



Paul Wootton

BENG(MECH), GRAD DIP BMAN

Technical Director - Power



Location

Brisbane, QLD, Australia

Qualifications/Accreditations

- Bachelor of Engineering (Mechanical)
- Graduate Diploma of Business Management

Relevant experience summary

Paul commenced his career in the mining and then pulp and paper industries. For the last 25 years he has focussed on power generation and fuel systems. In power he has specialised in distributed plants (renewable, conventional and hybrid systems), and has extensive experience with reciprocating engine generators. His experience with fuel systems covers a broad range of gasses (NG, LNG, CNG, LPG, syngas, biogas, LFG, coal mine gas, hydrogen) and liquids (diesel, biofuel, fuel oil).

His primary role has been in technical management of multi-discipline design and study teams. However, he has also held lead roles in manufacturing management, environmental licensing, project approvals and development of innovative technology.

He currently leads GHD's Energy from Waste (EfW) initiative and is member of the Future Fuels initiative with his focus on hydrogen systems.

Project experience – Microgrid or Islanded Power Station

Hydrogen PV Integration Project

Role: Lead Mechanical/Process Engineer

Lead Engineer for non-electrical/control aspects of the project which covers the installation of BESS, fuel cell, electrolyser and new storage technology at an existing solar farm. The scope of work included scope definition, initial design and production of specifications for procurement of key items of equipment and construction contracts.

Independent Report on Alice Springs Blackout

Role: Project Manager

Location: Alice Springs, Australia

Undertook an independent review of public information and plant data to ascertain the contribution of engine performance and other factors to the cause of the blackout.

The review also commented on the findings of the official inquiries undertaken by Entura and the NT Utilities Commission.

Project Feasibility Study

Role: Project Manager

Client: Horizon Power

Manager for a project feasibility study for a remote hybrid power station to supply power to Murchison Radio Observatory. Power station consists of a 4km access road, 4x500kW diesel generators, 500kW

solar PV system and a 6 km underground 11kV cable. The power system is in a radio quiet area and has low RFI (radio frequency interference) emissions.

Preparation of Tenders for 45MW Power Station

Role: Project Manager

Client: Kiewit Australia

Location: Alice Springs, Australia

Manager for design and work packaging for preparation of tenders for 45MW power station at Alice Springs and 6MW power station at Tennant Creek. Options for Wartsila, Kawasaki, Mitsubishi, Jenbacher and Caterpillar engines were prepared.

Owen Springs

Role: Study Manager

Client: PWC

Location: Alice Springs, Australia

Options study and preliminary plant layout for approvals for new 100MW dual fuel power station to serve Alice Springs.

Multi-unit Islanded Power Stations

Role: Project Director

Client: Santos Ltd

Location: Queensland, Australia

Several projects for multi-unit islanded power stations (200-800 kW) at CSG facilities in Queensland.

Karumba Power Station

Role: Engineering Manager

Location: Queensland, Australia

5 MW diesel reciprocating engine (Caterpillar) power station in Queensland.

West Kimberly Power Project

Role: Engineering and Approvals Manager

Location: Australia

Project comprised six power stations, 2-40MW, four based on reciprocating gas engines (Caterpillar) fuelled with liquefied natural gas (LNG), one based on diesel engines (Cummins), and one based on gas turbines (Solar) fuelled with natural gas/liquefied petroleum mix.

Wadeye Power Station

Role: Design Manager

Client: PWC

Location: Australia

Design Manager for FEED of 8.9 MW multi-engine gas fired power station (Cummins 2MW, 1.75MW and 1.1MW). Power station was to operate in island mode but had to be able to transition load from existing diesel fired power station. The design required incorporation of the PWC Remote Generation standards and environmental requirements. In addition, the coastal location required compliance with cyclone standards.

Wadeye Gas Supply

Role: Project Director

Client: PWC

Location: Australia

Project director for updating the FEED study to accommodate higher flowrates and amended client requirements. The scope consisted of a 300m 15MPa spur line and a conditioning/ metering/ pressure reduction station to reduce the pressure to 500kPa.

