



## HYDRO POWER PROFILE



World-class skills. World-class team.

Hydro Power Plant Engineers

HYDRO

GEOTHERMAL

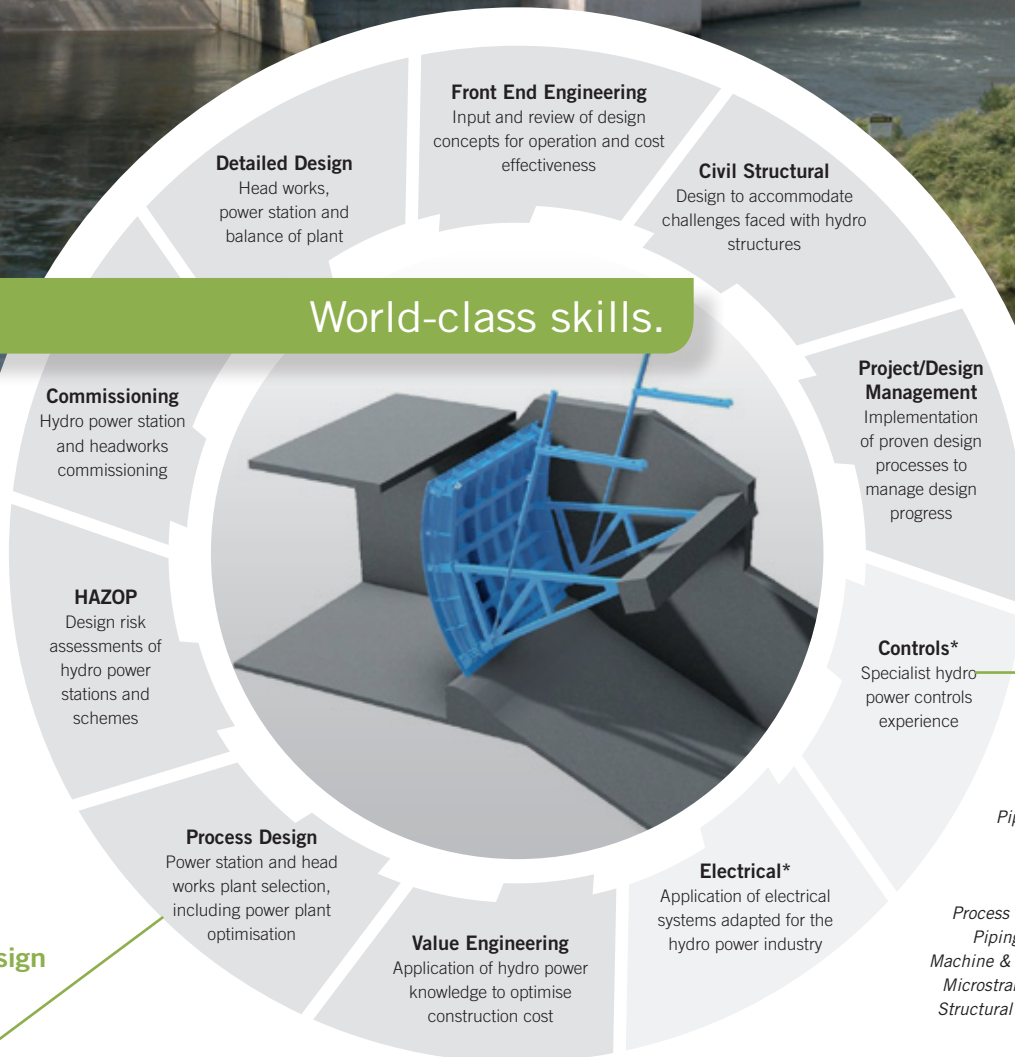
THERMAL

WATER

INDUSTRIAL



## World-class skills.



\* We partner with Electrical and Controls Consultants

### Key Software Capabilities:

Pipe Stress Analysis – AutoPipe  
Pipe FEA – Nozzle Pro  
Transient Modelling – Hytran  
Head Loss – Pipeflow  
Process Engineering – AutoCAD P&ID  
Piping Design – AutoCAD Plant 3D  
Machine & Equipment Design – Inventor  
Microstran – Structural Frame Analysis  
Structural Design – AutoCAD Structural  
Detailing / Revit Structure

