

Gaffney  
Cline

Gas and LNG Expertise



## About GaffneyCline

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GaffneyCline is a global consultancy that has been offering technical, commercial, and strategic advice to the oil and gas sector since 1962. GaffneyCline's reputation demonstrates that its advice, along with its insight, is high-quality, impartial, technically based, and commercially astute. GaffneyCline is often referred to as one of the leading Reserves consultants within the industry, but in reality, GaffneyCline offers a full range of upstream, midstream and downstream technical and commercial consultancy services. These range from seismic interpretation, static and dynamic reservoir modelling, field development planning, field engineering, gas monetisation, LNG/GTL, expert witness, mergers and acquisition, economics and project finance. GaffneyCline operates worldwide from three main offices in London, Houston and Singapore, and from regional offices located in Buenos Aires, Sydney and Moscow.



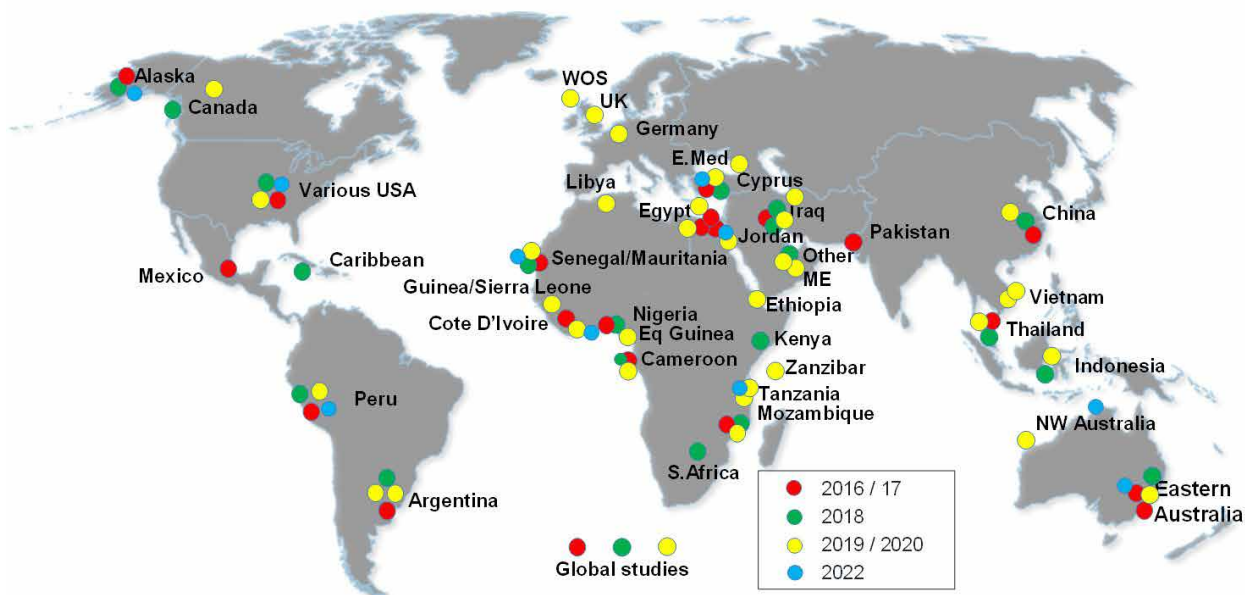
# Gas and LNG



## Global Gas and LNG Practice Overview

Our leading Global Gas & LNG practice supports clients along the gas value chain on a range of technical, commercial, and strategic issues

We have developed specific expertise in assessment of upstream and midstream infrastructure developments, LNG exports (onshore and FLNG), as well as LNG imports/regas (FSRU and onshore), market studies, gas-to-power or gas monetisation elements, as well as expert witness advisory services. A selection of projects covered in past few years (map below) shows our breadth of experience, and further details can be provided on request.



# Our Experience

## Government/Ministry Advisory, Regulation, Fiscal Structuring, Contractual, Gas & LNG Pricing, Expert Witness

### Senegal Offshore Government Advisory

Advised the government of Senegal on value and financing options of upstream developments. Conducted an analysis and provided advisory services on the implications of considered tax changes to the upstream sector.

