LNG LIMITED

OSMR®

Optimized Single Mixed Refrigerant

Liquefaction Process Technology

for the

Global LNG Market

LNG TECHNOLOGY

"Innovative Liquefaction Process Technology"

LNG TECHNOLOGY PTY LTD

History | Technology | Advantages | Advantages | Applications | Solutions

A Historical Perspective

LNG Limited

- Founded in 2004 in Perth, Australia
- Our mission is to create value by delivering safe, reliable, energy-efficient, and flexible mid-scale natural gas liquefaction solutions to the global energy market, at the industry's lowest full cycle cost, while minimizing ecological impact
- Our business model derives from the Company's wholly owned and developed OSMR® LNG process technology, centered on delivering four key principles: industry-lowest full cycle cost; optimized plant energy efficiency; shortened development and construction schedules; and an overall smaller environmental impact footprint (including reduced carbon emissions relative to other LNG technologies)

LNG Technology PTY LTD

- Wholly-owned subsidiary of LNG Limited
- Domestic patent applications filed in approximately 20 countries and regions around the world as part of its international patent program
- The patents PCT/AU2008/001010 (Patent 1) and PCT/AU2008/001011 (Patent 2), together with worldwide support in reporting and monitoring any intellectual property infringement, provide protection for LNG Limited's technology for 20 years commencing from 2008
- Patent 1 is titled "A method and system for production of liquid natural gas" and patent 2 is titled "Boil-off gas treatment process and system"

Over a Decade of Development

2004	LNGL Engineering commenced an Ammonia Absorption LNG (AALNG) process as a mid-scale LNG solution
2005	Simplified the process by recovering waste heat from main gas turbine exhausts (combined cycle plant) to generate steam and provide motive power to the ammonia refrigeration pre-cooling plant
2005 - 2006	Further optimization of process; introduced the name OSMR®, and lodged patents for OSMR® and innovative BOG system;
2006 - 2007	Commenced floating OSMR® concepts with Golar LNG
2008 - 2010	Commenced the development of Gladstone LNG Project using OSMR® technology. FEED undertaken by SKEC and LOR. Comprehensive EIS completed and approved; Technical verifications by CHIV, Foster Wheeler, SKEC, Shell/Arrow, WorleyParsons and HQCEC validated OSMR® technology.
2010 - 2011	Comprehensive development/refinement of OSMR® technology with respect to process efficiency, layout, availability, maintainability and construction & operation methodology
2011 - 2012	Progressed floating OSMR® concepts
2012-2016	Commenced the development of Magnolia LNG Project using OSMR® technology; **Pre-FEED** by SKEC-USA; **FEED** by KBR and SKEC-USA; Acceptance by FERC for the use of OSMR® technology on the Magnolia LNG Project. Negotiated **LSTK EPC** with KBR; Magnolia LNG is 'shovel-ready'
2013	Commenced the development of Bear Head LNG Project using OSMR® technology
2016	Further development of a Near Shore floating solution (OSMR®-NS)

