Nello Nigro BE (MECH)

Technical Director Power Generation

Location

Melbourne, Australia

Qualifications/Accreditations

– Degree in Mechanical Engineering, Swinburne University (BE (Mech))
– Graduate Diploma of Computer Simulation and Modelling, Swinburne University (Melbourne)

Key technical skills

– Fossil fuel power generation technologies (Coal, OCGT, and CCGT)
– Hydrogen
– ORC technology
– Boilers
– CO2 Capture System
– Feasibility Studies
– Due Diligence
– Energy audits
Cogeneration

Relevance to the project

Nello's focus has been mainly on business evaluation, power and energy work in consulting, oil & gas, coal, process, mining and utility industries. The emphasis in the latter years has been to take a technical and commercial view on the viability of a variety of assets. Nello has worked in teams with a number of multinational companies as a consortium member through all facets of project development, from concept to financial close, of both coal and gas fired plants, and project implementation and has a thorough understanding of all technical aspects from design through to maintenance and operation. Throughout his career Nello has worked on the development of a number of gas fired and coal-fired power plants in Australia and abroad. Nello has good experience in front end studies from concept to full feasibility and front-end engineering & design (FEED) studies and has participated in a number of tender assessments. Nello has carried out a number of due diligence projects and feasibility studies involving assessment of gas turbine assets for a number of OCGT & CCGT plants.

Project experience

Decarbonisation for Loy Yang B

Role: R&D Industry & Technical Advisor
Client: LYB
Date(s): Ongoing

Currently working on an R&D project for LYB to identify projects that will enhance the power plant in terms of improvements in efficiency, reduction in carbon footprint, reduction in use of fuel and water and increase to power output. The work involves producing a stakeholder map and an EOI to obtain proposals from potential contractors that are able to provide proposals for improvement of LYB. This work has lead to assessment for decarbonisation of the power plant by considering a fuel switch to biomass, hydrogen, natural gas and renewable methane. Carbon capture and gas turbine repowering has also been considered.

Thermal Generating Audit (Stage 1, 2, & 3)

Client: AEMO

As a result of a directive from the Commonwealth Government AEMO engage GHD to carried out an audit in three stages for all thermal plants in the NEM which are <30MW. The audit focused on identifying upgrades that are technically feasible to implement that result in improvement to capacity, efficiency, flexibility and reliability. The outcomes of the audit will inform future policy options for improving system reliability, promoting affordability, and understanding the impacts of upgrades on electricity sector emissions. The work covered coal and gas fired plants (OCGT & CCGT) and included reviewing combustion system, fans, turbines (steam and combustion turbines), and balance of plant.

E nello.nigro@ghd.com www.ghd.com

Benchmark Reserve Capacity Price for the SWISS

Client: AEMO
Date(s): 2018-2020

Updated the report for AEMO's 2018' 2019 & 2020 Benchmark Reserve Capacity Price for the South West Interconnected System. Each year the Siemens SGT5-2000E 33MAC gas turbine was evaluated to be the most appropriate Gas Turbine on which to base the cost estimate.

Cost Estimate Study

Client: Mortlake Power Station

Carried out a cost estimate study for several life extension options for Mortlake Power Station.

The options were focused around Siemens SGT5-4000F gas turbines and the Siemens lifetime Extension (LTE) program for the Mortlake units

Cost Estimate Study

Client: Public Utilities Office Western Australia
Location: Western Australia

Carried out a cost estimate study for the Public Utilities Office (PUO) in Western Australia. This included a number of coal (Rankine Cycle), combustion turbine (CCGT/OCGT) and wind technologies. This information provided them with the necessary data for their new entrant power model supporting their forward estimation for new entrant and power price tariffs.

Support Engineer for a 14 MW Organic Rankine Cycle for Berakas Power, Brunei.