**MTL's core  
Hydro Power design  
skills available.**

### MTL Scope

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

### MTL Projects

Our experience extends to working on projects within the hydro power, water treatment, thermal power and geothermal power industries. Recent hydro projects include the balance of plant design for West Kiewa 62MW Hydro Power Station upgrade, design and refurbishment support for Mercury stations on the Waikato river, hydro power scheme gate designs and the design of six hydro power facilities in Samoa.

### MTL Experience

We have experience in preparing hydro power feasibility studies, detailed hydro power station and head works design, hydro power plant procurement, power station and head works construction management and commissioning. We offer the complete package from project feasibility to handover.






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

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

**Matt Chubb**  
Civil and  
structural  
design

**Chris Brown**  
Mechanical  
Design,  
Construction  
Supervision,  
and  
Commissioning

**David McLachlan**  
Hydro Power Specialist,  
Mechanical Design,  
Construction Engineer,  
Design Management

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

World-class team.

### Design Process

MTL follows a formal design process for hydro plant 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.

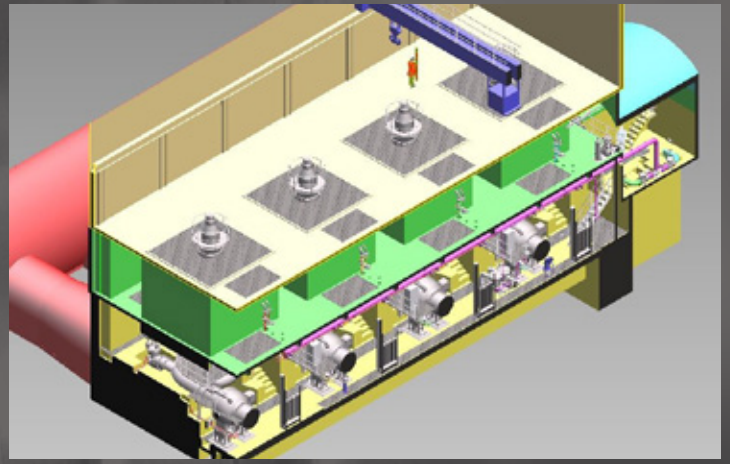
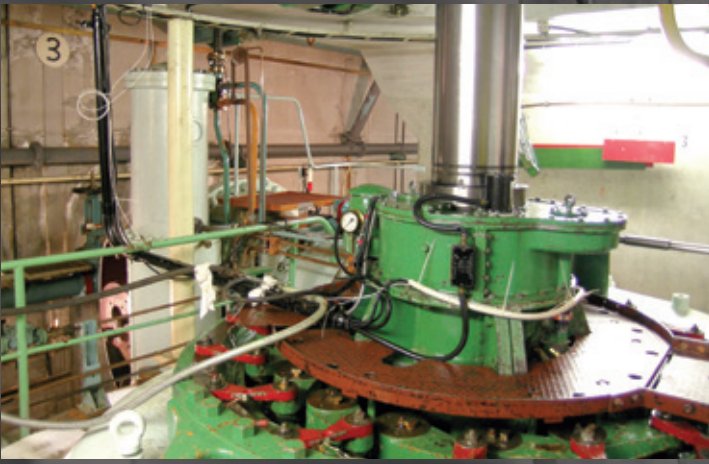
### Collective Power

Collectively, MTL's hydro power engineering personnel have a significant amount of specialist knowledge and experience to draw on. An overview of some of our key hydro power engineering personnel and partner consultants can be provided on 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.





World-class results.



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# CONTRACT MANAGEMENT SERVICES



## **Why invest in an experienced and suitably qualified Contract Administrator to manage your Construction Contract?**

Because your project is likely to be at risk of significant avoidable delays and costs, without their expertise. MTL have Senior Professional Engineers who have considerable experience in administering Construction Contracts. We understand the commercial constraints that Clients and Contractors face.

