Amec Foster Wheeler

LNG

Founded 1848

165 years history

40,000 exceptionally talented people worldwide

As an EPC contractor or project management consultant, we have executed projects with a total installed cost far exceeding $80 billion.
More than **30 modular projects** around the world totalling....

...more than **1,500 modules**

We designed and delivered the first LNG plants to have been completed on a **multiple module** construction basis.

Developed innovative modular design for expansion of the world’s **northernmost LNG facility**, approximately 450km north of the Arctic Circle

**1st** CBM (coal bed methane) to LNG designed

**Over 25 years** experience in LNG.
Turning vision into reality

We have the skills, experience and creativity to add value throughout the LNG asset lifecycle, from the earliest screening or conceptual phases through to establishing a robust basis of design in the pre-FEED stage, ready for FEED execution and the final investment decision, and ongoing asset support and improvement.

Our specialist consultancy teams combine the skills of our highly qualified LNG experts with the benefits of our extensive in-house cost and schedule information and our project execution know-how based on successful delivery of thousands of projects around the world.

Our experts work very closely with our clients to develop, analyze and evaluate a wide range of concepts, plant configurations, technologies and execution strategies to arrive at optimum solutions.

We have executed a wide and diverse range of LNG studies and pre-FEEDs for both onshore and offshore plants covering most liquefaction technologies and plant configuration options.

We recognize the growing importance of non-technical factors in project development and we have significant expertise in overcoming environmental issues and meeting local content requirements.

Our consultancy groups play a major role in shaping LNG investments at early stages in the project lifecycle when key strategic decisions are required. From the earliest stages of feasibility studies, our expertise in technical aspects of LNG processing is combined with conceptual innovation and constructability aspects for major developments in remote locations. As a result, our studies and pre-FEEDs deliver robust solutions which can be built upon during the subsequent project development phases. By combining our LNG and upstream gas expertise, we are able to produce integrated gas development studies and pre-FEEDs covering the whole gas monetization chain.

Our gas monetization expertise includes:
- LNG liquefaction and regasification
- Overall gas monetization planning
- Monetizing unconventional gas reserves
- Onshore and offshore project solutions
- Process and technology selection
- Plant layout/modularization
- Constructability in remote and challenging locations
- Environmental, permitting and local content solutions

We completed a detailed pre-FEED concept selection study for a 3-4 mtpa liquefaction plant and associated infrastructure, planned to be one of the first LNG facilities in the world to use coal-bed methane as a feedstock for LNG production.

We also executed the FEED for the extraction, collection, compression and transportation of coal-bed ethane to the transmission pipeline, and associated infrastructure and services, including power generation and water treatment facilities.

First CBM to LNG, Santos GLNG®, Australia

We completed the pre-FEED, including an energy optimization study, for a second train expansion at the world’s northernmost LNG facility, approximately 450km north of the Arctic Circle. Construction of new facilities next to a live plant on an Arctic island brings unique challenges. We leveraged our expertise in LNG modularization and developed innovative construction methodologies - getting the construction strategy right plays a major role in the choice of the right development concept.

We were also awarded a study contract to define longterm solutions to achieve the Snøhvit partnership’s objectives of increasing the operating performance of the facility, and increasing its capacity and feed gas flexibility.

Modularization, Snøhvit, Norway

We completed the pre-FEED, including an energy optimization study, for a second train expansion at the world’s northernmost LNG facility, approximately 450km north of the Arctic Circle. Construction of new facilities next to a live plant on an Arctic island brings unique challenges. We leveraged our expertise in LNG modularization and developed innovative construction methodologies - getting the construction strategy right plays a major role in the choice of the right development concept.

