



GEOTHERMAL POWER



World-class skills. World-class team.

GEOTHERMAL STEAMFIELD & POWER PLANT ENGINEERS

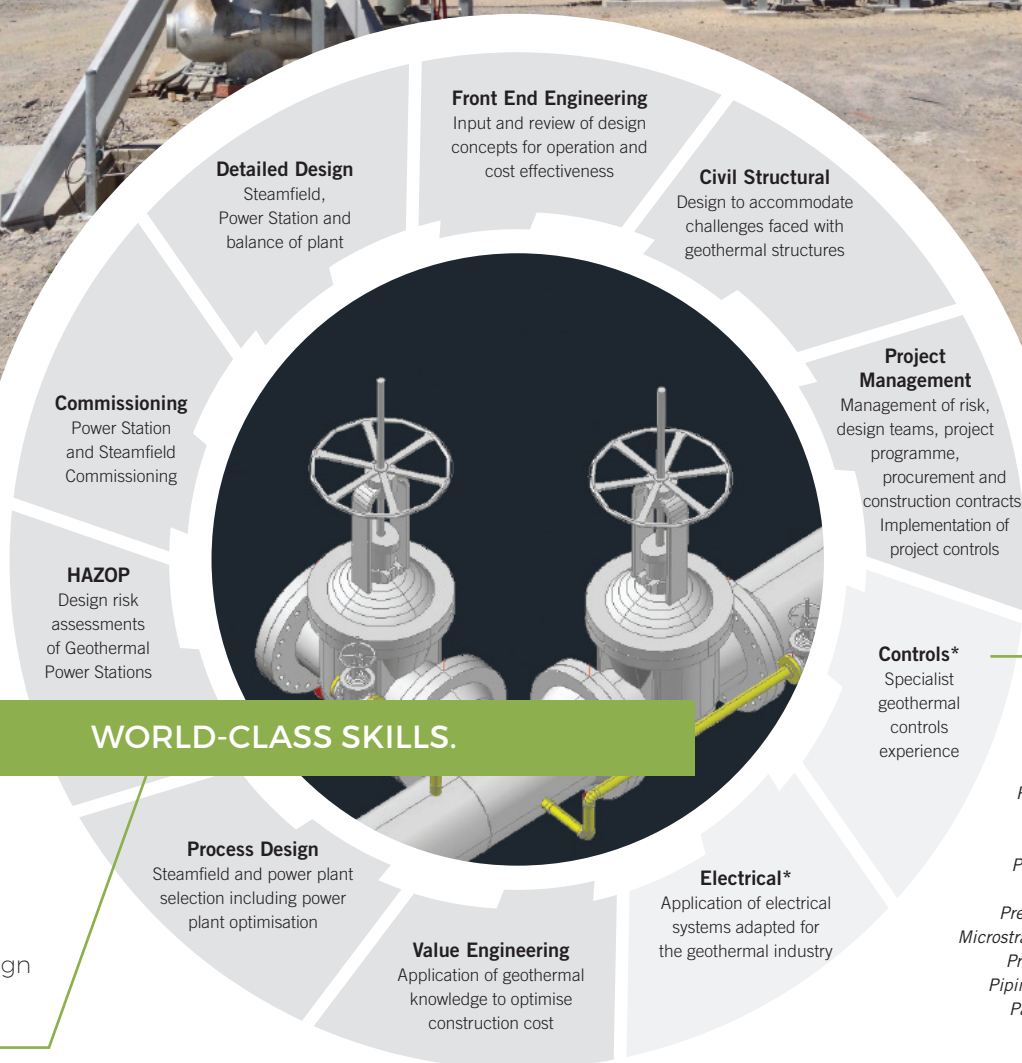
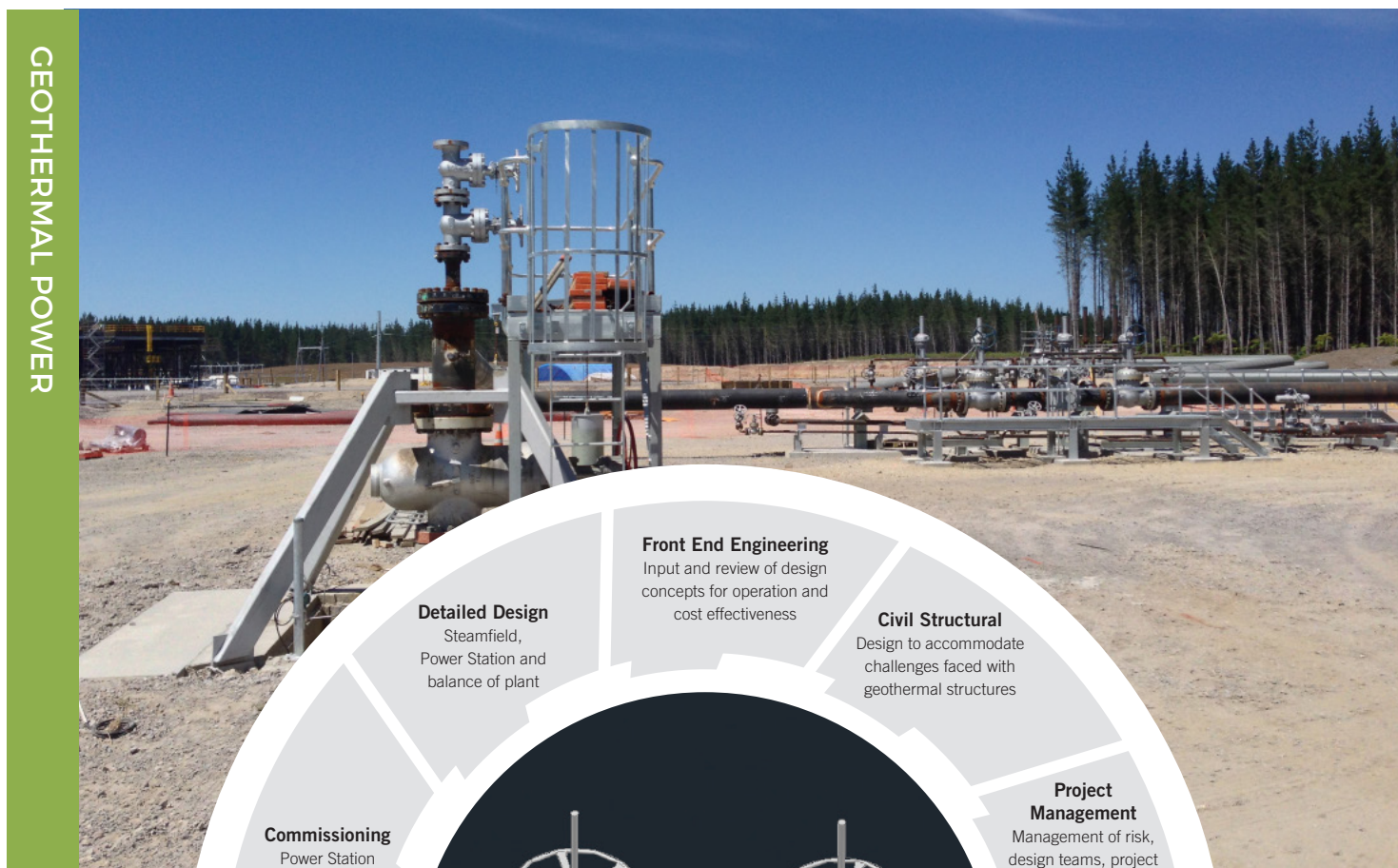
HYDRO

