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 **entura** | The power of  
Hydro Tasmania natural thinking

Hydro power

## Entura is one of Australia's most experienced energy and water consultants.

As a leading consultancy in the Asia-Pacific region, we help utilities, governments, developers and international companies tackle big problems with clever solutions.



We offer a full range of consulting services covering the planning, design, construction, operation and maintenance of all kinds of major energy and water projects.

There are over 350 dedicated minds at Entura, all ready to work closely with our clients — wherever they are.

### Areas we specialise in

- Renewable energy
- Power engineering
- Hydro power
- Water management
- Water infrastructure
- Environmental management and planning

And because we're part of Hydro Tasmania, Australia's largest renewable energy supplier and water resource manager, our expertise is backed up by almost 100 years of experience in developing and operating power and water infrastructure.

### Hydro power

Hydro Tasmania's water network consists of 30 hydro power stations, 59 major dams and 212 km of pipelines, tunnels and canals. Enturas involvement in the development and maintenance of this system has naturally led to an intimate knowledge and understanding of all aspects of hydro power and water engineering.

Our industry leading experience enables us to deliver services to our clients in consideration of the entire asset lifecycle. Our designs are fully considerate of operation and maintenance issues, ensuring the owner is well served over the full life of the asset.

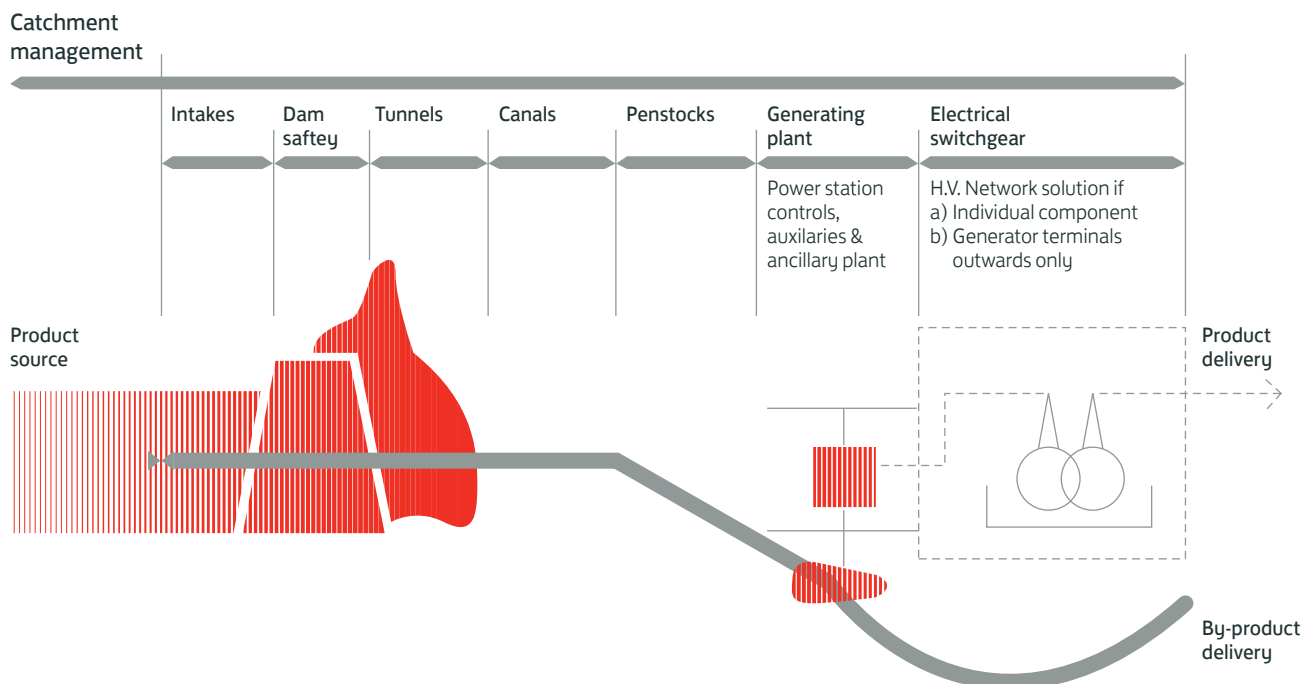
We work in partnership with clients in the development of new hydro power stations of varying sizes, as well as the management and refurbishment of existing developments. Our well-deserved reputation for delivering innovative designs that are practical, economic and enduring extends throughout Australia and across the world.

# Our services

Client needs	Strategy	Design	Approval	Construction	Operation	Review
Entura services	Concept	Asset design, documentation and procurement	Planning application and approval process	Construction management and review	Operational asset management	Asset upgrade and modernisation options
	Investigation and pre feasibility	Environment impact assessment	Compliance audit	Testing, documentation & commissioning	Condition assessment and performance monitoring	Due diligence
	Concept design		Technical policy and procedures	Client engineer	Asset improvement program	
	Business case and full feasibility			Certify for operation	Energy efficiency	

In addition to providing the above services, our technical, scientific and consulting specialists are well placed to perform independent peer reviews of other service providers to support the risk management needs of your business.

