BMT Group

"Where will our knowledge take you?"

Liquefied Natural Gas Terminals

Services and solutions

Where will our knowledge take you?

BMT is a leading international multi-disciplinary engineering, science and technology consultancy, employing approximately 1,300 professionals in 60 offices across Europe, Asia, the Americas and Australia.

Our technical expertise, backed by more than 25 years' experience in the maritime and offshore oil and gas industries, means we have a deep understanding of the challenges our customers face and can provide a wide range of innovative solutions.

For the LNG market, the location of terminals and their environmental impact, together with transport links and operational issues, are paramount considerations. Our services cover project management, front end engineering design (FEED), detailed design, construction and operation, supporting clients at every stage.

From detailed design and engineering for an LNG terminal expansion in Singapore to enabling the first alongside ship-to-ship transfer of LNG in the UK, BMT has an extensive track record in delivering high-value solutions for storing and safely transporting this most important energy source.

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Pre-investment/planning and feasibility

From site selection to rigorous feasibility studies and project management, BMT provides an extensive portfolio of services to guide customers through the early planning stages of LNG facilities.

Site location – assessment and selection

The economic, transport, environmental and social implications associated with LNG terminals mean that the choice of site is crucial. BMT's experts in geo-technics, marine accessibility, transport planning, concept design and marine environmental conditions thoroughly research and consider all the options to identify the most suitable location.

We take into account the specific risks associated with loading and unloading LNG tankers and siting regasification terminals in populated areas. Our feasibility studies also include environmental impact assessments and the influence of prevailing metocean and geotechnical conditions on the design of jetties and breakwaters.

Navigation and marine transport feasibility report

The position and layout of terminal offloading jetties and breakwaters is determined by both the environmental conditions and vessel manoeuvrability. BMT uses its real-time ship handling and manoeuvring simulator REMBRANDT to evaluate terminal layouts.

This system has been continuously refined over the last 25 years and has been used by a wide range of ship and terminal designers and operators. It is also widely used by pilots. This system has a wide range of high fidelity ship models which can interact with varied environmental conditions and tugs to produce realistic vessel behaviour within the planned layout of the berth.

BMT also carries out sediment transport studies to identify dredging requirements and support breakwater design. In addition, we provide impartial and expert advice for planning approvals and for mitigating risks cost-effectively.

LNG Marine Terminal Feasibility Study

BMT used REMBRANDT to establish the metocean conditions at an LNG site location in the Caribbean, to evaluate manoeuvring and mooring aspects for various jetty configurations (location and orientation) and predict operational downtime, cargo transfer and storage requirements over a 20-year period.

Swan Energy LNG Terminal, Pipavav Port, India (shown here)

BMT carried out cost and feasibility studies at sites in Pipavav Port to identify the best location for an LNG import terminal. We were subsequently selected for engineering design work and an environmental impact assessment. This included disaster management plans and a risk assessment for LNG handling.

Feasibility Report and Bid Package, Dahej, India

Petronet LNG Ltd appointed BMT to prepare a detailed feasibility report and bid package for a stand-by jetty at Dahej Port. Our services included a review of the pre-FEED report, ship mooring analyses, navigation simulation, preliminary design of marine facilities and preparing the specifications and bid package for the engineering, procurement and construction contract.

Marine facilities and master planning

BMT prepares long, medium and short-term plans for LNG terminals and bunkering facilities. Our master plans and detailed project reports encompass all aspects of the development and their phasing – including loading jetties, berthing and downtime assessments, dredging works, cost estimates and investment plans. Our specialists prepare conceptual and preliminary front end engineering designs (FEED) that are robust and flexible enough to ensure that the next stages of the project proceed smoothly.

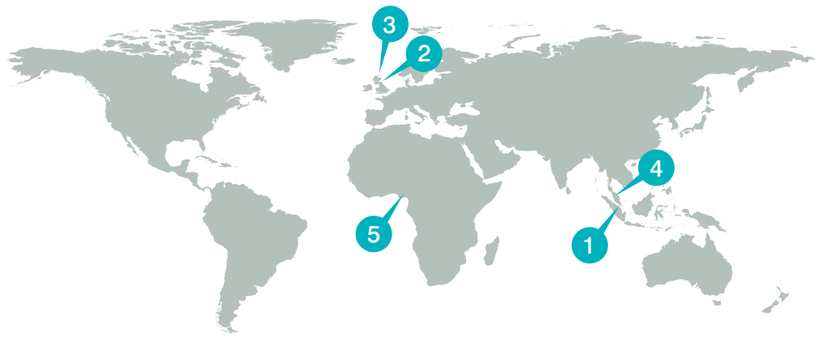
Because we provide an overall project management service, from initial feasibility until the terminal becomes operational, our customers do not need to appoint multiple consultants.