### World Bank Eastern Mediterranean Gas Master Concept

GaffneyCline was appointed by the World Bank to conceive a master concept to gradually develop gas infrastructure corridors for the Eastern Mediterranean and the 7 EMGF member countries (Cyprus, Egypt, Greece, Israel, Italy, Jordan, Palestinian Authority). The plan was required to maximise the economic value of gas in the region in the short, medium and long term.

This included an assessment of regional supply/demand dynamics, as well as consideration in the context of global gas/LNG markets, competitiveness and European Carbon policy. Utilisation of existing and potential gas/LNG import (FSRU) and export (onshore and FLNG) facilities were assessed, as well as supply and demand scenario modelling for all 7 countries covering 2020–2040.

As part of this assignment, GaffneyCline provided expert support to the WB in navigating and managing complicated political and organisational stakeholder requirements, amongst member countries with often competing goals.

### World Bank Iraq Gas Market Design & Regulatory Framework

GaffneyCline were selected to advise on the provision of a regulatory framework for consideration by the Iraqi Council of Ministers (CoM). This framework set the foundation for the creation of a sustainable and commercially viable mechanism to capture associated gas currently being flared, and enable the development of dry gas reservoirs primarily for use as fuel for power stations and electricity generation. The final regulatory framework included the following:

1. Contractual guidelines for future gas processing agreements
2. A gas transportation protocol
3. A gas marketing framework
4. A reference price framework for dry gas
5. A five-year outlook for the gas to power sector in Iraq

The report detailed the evaluation, consultation, synthesis and delivery of the natural gas framework.

### Zanzibar Ministry Fiscal and Regulatory Advice and Capacity Building

Reviewing fiscal terms on behalf of client in order to enable the exploration and potential development of natural gas resources. Provided training on fiscal terms and GaffneyCline industry perspectives to representatives of the Ministry.

### Alaska Government / Dept of Revenue

GaffneyCline served as advisors to the State of Alaska in its legislative hearings and passage of the ACES tax legislation in November 2007 and then subsequently in various capacities from 2008 to 2019. The work involved an assessment and presentations to public hearings on the state's strengths and weaknesses vis-à-vis its attractiveness to the industry in the existing business climate along with an analysis of proposed changes. This involved addressing the competitive nature of governmental regulations and fiscal regimes in a global industry and commenting on trends around the world.

### Middle East Rules & Regulations

Provision of support to the Petroleum Ministry and national oil & gas company of a major Middle East country in the development of overlying rules and regulations, ahead of the opening of the country's gas sector.

### Middle East Royalty Mechanism

Design and presentation of proposals for a new royalty mechanism as part of a fiscal regime review activity for a major Middle East NOC. The assignment also included in-country assistance with the design and implementation of internal processes/procedures within the NOC for the calculation of royalty payable to the government under the new royalty regime.

### Asian Sovereign Fiscal Contract Negotiations

GaffneyCline was engaged by the Ministry of a country in South East Asia to support the renegotiations of an existing upstream contractual framework, covering a wide range of topics including contract extension, abandonment provisions, fiscal take, financing arrangements and work obligations.

### Australia and Timor Leste Fiscal Advisory

Advising the Governments of both Timor Leste and Australia on petroleum and fiscal policy, contractual structuring, as well as institutional capacity development within the sector.

### Middle East NOC LNG Advisory

Established a gas market clearing price based on LNG import parity, and created a wholesale gas market and reference price structure to reflect global gas clearing prices. Economic modelling of natural gas production based on the recommended pricing approach, with suitable sensitivities and oil/gas price forecasts.

# Our Experience

## Angola NOC Gas, LNG Training and Advisory

GaffneyCline has had a very long relationship with various entities within the Angolan National Oil Company, Sonangol. GaffneyCline continues to be engaged with Sonangol providing various work streams to support reserves, asset evaluations, portfolio planning and training.