Project experience – Reciprocating Engine Power Projects

Technical Review of Operations

Role: Principal Engineer

Client: EDL

Location: Various

GHD undertook a technical review of 52 of EDL's 80 Power stations, including those in UK and USA. The review considered the operations, environmental and safety performance at the power stations and LNG plant. In particular, GHD reviewed the budget, risks and supporting evidence for the maintenance strategy and the new Asset Management system being implemented by EDL.

Moranbah Power Station, Verification of Performance Testing

Role: Independent Engineer

Client: EDL

Advised procedures to determine contract Performance and Acceptance Test compliance for 45 MW (15x3 MW Jenbacher units) power station. Witnessed tests and verified test report.

Appin Power Station

Role: Engineering Manager

Location: Appin, Australia

Engineering Manager for 54 MW power station using both gas and vent air methane from an underground coal mine. Scope included safety interface with the mine, gas pressure control, gas cleaning, regulation and metering.

X42 Power Station Gas Supply

Role: Project Director

Client: Xstrata Copper

GHD provided advice on gas supply options at several sites for a temporary 16-21MW (Cummins 1.1MW units) power station. Once the locations were selected, GHD was responsible for fast track detail design, procurement management, construction procedures and commissioning for the gas system (including modifications to APA's X41 gas skid, 800m pipeline, gas reticulation to engines).

Mt Isa and Daandine

Role: Owners Engineer

Client: APA Group

Location: Australia

Owners Engineer for two APA 33 MW (11x3 MW Jenbacher units) power stations. One station is natural gas fired and the other runs on coal seam methane.

Cannington Mine Power Station

Role: Engineering Manager

Client: BHP

Location: Queensland, Australia

24MW diesel power station subsequently converting to natural gas fuelled reciprocating engines (Caterpillar) in Queensland.

Maroochydhore WTP Cogeneration

Role: Technical Lead

Location: Queensland, Australia

Generator plant lead for 200-400kW cogeneration plant study.

Colac WTP Cogeneration

Role: Technical Lead

Location: Queensland, Australia

Technical lead for 300-600kW cogeneration plant study.

Oxley Creek

Role: Technical Lead

Client: QUU

Location: Queensland, Australia

Review of biogas system, identification of improvements, costing and development of business case to reduce natural gas and electricity costs in existing boiler and cogeneration plant. Identification of changes in boiler operation to increase capacity for proposed Cambi plant upgrade.

Dairy Factory Biogas Power Facility

Role: Expert Witness

Client: Confidential

Review of contract documents and as-built 750kW facility to advise the court on liabilities of parties. Report prepared. Case settled before going to court.

Corowa Piggery and Abattoir

Role: Principal Engineer

Location: Australia

Feasibility Study and tender review of proposals for a 2 MW biogas power station with heat recovery to produce steam and hot water for use in the abattoir.

Cargill Beef Abattoir

Role: Principal Engineer

Location: Australia

Feasibility study for 1.2MW power station with heat recovery to produce steam and hot water for use in the plant.

Tapioca Processing Plant Feasibility Study

Role: Principal Engineer

Client: Babcock and Brown

Location: Indonesia

Feasibility study, specification, and design review of a 3 MW power station at a tapioca processing plant in Indonesia. The plant had a limited supply from the grid and the power station was designed to operate in island mode and to operate with the existing diesel generator sets.

Werribee Treatment Plant

Role: Principal Engineer

Client: Melbourne Water

Location: Melbourne, Australia

Assessment of economic generation capacity for increasing renewable energy production using fluctuating biogas production.

Western Water Sludge Digestion

Role: Principal Engineer

Client: Western Water

Location: Australia

Job manager for a study and specification of 300kW cogeneration package and gas treatment package integrated with an existing boiler for digester heating. The specification allowed for either reciprocating

engine or micro-turbine generators. The micro-turbine option with siloxane removal was installed.

Bindaree Beef, Inverell Plant Upgrade

Role: Project Manager

Client: Bindaree Beef

Location: Inverell, Australia

Independent technical review and advice for funding application for new biodigestion plant, cogeneration plant and rendering plant.

TDD for Acquisition of 5 LFG Projects

Role: Mechanical Engineer

Engineer responsible for TDD of 5 landfill gas projects, three of which included power generation facilities.