We were also awarded a study contract to define longterm solutions to achieve the Snøhvit partnership’s objectives of increasing the operating performance of the facility, and increasing its capacity and feed gas flexibility.
We completed detailed concept studies for a planned first-of-a-kind facility to produce LNG from the Browse Basin, off the coast of Western Australia, developing a number of both onshore and offshore concepts, including:

- Modularisation of liquefaction trains
- Liquefaction technology evaluation
- Driver selection
- LPG extraction
- Cooling media
- Heat integration
- Platforms and gravity-based structures
LNG liquefaction
Safe and successful project delivery

We strive continuously to improve our already world-class safety record. We have received over one hundred safety awards from clients, safety and industry organizations, and government bodies around the world, and we continue to drive safety performance through our ‘Beyond Zero’ programme.

We have proved that we can deliver our projects in line with our clients’ local content objectives, whether it involves local execution, local partners, local materials and equipment supply, matching export credit needs, or training a local workforce.

Designing and building LNG liquefaction facilities
We are a key player
We enjoy a challenge!

LNG liquefaction facilities are large, complex developments, frequently in remote and challenging locations. Our track record demonstrates our ability to deliver entire liquefaction projects, including all offsites and infrastructure.

With our in-depth technical expertise, global EPC experience and particularly our proven ability to execute large and complex projects successfully and safely, we are a key player in the LNG market.

North West Shelf Venture Phase V Expansion, Australia

We led the JV executing the EPC phase for the construction of a fifth LNG processing train of up to 4.4 mtpa capacity at the Woodside-operated Karratha gas plant. Our in-depth modular design and construction experience was pivotal to this ground-breaking project, the first onshore liquefaction plant in the world to be designed and built in modules. In all, there were 75 separate modular structures, the largest of which contained the majority of the liquefaction process equipment.

Pluto LNG, Australia

We started the greenfield Pluto Train 1 project with feasibility and pre-FEED studies undertaken by our specialist consultancy group, combining the team’s LNG study capability with the extensive modular design and construction expertise of our EPC organization to implement a modular approach. Following execution of the FEED for the Pluto foundation project, we then led the JV executing the EPC phase and supported startup and commissioning of the completed plant. We also undertook the FEED for potential future Pluto Train 2 and Train 3 expansions.

NLNG SevenPlus, Nigeria

We led the JV undertaking the FEED for a new natural gas liquefaction facility, involving the design of two LNG trains, each capable of producing 8.5 mtpa of LNG, the largest planned LNG trains in the world. The design and execution planning for this mega-train presented unique challenges in terms of remote location and scale of development.

Cameron LNG, USA

We were appointed owner’s engineer for a new LNG liquefaction facility planned to export up to 12 mtpa of LNG. Our scope included technical assistance for project development, FEED work to support permit applications to the US Federal Energy Regulatory Commission, support for EPC planning activities, and technical reviews.

Qalhat LNG, Oman

We designed and delivered this stick-built LNG facility, with our JV partner, ahead of the target 34-month schedule and within budget. With the close co-operation of Oman’s Ministry of Manpower, the project achieved its local content ‘Omanization’ target of 38%, the highest then recorded for any construction project in the Sultanate. It also achieved a truly world-class safety performance of 20 million manhours with no lost-time incidents.

KNPC LNG Terminal project, Kuwait

Our scope included pre FEED and FEED for KNPC’s world class LNG import facility with a maximum sustainable regasification capacity of 3,350,000 Nm³/h. This will be the largest grass-roots LNG regasification terminal ever constructed in a single attempt.

It includes eight full containment LNG storage tanks with a working capacity of 225,000 m³ each as well as two berths for simultaneous unloading of large LNG carriers. The whole plant will be erected on reclaimed land formed by hydraulic filling.
Life of asset services
Amec Foster Wheeler

We deliver projects, from concept to start-up and beyond.
For any development, we start adding value from day one, helping our customers to evaluate the opportunity, screen options, select the right option, and then realise the revenue as quickly as possible.