GEOTHERMAL

THERMAL

WATER

INDUSTRIAL



\* We partner with Electrical and Controls Consultants

**Key Software Capabilities:**  
 Process Modelling – Fluid Flow  
 Head Loss – Pipeflow  
 Transient Modelling – Hytran  
 Pipe Stress Analysis – AutoPipe  
 Pipe FEA – Nozzle Pro  
 Pressure Vessel Design – PV Elite  
 Microstran – Structural Frame Analysis  
 Process Design – AutoCAD P&ID  
 Piping Design – AutoCAD Plant 3D  
 Parametric Modelling – Inventor  
 Structural Design – Revit

MTL's core geothermal design skills available.

## ABOUT MTL

MTL, established in 1994 is a medium sized owner operated engineering design consultancy located in Auckland, New Zealand employing Mechanical Engineers, Designers, Civil and Structural Engineers and Project Managers.

## GEOTHERMAL PROJECTS

Key projects include Steamfield detailed design for Karaha and Lumat Balai Geothermal Power Projects in Indonesia, Owners Engineer for Olkaria 1 Unit 6 Steamfield in Kenya and Steamfield detailed design for Ngatamariki Geothermal Power Project in New Zealand.

## MTL EXPERIENCE

We have experience in preparing geothermal feasibility studies, detailed geothermal power station and steamfield design, geothermal plant procurement, power station and steamfield construction management and commissioning and HAZOP Facilitation. We offer the complete package from project feasibility to handover.