Market and economic assessment

One of the challenges facing the LNG sector is transporting gas from fields in remote areas, with little or no infrastructure, to liquefaction terminals and then onward to the market. BMT provides financial and economic assessments for LNG investors. Our technical and commercial expertise extends to reviewing traffic flows and planning the optimum routes, a competitive analysis of other terminals in the region, feasibility studies and acting as the owners engineering consultant during procurement.

Detailed engineering and design

BMT's successful track record in maritime engineering, including India's largest LNG jetty, means we are the partner of choice when projects enter the detailed design phase. Our experts use state-of-the-art design and optimisation tools to support this crucial phase.



Metocean conditions

Because our engineers and scientists understand how tides, currents, winds and waves can challenge the structural integrity of offshore and coastal developments, they fully account for them in their designs.

BMT has extensive experience in setting up, running and validating metocean models. They can generate validated historical simulation data (hindcasts) that provide a reliable representation of the metocean climate for design, including extreme value extrapolation of in situ, modelled and satellite observed data to ISO engineering standards.

Navigational safety and risk

BMT's internationally recognised REMBRANDT simulator provides accurate modelling for mooring, berthing and channel access. It provides risk assessments to aid the development of safe operating procedures, which helps to limit design errors.

The BMT traffic management team, with their extensive knowledge of ship behaviour and AIS traffic data analysis techniques, can assess the effects of LNG operations on other vessel and port operations and advise on the introduction of additional traffic management measure to mitigate against navigational risk, such as changes to vessel traffic monitoring and traffic separation schemes.

Breakwater and jetty design

Our expertise in designing and constructing breakwaters and jetties, combined with a thorough understanding of the marine environment, ensures that we can provide innovative and cost-effective solutions.

Dredging assessment and hydrodynamic modelling

Silting at terminals requires regular dredging to maintain navigation channels. BMT specialises in planning, designing and project managing all capital and maintenance dredging works. This includes obtaining the required approvals and licences. Using BMT's in-house hydrodynamic modelling capability, our experts can determine the cause of sediment and develop strategies for cost-effective dredging and spoil disposal.

Risk and Safety Engineering

BMT is able to identify hazards and evaluate associated risks by conducting studies such as Quantitative Risk Assessments (QRA), Hazard and Operability (HAZOP), Hazard and fire and gas mapping studies and a full range of consequence modelling.

Consequential and explosion

BMT has conducted consequence studies for many of the world's oil and gas facilities. We provide a quantitative assessment of the consequences of all major hazards – including fire and explosions – that could potentially damage a structure's integrity and cause personal injury.

The results are used to improve the design, incorporate mitigation measures or devise strategies for keeping the risk within acceptable levels. BMT provides comprehensive consultancy and consequence evaluation, from FEED to detailed design engineering. This helps HSE specialists and engineers to make informed decisions at every stage of the design process.

1: Detailed Design and Engineering, Singapore

BMT was appointed by the Singapore LNG Corporation as a consultant for the complete detailed design and engineering of a secondary berth for the LNG terminal on Jurong Island. The scope of work included a secondary jetty to accommodate an LNG carrier range of 60,000 m3 to 265,000 m3.

2: LNG Ship-to-Ship Transfer, Teesport

BMT developed a safety strategy for the UK's first alongside ship-to-ship transfer of LNG at Teesport. It was also the first to be conducted in the northern hemisphere. This ground-breaking feasibility study and assessment involved close co-operation with regulators, operators and stakeholders.

3: Navigational Risk Assessment, Orkney Islands

BMT carried out a navigational risk assessment for the first ever non-emergency ship-to-ship transfer of LNG in Scapa Flow. As well as addressing the hazards associated with this procedure, BMT took into account risks linked to the arrival and departure of LNG vessels and the LNG regasification vessel.