Design of 12 Landfill Gas Power Stations

Role: Engineering Manager

Client: Energy Developments Pty Ltd

Engineering Manager for design of 11 landfill gas power stations:

- Wingfield 1, SA, Australia, 4 Caterpillar gensets, 4 MW capacity;
- Wingfield 2, SA, Australia, 2 Caterpillar gensets, 2 MW capacity;
- Tea Tree Gully, SA, Australia, 3 Caterpillar gensets, 3 MW capacity;
- Pedler Creek, SA, Australia, 3 Caterpillar gensets, 3 MW capacity;
- Highbury, SA, Australia, 2 Caterpillar gensets, 2 MW capacity;
- Belrose, NSW, Australia, 4 Caterpillar gensets, 4 MW capacity;
- Lucas Heights 1, NSW, Australia, 3 Caterpillar gensets, 3 MW capacity;
- Brown Plains, Qld, Australia, 1 Caterpillar genset, 1 MW capacity;
- Springvale, Vic, Australia, 12 Jenbacher gensets, 8 MW capacity;
- Clayton, Vic, Australia, 12 Jenbacher gensets, 10 MW capacity;
- Brazier, England, 4 Deutz gensets, 5MW capacity; and
- San Ju Ku, Taiwan, 4 Deutz gensets, 5MW capacity.

Engineering Manager for Development of Landfill Gas Collection Systems, and Gas Conditioning Systems – These are installed at many landfill sites in Australia, UK and Taiwan. At some sites the collection systems feed flares and at others they feed power stations. At some power stations there are scrubbing systems for hydrogen sulphide removal and for siloxane removal.

Project experience – Hydrogen Systems

Providence Lavo Unit Development

Role: Mechanical and Process Lead

Independent oversight of development, compliance and certification of an integrated energy storage system for the domestic household market comprised of both batteries and an innovative hydrogen energy storage system. The system is to work in conjunction with solar panels and the electricity grid.

Hydrogen Ammonia Export Opportunity Modelling

Role: Technical Reviewer

The project is to assess the medium-term global scale commercial opportunity at a particular port and develop a business case for the short term demonstration plant. Undertook a review of cost and performance data for key components (water treatment, electrolyzers, ammonia production, hydrogen liquefaction, storage systems, product delivery systems) for the demonstration plant. Member of the team developing the commercial opportunity assessment including identifying state infrastructure synergies.

Assessment of Innovative Hydrogen Generation Technology

Role: Peer Reviewer

Review of a study on the status, technology development and commercialisation prospects for an innovative lab scale hydrogen generation technology.

Hydrogen Facility and Port Planning Assessment Method

Role: Technical Lead

Location: Queensland, Australia

Technical Lead for a study to identify urban planning requirements for hydrogen facilities at two export locations in Queensland.

Hydrogen Production and Export Study; Hydrogen System Options Investigation

Role: Technical Specialist; Principal Engineer

Lead engineer for a study into the utilisation of renewable energy to generate 4,000-10,000 kg/d. of green hydrogen for energy use or chemical production. The study looked at a number of value pathways to identify the potential benefits to the client of different electrolyser technologies, as well as different downstream plant options for utilising the hydrogen.

HyP SA FEED Study

Role: Technical Lead

Client: AGIG

Location: Adelaide, Australia

Technical lead for a FEED study for a hydrogen hub at Tonsley Park in Adelaide. The hub includes a 1.25MW electrolyser, Hydrogen injection systems to

two natural gas networks, hydrogen storage and a tube trailer loading bay.

HyP SA Concept Study

Role: Project Manager

Client: AGIA

Location: Adelaide, Australia

Preliminary advice, assessment of concepts and site options and proposed development option and costs for HyP SA hydrogen demonstration project in Adelaide.

FEED Study for Hydrogen Demonstration Plant

Role: Project Manager and Principal Mechanical Engineer

Client: Jemena

FEED Study for hydrogen demonstration plant. The demonstration plant included a 500kW electrolyser, gas injection to natural gas network, public hydrogen refuelling station, public demonstration building, research area and research fuel cell.

Review of Funding Application

Role: Project Manager

Client: A.R.E.N.A.

Review of funding application for an innovative electrolyser technology. Review considered current and projected performance and costs for the both the new technology and existing technology. It also considered the proposed commercialisation steps and timeframes.