**Chris Mann**  
Project and Contract Management, Commissioning Management and HAZOP Facilitator

**Don Purdie**  
Process / Mechanical Design  
Project & Contract Management  
Commissioning Management  
Asset Management

**Phillip Orr**  
Geothermal Steamfield Design

**Stephen Kennedy**  
Design Management, Detailed Engineering Design

**James Powell**  
Project Management, Contract Management, Procurement, Scheduling

**Matt Chubb**  
Civil and Structural Design  
Project & Contract Management  
Asset Management

**WORLD-CLASS TEAM.**

## DESIGN PROCESS

MTL follows a formal design process for geothermal steamfield design, utilising industry standard P&ID's and Engineering Lists to define the equipment and interfaces. This practice is also used on existing plants, where accurate P&ID's are used to manage plant upgrades, and automation projects.

## SKILLS & KNOWLEDGE

Collectively MTL's geothermal engineering personnel have a significant amount of specialist knowledge and experience to draw on. An overview of some of our key geothermal engineering personnel and partner consultants\* can be provided upon request.

## MTL ROLE

We believe we have a unique offering due to our range of skills and our organisation's size. We are able to work closely with clients and partner consultants\* to repeatedly provide quality results.



# SELECTED MTL GEOTHERMAL PROJECTS

55 MW POIHIPI  
GEOTHERMAL  
PROJECT



1997



50 MW LIHIR  
GEOTHERMAL  
PROJECT

2005

WAIRAKEI REINJECTION  
SYSTEM DESIGN  
PROJECT



2007

16.5 MW EXORKA  
SAN JACINTO  
PROJECT



2009

90 MW NGATAMARIKI  
STEAMFIELD DESIGN



2011

MOKAI II EXPANSION  
STEAMFIELD DESIGN



2013



30MW KARAHA  
STEAMFIELD DESIGN

2015



70 MW OLKARIA 1  
UNIT 6 STEAMFIELD,  
KENYA

2017

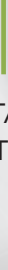


5 MW ROTOKAWA  
OEC21

2001

2003

250 MW TAUHARA  
CONCEPT DESIGN



2005

WAYANG WINDU II  
DESIGN ASSISTANCE



2007

TE MIHI STEAMFIELD  
PROCESS DESIGN



2009



KA-51 BRINE  
REINJECTION LINE

2011

55MW LUMUT BALAI  
STEAMFIELD  
DESIGN



2013

80 MW MUARA LABOH  
STEAMFIELD DESIGN



2017





## OLKARIA 1 UNIT 6 OWNERS ENGINEER

Fichtner / KenGen, Rift Valley, Kenya

### PROJECT:

**70 MW Geothermal Steamfield.**

### MTL ROLE:

KenGen are custodians of a significant geothermal resource in the Rift Valley, Kenya. The Olkaria I Unit 6 project will add 70MW to KenGen's significant geothermal capability. The project aim is to optimise the use of existing, unutilised production wells, minimising project development risks.

MTL is performing the role as the steamfield Owners Engineer. Fichtner are providing Owners Engineer Services for the Geothermal Power Plant. The steamfield utilises 12 production wells gathered into three separation plants with a total of 14km of cross country piping.

### PROJECT OUTCOME:

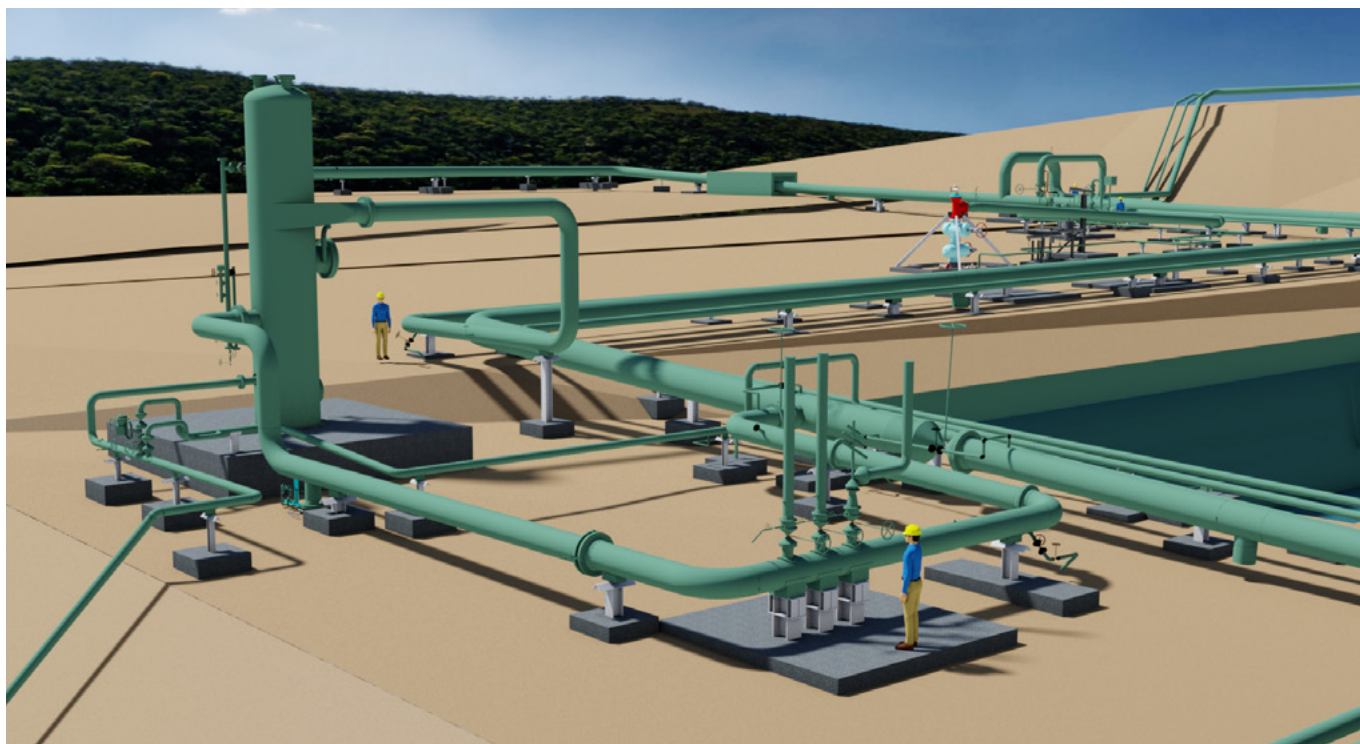
MTL has worked closely with KenGen to produce a comprehensive preliminary design that suits KenGen's requirements. The project is currently in tender stage.