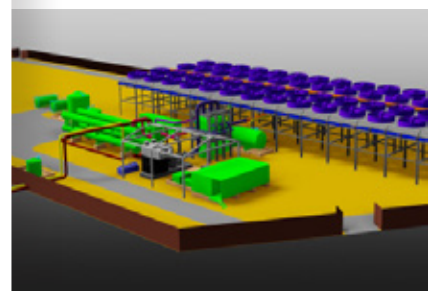
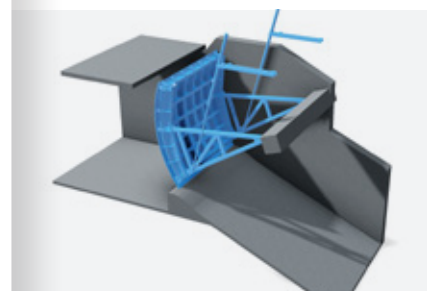
## **A project is a true success if everyone, including Clients, Stakeholders and Contractors accomplish their project objectives.**

Recognition of each other's objectives and working together proactively to achieve these is beneficial for all parties. The Contract Administrator is best placed to promote collaborative working relationships between parties. This is assisted by providing clear and concise contract documentation to clearly communicate expectations to avoid surprises.

A Construction Contract in its strictest form is only relied upon when either party fails to deliver to agreed expectations. It is therefore essential that day to day business is managed to comply with general requirements of the contract to ensure it can be relied upon if needed. This includes the preparation of suitably worded contract instructions throughout the project to ensure time, cost and quality are closely managed.

### **Contract Management Services MTL offer:**

- Tender document preparation
- Tender process management
- Advice on suitable forms of contract to be utilised
- Preparation of Construction Contract documentation
- Compilation of Contract Scope documents (Employers Requirements)
- Coordination of Technical on site Supervision
- Administration of a range of Construction Contracts
- Knowledge and advice concerning NZS3910, NZS3916, FIDIC, NEC3 forms of contract and CCA compliance requirements
- Fulfilment of "Engineer"& "Project Manager" contract representative roles



# ASSET OPERATING DOCUMENTATION



**Up to date, accurate and clear Plant Asset Documentation is essential to be able to efficiently and safely manage assets.**

MTL are experienced at preparing Asset Operating Documentation for new and existing plant. MTL provide these services for Clients with critical facilities such as Hydro Power Stations, Geothermal Power Plants and Steamfields, Water Treatment Plants, General Industrial Applications and associated balance of plant.

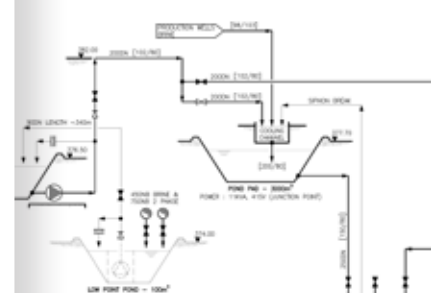
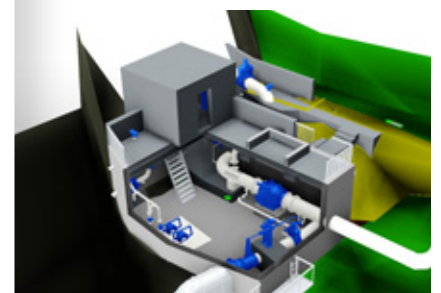
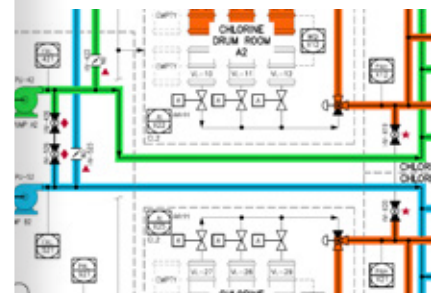
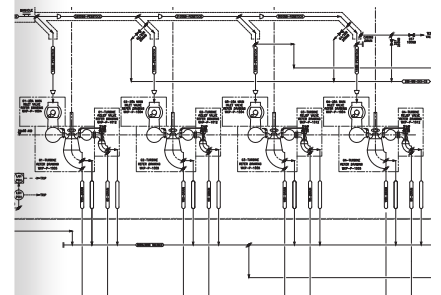
**There are significant, and sometimes unrealised, benefits of producing up to date Asset Documentation.**

They provide a foundation for a robust engineering process for upgrade works, improves understanding of Plant capabilities, results in clearer communication of asset operations/requirements amongst operators and third party contractors. Ultimately health, safety and environmental risks are reduced as a result.