Reviewed subsurface data and information to confirm gas resource volumes offshore Angola. Considered alternative uses for different accumulations, depending on their geographic location and recoverable volumes.

Carried out an economic assessment of the main fields including evaluation of fiscal terms. Prepared development scenarios and economics models as a basis for commercial evaluation.

Provision of technical, commercial and strategic support to the development of a LNG liquefaction project, including assistance on issues related with: the negotiation of key LNG liquefaction project parameters; the development of gas sales agreements; LNG carrier transport options; and planning for the integration of the LNG facility/site with a potential new-build industrial area.

Regular training provided to various NOC teams and supporting numerous asset evaluation and portfolio analysis efforts to support internal decision making.

## Thailand Gas and LNG Market Reform

GaffneyCline supported Thailand's PTIT, Energy Regulatory Committee and Ministry of Energy representatives in an evaluation of gas market structure, regulatory controls, and pricing regimes, using experiences and lessons from similar gas market reforms in USA, UK, Netherlands, Turkey and Japan.

GaffneyCline provided support to PTIT and delivered final recommendations regarding the required key market structuring parameters to ensure success in Thailand's transition to a market based price.

GaffneyCline have been advising in Thailand in terms of further LNG imports, and utilisation of existing and new gas infrastructure, in order to utilise imported gas and increase gas fired power generation.

Subsequently, capacity building and training sessions have been held with key gas and power market participants, as well as detailed recommendations towards the development of Third Party Access/Network Code Arrangements.

## Australia Government LNG Transfer Pricing

GaffneyCline was engaged by a branch of the Australian Federal Government to conduct an LNG transfer pricing review of 3 significant LNG projects. This included advice on:

- Historic, current and future state of global LNG markets
- Global LNG Supply & Demand modelling
- Pricing developments, price reviews and negotiations
- Economic analysis and assessment
- Expert witness

## Gas Monetisation, Domestic Utilisation, Gas to Power

### Kuwait / Bahrain / Middle East Gas & LNG Studies

For a major independent oil & gas company, a natural gas supply/demand study assessing prospects in Bahrain and Kuwait.

Several oil and gas companies retained GaffneyCline to review the regional gas industry in the Middle East Gulf (Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia and the UAE).

The study examined the more important current and potential gas production/consumption/export options in the context of available reserves, intra and inter regional demand and potential gas infrastructure developments.

GaffneyCline have also assisted in the assessment of tenders regarding LNG supply to Middle East countries.

### Nigeria LNG Feedgas Advisory (various)

Various gas reserves consultancy advisory projects evaluating the adequacy of the gas supply from offshore and onshore oil and gas fields to supply LNG and power plants in West Africa. Work has been carried out on behalf of lenders, IOCs, independents, operators, power producers and other third parties.

### Indonesia Gas Market Study

Establishing likely natural gas demand, both for power generation and industrial/other facilities. Projections of supply and demand and the potential for new sources of gas to be profitably developed for local and regional markets. Included netback pricing analysis and well-head breakeven costs.

### Cyprus Offshore Gas Development Monetisation

Assisting National Gas Company in the creation of a resource development strategy. Economic Analysis of field development plan, assistance in establishing a negotiating strategy with its IOC partners, gas infrastructure pricing, regional supply and demand and economics.

### LNG Marketing Prospects Asia Pacific Region

As part of a study for a European independent oil and gas exploration company, GaffneyCline advised on the major role played by LNG in that regional market, and assessed the market prospects for LNG in the Asia Pacific region. The attractiveness of LNG export projects was reviewed as a method of developing gas reserves, previously left undeveloped due to a lack of natural gas infrastructure.

### Gulf Gas Export Market

For a European company examining the development of gas supplies from a Middle Eastern field, GaffneyCline was engaged to examine the prospects for regional gas export projects, concentrating on markets within the Gulf area. Key aspects of the study included determining the netback price which gas would realise in-country in order to be competitive with other fuels in the market, and quantification of the timing of the window of opportunity for these exports. The study was intended both to assist the client's promotion of local regional gas export projects and to facilitate negotiations with the local authorities.