### PROJECT PARTNERS:

Fichtner, McMahon Electrical.







## KARAH A STEAMFIELD DESIGN (Fluid Collection and Reinjection System)

Hawkins / BCK Singapore Ltd

### PROJECT:

**30MW Geothermal Power Plant.**

### MTL ROLE:

MTL was the steamfield (FCRS) detailed designer for the EPC contract to build the 30MW Karaha Power Plant. The development is located in the West Java Province, Indonesia, and is being constructed for operator Pertamina Geothermal Energy (PGE) using existing and new wells.

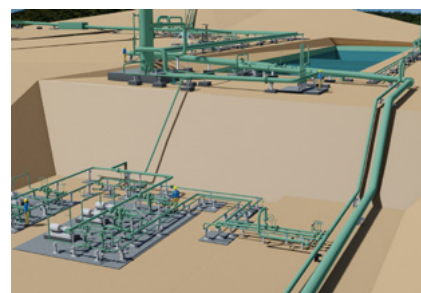
The steamfield consists of 22km of cross-country piping on steep mountainous terrain, along with four production wellpads (clusters), three of which included separation plants and pump stations. The steep terrain posed many challenges for both the process, mechanical and civil design.

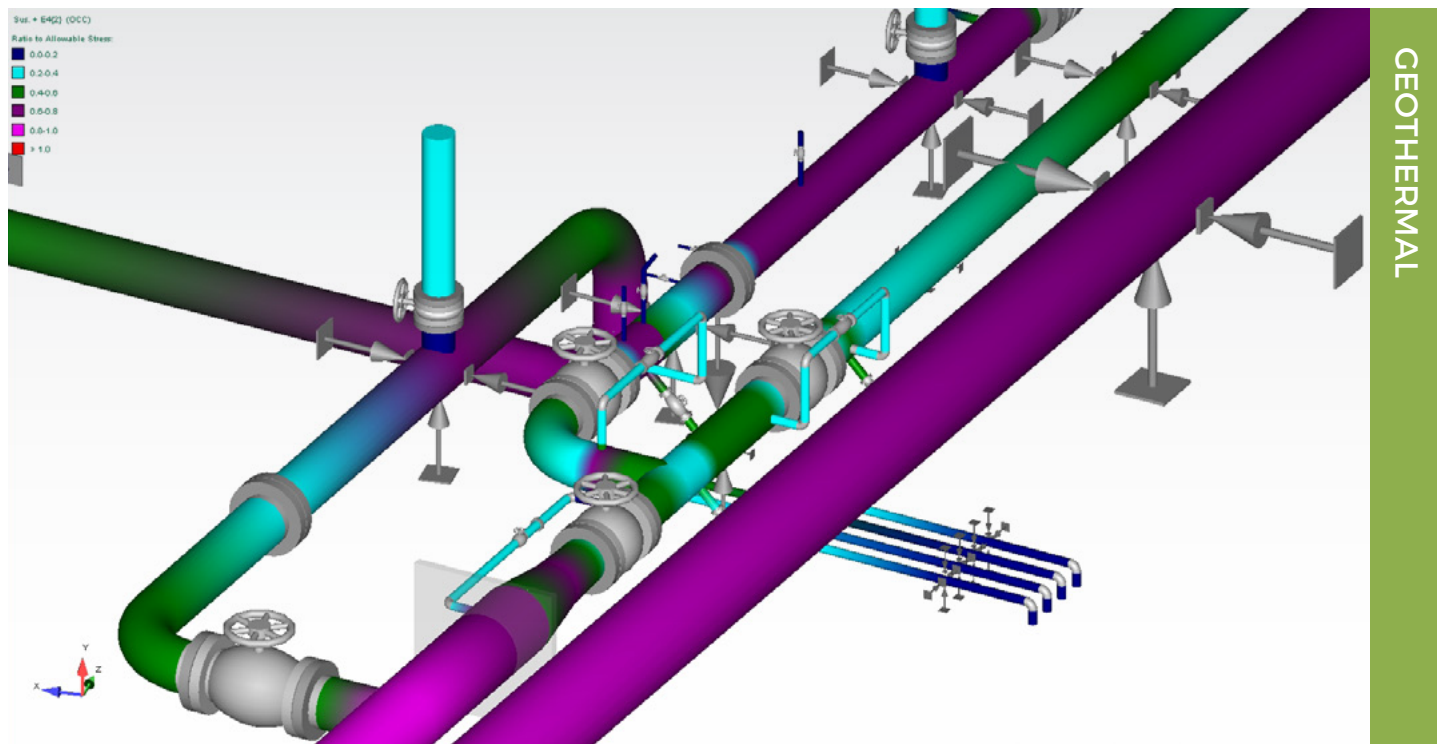
### PROJECT OUTCOME:

MTL worked closely with the constructors to produce an optimised design for the difficult topography. The design was successfully delivered and construction phase is currently underway.

### PROJECT PARTNERS:

Hawkins / BCK, McMahon Electrical, Beta.





## WELLHEAD PIPING

Central North Island, New Zealand

### PROJECT:

Connection of a wellhead into the existing wellhead manifold.

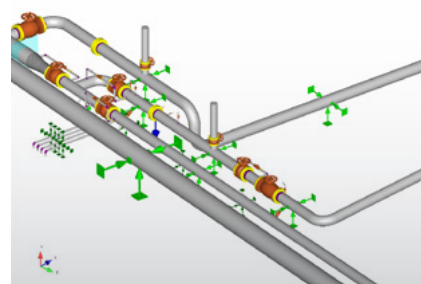
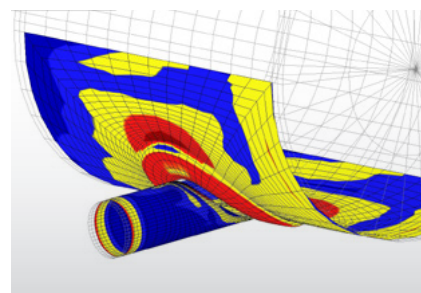
### MTL ROLE:

MTL carried out the detailed design of the wellhead piping including the civil and structural design of the pipe supports and foundations.