## Engineering solutions for hydro power schemes



**Our extensive experience has led to the development of a wealth of knowledge, and an ability to provide leading and innovative solutions for our clients.**



#### **Hydrology and system studies**

In hydro-electric generating systems, determining how to make best use of available water resources is complex. Entura's clients are provided with the most precise information possible due to our use of powerful computer hardware, specialised software and modern computer programming techniques. These systems enable us to accurately estimate system capability, plan system augmentations and value water inventory.

Over the years, we've developed numerous models for a variety of applications, from water resources to financial optimisation. We also provide advice and assistance in statistical analysis, with particular specialisation in the area of synthetic data generation techniques.

#### **Survey and GIS**

Entura's multidisciplinary surveying potential is considered one of the most versatile and resourceful in Australia. We are equipped with modern, centimetre-accurate RTK GPS receivers, precision theodolites, total stations, echo sounders, marine craft in survey and targetless laser systems.

**Our skills and infrastructure encompass a broad range of survey disciplines, including**

- Cadastral surveying
- Easement/wayleave determination
- Precision engineering surveying
- Hydrographic surveying
- Deformation surveying
- GPS (RTK) measurements
- Geodetic surveying

#### **Civil engineering**

With a rich history originating from the development of Tasmania's hydro-electricity generation scheme, Entura's reputation in civil engineering is second to none.

Our leadership in civil engineering consultancy and design services spans across the analysis, risk assessment, pre-feasibility, feasibility and detailed design of projects involving hydraulics, geomechanics, structural engineering, materials engineering and economics.

#### **Such projects include**

- Hydro power schemes and other renewable energy schemes, e.g. small hydro and wind
- Dam design, dam upgrade design, dam safety and dam risk assessment
- Tunnels, pipelines and structures, e.g. power stations, sub-stations and bridges
- Transmission towers
- Substation foundation design
- Structural analysis, design and refurbishment
- Geotechnical analysis and design
- Hydraulic analysis and design
- Preparation of specifications and tender documents, tender analysis and awarding of contracts, and contract supervision and administration

#### **Electrical and mechanical engineering**

Entura's contribution to the successful operation of the Tasmanian hydro-electricity system is reflected by the ever-increasing demand for our services in Australia and overseas.

What sets us apart is the ability to integrate our wide range of skills into complete solutions. This, coupled with our extensive experience, makes us ideally positioned to provide our clients with the best advice in the market.

Entura's electrical and mechanical engineers have expertise in feasibility studies, investigation, design, implementation and operation and maintenance of a wide range of projects related to the renewable energy industry, water supply industry and a range of industrial applications.

#### **Our electrical and mechanical engineers offer expert services in**

- New mechanical and electrical hydro plant
- Modernisation and automation of hydro power stations
- Mini hydro power systems
- Gates, bulkheads, valves, and trashracks for spillway, hydro power and irrigation applications

## Our products

Our highly customised expert services, backed up by our successful track record, provide clients with peace of mind on their own projects.



### Mini-hydro

In the past decade, Entura has been involved in over 30 mini-hydro projects, assessing more than 300 individual schemes. This has built a solid foundation of experience in mini-hydro investigation, design and implementation.

This experience puts us in an excellent position to understand and manage the technical and commercial issues that are unique to small-scale hydro schemes.

Our highly customised expert services, backed up by our successful track record, minimise the risks associated with such complex projects, and provide clients with peace of mind on their own projects.

### Outage management

We understand the importance of managing time with outages and the associated commercial impacts of such projects. Our personnel are experienced in outage management for Hydro Tasmania's 30 power stations and associated assets. We have also used this knowledge to help similar companies around Australia and overseas.

Our well documented procedures allow us to effectively manage work quality and minimise project time, costs and project related risks. We have proven performance in managing competing financial and technical demands on technically challenging projects with difficult site conditions and tight deadlines.

### Asset management and refurbishment

Entura's asset management and refurbishment services have been developed based on our ongoing management of Hydro Tasmania's own assets. This 'whole of life' knowledge gives us the ability to consider asset management during all phases of plant life, from planning to replacement and upgrade.

Entura is able to transfer this knowledge to develop and optimise similar strategies and procedures for our clients. Our experience in performing monitoring, testing and inspection services gives us the edge in identifying issues early and recommending strategies to overcome them, saving our clients time and money in the future.