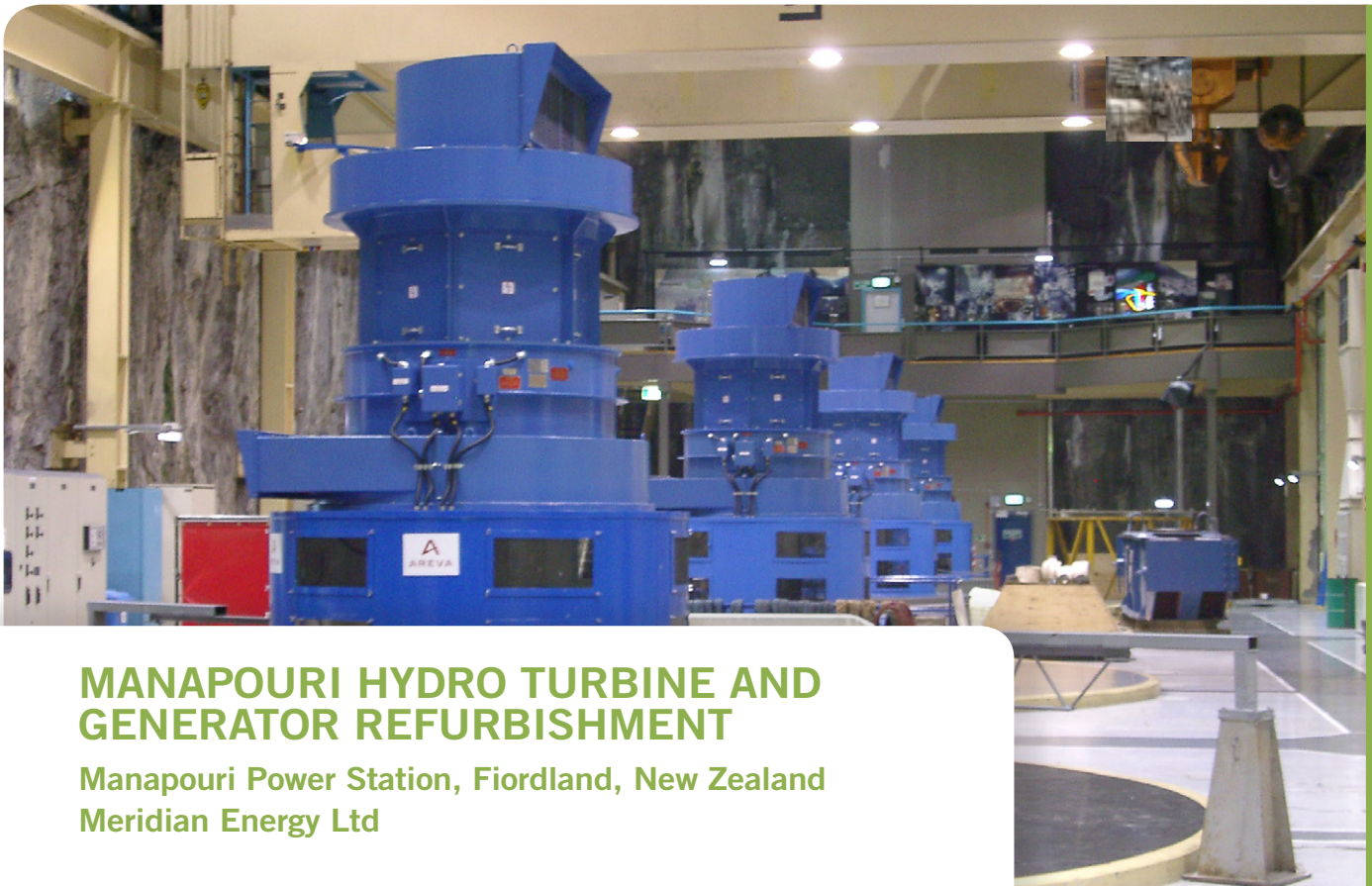
MTL would typically spend time on site liaising with Plant Operators and review existing drawings/documentation to gain a clear understanding of how the specific plant is operated. MTL can tailor documentation to specific Client needs and with a focus on the end users specific knowledge/capabilities.