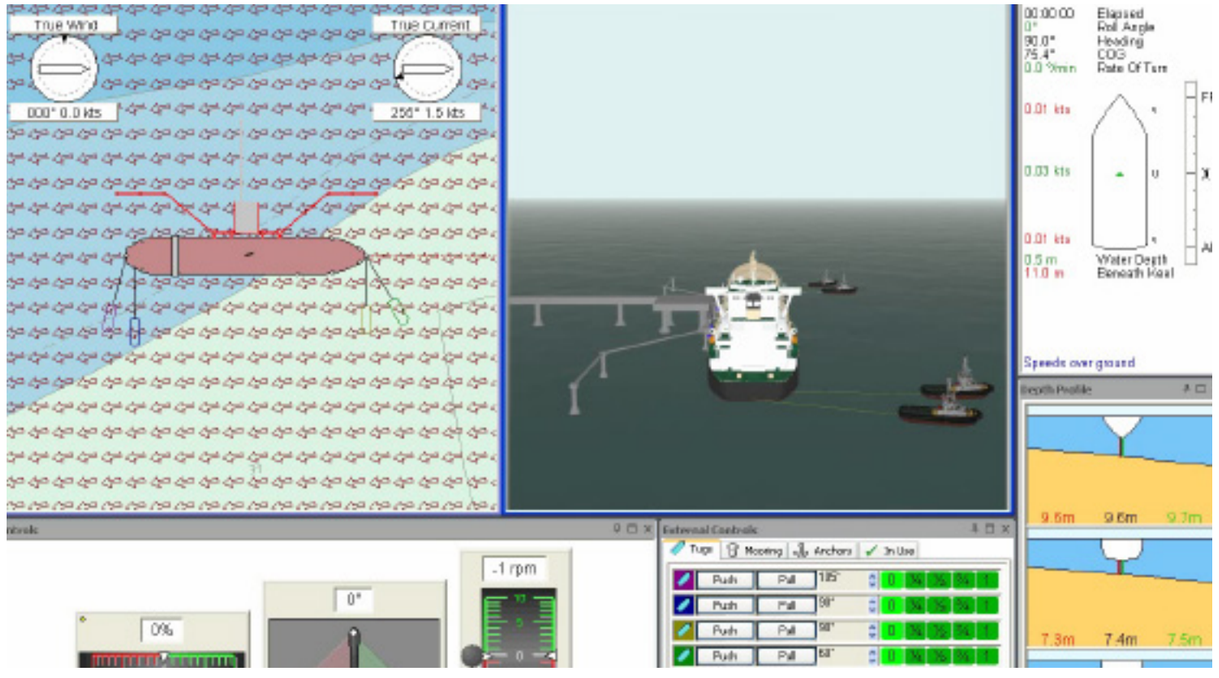
4: LNG Re-gasification Project, Malaysia

BMT provided FEED for an LNG re-gasification unit and island berth in Mukim Sungai Udang, Melaka. We were subsequently appointed as consultants for detailed engineering and design and technical support during the engineering, procurement, construction and commissioning stages of the island berth and facilities.

5: Navigational Risk Assessment, Bonny Channel

The anticipated increase of Liquified Natural Gas (LNG) tankers transiting the Bonny Channel in Nigeria required various options for two way traffic to be considered as a means of ensuring safe passage for these vessels. Based on BMT's experience and track record of similar studies of this nature, we were chosen to facilitate and chair a structured risk assessment process in order to inform decision making."

Some $40M worth of savings were identified as part of a capital dredge programme. In addition, several strategic risk reduction methods were identified in order improve the safety of shipping.



Construction and operation

Drawing on its global expertise in project management, metocean forecasting, navigational safety and risk mitigation, BMT provides vital support during construction, operation and maintenance of terminals.

Navigational simulation and training

BMT's real time ship-handling and manoeuvring simulator, REMBRANDT, is used by pilots, ship operators, naval architects and port authorities worldwide. The accuracy of its modelling simulations over multiple scenarios makes it a flexible and affordable training tool.

REMBRANDT gives pilots a realistic experience of large vessels, such as LNG tankers. It is also used to train crew in arrival and departure manoeuvres in relation to the operational jetty, giving them an accurate feel for the conditions. The future expansion of a terminal during daily operations may be supported with the use of REMBRANDT to study design plans and operational limits.

Weather downtime and operational forecasting

BMT uses its state-of-the-art capabilities in data collection, data management, data analysis, numerical modelling and forecasting to improve safety, efficiency and reliability during construction and operation. Our forecasting services help customers minimise time lost due to bad weather and ensure operations are conducted within safe working limits.

Risk assessment

BMT assesses the safety and environmental risks involved in handling and storing LNG and advises on the most appropriate ways of reducing them. This work extends to subsea pipelines transporting the gas. Our experience in hazard assessment and marine safety enables us to accurately identify the relative risks of various transit routes, particularly in busy and narrow water channels.

3D Dredging Model of Walker Shoal, Australia

Following a review of the geotechnical data at Walker Shoal, BMT developed a 3D model to support dredging works at the Ichthys LNG development to accommodate the required export facilities. Previously we supplied a range of specialist dredging consultancy services during the FEED and tender phases of the project.