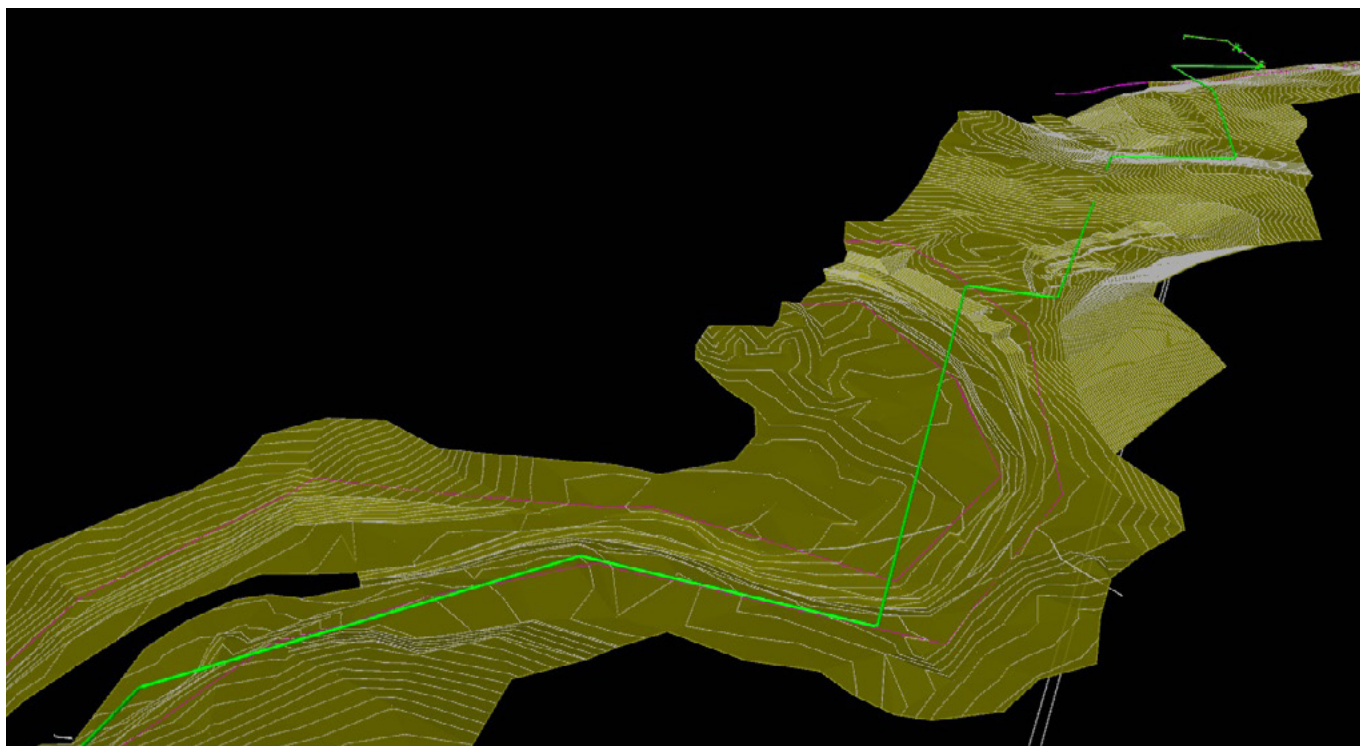
The design connected the well via a DN300 line to the existing cross over piping between production systems. Our scope included design of the secondary systems such as drains, bypasses and pressure relief.

### PROJECT OUTCOME:

The project was completed in June 2013.







## PRODUCTION PIPING

Central North Island, New Zealand

### PROJECT:

Connection of production well to Power Station production facilities.

### MTL ROLE:

MTL were engaged as the designer to connect the new production well into existing production piping system. The detailed design included the design of the high pressure wellhead piping, two-phase cross country piping, tie-in piping and civil/structural design of all pipe supports and foundations.

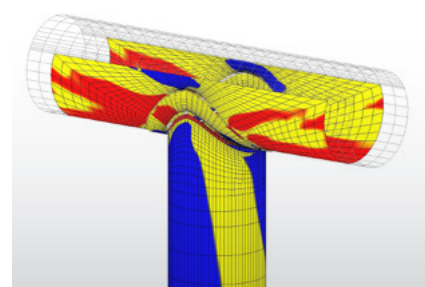
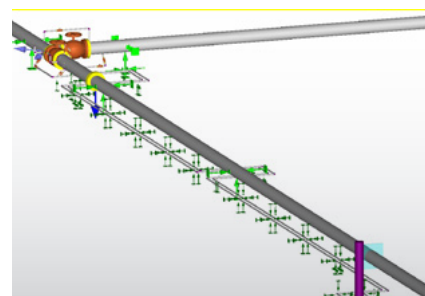
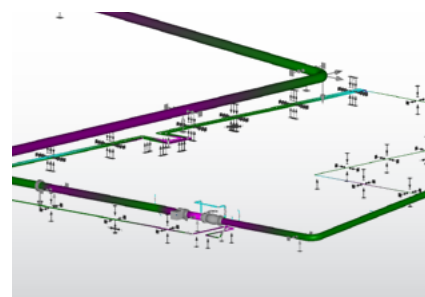
The wellhead piping had the challenges of an unusually high design pressure and temperature of 112barg and 320°C. The two phase pipeline is DN500 and runs 1.1km from the production well pad to the existing two phase production line.

### PROJECT OUTCOME:

The project was constructed in 2013, and started producing in 2014. MTL worked closely with the client to deliver a pipeline that suited their requirements while offering sound and efficient engineering solutions.

### PROJECT PARTNERS

Transfield Worley.





## World GeoPower Market Award

“BEST PROJECT” 2013



## NGATAMARIKI STEAMFIELD

Hawkins Infrastructure Ltd, Central North Island

### PROJECT:

Steamfield to serve the 82 MW Ngatamariki Geothermal Power Station.

### MTL ROLE:

MTL were part of a design build team for the Steamfield led by Hawkins Infrastructure. The detailed design of over 7.5km of Steamfield including 2 phase pipework, brine pipework, production and hot reinjection well pad piping, flash vessels and condensate injection pumping system. The design included DN750 and DN900 2 phase piping and support systems and cooling water channels.