Role: Support Engineer
Client: Berakas Power Management Co.
Location: Brunei

Supported Berakas in Brunei to:

- Assess and comment on quality issues pertaining superheater and re-heater units for a 14 MW Organic Rankine Cycle power plant;
- Reviewed and comment on the test plan from the OEM (GE/Nuovo Pignone);
- Reviewed expander gearbox vibration issues and commented on life expectancy of the gearbox; and
- Witness test commissioning of the plant and reviewed performance calculations on behalf of the Owner.

The ORC operates by recovering waste heat from three (3) LM2500 gas turbines and converting the heat to power via a 14 MW net Organic Rankine Cycle.

Gladstone Hydrogen Project

Client: CSIRO
Location: Gladstone, QLD
Date(s): Ongoing

Currently working on a pre-feasibility hydrogen study to identify potential project partners, costs associated with establishing and undertaking the technology trial, a timetable for completing the project, and identify the pathway for developing the full upstream and downstream elements of the renewable hydrogen supply chain (using ammonia as a carrier) from Queensland to Asia. The first stage of this project will provide an overview of CSIRO's membrane cracker technology to separate hydrogen from ammonia.

5 MW Organic Rankine Cycle Project

Role: Independent Technical Reviewer
Client: RayGen
Date(s): Ongoing

Currently carrying out an independent technical review for a 5 MW ORC operating on a hot and cold sink The hot and cold sink is created using solar energy from a concentrated solar receiver tower. The engine used as the ORC is a twin screw expander with ammonia as the working fluid. Delta T is approximately 90 degree C. Both hot and cold storage reservoirs contain sufficient fluid for 10 hours of ORC operation.

Due Diligence for EGCO in the Philippines

Role: Due Diligence
Client: EGCO

Carried out a technical due diligence for proposed 2 x 600 supercritical PF coal fired power plant to be built in Luzon, Philippines. The DD included review for the boiler, BOP, once through sea water cooling, and coal handling facilities.

Due Diligence for various Confidential Clients

Role: Due Diligence

A number of due diligence studies were carried out for the sale of thermal power stations. These included coal fired (black & brown) utility power stations, NG fired (CCGT and OCGT) power plants as well as diesel and landfill fired reciprocating engine power stations. These due diligence assignments were carried out as lead technical and support technical and reviewed technical documents and asset management plans.

Cost estimate study, Mortlake Power Station

Client: Mortlake Power Station

Carried out a cost estimate study for several life extension options for Mortlake Power Station.

The options were focused around Siemens SGT5-4000F gas turbines and the Siemens lifetime Extension (LTE) program for the Mortlake units.

Power Specialist BHP Billiton Marketing P/L Singapore

Role: Power Specialist
Client: BHP Billiton
Location: Singapore

Lead power specialist providing capital cost estimates, operating and maintenance cost estimates, metal intensities, and cost trends for 13 power generation technologies for a total of 52 countries/regions for BHP Billiton Marketing P/L Singapore. The technologies included fossil fuelled (coal, gas, oil), nuclear, and hydro. These estimates were an update to figures prepared for BHP Billion three years ago. Cost trends involved a time frame of 2015 to 2040.

Geraldton Renewable Hydrogen Project

Client: BP
Location: Geraldton, WA

GHD carried out a study to investigate the technical requirements and economic viability for a 20,000 tpa and 100,000 tpa of renewable ammonia export facility in Geraldton WA. This study included a process involving desalination of sea water, producing demineralised water, producing hydrogen by electrolysis, using an ASU to produce nitrogen and delivering hydrogen and nitrogen to an ammonia synthesiser to produce renewable ammonia. Storage and handling facilities at the port were also included in the study.

Renewable Methane Production Project

Client: Southern Green Gas

GHD was commissioned by Southern Green Gas Limited (SGG) to undertake a technical feasibility and commercial model assumption review of their renewable methane technology and its ability to produce carbon-neutral methane. GHD understands that SGG is in discussions with potential strategic investors with the view of renewable methane technology.

