

Hydropower

Identifying needs

Hydropower forms the world's largest source of renewable energy. With an increasing emphasis on developing renewable energy sources, the need for new hydro-electric power stations, and refurbishing and optimizing existing facilities is also increasing.

Associated with the increase in renewable energy generators is the need for storage. Pumped storage hydro-electric schemes remain a favoured choice world-wide for energy storage, particularly when it comes to their benefits when considered in conjunction with other renewable sources.

One of the key differentiators of hydropower development compared with other forms of renewable energy is the broad range of skills required to develop a scheme. Designing and constructing a scheme requires specialised input from electrical, mechanical and civil fields, but may also require guidance from various support services including environmental, financial, advisory and contractual aspects, such as negotiating development approvals and Power Purchase Agreements. GHD's wide-ranging service offering allows us to tailor a fully-integrated team to solve your hydropower needs.

Our service offering

Hydropower requires more than consideration of turbines, transformers and transmission lines. GHD offers a broad range of professional services associated with hydropower projects including the following:

Planning

- Hydropower and pumped storage planning studies
- Scheme layouts
- Risk assessments and models
- Geotechnical and hydrological investigations
- Preliminary design and cost estimates
- Value engineering
- Business case development
- Environmental impact assessments
- Submissions to relevant authorities for planning permissions
- Third party and stakeholder liaisons

Design

- All design stages
- Hydraulic modelling and transient analysis
- Dams and hydraulic structures design
- Gates, screens and other hydro-mechanical equipment design
- Tunnelling, cavern and shaft design
- Penstock and high pressure hydraulic conveyance design
- Structural design
- Turbine and generator sizing and specification
- Design verification/ proof engineering
- Ventilation design
- Mechanical and electrical services design
- Seismic design
- Monitoring system design
- Architectural design
- Communications and control system (SCADA) design
- Switch yard and substation design
- High voltage transmission design
- Fire and life safety systems design
- Risk assessment
- Value engineering
- Due Diligence

Project management

- Tender documentation, including specifications
- Tender assessment and adjudication
- Construction methods and programmes
- Quality assurance

Construction supervision

- Resident engineers and control systems
- Site inspectors
- Factory Acceptance Testing
- Audit/monitoring of contractors quality assurance systems
- Financial monitoring and reporting
- Geotechnical monitoring
- Design compliance reporting and certification

Life cycle management

- Scheme condition assessments
- In-situ monitoring
- Lifecycle assessment
- Remedial designs
- Emergency response planning
- Temporary works design

Benefits

GHD applies its client relationship focus and its in-depth engineering experience in hydropower and related disciplines to work closely with client representatives addressing key concerns, constraints and issues. Once identified and analysed, sound engineering options are developed to provide tailored solutions to suit the project at hand. We provide in-house capabilities across the broad range of disciplines to successfully deliver complex projects.

Experience

We work closely with clients, responding to their needs for hydropower projects. Our team has worked on a number of hydropower projects, some of these are described below.

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Project	Year	Description
Kidston 330 MW Pumped Storage Hydropower Scheme	2017-ongoing	GHD has been appointed as part of a Design and Construct Consortium to undertake the tender design of Kidston Pumped Storage Hydropower Scheme which utilises an existing mine pit as the tail water pondage with a new headwater pondage to be constructed.
Burdekin Falls Hydro-Electric Power Station Pre-Feasibility – Detailed Business Case	2017-ongoing	Following the acceptance of the Preliminary Business Case, GHD was further engaged to undertake the engineering and environmental assessment associated with the Detailed Business Case including optimisation of the scheme and the design development of an additional power station option.
Burdekin Falls Hydro-Electric Power Station Pre-Feasibility – Power Station Fatal Flaws Analysis	2017	Our team undertook a fatal flaws analysis of two options for a hydropower station proposed for addition to the existing Burdekin Falls Dam. This formed part of the Preliminary Business Case for the project. The scope included updating the energy yield assessment, fatal flaws analysis of the project, environmental approvals review, and update of capital cost estimates.
South Australia Pumped Storage Prefeasibility Study	2017	GHD was appointed to conduct prefeasibility study of two pumped storage sites in South Australia.
Western Australia Pumped Storage Prefeasibility Study	2017	GHD was appointed to conduct a prefeasibility study of a pumped storage site in Western Australia
Australian National University Pumped Storage Study	2017-ongoing	GHD is supporting the ANU as technical advisor for this ARENA funded study into pumped storage potential nationally.
Mendi Hydropower Concept Study, Papua New Guinea	2016-2017	GHD performed a concept study for new hydropower sites in the Mendi region of PNG.
40 MW Derby Tidal Power Project	1997-2004, 2012-2015	GHD carried out the site investigation, energy modelling, preliminary design and land acquisition services for this tidal energy project
Thomson Hydropower Station Electrical Upgrade	2011-2015	The services comprised detailed design based on GHD's functional design and construction phase services for upgrading the electrical installation and control system.
Small And Mini Hydro Development Project, Lao PDR	2009-2013	GHD prepared new processes and documentation to support a change in strategy for planning new small hydropower projects, identified five pilot schemes and provided training for Client capacity building.
PNG Power Sector Project, Papua New Guinea	2010-2011	GHD was appointed to review six potential hydropower sites in Papua New Guinea.
1,200 MW Baleh Hydroelectric Project, Malaysia	2008-2010	GHD was appointed to conduct prefeasibility and feasibility studies for this scheme with a dam height up to 220 m and 5 Francis turbines.
140 MW Bogong Hydropower Project, Australia	2007-2008	As Owner's Engineer, GHD delivered the geotechnical baseline report (GBR), reference design, planning and statutory approvals, all tender documentation and supervision services for the \$240 million project.
South-East Queensland Pumped Storage Pre-Feasibility Project	2004	GHD undertook a pre-feasibility study for a pumped storage scheme with an installed capacity in the range of 100 MW to 500 MW. A key feature of the scheme was the utilisation of two existing reservoirs as the headwater and tailwater pondages to minimize civil costs.



