North Australian Centre for Oil and Gas

Developing skills and expertise for the oil and gas industry
Location, Location, Location

Located in Darwin at the heart of Northern Australia’s emerging oil and gas industry, Charles Darwin University’s North Australian Centre for Oil and Gas (NACOG) is ideally equipped and situated to offer a complete service to the resources sector.

Established with funding from Ichthys LNG Pty Ltd, the Northern Territory Government and Charles Darwin University, NACOG offers well-established Vocational Education and Training (VET), Higher Education and state-of-the-art research facilities thereby providing a one-stop-shop to industry. Through building the skills and capacity of the local and regional workforce, NACOG promotes the growth of the Northern Territory’s resources and construction sectors.

As the northern capital is increasingly identified as a major operations and maintenance hub for the petroleum industry through the Bayu-Undan and Blacktip offshore gas projects and associated gas pipelines, NACOG is able to respond to industry needs by providing existing or tailored training and education programs as well as world-class consultancy and research services to support oil and gas operators.

Our strategic location offers close proximity to neighbouring Timor-Leste and South-East Asia, access to Indigenous training facilities and a unique knowledge and understanding of Territory conditions and their potential impact on resources.

“Our community, our industry and our university will all benefit from industry engaging with NACOG and contributing to its long-term, industry-focused sustainability.”

The Honourable Paul Henderson, Chair of the NACOG Advisory Board, Charles Darwin University.
Working with Industry

Strong strategic partnerships not only provide opportunities for direct and tailored services but also long-term strategic planning and direction.

NACOG has joined with key oil and gas industry stakeholders to provide nationally and internationally recognised services and accredited training and education to address labour demands of an emerging industry now and into the future.

The School of Trades, for example, offers extensive VET programs covering electrical and instrumentation, construction, metal trades, transport and logistics and other trades relevant to the petroleum and mining sectors across the Northern Territory.

A strong link with JKC Australia LNG (JKC) has also established CDU as a preferred provider of high risk and trades skills during the construction phase of the INPEX-operated Ichthys LNG Project.

Answering a need for qualified plant operators, there is now a particular focus on process plant operations, and new laboratory facilities have been installed to deliver more advanced trade qualifications required by the petroleum and mining industries.

Initiatives include:

INPEX and ConocoPhillips – Process Plant Operations

CDU began Certificate II and Certificate III in Process Plant Operations training in 2014 with tailored programs for industry. The course provides operators with practical skills and knowledge to operate production equipment in the chemical, hydrocarbon and oil refining industries.

Pilot Plant

NACOG is in discussions with industry partners regarding infrastructure requirements for a Pilot Plant. This long-term goal will see the Pilot Plant support process operator training and enable a range of practical exercises around instrumentation and process control, which otherwise would be performed on bench-top equipment.

Marlins English Language

CDU became the only approved Marlins Test Centre in Australia in May 2014, offering tests of spoken and written English for the offshore, shipping and cruise industries. It is particularly sought after by the oil and gas industry for their employees, who don’t have English as their first language.
Environmental management

The North Australian oil and gas industry has a significant environmental footprint. It is also characterised by multinational corporations with a strong commitment to go beyond regulatory compliance to implement best practice environmental management.

CDU’s Research Institute for the Environment and Livelihoods (RIEL) through its Darwin Centre for Bushfire Research works closely with Indigenous communities to develop, implement and monitor world-leading carbon emissions offset projects through Indigenous savanna burning programs. ConocoPhillips and Caltex are already investing in significant projects.

RIEL scientists also work with a number of resources and energy companies on mine site rehabilitation approaches for monsoonal Northern Australia, and also on long-term environmental monitoring programs onshore and offshore in environmental chemistry, microbiology using state-of-the-art genomics techniques, and monitoring of populations of marine mammals and rare and endangered species. RIEL staff are also working with ConocoPhillips, NT Fisheries and the CSIRO and other organisations, to develop fish research opportunities in the Bonaparte Basin of the Timor Sea.

Renewable energy

CDU’s Centre for Renewable Energy provides complementary expertise to NACOG, in working with industry, power utilities and government to develop renewable energy options tailored to the demanding conditions associated with remote off-grid operations in Northern and Central Australia.

Neptune Asset Integrity and CDU partnership

Neptune Asset Integrity (NAI) Services, a Welding Technology Institute of Australia (WTIA) Sustaining Member and OzWeld Technology Support Centre (TSC), signed a MOU with CDU in December 2013 to provide a world-class Asia-Pacific technical facility that assists companies with their maintenance and asset management programs.

The NAI–CDU partnership is aimed at establishing a mutually beneficial relationship focused on developing technical and commercial linkages in related training, research and commerce areas.