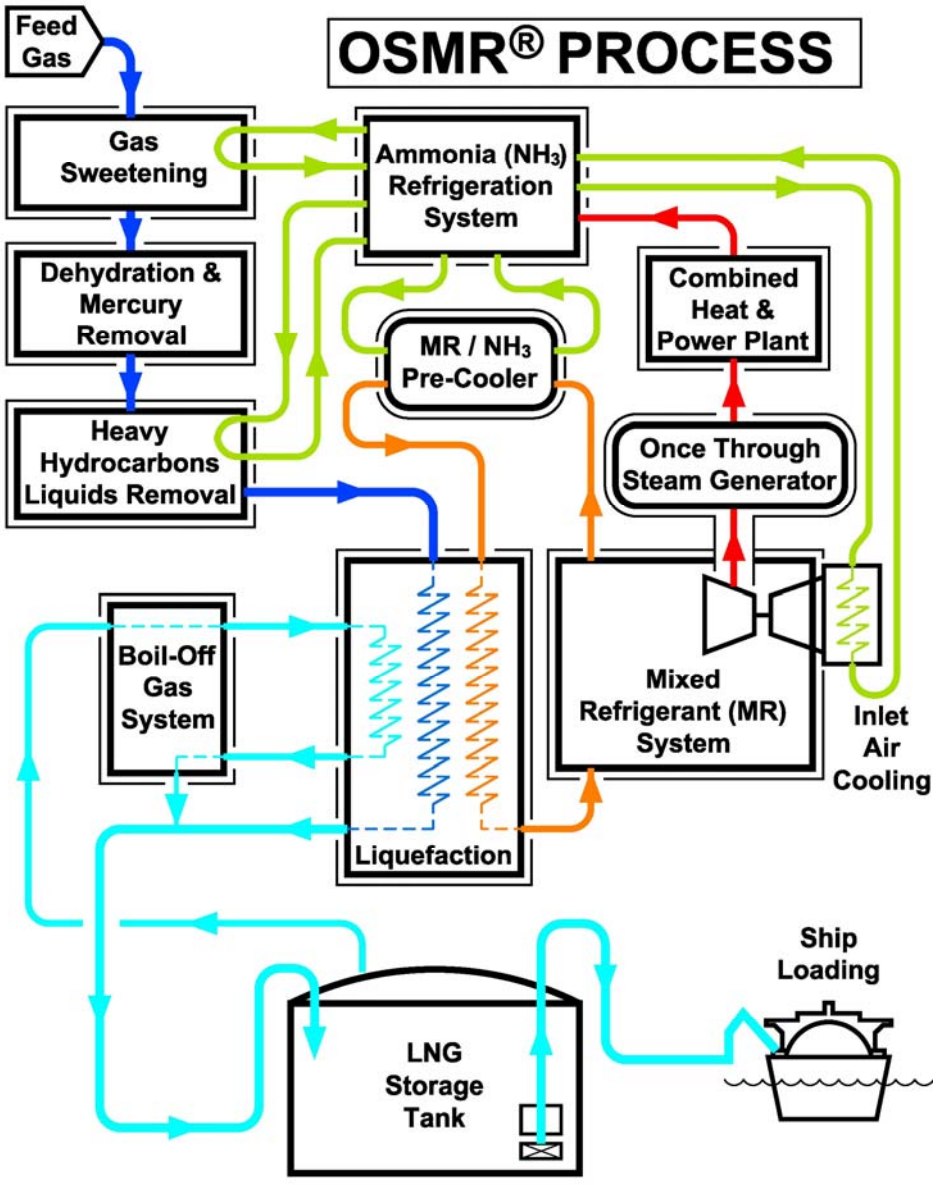
OSMR®

“O” IS FOR OPTIMIZED

What does Optimized SMR really mean?

The OSMR® Technology maximizes the energy efficiency of LNG liquefaction trains by combining several well-proven, existing technologies into one integrated system. This integration is at the heart of the core liquefaction process.

Optimized Process + Optimized Execution



Innovation, not Novelty

OSMR® PRIMARY COMPONENTS

- A single mixed refrigerant (SMR) liquefaction process, using cold boxes for liquefaction
- Ammonia as a pre-cooling refrigerant, providing higher efficiency and enabling smaller condensers, exchangers, and overall plant size
- Highly efficient and reliable mechanical gas turbines used for MR compressor drive
- Gas turbine waste heat steam generation, which drives the ammonia refrigeration circuit
- “2-in-1” train configuration providing high reliability and excellent turndown
- Inlet air chilling to the gas turbines, providing a consistent power output
- Low pressure boil-off gas re-liquefaction
- A simple, compact systemized modular arrangement enabling an optimized execution strategy