We deliver value at the front end, then can bring our global EPC skills and experience to bear, developing the right execution strategy, and then delivering on time, safely, cost effectively, and right first time. Right through the life of your asset we can provide the right support, from turnarounds and brownfield projects through to long term asset support, performance improvements, through to late life planning and decommissioning.

Consultancy services
- Environmental
- Marine and coastal
- Geotechnical
- Permitting and regulatory
- Community and social affairs
- Water and wastewater
- Transportation

Project delivery
- Feasibility studies, concept and pre-FEED
- Cost and schedule planning and control
- Technology integration
- FEED design
- Engineering and procurement
- Fabrication and construction
- Project management
- Start-up and commissioning
Amec Foster Wheeler is a global EPC contractor with a proven track record for safely and successfully delivering world-scale projects, including LNG facilities.

We are a key player in the LNG industry. We have demonstrated our ability to deliver high quality LNG facilities which meet our clients’ objectives.

We have also pushed the boundaries of LNG, pioneering modularization of liquefaction plants, working on everincreasing LNG train sizes, applying creativity to solve technical challenges, developing innovative offshore options, overcoming environmental issues and meeting local content requirements.

As we’re also experts in upstream gas field development, we can design and execute the entire development and monetization project, from wellhead to terminal, and from concept to start-up and beyond.

We add value at every stage:

- Concept and feasibility studies
- Site selection studies
- Pre-front-end engineering design (Pre-FEED)
- Front-end engineering design (FEED)
- Engineering, procurement & construction (EPC)
- Commissioning & start-up
- Ongoing asset support

**Asset management**

- Due diligence and site assessments
- Asset integrity and optimisation
- Operational readiness and implementation planning (OIP)
- Operator training, systems and management
- Operations & Maintenance term services
- Brownfield upgrades and expansions
- Shut-downs/ turnarounds
- Dutyholding
- Late life management
- Mothballing and decommissioning
Pushing the boundaries

For us it’s not just about setting new benchmarks for cost, schedule, safety, quality and train size. It’s also about developing innovative new technical solutions to meet our clients’ objectives, and to overcome the challenges that they face.

Modularisation

In Australia, we pioneered the modularisation approach to LNG plants, on the North West Shelf Venture Phase V Expansion, using all of the modularisation experience we have gained over the last 25 years. During this time we have designed and constructed more than 30 modular projects around the world comprising more than 1,500 modules.

Train 5 has been safely and successfully completed on time and at a highly competitive cost in an environment of extremely constrained resources. This remarkable achievement is testament to the focus and commitment of the project team in delivering this additional production infrastructure.

Executive VP North West Shelf, Woodside Energy Ltd Pluto LNG, Australia

We led the study, pre-FEED, FEED and EPCm phases for the onshore component of this 4.3 mtpa LNG facility with our JV partner. The plant was built in modular form. Around 260 modules and pre-assembled racks, the largest of which contained the majority of the liquefaction process equipment, were fabricated in Thailand. This greenfield project includes a single LNG production train, a fractionation unit, an acid gas recovery unit, gas purification units, tank storage facilities, a boil-off gas compressor, loading berths, gas turbine power generation units, utilities, a jetty, and supporting infrastructure.

Arctic & Remote Regions, Rosneft & ExxonMobil, Russia Far East

We were selected to undertake the initial phase of the FEED for a proposed Russian Far East LNG project. We undertook preliminary engineering and execution planning for the plant and associated gas pipeline, infrastructure and marine facilities. Our work included location and concept studies, design basis definition, main technical solutions development, constructability assessment, and definition of project execution strategies. We also subsequently completed the FEED for potential future Trains 2 and 3.
Our study for the Snøhvit LNG Train II at Melkøya brought many interesting challenges, not least that the site is 450km north of the Arctic Circle. The world’s northernmost LNG plant, it has a design capacity of 4.2 mtpa and processes gas transported through a 143km pipeline from subsea facilities. Melkøya experiences long periods of darkness and low temperatures, with storms blowing in sea spray that freezes as it hits structures. So our study focused on minimizing the work required on site, with maximum modularization in the fabrication yard. We were also awarded a study contract to define long-term solutions to achieve the Snøhvit partnership’s objectives of increasing the operating performance of the facility, and increasing its capacity and feed gas flexibility.