## **Asset Documentation Services MTL offer:**

- As-built Process Flow Diagram (PFD) and Piping & Instrumentation Diagrams (P&ID's)
- AutoCAD Plant 3D capabilities featuring integrated P&ID - Plant Models – Engineering Lists
- Customised plant numbering systems (including KKS format)
- Operating and Maintenance Manuals (O&M)
- Standard Operating Procedures (SOP's)
- H&S Plant Isolation Procedures
- 2D or 3D as built documentation (Using 3D laser scanning if required)







## MANAPOURI HYDRO TURBINE AND GENERATOR REFURBISHMENT

Manapouri Power Station, Fiordland, New Zealand  
Meridian Energy Ltd

### Project:

Mechanical refurbishment of Manapouri hydro turbine and generators. Manapouri has 7 by 122MW vertical Francis machines in an underground machine hall.

### MTL Role:

MTL developed detailed refurbishment scope of works, and technical specifications for each of Manapouri's 7 units. The specs were developed to identify and resolve individual machine defects and condition, as well as provide a common refurbishment specification, and performance requirements.

Development of the scope of work required 2-3 weeks on site inspecting the machine, interviewing the stations operations and maintenance team, and reviewing maintenance records. This project presented a number of technical challenges, with the machine hall carved out of solid rock 100m underground.

MTL's role included index efficiency testing of machines pre upgrade for baseline performance measurement. MTL has specific expertise in hydro machine efficiency testing, and the efficiency testing was performed in accordance with IEC 41:1991 and PTC 18.

### Project Outcome:

Manapouri was undergoing an upgrade at the time of the refurbishment, with a second tailrace tunnel being built (a 10km long tailrace tunnel in parallel with the existing 40 year old tunnel). The reduction in tailrace level allowed the machine outputs to rise from 83MW per machine up to 122MW per machine.

The client utilised MTL's technical specifications as generic specifications for use throughout their hydro fleet.



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## EILDON POWER STATION UPGRADE

Southern Hydro/AGL Hydro, Victoria, Australia

### Project:

Control and protection systems upgrade of 120MW Eildon Power Station.

### MTL Role:

MTL carried out the mechanical design and contractor site management/ commissioning for the control and protection systems upgrade.

The detailed design included: development of P&IDs and a functional description (FD) for the machines and for the station, followed by equipment specification and design to meet the requirements of the FD.

### Project Outcome:

The project was delivered successfully with the station recommissioned in August/September 2006. The commissioned systems operated with remarkable reliability, with over 99% availability achieved in the first month of operation.

### Project Partners:

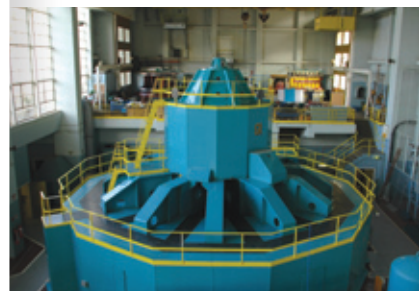
McMahon Engineering Consultants (MECL), AgFab Engineering, EDC Electrical.

*"Every effort was made by MTL and MECL in the procurement, design and implementation stages to ensure that all the clients' requirements, expectations and desired outcomes were catered for."*

**Ian Foy – Southern Hydro/AGL Project Manager**



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## WEST KIEWA, VALVE AND PLANT UPGRADE

### AGL, NSW, Australia

#### Project:

62MW Turbine, Main Inlet Valves & Balance of Plant Upgrade

#### MTL Role:

AGL engaged MTL to provide engineering and contract support for the upgrade of the West Kiewa turbines, replacement MIV's and balance of plant upgrades. The turbine upgrade includes replacing the runner, head cover, bearing and seal, guide vanes, servo motors, links and levers, and governor.