# Our Experience

## Gas & LNG Export

### Mozambique Rovuma LNG

GaffneyCline advised on the feasibility of an LNG export project in Mozambique. This included assessment of the feasibility of both domestic utilisation of gas and international marketing of LNG from the project and covering key aspects such as:

- Economic evaluation: LNG market analysis and industry trends, LNG revenue review, CAPEX and OPEX, fiscal regime, ownership and business structure, capital structure, annual financial statements, project competitiveness, project economics
- Technical evaluation: upstream production and midstream plant technology selection, production of feedgas from straddling and non-straddling structure, concept of drilling and completion and subsea facilities, appropriateness and configuration of facilities selection, appropriateness of liquefaction process selection, appropriateness of site selection, schedule and EPC contracting, EPC cost reasonableness compared to other projects
- Risk Evaluation: risk register – project risk analysis and countermeasure plan, project environment analysis in host country, market/finance, currency and foreign exchange risk, contracts, project partners, technology, review of LNG affiliate marketing strategy.

### LNG Canada

GaffneyCline advised on the feasibility of an LNG export project in Western Canada. This included assessment of the feasibility of marketing LNG from the project and covering key aspects such as:

- Forecasting of demand/supply balance into the future
- Characteristics and recent trends in LNG markets – traditional as well as emerging
- Trends in LNG pricing and other contractual terms, e.g., duration, flexibility
- Review of offtake and LNG marketing strategy, including security of offtake demand
- Comparison of the relative competitiveness of LNG export projects being developed in different part of the world
- Risk assessment and analysis on other parts of the project including host country risk, government and political, economics, project, EPC contracting, pricing, capital structure, pipeline right of way and construction, schedule and timeline, permitting, regulations

### East Africa LNG Due Diligence

A Chinese client requested GaffneyCline to perform due diligence and make strategic, technical and commercial recommendations regarding potential entry into an East African LNG export project. GaffneyCline provided advice on:

- Upstream and midstream development costs and risks
- Valuation of entire value chain from upstream, through midstream, liquefaction (both FLNG and land based) and export to Asian country
- Analysis of LNG shipping costs and risks
- Global LNG supply and demand analysis covering all projects
- Economic analysis on competing LNG projects
- Risk identification and management
- Project timeline, schedule and impact of political and regulatory uncertainties

### USA LNG Export Projects Due Diligence

Lenders' Commercial and Market Advisor for various LNG Export Projects (confidential projects). Review of technical, contractual, regulatory and port/marine documents and studies present in the datarooms typically on behalf of project investors or lenders.

- Modelling of the production, economics and breakeven gas pricing scenarios and outlooks across all US gas basins.
- Facilitated and held meetings with the project developers (and their contractors) to crosscheck key project details.
- The clients were then provided with pros and cons associated with participation in the respective projects, which included commercial implications from the findings that could impact the viability and competitiveness of the projects.
- Recent work includes the analysis of gas production economics from the Haynesville shale play in the context of one of the proposed LNG export projects.
- Likely global LNG demand compared to the proposed timing of startup of major US LNG liquefaction projects carried out on behalf of a major lender to LNG projects.
- Review of project economics, profitability and risk to debt service on operating USGC LNG facilities.

### Alaska LNG Project

Since 2014, GaffneyCline has provided a range of advisory services to Alaskan State Government departments and the State Legislature, regarding features of the proposed LNG project based on gas resources on the Alaskan North Slope.

The project was previously being developed by ExxonMobil, along with upstream partners BP and ConocoPhillips, but is now under the direct leadership of the Alaska Gasline Development Company (AGDC).

GaffneyCline has provided guidance on many features of the project including commercial analysis, project structuring, economic modelling, economic feasibility, risk assessment and allocation, LNG marketing and pricing, assessment of offtake markets, tax and fiscal features, and property tax/community engagement.

