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Academy



# LNG Fundamentals

Navigating LNG Dynamics: Technical Insights and Commercial Realities.



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## Course Overview

This LNG course contrasts the technical and commercial differences between LNG and natural gas to point out the benefits and constraints that arise from the LNG option. It will examine the technical process of producing LNG, plant design considerations, and global comparisons along with the design of regasification terminals.

A description is given of the elements in the 'gas chain' which apply to LNG and of drivers that would lead to optimisation of design and commercial operation, and the range and role of relevant parties to a successful LNG project. LNG safety training is included, along with ways and means by which a new entrant to a proposed LNG project may ensure an investment that meets expectations.

An introduction to terminology and practical 'rules of thumb' should further enhance the participant's ability to immediately contribute to a successful gas project –and to ask the right questions to test and improve the viability of a proposed project.

New initiatives in floating LNG technology, both liquefaction and regasification, will be examined. Floating regasification projects are contrasted with land-based projects. Actual case histories will be used frequently to demonstrate learning points.

## Who Should Participate

This is not a basic-level introductory course. It has a specific techno-commercial focus for technical and business oriented professionals who are either new to the LNG industry or experienced in one part but could benefit from a wider perspective.

- Technical (exploration and production, geoscience and engineering).
- Non-technical (commercial, finance, government, marketing and legal) backgrounds.
- Those who have recently joined an LNG market development team with expertise in one area of gas development.

## Key Benefits

- Understand the technical procedures for turning natural gas into LNG, its regasification and safety considerations
- Review LNG plant and terminal design, storage and shipping considerations
- Identify recent developments in FLNG technology
- Discover the unique characteristics of LNG that broaden yet constrain the commercial and technical links in the 'gas chain'
- Generate various options for LNG market development proposals
- Discover risk and risk mitigation strategies to aid decision making
- Analyse LNG sales agreements and tactics to more effectively negotiate contract terms
- Discover perspectives of the investor, operator, customer, and government towards LNG projects
- Recognise the political and diplomatic implications of international trade in LNG, including recent trends



## Introduction and Overview

The objective of this course is to provide the newcomer to an LNG project development team with insight into the fundamental principles governing the successful development and operation of an LNG project.

Technical characteristics of natural gas and LNG

An introduction to the unique physical characteristics of NG and LNG is presented so that technical and commercial opportunities and constraints may be understood and contrasted with other liquid and gaseous fuels.

## Gas Liquefaction

- Capital costs and economies of scale, cost trends and benchmarks
- Technology and typical processes, lead and construction times
- Storage requirements
- Typical EPC contracts, their operation and examples

## LNG Shipping

- Capital costs and operating conditions of LNG carriers, benchmarks, typical designs, lead and construction times
- Vessel size and constraints
- FoB vs. DeS
- Fleet management issues
- Discussion of degree of technical and commercial flexibility in LNG delivery schedules and associated contractual terms
- Examples of delivery arrangements are examined from buyer and seller perspectives

## LNG Terminals and End-Users

- Capital costs and benchmarks, typical designs, lead and construction times
- Storage requirements
- Upset conditions and responses
- Capacity/storage optimisation
- Special issues involving power generation

## LNG Safety

The cryogenic temperature of LNG and the generation of large quantities of gas on vaporisation require significant and different safety requirements for the safe handling, storage and use of LNG. LNG will be compared with other fuels.

## Market Identification and Development

- The three levels of market identification, costs, compatibility of gases, and conversion to reticulated natural gas
- History of LNG market development and their pricing mechanisms
- Outline of LNG sales and purchase agreements, related contract terms and conditions, and their evolution

## International Competition for LNG Markets

- Current intense competition for markets placed in a historical context
- Analysing the effect on pricing formulae and contract terms
- The short-term trade – ‘the spot market’ – regional pricing conventions and their robustness
- Examining signs of price convergence
- Analysing market share data and relative positions of LNG participants



## LNG Business Development

- Understanding the key factors that generate a successful LNG market
- Examples of the dynamic balance between supply and demand with reference to substitute and 'swing' fuels
- Project 'realities' – including reputation issues and the sponsors' track record
- Project governance
- Drivers behind project participation and role of the state
- Examples of successful and sub-optimal participation by small and larger new-entrants
- Necessity for independent advice, and ways and means to keep up to date

## An Integrated LNG Project – 'Rules of Thumb'

- Typical default parameters frequently encountered in a successful LNG project
- International convergence in capital costs allows estimation of netbacks or margins at each element of the gas chain – local variations may call for an explanation