The partnership has established an Industrial Rope Access Trade Association (IRATA) Accredited training facility and specialised welder testing and training, and has contributed to the establishment of National Authority of Testing Authorities (NATA) Accredited Mechanical and Non-Destructive Testing (NDT) laboratories.

Clients to the NAI–CDU partnership facilities in Darwin benefit from a broad base of experienced personnel, independently accredited procedures and access to world-class technical resources.

Ichthys LNG Project

Demonstrating NACOG’s ability to cater for a range of industry support services, the School of Trades is assisting JKC with the provision of a training program for workers at the Ichthys LNG Project.

The program will provide on-site training in industry-specific competencies such as working at heights, rigging, elevated work platforms, dogging and White Card Occupational Health and Safety Training to ensure that all workers have the necessary skills and site accreditation.

A further 40 School-based Apprentices, employed through GTNT, have training contracts with CDU. They are engaged in local industry supporting the project before working on-site at Bladin Point.

Chemical engineering and Dow Chemical (Australia)

Dow Australia and CDU signed an agreement to deliver the first flexible online accredited chemical engineering program in Australia.

The agreement supports the development of research, distance education and training at NACOG and will help train future NT-based engineers.

The industry interaction afforded by NACOG is a benefit in terms of education as well as potential employment.

Second Year Chemical Engineering student

As the expansion of energy facilities becomes a reality over the next decade, and the potential of downstream advanced manufacturing begins to be realised, there will be considerable need to develop an appropriately skilled workforce and advanced engineering capability to support this and allied industry sectors.

CDU’s foresight through the expansion of NACOG will help Australia to maximise the competitive advantages of the country’s natural resources through creative solutions that use energy as a driver, not a drain, on long-term economic growth and sustainable prosperity and wealth.

Mr Andrew Liveris, CEO and Chairman, The Dow Chemical Company
Building Capacity

As the Northern Territory prepares for growth and development in the resources sector, careful consideration needs to be given to how the population and economy will support and sustain it. Do we have the expertise and regional understanding that is needed? Can we develop a diversified workforce and reduce skill shortages? Can we tap into and up-skill a potential labour force in Indigenous communities or Timor-Leste? And what regional benefits can we develop?

In response to these questions, NACOG is at the forefront of developing a local and sustainable workforce suitably equipped to support the industry.

Initiatives include:

Katherine Regional Employment and Training Program
Students employed by GTNT have undertaken an intensive six-month live-in engineering and automotive training program funded by the Department of Business at the request of the Katherine Mining Services Association. On completion of the training, students will be employed by industry in the Katherine region.

Crane/rigging/dogging
A 12-week program to up-skill local disengaged youth in areas of identified skills shortage has recently been undertaken through funding provided by the Department of Business. The Neptune Asset Integrity/CDU partnership was able to add value to the program by offering Neptune IRATA Rope Access Training to the students.

Indigenous education and training
CDU has a strong track record in Indigenous training, education and research. Indigenous education, training and research are undertaken within the Australian Centre for Indigenous Knowledges and Education (ACIKE), a collaboration between CDU and the Batchelor Institute for Indigenous Tertiary Education.

The Indigenous Academic Support Unit offers a range of distance education and residential programs to assist Indigenous students adapt to the university environment and meet the academic requirements of their courses. Indigenous Studies courses at both VET and Higher Education levels are offered at CDU along with short cross-cultural awareness courses.

CDU’s extensive experience and planned enhancement of its capability in Indigenous training and education can be applied to supporting the long-term workforce needs of Northern Australia’s expanding resources industries.
Building foundation skills in Timor-Leste’s oil and gas industry

Launched in August 2014, the Foundational Skills Training and Internship Program–Phase 1 saw 12 Timorese graduates participate in a six-month training program delivered by CDU.

The training provided important foundation skills and knowledge about the oil and gas industry and included subjects such as oil and gas safety, training in computer literacy and communication skills – all essential for future employment.

The program was developed in collaboration with the Government of Timor-Leste and was jointly funded by Bayu-Undan Project joint venture partners.

Shell Prelude to the Future

A new training program designed to develop the skills of Territorians seeking opportunities in the resources, construction, and oil and gas industries started at CDU in January 2015 with a full class of 20 students.

The Prelude to the Future partnership program takes mechanically minded students through the first year of their automotive apprenticeship in just six months, and while there is a ‘heavy vehicle twist’ to the course, students also undertake qualifications in a number of related areas.

CDU equipped to deliver on Process and Chemical Engineering

The installation of engineering equipment in 2013 has ensured that CDU has one of the most comprehensive engineering training facilities in Australia.