Experienced Hydropower team



Roger Fulton Principal Hydropower Consultant

Roger started hydro consultancy in 1975, and resumed in 1991. He has been design engineer, project manager, and commissioning engineer of hydro projects for Pacific Hydro, and has worked in Chile, Laos, Nepal, Kenya, Australia, Indonesia, Malaysia and NZ.

He was leader of the due diligence cornerstone report for the sale of Contact Energy, NZ's largest privatisation. He was M&E leader for the ADB Se Kong-Se San study ranking 37 hydro schemes in Laos, Vietnam and Cambodia.

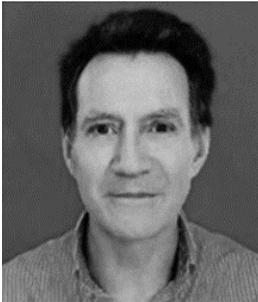
Roger's experience includes detailed design, project management, commissioning, refurbishment, rehabilitation, due diligence, reliability studies, and he is comfortable with mechanical and electrical aspects of hydropower projects from water to wire in both small and large hydro.



Greg Watson Principal Dams/Hydro Mechanical Engineer

Greg has 39 years experience in mechanical design (conceptual through to detailed design) related to hydropower, dams (including spillways, outlet works, fish passages etc), waterways, pump stations, process control and automation systems, and other hydro-mechanical installations. This has also included management of civil, electrical and mechanical engineering design teams undertaking feasibility studies, energy studies, conceptual and tender design and contract document preparation as well as management of multi-disciplinary engineering teams associated with the construction supervision of large scale hydropower developments.

Significant hydropower projects on which Greg has had key roles include 1,325 MW Baleh & 1,236 MW Baram HEPs (Malaysia), 2,400 MW Purari HEP (NZ), 1,080 MW Nam Theun 2 HEP (Laos), 2,400 MW Bakun HEP (Malaysia), and 600 MW Pergau HEP (Malaysia).



Mike Westerman Principal Hydropower Consultant

Mike has 38 years experience in identifying, developing, feasibility studies for, documenting, procuring and supervising construction and commissioning of renewable energy projects, particularly hydroelectric projects in Australia and internationally.

He has a comprehensive technical and commercial understanding of renewables projects including due diligence, risk management and contract packaging.



Colleen Baker Principal Dams and Hydropower Engineer

Colleen has 17 years experience in the design and construction of dams and hydropower projects.

Her expertise lies in the project management and design of dams and hydropower projects, but she is also frequently involved in other aspects of water supply headworks including investigations, safety and risk management, capital works upgrades and construction management.

A career highlight was her role as Deputy Project Manager on the Barram and Baleh (SCORE) project which included assisting the Malaysian government in the development of two 1200 MW hydropower projects. She has also been involved in the feasibility assessment of pumped storage sites in Australia



David Bones Principal Consultant – Power Economics & Regulation

David has over 20 years' experience within the Electricity Supply Industry covering power system planning, load and generation connection, economic evaluation, regulation and electricity market operation. Having held executive and management positions within regulated electricity network companies and the national electricity system and market operator, he has successfully delivered nationally significant projects and leading capacity planning activities, across both transmission and distribution networks.

David is able to leverage expert knowledge to provide strategic advice to clients, particularly in relation to power system planning, operations, economic evaluation and regulation. David has an appreciation of asset management strategies and practices and his experience and superior communication skills allow him to navigate complex planning, regulatory and commercial issues.



Ian Charlier Principal Electrical Engineer

Ian has over 30 years' experience in industrial electrical engineering in the areas of water/waste water treatment, material handling, steam and power generation, transport infrastructure and marine and defence. His career combining both design and construction and consultancy engineering has provided him extensive project experience in electrical, instrumentation and control/process design, HV/LV substation and cabling design, multi-discipline design and project management.



James Willey Principal Dams Engineer

James is a Principal Dams Engineer based in Brisbane. He has over 20 years experience in a range of projects including dam design, spillway design, hydraulic design, outlet works design, hydropower, dam safety, surveillance reviews, dam upgrades and remedial works, and risk assessment.

James' involvement in hydro projects includes the recent assessment of the Burdekin Falls Hydro-Electric Power Station feasibility and business case. His key role on that project was the development of a model for simulation of the reservoir operation and assessment of the energy yield. He was also the project manager and design engineer for a pumped storage pre-feasibility assessment in Southeast Queensland.

To discuss how we can assist, contact:

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