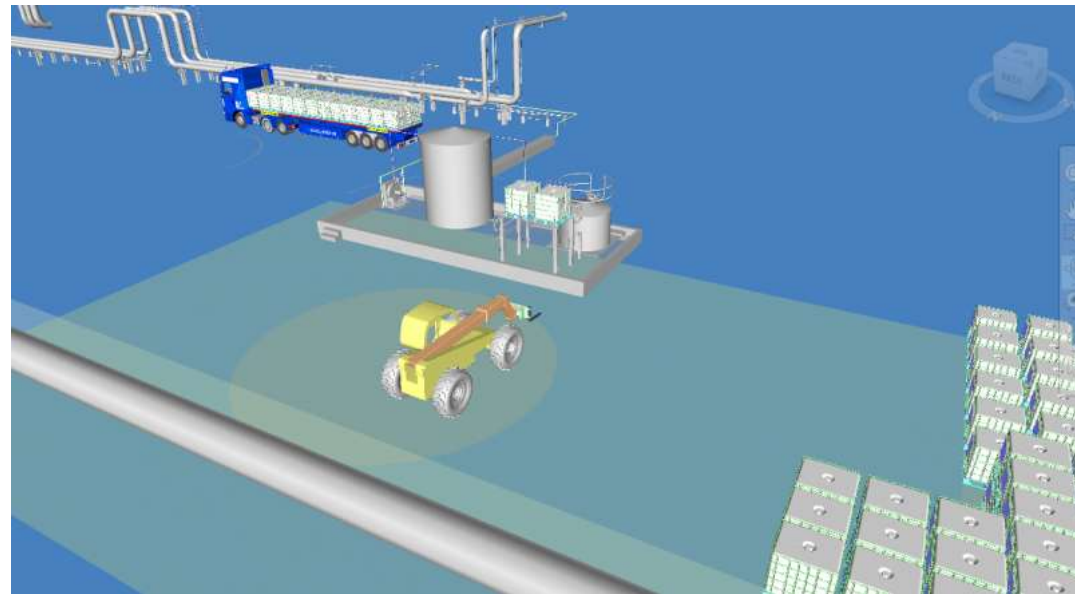
# Remnant Life Assessment Study for TG2 Binary Plant, Kawerau, NZ

- Engaged by Nova Energy to undertake a Remnant Life Assessment for this 22 year old binary power plant.
- Detailed assessment was undertaken on the condenser, preheaters, vapouriser, turbine and generator.
- Updated recommended acceptable minimum tube wall thicknesses were calculated for the heat exchangers. Review was undertaken of acoustic eye methodology for testing of tube wall thickness.
- Recommendations were provided for ongoing preventative maintenance for each of the main items of equipment.

# Ngatamariki Antiscalant Mix Plant Design, NZ

- Detailed design of a continuous inline mixing plant for calcite inhibition antiscalant to supply well-pad based delivery systems injecting diluted antiscalant into the wells below the flash point..

Delivered the complete detailed design consisting drawings, construction specifications, tables, schedules and data sheets that comprised the technical documents for MRP's request for supply and installation tenders



# Nga Awa Purua O&M Agreements Review

- Engaged by Mighty River Power to undertake a review of the KPIs and KOPs for the power station and steamfield Operation and Maintenance contracts between MRP and the Nga Awa Purua JV and Rotokawa JV respectively





# Dieng Binary Plant FEED, Indonesia

- Concept design and optimisation for a 12 MW Binary Power Plant using brine from well pads 7, 28 and 30.
- Chemical sampling of candidate wells and detailed analysis of silica scaling issues to establish the required mitigation measures, including acid dosing.
- Design of 15kV interconnection to existing Unit 1 station board.



# Presentation on Accelerating Geothermal Developments, Indonesia

- Preparation and delivery of a presentation to the Ministry of Energy and Mineral Resources - Directorate of New Renewable Energy and Energy Conservation, on behalf of Medco Energy, regarding strategies for accelerating the development of geothermal energy in Indonesia.



## Valuation of Rotokawa wells RK6 and RK8, NZ

- Engaged by the NZ Treasury to produce a non-binding independent valuation of the wells RK6 and RK8 and associated assets.
- The value was determined in accordance with NZ IAS 16: Property, Plant and Equipment accounting standard. An income and depreciated replacement cost (DRC) approach was applied per paragraph 33 of NZ IAS 16.





# Wayang Windu Unit 1&2 Rebuild, Indonesia

- Thorndon Cook provided a specialist project manager to manage the turbine generator overhaul rebuild process and coordinate input from Progen turbine specialists and local PT SBS Indonesia technical resources.



# Karaha and Lumut Balai Geothermal FCRS Design, PGE Indonesia

- Provided Engineering Design services under subcontract to MTL for the Fluid Collection and Reinjection Systems for the Karaha (EPC contractor: Alstom-Hawkins consortium) and Lumut Balai (EPC contractor: Hawkins-Toshiba consortium) geothermal power projects.

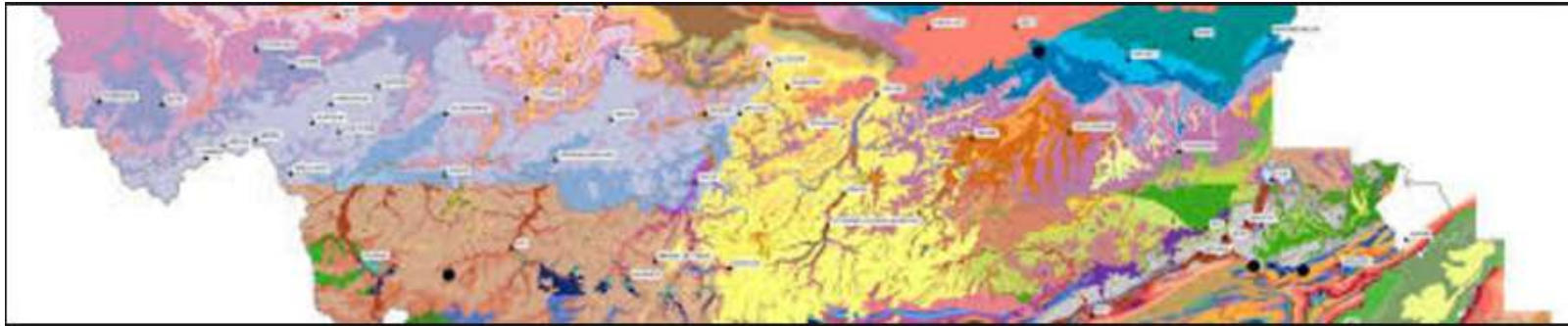
## Services included:

- development of functional control descriptions
- support for process engineering
- support for equipment specification
- Stress analysis of steamfield piping.



# Beerse District Heating Scheme Cost Review, Belgium

- Engaged by Ove Arup to undertake a review and audit of concept design cost estimate for this low temperature, downhole pumped, geothermal project.
- The concept design options included binary power plant, absorption chillers and district heating schemes.
- Review of well testing program.





# Due Diligence of the Alasehir-I and II and Maspo geothermal projects, Turkey

- Engaged by Akfen Energy to undertake a pre-purchase Scientific and Engineering Due Diligence of the Turkerler Alasehir-I and II power plants and geothermal concession, and the Maspo geothermal concession.
- Thorndon Cook associated with PB Turkey for this project and subcontracted Middle Earth Geothermal for the geoscience scope.



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**Thank you**