The equipment, used by undergraduate and postgraduate students and researchers, includes distillation and extraction columns, crystallisers and chemical reactors, placing CDU at the forefront of process and chemical engineering training in Australia.

Students can study the physics and chemistry behind mineral and oil and gas processing, building their understanding of chemical engineering and ensuring they have the capacity for work in the industry.

CDU’s School of Engineering and Information Technology offers comprehensive undergraduate and postgraduate Higher Education programs in Chemical, Civil, Electrical and Electronics and Mechanical Engineering. The undergraduate Process Engineering programs have been available since March 2012, and a degree in chemical engineering since March 2013.

International standards and accreditation

Aspiring engineers with global ambitions will feel right at home at CDU with the university’s engineering programs achieving Europe-based accreditation.

In 2014 CDU received EUR-ACE® accreditation for its Bachelor of Engineering Science, the first university in Australia to do so. The university was also awarded accreditation for its two-year Master’s of Engineering program.

This will allow graduates of these programs to have their qualifications recognised in most of central and western Europe.

The EUR-ACE® label system is awarded by the German accreditation body, ASIN, which identifies high-quality engineering degree programs in Europe and abroad, and means graduates can travel almost anywhere in the world and have their qualifications recognised.

The EUR-ACE® accreditation is in addition to the Washington Accord provided by Engineers Australia, which includes accreditation for CDU engineering programs in the United Kingdom and the United States.
Humidity, extreme weather conditions and a wet tropical climate can present key environmental challenges for any industry. It is also important to consider issues related to the social impact of mining development, cross-cultural communications and to understand international laws and regulations.

For the oil and gas industry particularly, these challenges can impact on the success of multi-million-dollar projects, sustainability and workforce resilience. Through the work of high-calibre researchers and research students, NACOG focuses on key issues facing the oil and gas industry in the local and neighbouring region to gain valuable insight and possible solutions.

CDU offers expertise to assist industry to solve any problems that arise. These partnerships also contribute to the development of local skill for the benefit of industry and the Territory.

Dealing with corrosion
NACOG is leading the way in the Northern Territory with its research into the corrosion processes affecting metals in the monsoonal tropics.

This research will assist in developing preventative measures and save the oil and gas industry millions of dollars.

Over the next few years, in collaboration with the Australian Institute of Marine Science, Monash University and the CSIRO, the NACOG research team will set up monitoring stations along the north Australian coast to investigate how materials are affected by the tropical environment.

The goal of the research will be to determine how the marine environment in tropical waters will affect equipment, and then to assist with improving the integrity of the materials so they are better suited to northern conditions.

“We have very little understanding of the corrosive processes in this environment. With the current oil and gas boom, Darwin is the ideal location to investigate corrosion prevention and control in the wet tropics.”

Krishnan Kannoorpatti, Associate Professor – Engineering, NACOG
Testing facility

A new $170,000 testing facility at NACOG will enable the oil and gas industry to perform material tests locally that were previously only available interstate.

Oil and gas and mining industries will now be able to test the strength of welds and conduct failure analysis, assisting them to make crucial decisions about the integrity of materials used in fabrication and possibly prevent catastrophic failure.

The new Instron 8802 has a load capacity of +/- 250kN or in static up to 312kN. It is a modern servo-hydraulic testing machine completely controlled using a computer.

Resources and energy law

The CDU School of Law offers a semester length unit on Resources and Energy Law, which focuses on an introductory examination of the legal environment of the petroleum exploration and production industry in Australia.

Heat stress

Despite the Top End experiencing severe levels of heat and humidity for more than half the year, little is known about the social and organisational mechanisms through which heat stress is managed in practice. Understanding how workers respond to weather extremes is vital for occupational safety.

CDU and the National Critical Care and Trauma Response Centre are working together to assess the impacts of heat stress on labour-intensive industries in the NT to help improve work-related heat stress management strategies.

Multi-phase flow and phase behaviour

Studying petroleum fluids in order to define the optimal conditions under which components can be extracted or production minimised is another key focus of NACOG.

Central to this research is the Full Vision Sapphire High Pressure PVT (Pressure/Volume/Temperature) Cell. The facility enables researchers to simulate conditions in oil and gas reservoirs, pipelines and process plants at varying pressures and temperatures.

Associated research areas include gas hydrate formation, prevention and control, and carbon dioxide separation and capture.

Process Analytical Technology for oil and gas

Increased global competition and environmental regulations mean that it is important for oil and gas industries to focus on reducing manufacturing costs through effective control and optimisation of offshore and onshore process operations to achieve sustainable levels of profitability.

To achieve efficient manufacturing through minimising waste (for example, off-spec products) and energy consumption, Process Analytical Technology (PAT) tools consisting of measurements and models to monitor the process trajectory enabling timely corrective actions are required.