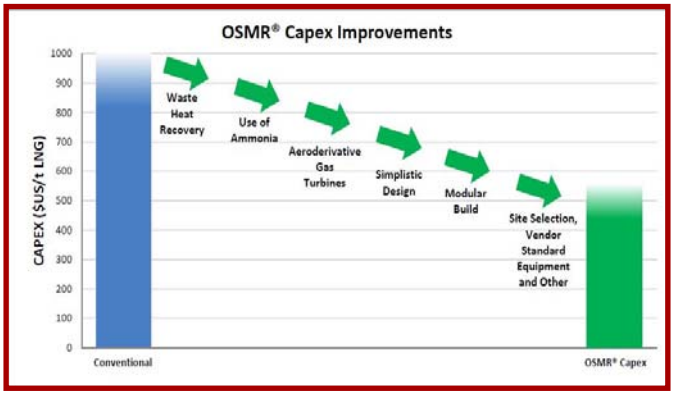
OSMR®

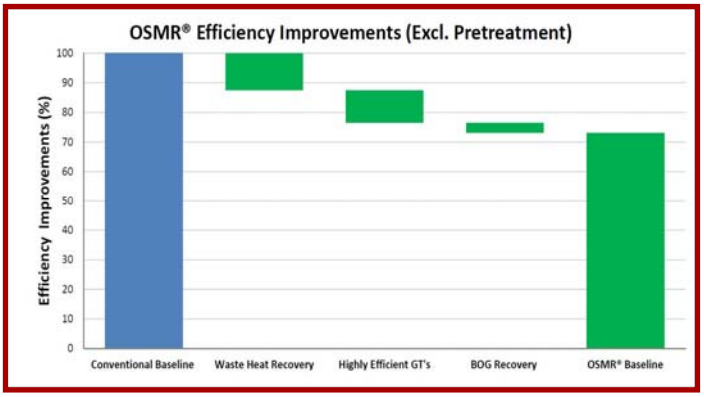
Key Advantages

Mid-scale, OSMR® liquefaction process attributes (1)

- **Lower capital cost**
- **Shorter development and construction**
- **Improved energy efficiency**
- **Smaller Footprint**
- **Improved reliability and turndown**
- **Lower carbon emissions**

(1) Relative to conventional LNG plant design





LNG Limited has targeted a nominal train design capacity of 2 million tons per annum (mtpa), with conceptual designs demonstrated in the range of 1-3 mtpa. Each train incorporates two identical independent cold box exchangers, each chilled by an independent closed loop mixed refrigerant (MR) supply. Each of the dual MR loops has its own gas turbine driven compressor. The two parallel MR circuits within each LNG train generate excellent turndown characteristics, while plant reliability also greatly improves since each LNG train can still achieve 50 percent capacity when one MR circuit is offline.

Inlet air chilling plays an important role in the OSMR® process. The higher the ambient conditions, the lower the gas turbine power, which results in lower LNG production. Pre-chilling the air to the gas turbines allows for improved and consistent gas turbine power in various ambient conditions, increasing LNG production through changing seasons.

Using ammonia to pre-cool the MR and feed gas ahead of the cold box increases plant capacity even further, with little additional fuel use fundamental to the overall OSMR® configuration.

The ammonia pre-cooling system itself is largely powered by a combined-cycle steam system supplemented by auxiliary boilers for start-up and control. This arrangement maximize the use of the gas turbines' available waste heat and contributes significantly to the overall process energy efficiency.

With an innovative and patented boil-off gas handling system, boil-off gas is lightly compressed, re-liquefied in the cold box and then passed through the liquid methane separator before it is delivered as LNG to the storage tank. This system enables recovery and re-liquefaction of low temperature boil-off gas while minimizing compression losses that are commonly seen in other liquefaction designs.

Achieving high efficiency improves both the economics and environment performance of a liquefaction facility. In real terms, for an 8 mtpa capacity facility, improving the overall process efficiency by only two percentage points, from 92 percent typical for large base load trains to 94 percent expected for Magnolia (6 percent retainage expected) reduces the annual fuel consumption costs by nearly US$30 million (based on US$3.00/mm Btu feed gas value). It also reduces the CO2 greenhouse gas emissions by 1.1 billion lbs/year and reduces NOx emissions as well.