The purpose of this review is to test SGG's technical assumptions for a module producing 700kg per annum of methane and to comment on the potential for a high volume of modules (1 million or more). Furthermore, GHD reviewed the key inputs to SGG's financial model which targets a 2025 natural gas price forecast by Wood Mackenzie.

Technology Options Study into a MSW Cogeneration Plant

Client: Australian Paper (AP)
Date(s): Ongoing
Currently carrying out a technology Options Study to compare travelling grate and fluidised bed combustion technologies for a power and steam plant using municipal solid waste (MSW) for an energy from waste EfW plant.

2.5 MW PV Solar Farm Hydrogen Production

Role: Project Manager
Client: Mitsubishi Corporation
Location: Japan
Project Manager for a feasibility study involving a 2.5 MW PV Solar farm generating power and a 2.5 MW electrolysis plant to produce hydrogen for hydrogenation to a Liquid Organic Hydrogen Carrier (LOHC) for export to Japan. This project was carried out for Renewable Hydrogen and Mitsubishi Corporation. Once in Japan the LOHC will be re-hydrogenated for use in hydrogen powered cars.

Hydrogen for Ammonia Production

Role: Project Manager
Client: Yara Fertilisers
Location: Karratha
Project Manager for a feasibility study involving a 2.5 MW PV Solar farm generating power and a 2.5 MW electrolysis plant to produce hydrogen which is to be injected into Yara Fertilisers ammonia plant in Karratha (using Haber Bosch process). This project was carried out for Renewable Hydrogen and Yara Pilbara Fertiliser at a concept level to prove the technology and to develop a demonstration plant inclusive of energy storage to provide a 24/7 hydrogen production facility.

Torrens A Station, AGL Torrens

Role: Project Manager
Client: AGL Torrens
Project Manage a study for AGL Torrens in mothballing Torrens A Station for a period of up to 10 years. This study identified a high-level strategy for plant preservation as well as reviewed the risks involved.

Ararat Wind Farm

Role: Due Diligence
Client: OPTrust
Project Manager for Ararat wind farm due diligence for OPTrust (a Canadian Company). The wind farm is yet to be built and will have a generating capacity of approximately 75 MW.

Energy Audit - Kinsevere Copper Mine

Role: Project Manager
Client: MMG
Location: Democratic Republic of Congo
Project Manager for an energy audit for MMG at their Kinsevere copper mine in the Democratic Republic of Congo. This work involved an existing diesel fuelled generation plant and the possibility of converting it to a solar/diesel hybrid plant as well as investigate the option to install battery back-up to support the site demand.

Business and Innovation (Victoria) project Victoria

Client: Department of State Development, Business and Innovation (Victoria)
Location: Victoria, Australia
Carried out a strategy study for CO2 removal technology for Victorian brown coal generators for the Department of State Development, Business and Innovation (Victoria) project. This assignment targeted over 5000 MW of coal fired power and involved GHD and CCS Consulting to assist with a strategic assessment of carbon capture technology research priorities applicable to Victorian brown coal. The report produced as part of this project combines the results of investigations and research conducted by GHD and CCS Consulting. The technologies reviewed include pre-combustion capture systems, post combustion capture systems, and oxy combustion capture systems.

Various Projects Generation licence and asset management compliance audit

Role: Lead Auditor
Lead auditor for generation licence and asset management compliance audits for the following:

- Alinta – 285 MW Pinjarra gas fired cogeneration plant;
- Alinta – 380 MW Wageup gas/distillate fired peaking plant; and
- BHP Billiton – Worsley Alumina power plant.

HFO Power Generation Plant Feasibility Study Newcrest Lihir Island gold mine Papua New Guinea

Role: Project Manager
Client: Newcrest Lihir
Location: Papua New Guinea
Carried out a feasibility study as project manager for a remote 20MW HFO power generation plant for Newcrest Lihir Island gold mine in PNG. This project progressed to the construction phase on the basis of an EPCM contract to carry out detailed engineering and construction supervision on site for the 20 MW HFO generation plant. Watsila was the OEM that supplied the generation equipment under an EPC contract.