The production well pads included for well minimum flow systems to allow continued well operation during Steamfield shutdowns. The minimum flow required separated fluid handling systems to be developed, that included brine cooling, brine reticulation, storage and reinjection pumping systems.

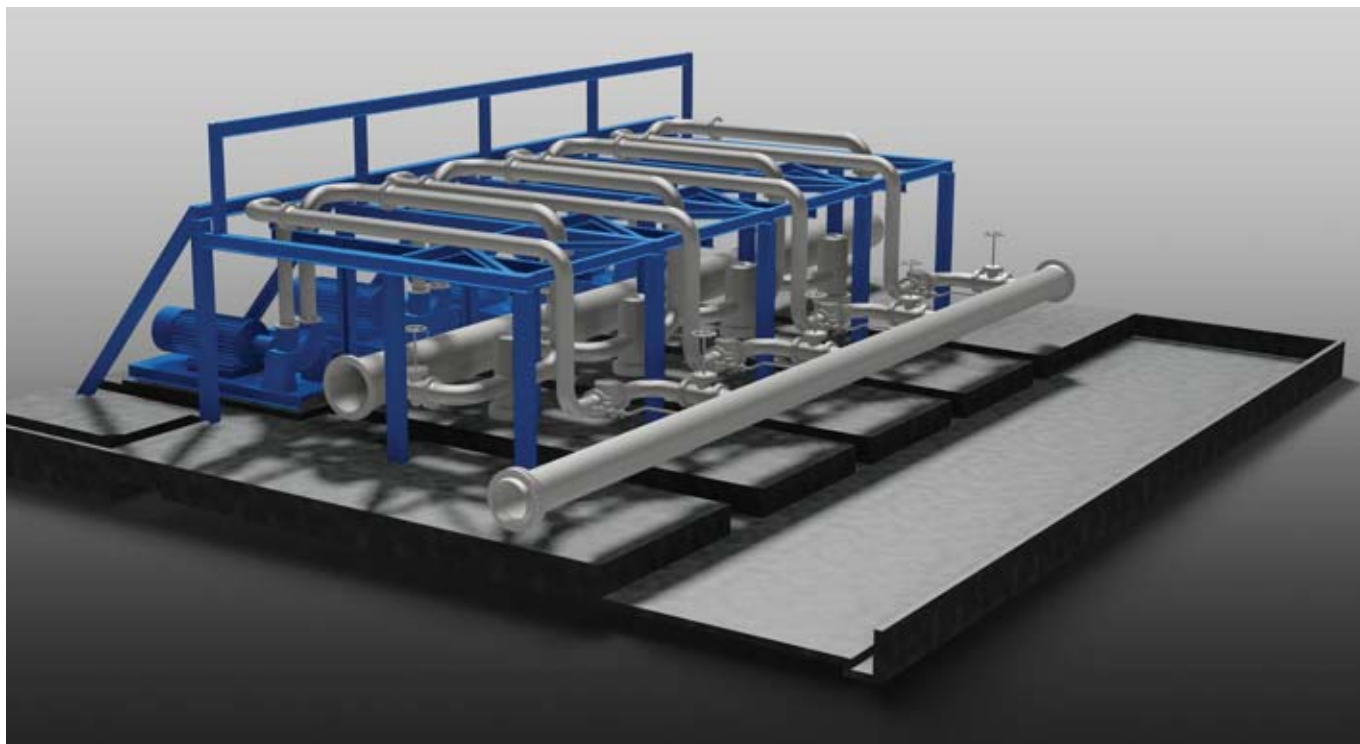
### PROJECT OUTCOME:

The project is fully operational. The design was completed under tight time constraints to ensure that project objectives were met. This required working closely with the constructor of the Steamfield, Hawkins Infrastructure to ensure timely delivery of the project.

### PROJECT PARTNERS:

Mercury NZ, Hawkins Infrastructure, McMahon Electrical.





## TE MIHI REINJECTION PUMP STATION

Contact Energy, New Zealand

### PROJECT:

**Te Mihi Steamfield Geothermal Reinjection Pump Station.**

### MTL ROLE:

MTL undertook the detailed design of Contact Energy's Karapiti Pump Station, a critical facility which provides for the brine reinjection for to three Contact Power Stations; TeMihi 164 MW, Wairakei 132 MW and Poihipi 55 MW. The pump station re-injects geothermal separated water (brine) discharged from the production wells.

The design accommodates a range of different operating scenarios that provides Contact Energy with flexibility in operating their Power Stations and allows for safe removal of a complete pump assembly for cleaning offsite while maintaining operation of the pump station. An OPEX analysis was completed as part of the final pump selection process to identify the optimum configuration.