Key Advantages

Benefits of Using Ammonia

The use of ammonia as a pre-cooling refrigerant is a core element of the process. Ammonia is a highly efficient refrigerant with more than 100 years of industrial experience. It is commonly used as a primary refrigerant across high duty applications and industries, including cold storage, food and drink processing, wineries and ice skating rinks. It is even used on the International Space Station as well as at the Houston Food Bank.

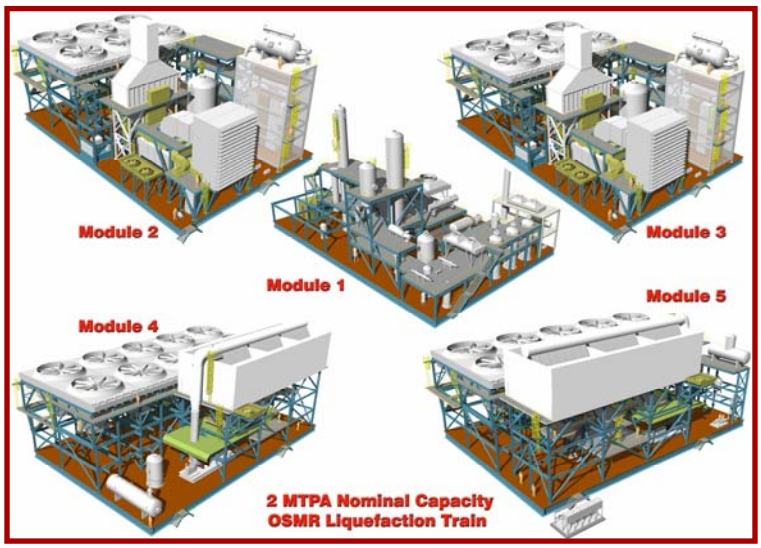
Ammonia is classified as a "natural refrigerant" and is inherently environmentally friendly with a life cycle in the atmosphere of less than one week. It has a global warming potential of zero and an ozone depletion potential of zero.

In refrigeration cycles, ammonia demonstrates superior thermodynamic qualities compared to propane, with these qualities resulting in greater efficiency and reduced emissions. Ammonia is fundamentally 20 percent more efficient than propane—that is, the same refrigeration duty can be delivered from 20 percent less energy.

Anhydrous ammonia can be toxic so it must be effectively managed (propane is a simple asphyxiant). Overall, ammonia outperforms propane from a total safety perspective with the following characteristics:

- Ammonia is not readily flammable or explosive—in most situations, ammonia can be considered effectively non-flammable; propane is highly flammable and highly explosive
- Ammonia is lighter than air, and tends to rise and naturally dissipate as it warms. Propane is heavier than air and accumulates in low spots
- Ammonia releases can be readily detected at relatively low concentrations
- Mitigation of ammonia release is reliable and effective through automated detection systems and automatic isolation. Application of water spray will control the release due to ammonia's high affinity to, and solubility in, water.

The use of ammonia is regulated under US EPC and OSHA, and approved by the Federal Energy Regulatory Commission (FERC) in the U.S.A., and Hazardous Industries and Chemicals Branch (HICB) in Australia, for use in LNG plant design.



Modular Construction

A modular construction approach complements OSMR® efficiency and further improves project economics. Each LNG train can be built using only five main process modules, with the modules fabricated offsite and transported to the project site for installation

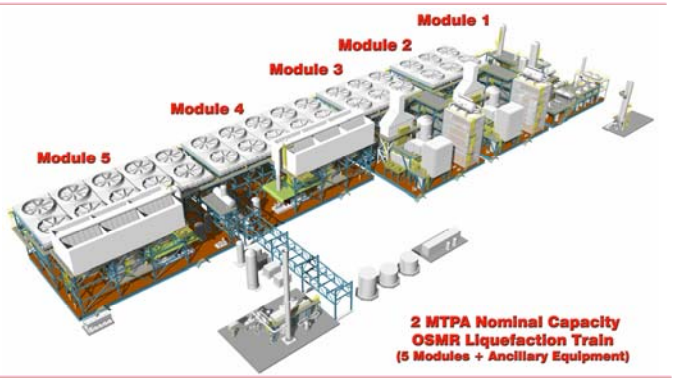
The five modules are highly systemized enabling a higher degree of fabrication yard completion further reducing site works, hook-ups, manpower and temporary facilities—targeting "plug and play"

Using an offsite fabrication yard reduces on-site labor while providing a high degree of quality, safety and schedule control during the module fabrication process.