Chevron Gorgon project, Australia

BMT has been providing extensive marine and coastal environmental services into the Chevron Gorgon LNG project, situated on an A-Class reserve in Western Australia. Robust Quality Assurance Quality Control systems coupled with extensive statistical knowledge have allowed us to deliver a high quality service.

LNG Metocean Forecasting, Yemen

BMT provides operational forecasting of offshore winds, offshore and near shore waves, currents and water levels in support of operations at the Balhaf LNG export facility in Yemen. Port operability is optimised by minimising weather-related downtime.

Floating Liquefied Natural Gas (FLNG)

FLNG has become an important concept for the development of gas reserves in locations where connection to shore facilities is not viable on economic or environmental grounds. BMT's capabilities can be broadly applied to these developments from concept to operation.

Risk assessment

BMT's wealth of knowledge of all types of offshore oil and gas assets gives us a unique capacity to assess risk and guide actions needed in the event of an emergency.

Consequence modelling

Our expert computational fluid dynamics teams use consequence modelling to provide quantitative information on structural and thermal loading and personal safety resulting from accidental loss of containment.

Marine integrity modelling

For FLNG, BMT can provide Integrated Marine Monitoring Systems (IMMS) to help reduce operational risk and costs and contribute to an overall safer floating facility environment. FLNG structural performance and environmental conditions, such as wind speed, current profiles, air gap, and wave height, are simultaneously monitored in real time using components of the IMMS. This reduces operational risks and costs and contributes to overall safety of the structure.

Metocean studies

BMT provides comprehensive metocean information to support safe and cost-effective design and operations of all offshore oil and gas facilities.

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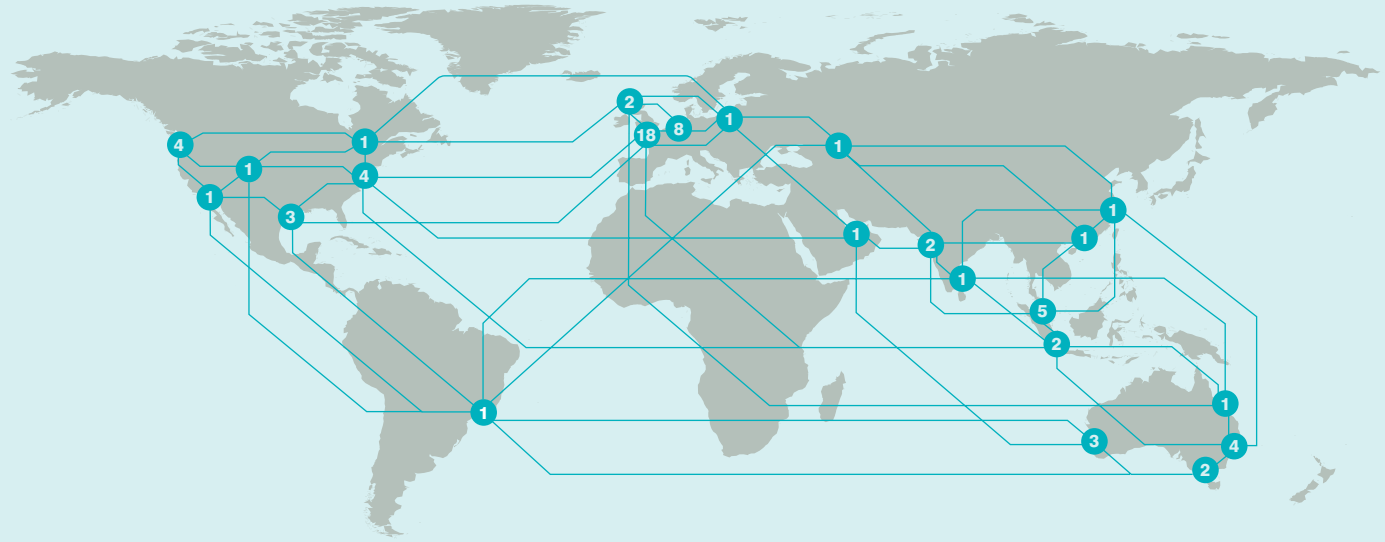
Vessel manoeuvrability and mooring analysis

BMT has extensive experience in evaluating the feasibility of ship-to-ship and ship-to-structure operations. Manoeuvring simulations made with our REMBRANDT system determine limiting wind, wave and current conditions for the safe arrival and departure of LNG carriers to the FLNG barge.

The BMT group is an international design, engineering and risk management consultancy, working principally in the energy and environment, transport and defence sectors.

With locations in all of the major markets we serve, ours is an active network that sees us sharing skills and knowledge, combining disciplines and building international teams to create integrated answers to the questions of our customers.



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