### PROJECT OUTCOME:

The Karapiti Pump Station has been in operation since 2011, providing reliable service re-injecting over 3000 tonnes/day of brine.

### PROJECT PARTNERS:

MB Century, McMahon Engineering Consultants, and Sigma Consulting.







## TE MIHI STEAMFIELD

Contact Energy. New Zealand.

### PROJECT:

162 MW Te Mihi Steamfield process design, Pump Station detailed design.

### MTL ROLE:

Process design for the expanded Te Mihi steamfield serving the new Te Mihi Power Station and the 60 year old Wairakei Power Station.

A flexible process design was required to accommodate the various stages involved with integrating the new power station. Process design covered two phase systems, separation plants, dump systems, intermediate pressure separated water systems, low pressure separated water, condensate for reinjection, and separated water reinjection systems.

### PROJECT OUTCOME:

The Te Mihi steamfield has been operating successfully since 2014, supplying steam and separated water to Te Mihi Power Station, and re-injecting over 3000 tonnes/day of brine.

### PROJECT PARTNERS:

MB Century, McMahon and Sigma Consulting.







# LIHIR GEOTHERMAL POWER STATION

Lihir Gold Ltd, Papua New Guinea

## PROJECT:

**50 MW Geothermal Power Station.**

## MTL ROLE:

MTL was engaged to provide detailed design for the Balance of Plant (BOP) for the first stage 30 MW, and second stage 20 MW power plant projects. MTL provided site construction supervision and commissioning for the BOP on both stages, and commissioned the 10 MW steam turbines. The project was challenging because of the remote location.

## PROJECT OUTCOME:

The selection of turbine was interesting as 5 by 10 MW surplus second world war frigate LP turbines were used, including reversing blades. These turbines are very robust and well suited to a geothermal application. The power station has been operating successfully for a number of years supplying the gold mine.

## PROJECT PARTNERS:

Smec, Lihir Gold Ltd.







## ROKAWA OEC21

Mercury NZ, Central North Island

### PROJECT:

5 MW Geothermal Binary Power Station.

### MTL ROLE:

MTL provided engineering services for this plant from initial procurement advice through to plant commissioning. Our Engineers were on site during the complete construction period, managing the mechanical contractor, and overseeing the quality of the workmanship.

This project involved the construction of an Ormat 5 MW OEC plant to utilise excess brine from the plant's steamfield. The brine was available from the separator at the plant inlet, and the energy extracted from the hot fluid before being passed to the reinjection system.

### PROJECT OUTCOME:

The power plant has continued to operate successfully for over 10 years.







## POIHIPI POWER STATION

Mercury Geotherm Ltd, Central North Island, New Zealand.

### PROJECT:

55 MW Geothermal Power Station.

### MTL ROLE:

Design for the new 55 MW power station including; Preliminary design, from the receipt of Fuji turbine and generator drawings, through to initial layouts, plant arrangements, principal plant procurement; Detailed design of the complete plant, mechanical, electrical, and controls and instrumentation, suitable for construction; Construction supervision; Commissioning and Operator training.

### PROJECT OUTCOME:

Commissioned successfully in 1997 and has operated reliably since. The station incorporates an integrated steamfield and power station control system, thought to be the first of its kind when commissioned.

### PROJECT PARTNERS:

McMahon Electrical.

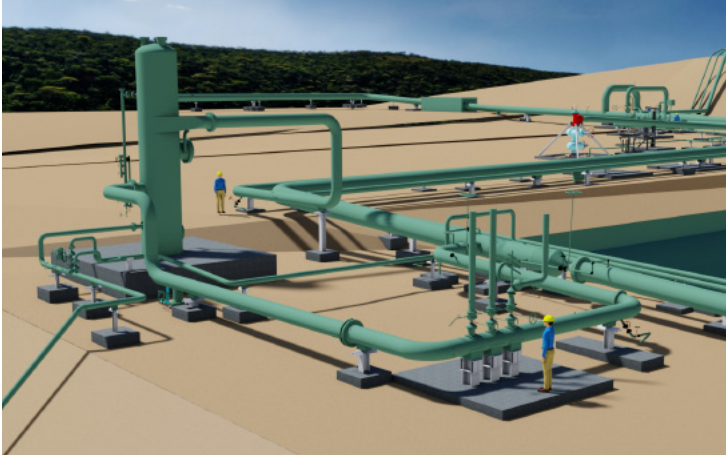
*"MTL's experienced Mechanical Engineers were a key part of the team that designed and built this 55 MW power station in 18 months - a very tight project program for a project of this size"*

**Chris Mann - MTL Project Manager**





WORLD-CLASS RESULTS.



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Mechanical, Civil & Structural Engineers