### Argentina LNG Monetisation

- Supply and demand balance, domestic gas markets, consideration of various monetisation routes
- Domestic sale vs export of gas / LNG
- Considerations regarding LNG import economics and competition
- Assessing current LNG imports via land terminals and in place and planned FSRUs
- Infrastructure access for gas monetisation, and associated wellhead netback analysis and scenarios for next 15 years

### Mid Modular Scale LNG Study

For a confidential client, GaffneyCline are currently carrying out an evaluation and analysis of market opportunities to potentially deploy small to mid scale LNG solutions. The areas of focus relates to both supply driven projects (modular phased developments) and demand driven projects (where resources are smaller).



# Our Experience

## Indonesia LNG Expansion Advisory

A major Japanese Electric Power company commissioned GaffneyCline to:

- Carry out due diligence from a financial, economic and technical perspective on a major Indonesia LNG export project
- To assess the opportunities for both taking an equity interest and also entering into an SPA for some of the output
- The prospects for LNG sales and pricing were evaluated, with particular reference to the market oversupply in coming years

## Peru LNG Commercial Advisory

For several years GaffneyCline have been retained to provide commercial and strategic advisory services in the form of a monthly report and briefing on international LNG markets (with a focus on Americas, Asia Pac, Europe), and global LNG flows and cargoes, pricing, trends, new projects. This assists our clients to make better technical and commercial decisions with regard to the export of LNG from their terminal to global customers, also ensuring their commercial interests are protected.

## Global LNG Supply, Demand Study and Model

Through various client and internal corporate engagements, GaffneyCline developed our own Proprietary Global LNG Supply and Demand model, which involves a database of export and import projects, both in terms of in operation, under development and planned. This model is updated quarterly and is used to provide insights and intelligence into all of our LNG export and import advisory mandates. In addition, we regularly carry out internal study updates to look at potential gas to power market opportunities globally, based on gas supply balances and demand drivers. This helps our clients (Governments, Ministries, IOCs, independents, lenders) to screen high potential opportunities and identify potential gas market offtakers, demand level and creditworthiness.

## Other LNG Export Advisory Mandates

Including Angola LNG, Equatorial Guinea LNG, Papua New Guinea LNG, various other African LNG projects.

## Gas & LNG Import

### Global LNG Regas Study

Carried out our most recent global LNG screening strategy on behalf of a major Asian LNG market player, helping them to refine their LNG strategy, and identify a top list of projects to target that were aligned with their overall corporate and commercial strategy, as well as investment goals. A key focus related to Gas to Power and utilisation of marine solutions (e.g. FSRUs).

### World Bank Jordan FSRU

- Evaluated Regas alternatives for the national electricity company
- Developed criteria for assessing various FSRU and land based options as well as hybrid arrangements
- Advised on commercial negotiations with existing FSRU provider, especially early termination
- Assessed the consequences of supply shortfalls from Egypt/ Israel and developed solutions
- Developed an RFP process and assist with selection of final concept and technical specifications
- Prepared LNG purchasing strategy

### World Bank Libya FSRU

Assessment of LNG importation options (via FSRU) to alleviate gas supply shortages in the Libyan power sector, and an appraisal of resulting savings in fuel procurement

- Assessment of upstream supply situation and outlook
- Quantification of electricity supply needs, location and timing
- Evaluation of previous work carried out in support of the evaluation of gas substitution of HFO and other fuels
- Evaluation of a range of LNG importation plans and possibilities
- Economic assessment of fuel savings associated with each supply option
- Firm recommendations on preferred supply options, sizing, location and next steps together with mitigation options to address risks associated with course of action
- Assessment of FSRU options and costings
- Assessment of pipeline costs, technical capacities, costings and competitiveness

### Australia LNG Import Advisory

A major industrial buyer of natural gas in Australia requested GaffneyCline to carry out a techno-economic assessment of LNG importation options, which included the study of:

- Import terminal design concepts
- Comparable economics
- Contracting strategy and procurement options
- Likely supply sources / costs