Through international collaborations with academic institutions and multinational companies, NACOG is developing novel measurement-algorithm tools for PAT by enabling on-line process monitoring and optimisation through data-based process models.

The research aims to build a framework and develop the necessary methodologies that can be applied to a wide variety of processes encountered in the oil and gas industry to:

1. Choose the right set of measurements that will maximise the information that can be extracted (measurements design).
2. Extract a maximum amount of information about the process (Multivariate Interpretation models).
3. Utilise the disparate types of data that are typically collected in process industries efficiently by combining them using state-of-the-art and novel Multivariate Data Fusion techniques.
4. Develop calibration, recalibration and calibration transfer methods so they can be used by plant operators without the need for data modelling experts.

“[The new laboratories/equipment at NACOG allowed me to undertake research in fields not previously open to me.]”

Fourth year Mechanical Engineering student

The workforce in the NT is very transient. We will be interested to explore the differences between local workers and those from interstate or overseas; what beliefs and behaviours regarding heat stress they arrived with, and whether these have changed through their experiences here."

Dr Matt Brearley, National Critical Care and Trauma Response Centre

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Understanding social issues
As Northern Australia faces a decade of rapid transformation, an understanding of the potential economic, social and environmental impact this growth and development will have on its communities is needed. We need to understand the ways in which Indigenous people, local communities, industries and governments can work together, recognise and support cultural diversity and develop solutions that are mutually beneficial for all involved.

CDU’s Northern Institute (NI) undertakes social and public policy research that is critically important to Central and Northern Australia and its near neighbours. Its research program and activities aim to provide evidence for policy development, generate informed debate, build capacity and respond to the needs of industry and communities.

The Institute brings together experienced people to undertake relevant research in desert, tropical, regional and remote contexts, which considers respectful negotiations with Indigenous communities, economic impact, demography, governance of industry-community relationships, and socio-cultural effects such as workforce support and management of livability issues.

Development of the northern regions will entail complex negotiations and implementation. Being able to establish processes that support mutually beneficial arrangements, opportunities to learn through previous experiences and allowing for change over time will ensure all partners, particularly those investing income, labour, infrastructure or environment resources, are suitably supported and their needs understood.

Industry expertise – visiting professors
The founder of a unique association of professors based in Paris visited Darwin recently to give students and industry a “real life” perspective on oil and gas offshore production and exploration.

With more than 40 years of experience as a structural steel engineer and onshore and offshore civil engineer, Professor Alain Quenelle from the TOTAL Professors Association (TPA) conducted a five-day course at Charles Darwin University.

Professor Quenelle, who formed the TPA after he retired in 2001, said the organisation, which began with a group of 10 professors teaching oil and gas courses in France, now conducts courses in 55 countries.

“After I retired I wanted to keep teaching and proposed the idea of the TPA to TOTAL,” Professor Quenelle said. “The TPA now has more than 270 professors with varying fields of expertise offering courses related to oil and gas.”

The TPA is a non-profit, independent organisation, which is supported by the international oil and gas company TOTAL. TOTAL has interests in the Northern Territory through its 30 per cent stake in the Ichthys LNG Project.

CDU is committed to providing opportunities such as these for the industry to meet and learn from visiting professors and subject matter experts.

“It is very important that we transfer our knowledge and real life experiences as engineers in the oil and gas industry to the next generation hoping to start their careers.”

Professor Alain Quenelle, TOTAL Professors Association
CDU Fast Facts

Charles Darwin University delivers Higher Education courses and VET programs online to the world and at its campuses and learning centres at Casuarina, Darwin Waterfront, Palmerston, Katherine, Jabiru, Alice Springs, Tennant Creek, Nhulunbuy, Yulara, Sydney and Melbourne, as well as at more than 170 other locations around the Territory on a drive in, drive out basis.

The university contributes more than $420 million to the Northern Territory Gross State Product (GSP) overall. This is on par with the contribution to GSP of the NT mining industry.

In 2012, 2013 and 2014 the university was ranked in the top 2% of universities in the world and was also ranked in the top 100 universities in the world under 50 years of age for those years.

More than 11,000 Territorians undertake a VET course with CDU each year. This includes some 3,800 Indigenous Territorians. The university has the highest rate of VET participation in Australia, accounting for 55 to 60 per cent of this delivery in the NT. Almost 100 per cent of the delivery involved significant infrastructure investment – courses such as trades that require investment in expensive equipment and facilities for delivery.

More than 10% of Territory residents over 15 years of age enrol annually in either Higher Education or Vocational Education and Training at CDU.

Industry Partnerships

NACOG kindly thanks all partners and supporters including:

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