MTL's role included developing the project scope and delivery strategy, technical specification and tender document preparation, technical review of contractor's designs, design reviews, and equipment inspection.

#### Project Outcome:

West Kiewa provides some unique challenges for upgrade projects. With restricted underground access, the logistics and planning of the work becomes a key element of the project management.

#### Project Partners:

McMahon Electrical, Alstom







## COSSEYS HYDRO POWER

Watercare Services Ltd, Auckland, New Zealand

### Project:

Development of a new 150kW hydro machine installed in the water supply system for Auckland, New Zealand's largest city.

### MTL Role:

MTL was responsible for the project management, detailed mechanical, civil and structural design, construction management, and commissioning of this 150kW mini hydro. MTL's role also included the selection of a Erhard needle pressure reducing valve in parallel with the mini hydro.

### Project Outcome:

The control system seamlessly coordinates the operation of the mini hydro and the bypass valve to provide the correct water supply flow rate in the most energy efficient manner.

### Project Partners:

McMahon Engineering Consultants (MECL), Hydroworks







## UPPER NIHOTUPU DAM

Watercare Services Limited, Auckland

### Project:

Upper Nihotupu Dam and Hydro Upgrade

### MTL Role:

Working closely with Watercare Services Ltd, MTL led a design team for a major upgrade at Upper Nihotupu Dam in the Waitakere Ranges Regional Park. The upgrade ensures the dam complies with stringent Resource Management Act & Building Act requirements. Two 1kW 24V Eco-Innovation micro-hydro generators are installed to power controls & instrumentation, including 230V actuated 600NB intake valves via a 5kW inverter. Control & consent compliance monitoring is via radio to Watercare's Newmarket control room.

### Project Outcome:

Upgrade of Watercare Services Ltd, Upper Nihotupu Dam ensures a sustainable water resource for the next 100 years in the Waitakere Regional Park. Meeting the consent discharge consent deadlines 12 months from kick-off was a major achievement.

### Project Partners:

McMahon Electrical, SKM, NZ Controls, Controlweb, Brian Perry Civil, Canadian Pacific Ltd, Clarksons, Service Engineers



*"It was rewarding to work with a focused and innovative design and construction team, where solving the issues was always a team approach."* **Don Purdie – MTL Project Manager**

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## DEEP STREAM 5MW POWER PROJECT

TrustPower Limited, Otago, South Island

### Project:

Design of Gates for the Deep Stream Power Project

### MTL Role:

MTL provided mechanical design for the project head works. This included the design of the scheme off-take gate, a scheme regulating (radial) gate as well as mechanical equipment for various intakes and pipelines.

MTL also provided implementation support with tendering review, manufacturing inspections and commissioning supervision for the off-take and radial control gates.

### Project Outcome:

The design services were delivered on time and within budget. The gates have been operating successfully since commissioning in early 2008.

### Project Partners:

Riley Consultants, MA Corkery & Associates, E-Type Engineering, Jesco Hydraulics, Civil Construction Ltd, Earthworks Marlborough







## EFFICIENCY TESTING

Mighty River Power, Genesis Energy, Meridian Energy, PT Inco

### Project:

Efficiency Testing of Power Station Hydro Turbines.

### MTL Role:

MTL developed test procedures specifying the testing process/test instruments and supervised the testing including: instrumentation setup and calibration; conduct of testing; post-test calibration and instrument checks. MTL processed and presented the test results to the client.

### Project Outcome:

Efficiency testing enables optimisation of plant operation providing data for calculating efficiency using existing SCADA measurements. With Mighty River Power, MTL pioneered the sliding gate test method as an alternative to the static test method. It provides a more cost effective option for measuring operational efficiency data.

IEC/ASME code compliant testing provides efficiency data for turbine upgrade benchmarking.

### Project Partners:

ConTech Services Limited