Project experience – Other Biomass and Energy from Waste

Galiford Try Gasification Projects

Role: WTE Power System Specialist

Client: Various

Location: United Kingdom

Responsible for specialist advice for detail design of steam, condensate and feedwater systems on three 11 MWe plants in UK. Areas covered included process and plant performance (using SteamPro software), plant and piping layout, access, turbine bypass system selection, pipe stress analysis, isolation philosophy, equipment (boiler, steam turbine, ACC, FWH, deaerator, BFP, vacuum system) interface.

Technical Advice for a Pyrolysis/Gasification Plant

Role: Principal Engineer

Client: Ballina Shire Council

Location: New South Wales, Australia

Technical advice and process vendor selection for a pyrolysis/gasification plant to process 16,000 tpa (dry basis) of select council waste to produce biochar and electricity.

Solid Waste and Energy Recovery Facility (SWERF)

Role: Engineering and Environmental Manager

Client: Brightstar Environmental Pty Ltd

The Solid Waste and Energy Recovery Facility (SWERF) project was developed by EDL at Wollongong, New South Wales. It was designed to process 50,000 tpa of household waste to produce renewable electricity, recover recyclables and water, and reduce waste to landfill by 90 percent. The system consisted of a waste receipt and storage facility, autoclave waste processing, sorting system, separation of recyclable materials, solid fuel preparation system, pressurised entrained flow pyrolyser, steam gasification unit, bioliquids processing system, syngas storage and purification equipment, spark ignition gas engine generators, engine heat recovery system and a vacuum distillation water treatment plant. The process and much of the equipment was developed in-house.

Key aspects of the project were:

- Design, construction and intermittent operation over 3 years of a MSW EfW plant;
- Development of a waste stream model to calculate key properties (proximate and ultimate analysis, calorific value and key chemical contaminants; and
- Review of alternative waste processing technologies including MBT, composting, baling, incineration, gasification and pyrolysis.

Waste Gasification Prototype Plant; 35MW Almond Shell Power Plant

Role: Project Manager

Client: A.R.E.N.A.

Technical review of funding application 35 MW Almond Shell Waste Gasification Prototype Power Plant. Reviewed feed system, boiler, turbine, ACC, steam system, effluents, etc. for funding application.

Bagasse Cogen Plant Conversion to EfW

Role: Project Manager

Assessment of fatal flaws for conversion of a 30 MW bagasse cogeneration plant to operate with SRF.

The assessment considered:

- The impact of SRF fuel on the boiler operation (temperatures, retention time, exhaust flowrates, corrosion and slagging potential);
- Regulatory, fire and water issues associated with storing 3 months of SRF fuel on site;
- Preliminary modelling of air emissions from the existing stack; and
- Incorporation of new APC equipment into an existing plant with no available suitable space.

Laminex Board Mill Cogeneration Plant

Role: Project Manager

Client: Laminex

Location: Australia

Pre-feasibility of upgrading an aged hot oil system with a biomass fired cogeneration plant (3-10 MWe).

Colac Waste and Energy

Role: Technical Specialist

Location: Victoria, Australia

Technical lead for concept and feasibility study of a district waste and energy sharing scheme involving four separate businesses (water reclamation, timber processing, lamb abattoir, dairy food production) in Colac, Victoria.

Mt Piper EfW

Role: Lead Mechanical and Piping Engineer

Location: New South Wales, Australia

Lead engineer for ECI phase of the integration of a 200,000 tpy RDF project with the 1400MW coal fired power station at Mt Piper, NSW.

Responsible for

- Overall plant layout;
- Layout of the waste receiving, storage, handling, debaling and mixing pit; and
- Integration of piping systems (pipe sizing, routing, TIPS and MTOs).

Biomass Alternative Energy Study

Role: WTE Technical Lead; Technical Manager

Client: Confidential

Investigation for a confidential client into using a biomass fired boiler (approx. 35tph) to displace gas fired boilers to reduce energy costs.

Both clean fuels (wood waste) and contaminated fuels (SRF) were considered, including ash disposal cost. System options, including a backpressure turbine, were evaluated using Homer software.

Biomass Alternative Energy Study

Role: Technical Manager

Client: Confidential

Investigation for a confidential client into using a biomass fired boiler (approx. 15tph) to displace gas fired boilers to reduce energy costs. System options, including a backpressure turbine, were evaluated using Homer software.