OSMR® APPLICATIONS

Onshore

Three onshore LNG projects have proposed to use OSMR® technology to date: Magnolia LNG Project (Lake Charles, Louisiana), Bear Head LNG Project (Nova Scotia, Canada), and the Fisherman's Landing LNG Project (Gladstone, Australia). Of these, Magnolia LNG is the most advanced with a "shovel ready" design package available as the basis for subsequent projects.



Near Shore

OSMR® Near Shore (NS) is a natural progression of the highly efficient and patented Optimized Single Mixed Refrigerant liquefaction technology into the emerging near-shore floating market. When a project is located closer to shore and sources third party feed gas from an onshore pipeline system, a highly efficient liquefaction technology provides economic merits since every molecule of gas must be purchased. OSMR®-NS represents a mid-scale near-shore floating LNG solution with the potential to emerge as part of a more efficient, faster, cost effective and agile global LNG industry .

IMPLEMENTATION OPTIONS

OSMR® Technology can be implemented into global LNG projects via three paths:

LNGL Developed and Operated Projects

Liquefied Natural Gas Technology (LNGT) works with the LNGL project development team and FEED/EPC contractors to provide technical services including FEED Package development based on agreed internal costs in developing the project. A technology licensing fee (or related arrangement to optimize tax efficiency) applies at FID and successful completion of the performance test.

Third Party Equity Partner Projects

LNGT will work with third parties in greenfield or brownfield developments by providing technical services in developing the FEED Packages based on OSMR® Technology and associated Project Development work. LNGL will share the risk and development costs with other project partners. The know-how provided and cost incurred by LNGL/LNGT would then be converted to project equity at FID.

Technology Licensed Projects

LNGT will also provide the OSMR® process and delivery technology as a license. A lump sum technical services fee will support FEED package development work based on the work scope. Technology licensing fees at FID and operations technical services fees (optional) will be mutually agreed with project owners.

OSMR® LICENSOR PACKAGE COMPONENTS

OSMR® is offered as a complete solutions package encompassing LNG process liquefaction technology, related technologies (i.e. AGRU), extensive design documentation, and importantly, project execution and delivery strategy

LEVEL 4

LEVEL 3

LEVEL 2

OSMR® TECHNOLOGY LEVEL 1

- Liquefaction
- BOG Handling Design
- HYSYS Simulation Models
- Overall Process Schematic
- Annual Production Estimate

RELATED TECHNOLOGY

- Acid Gas Removal Unit Design
- Mol. Sieve Dehydration Design
- Heavy Hydrocarbon Handling System Design
- LNG Rundown & Tank Configuration
- LNG Loading & Ship Vapor Handling
- Utilities Design

DESIGN DOCUMENTATION

- Basis of Design
- Preliminary Heat and Mass Balance
- Plant Process Flow Diagram
- Preliminary P&IDs
- Process Control Philosophy
- Plus other, as required
- Key Equipment Process Datasheets
- Preliminary Equipment List
- Prelim Line List & Instrument Index
- Preliminary Vendor Data for Key Equipment
- Modular Layout Philosophy
- Preliminary Plot Plan

PROJECT EXECUTION

- Site Selection
- Overall Execution Strategy
- Regulatory & Permitting Support
- Modular Construction Execution
- Module Transport Philosophy
- Module Installation Philosophy
- Off-Module Layouts
- Indicative Project Schedule
- Commissioning & Start-Up Operations
- O&M Philosophy
- Plus other, as required

OSMR®

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