We executed a feasibility study for a floating LNG facility to be located north-west of Trinidad & Tobago. Our upstream and LNG specialists worked together to develop and optimize the configuration of the subsea gas-gathering network, mooring system, risers, turret and hull, liquefaction topsides, and storage and offloading systems.
We have worked with a wide range of clients around the world, delivering expert services for new terminals, both onshore and offshore, and for expansions, including technical development and design, cost estimating, permitting and project execution. We have particular expertise in optimizing an entire facility, and integrating the regasification element with other facilities such as power generation.

Send-Out Gas
For LNG receiving terminals serving certain markets, the C2+ content and heating value specifications for send-out gas are lower than most natural gases and most existing LNG baseload plants. Cost-effective management of these components enhances the LNG value chain, increasing flexibility in sourcing LNG cargoes. Our cost-effective process design manages the C2+ content of send-out gas at the LNG receiving terminal, coupling Foster Wheeler’s C2/C3 terminal extraction process with a pre-reformer that produces a low calorific substitute natural gas for re-injecting into the LNG terminal send-out gas.

Vaporisation
We have developed a process that uses the waste heat from either a power plant or industrial facilities for LNG vaporisation. By using the LNG as both a working fuel and a heat sink, this new configuration efficiently eliminates fuel requirements while reducing or eliminating emissions and improving the plant’s thermal efficiency and overall profitability.

Singapore LNG, Singapore
We played a key role as project management contractor for the S$1.7 billion Singapore LNG terminal, a key infrastructure development in Singapore’s energy diversification strategy. The first phase of development comprised two
Enagás, Spain

We have enjoyed a significant level of repeat business with Enagás, carrying out three LNG terminal expansions in Barcelona, performing basic design and EPCm, or EP, and civils work. In Cartagena, we have worked with Enagás for more than ten years, undertaking four expansions, and at Palos de la Frontera, we have completed two expansions.

Confidential Client, North America

We were project management consultant for an LNG regasification terminal. We also provided technical advisory services during the detailed EPC, commissioning and start-up phases.

Polskie LNG, Poland

We designed this LNG regasification terminal in Świnoujście. We also studied the possibility of installing a combined system to use the boil-off gas produced in the terminal as fuel gas. Following our conceptual study, we executed the basic design and part of the FEED.

Castle Peak Power, Hong Kong

Our study scope included expansion of the existing LNG terminal and power plant, and integration of the new facilities to enhance the efficiency of the combined cycle plant.

Ennore LNG, India

Our scope of work for IOCL’s new LNG receiving terminal to be built in the state of Tamil Nadu, includes basic design, FEED, and the preparation of capital and operating cost estimates for the new LNG import, storage and regasification terminal, which will be designed to process 5 mtpa of LNG.
Amec Foster Wheeler (www.amecfw.com) designs, delivers and maintains strategic and complex assets for its customers across the global energy and related sectors.

Employing around 40,000 people in more than 55 countries, the company operates across the oil and gas industry – from production through to refining, processing and distribution of derivative products – and in the mining, clean energy, power generation, pharma, environment and infrastructure markets.

Amec Foster Wheeler offers full life-cycle services to offshore and onshore oil and gas projects (conventional and unconventional, upstream, midstream and downstream) for greenfield, brownfield and asset support projects, plus leading refining technology.

Amec Foster Wheeler shares are publicly traded on the London Stock Exchange and its American Depositary Shares are traded on the New York Stock Exchange. Both trade under the ticker AMFW.

connected excellence in all we do

To find out more
amecfw.com
@amec_fw
linkedin.com/company/amecfw
youtube.com/amecfw
facebook.com/amecfw