## LNG Outlook and Future Trends

- 'The century of gas' – the basis for expected future market expansions and extensions
- Discussion of limiting factors and time constraints
- Suggested pointers for early warning of likely and sustained market changes
- Potential forces which impact on commoditisation and/or price convergence
- Integration in US and Europe
- Examining the effects of potential LNG trade to west coast US
- Contrasting Australian gas development experience with other regional markets

## Summary and Review of Course

- Detailed review and Q&A
- Check course coverage against objectives
- Feedback requested and addressed

*"Articulate and experienced with a nice splash of anecdotes. They grabbed my attention for 3 days, which isn't easy!"*

Operations Supt  
**Woodside Energy**

*"Clearly highly knowledgeable about the global industry and use of real project examples good."*

HR Manager  
**Woodside WA**

*"Their depth of knowledge and approachable nature. I enjoyed about their global LNG experiences and I learned a lot from them. Thank you."*

CSOC Advisor  
**Chevron**

*"Tremendous experience. Instructors are superbly knowledgeable and have a wonderful engaging presentation style. I'd recommend this to any Chevron employees"*

Gorgon Exploration Team Lead  
**Chevron**

## Michael Williams OAM

Michael is an energy professional with 40+ years of worldwide experience particularly in gas and LNG, most recently in Australia, China and Taiwan and. He has expertise in all technical and commercial phases of the gas and LNG business, and is acknowledged by industry experts, governments and government expert committees. He has proven abilities in technical design, project development, strategy and building and leading teams.

Michael is now an independent consultant. Was a non-executive company director of Epic Energy Holdings, a gas pipeline company, and is a member of the Panel of Experts of the Western Australian Gas Review Board. Previously he had a 33 year international career with Shell, culminating as Managing Director (Gas & Power) for the Shell Companies in North East Asia.

With vast experience working with governments, Michael has been acknowledged as a major influence in for changing China's energy policy to import LNG and to utilise gas. Locally Michael had a 3 year secondment to the Western Australian Government as Development Director for the Department of Resources Development where he liaised, negotiated with and assisted senior ministers and policy developers.

Michael's influence on the development of energy policy in China and in Taiwan was recognised by the Energy Working Group of APEC and by the associated policy development body, APERC (Asia Pacific Energy Research Centre, based in Tokyo). For a number of years he recommended and critique energy policies developed by APERC.

Michael was the inaugural manager of the onshore treatment plant of the North West Shelf LNG Project in Karratha, Western Australia, where he set up the organisation and managed the start-up and operation of the plant. As several innovative organisational concepts were pioneered, this involved complex, successful negotiations with unions to secure their buy-in, all against a tight timeframe.

Michael has a bachelor of engineering, with honors. He is also a fellow of the Institution of Chemical Engineers, the Australian Institute of Company Directors and the Australian Institute of Energy. Micheal was awarded on Order of Australia Medal by the Australian Government in 2015 for services to the LNG industry.





## Richard Harrison

Richard is a private consultant in the field of natural gas market development with 40 years in the business and is interested also in the integration of commercial and environmental opportunities offered by the use of natural gas.

Richard was formerly with the Shell Group of Companies for 30 years. His final post was General Manager, Natural Gas and Project Development Manager for Shell in China from 1997 to 2001. His main responsibility was to develop a liquefied natural gas (LNG) import project, as well as sales and marketing of natural gas, in China.

Richard acted as the Shell delegate on the joint venture project committee of the Australian North West Shelf LNG project between 1993 and 1997. During that period he was also gained government experience in a part-time secondment to the COAG Natural Gas Taskforce (to develop a national gas regulatory regime) to coordinate and report on the deliberations of the Upstream Working Group. He served on the NWS Exploration Committee from 1985 to 1990.


Prior to that, Richard was involved in managing the application of onshore and offshore technologies for Shell's own exploration and production program - the successful development of gas projects for base and peak load duties in the UK Southern North Sea gas province, gas and oil venture assessments in Russia, Kazakhstan and Turkmenistan, and deep-water gas and oil discoveries in the Philippines.

Richard has developed and currently facilitates an internationally recognised course on LNG and gas projects. He was formerly an occasional lecturer with the short course program of the University of New South Wales, School of Petroleum Engineering.

Richard has a Bachelor of Science (Physics) and a Bachelor of Arts (Mathematics & Economics) from the University of Melbourne.




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