# Our Experience

## Cyprus FSRU LNG Import Project Advisory

- Gas to power economics, fuel substitution and economic analysis, power plant conversion feasibility
- Power and gas demand by season, LNG procurement strategy, regional gas supply and demand appraisal, detailed project economics for various alternatives
- Evaluation of incremental demand other than existing and potential power generation from various sectors including industrial, cement, transportation
- Currently advising on key factors such as LNG/gas demand and scheduling, and agreements such as EPCOM, Terminal Use Agreement, Terminal Cost Sharing Agreement, Gas Sales Agreement, LNG SPAs and other ancillary agreements
- Consideration of associated infrastructure, costings, technical aspects in relation to marine, jetty, storage, buffer storage, cryogenic pipeline, measurement, gas pipeline and linkages to power station and other gas buyers

## Cyprus Gas/LNG Import Feasibility Study

- Assessment of global gas market developments in relation to LNG supply procurement
- Analysis of the quantities, flexibility and other main characteristics of natural gas demand taking into account LNG imports
- Recommendation following detailed evaluation of 8 different LNG import configuration options including cost, reliability, economics, flexibility, time
- Detailed analysis regarding onshore and offshore LNG import options, specifically focusing on FSRU technical configurations, and key commercial drivers such as CAPEX/OPEX, Charter/BOOT, new-build/conversion and other options
- Economics, scheduling, financing and risk management for project
- Assistance with EU filings and understanding of potential EU assistance/grants available to aid in market development and regional security of supply
- Gas pricing and contractual structuring
- Consideration of gas sales and procurement, LNG swaps
- Assessment of FSRU application, combined with power station conversions to natural gas
- Annual and peak loads were determined, and the leasing costs and overall tariff structure for the project were assessed, and compared to other gas supply alternatives

## Argentina LNG Imports Advisory

- Overview of the global LNG market
- Supply and demand balance, domestic gas markets, consideration of various monetisation routes, including potential LNG exports in the future
- Domestic sale vs export of gas / LNG
- Infrastructure access for gas monetisation, and associated wellhead netback analysis and scenarios for next 15 years
- Considerations regarding LNG import economics and competition
- Assessing current LNG imports via land terminals and in place and planned FSRUs

## Pakistan FSRU Due Diligence

A London based investment bank engaged GaffneyCline to assist in the evaluation and suitability of a proposed LNG FSRU facility in an emerging LNG importing country in South Asia, with particular emphasis on key risks to the lender.

- Technical audit of the developers project plans and design work
- Commercial audit of the proposed business model, including key gas SPAs and terminal use agreements, and contractual interactions with other stakeholders involved in the supply chain
- Financial audit of mechanism for receivables, gas transportation payments, terminal use payments and LNG procurement
- Regulatory and environmental audit to ensure compliance and presence of necessary permits and licenses

## Thailand LNG Imports Advisory

Advised Thailand's electricity authority on:

- Commercial, Technical and Strategic end to end gas value chain advisory services
- Included considerations regarding LNG imports (onshore and via FSRU), storage, pipeline infrastructure and distribution, Terminal Use Agreements, cost sharing, project design and structuring and capacity building
- LNG procurement strategy including short vs long term, sourcing options and counterparties, pricing, risk management and negotiation
- LNG Sale and Purchase Agreements, structuring, negotiation, management of key risks
- LNG and gas pricing, including consideration of appropriate strategy
- LNG terminal Third Party Access, slot management, gas quality controlling practice, key technical and commercial aspects of LNG Terminal Use Agreement
- Domestic gas transmission system, balancing, capacity management
- Strategy considerations regarding dispatch of power plants using gas and other fuels
- Recommendations on LNG business model and personnel requirements along with capacity building

## Ivory Coast LNG Supply/Demand

An independent assessment of the gas supply to the Azito power plant in Abidjan, Cote D'Ivoire:

- Data collection from and meetings with operators
- Reviewed reserves reports
- Forecasted gas production under various scenarios
- Evaluated whether gas supply can meet electricity demand to 2039
- Recommended implementation strategy





For more information about GaffneyCline's integrated services, please contact your regional GaffneyCline office.

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