### Particular focus areas include

- Plant condition monitoring, testing and inspection
- Maintenance optimisation and integration services
- Plant overhaul, upgrade and failure analysis

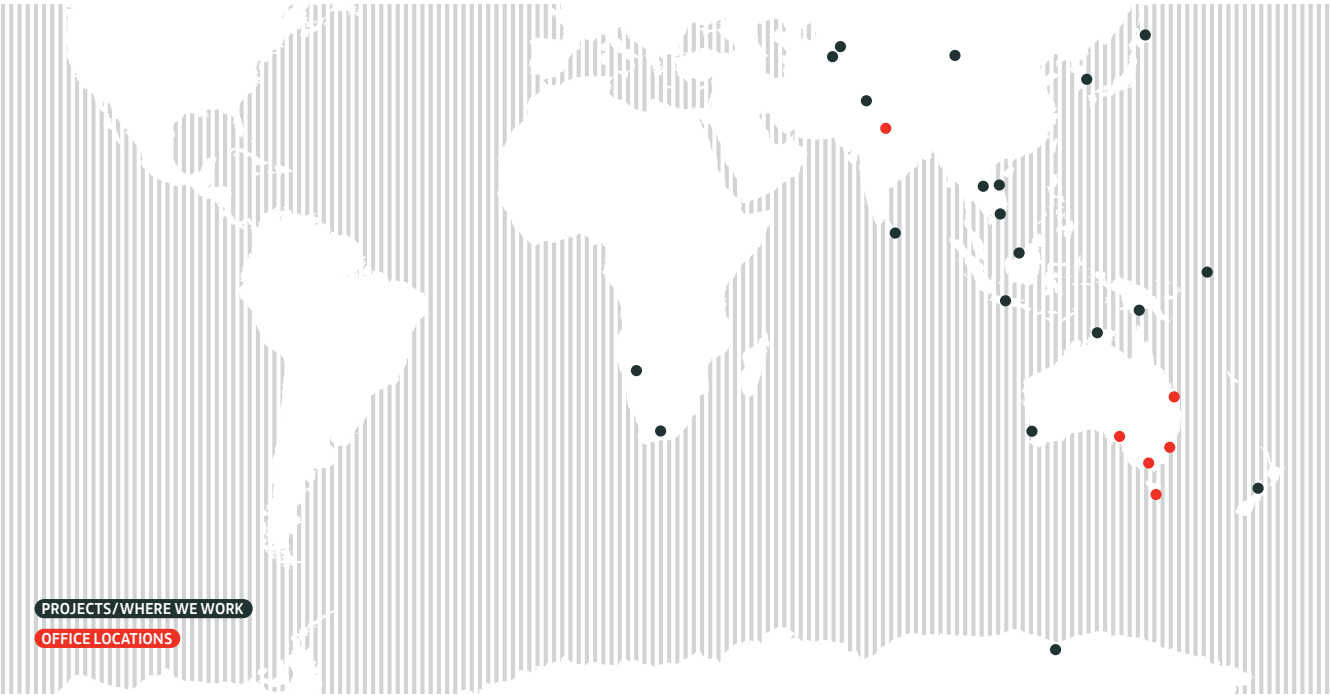
### Operator training

Entura offers extensive experience in all aspects of operator training and our training module is nationally accredited to certificate IV in ESI Generation (Certificate number UEP 40206).

### Our operator training includes

- Existing documented training modules that cover all civil, electrical and mechanical aspects of hydro electrical plant and equipment
- Existing safe operating procedures
- Experienced operating personnel to:
  - Review and tailor modules and procedures to suit specific client needs
  - Run complete or targeted elements of a training program
  - Supervise hands-on operations so that trainees have the opportunity to reinforce what they have learnt in the class room without exposing the plant or business to unacceptable risks
  - Assess the performance of trainees and provide additional targeted support as required

# International capability



We support clients across a range of geographic regions. Our strength comes from an ability to deploy the best combination of expertise to meet the needs of clients and projects in any location.

## Case studies



We have successfully completed a large number of projects for clients across a range of markets. These include managing large programs of work over many years, designing innovative solutions for complex problems, working in remote locations and managing various stakeholders for flagship projects.

The following is a sample of projects we have completed.

Project	Parameters	Client	Location	Date	Client need	Our solution
Sarawak hydro power feasibility studies	Four studies totalling 800 MW of potential	Sarawak Energy Berhad	Sarawak, Malaysia	2009	Identify feasible sites for hydro-electric projects	Feasibility studies
Melbourne Water mini-hydro program	6 mini-hydro plants ranging from 0.5 – 2 MW	Melbourne Water	Victoria, Australia	2007–2009	Renewable energy generation	Mini-hydro feasibility, design, construction and commissioning
Wivenhoe Power Station Unit 2 asset life cycle plan development	Power station contains 2 x 300 MW turbines	Tarong Energy	Queensland, Australia	2009	High level asset plan for civil and mechanical assets	Asset management advice, including conditions assessment and 30-year asset lifecycle plan
Sarawak Murum operator training	Total of 24 employees trained	Sarawak Energy Berhad	Sarawak, Malaysia	2010	Increase hydro power operator capability	Hydro power station operator training
Tina River hydro power feasibility studies	6 options ranging from 10 to 20 MW	Ministry of Mines, Energy and Rural Electrification	Solomon Islands	2008 – 2010	Identify feasible sites for hydro-electric projects	Pre feasibility and feasibility studies