Carbon Capture Plant Oyo Tolgoi Mongolia

Client: Oyo Tolgoi Power Plant
Location: Mongolia
Carried out a study into the addition of a carbon capture plant for Oyo Tolgoi coal fired power plant in Mongolia. This study involved assessing the utilities needed as well as the area required for a full-scale PCC plant.

Gas Fired Power Generation Project

Client: Newcrest Telfer
Location: Western Australia
Carried out a prefeasibility study for a remote 20MW gas fired power generation project for Newcrest Telfer gold mine in WA. This involved investigating, gas handling plant and current technologies and accessing the most appropriate solution to add 20 MW to the existing power plant.

Sub-Critical Coal Fired Captive Power Plant - Project Pearl

Client: BHP Biliton
Location: Halmahera Island, Indonesia
Providing support to BHP Billiton SSM CSG for Project Pearl to develop a remote 210 MW sub-critical coal fired captive power plant on Halmahera Island in Indonesia for a proposed nickel smelter. This project involved identifying the appropriate fuel and technology by way of a screening study followed by a pre-feasibility study to obtain firm EPC turnkey prices for the construction, testing and commissioning for the power plant. This included studying the viability of LNG supplies using a FSRU off the shore of Halmahera and coal supplied to a new port.
A concept study was based on their Cerro Matoso Nickel plant in Columbia where we carried out a due diligence on the process including the power supply to the facility. The Helmahera project was put on hold in 2008 after the pre-feasibility study.

Open Cycle Power Plant Budget Cost Estimate

Role: Project Manager
Client: Snowy Hydro
Location: Laverton, VIC
Project managed a budget cost estimate, for Snowy Hydro, for the conversion of their 320 MW Laverton open cycle power plant to a combined cycle power plant configuration.

Additional Mineral & Metal CSG Concept Studies for Remote Power Supply

Client: Various
Location: Various
Supported mineral & metal CSG in a concept study for remote power supply for the following projects (a number of plants involved heat recovery from sulphuric acid plants):

- A copper refinery in Afghanistan (Aynak) – coal fired 140MW in a remote area of Afghanistan using either indigenous lignite or imported coal;
- An aluminium refinery in Jamaica (Mincenco) – coal fired 140 – 500MW near the coast providing power and steam for the process plant and exporting power to the local grid for sales to third parties. This project considered sea water

cooling, a port for coal import and coal unloading/stacker & coal yard facilities; and

- A nickel smelter in Brazil (Mirabela) – Waste heat recovery 40MW in a remote location in Brazil, this project considered heat recovery from furnace off-gases and generation of power and steam for the process using both condensing turbines and back pressure turbines.

Aluminium Smelter Century Aluminium | Republic of the Congo (Brazzaville)

Role: Power Expert Consultant
Client: Century Aluminium
Location: Brazzaville, Democratic Republic of Congo
Power expert providing support to Century Aluminium for the development of a 360,000 tpa aluminium smelter in the Republic of the Congo (Brazzaville). The work involved the assessment of gas supplies for a remote gas fired power plant required to operate the facility for a 25-year life as well as selection of appropriate generating technology.

Feasibility Study 500 MW PF Coal

Client: Petroleum Development Oman
Location: Oman
Carried out a pre-feasibility study for a 500 MW Coal fired power plant to be developed in Oman for PDO. The work scope involved a site study, a fuels logistic study, a +/- 25% cost estimate as well as SteamPro modelling, and economic modelling. The study outlined the requirements for the boiler, steam turbine and ancillaries.

Career history

2012 – Present	GHD, Technical Director – Power Generation
2006 – 2012	Worley Parsons – Senior Principal Consultant
1994 – 2006	BHP Billiton – Senior Business Analyst / Power Generation Advisor
1982 – 1994	MERZ Australia Pty Ltd, Senior Engineering Manager
1980 – 1982	Clyde Riley DODDS Pty Ltd, Mechanical Design Engineer (Boilers)