

Gaffney  
Cline

Southern Africa 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 include 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 and Sydney.

## Southern Africa

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Southern Africa, comprising Angola, Namibia, South Africa and Mozambique, offers a diverse backdrop of energy opportunities and challenges. GaffneyCline is proud to be active in all of these countries, working with IOCs, NOCs and government departments to provide technical, commercial and strategic advice across the entire energy chain.

Angola's offshore oil and gas resources, dominated by the prolific Lower Congo Basin, has been the focus of activity for decades, attracting many of the larger International Oil Companies. That province is maturing and production levels are not currently being maintained. This is being addressed by encouraging the development of marginal fields, pushing further offshore into ultra-deep waters and exploring in immature basins further south. Angola also has the only operating LNG plant in the region, using solely Associated Gas from those Lower Congo oil fields. Onshore concessions are beginning to provide opportunities for smaller local companies to participate in the industry. A restructured Sonangol is now focused on its role as an indigenous integrated energy company, with concessionary activities now the responsibility of the recently created ANPG.

Deep water sands offshore Mozambique have proved to be amongst the most prolific offshore gas basins in the world, with over 100 Tcf of natural gas resources having been discovered in the Rovuma Basin since the first well completed in March 2010. The development of these fields and the construction of new land based liquefaction plants is eagerly anticipated.

Despite significant energy shortages, South Africa has taken a long time to begin to explore its deep water basins, largely due to concerns with and uncertainties around the impending Minerals and Petroleum Resources Development law. Following initial success in 2019 and again in 2021, off the south coast, and the 2022 discoveries in Namibia, perhaps we will see further deep water activity in South Africa's Orange Basin in the near future.

# Our Experience

## Development Scenario Evaluation and Costing – South Africa

For a non-operating partner wishing to assess the range of NPVs of two discovery wells, GaffneyCline evaluated a variety of development scenarios for a fairway comprising these discoveries and further derisked prospects, deep water South Africa. The evaluation considered production profiles, development costs, alternative schedules and a potential EPS.

## Prospective Resource Valuation – South Africa

GaffneyCline undertook a technical evaluation of an undrilled deep water prospect, offshore South Africa. Based on the Operator's management presentations and an assessment of a number of key risks, assumptions and conditions, GaffneyCline provided an opinion of the Fair Market Value of a Working Interest in the block.

## Exploration Potential, South Africa

GaffneyCline evaluated the exploration potential and play risk of two frontier blocks offshore South Africa from 2D data. Over 19 Leads were mapped, quantified and risked. GaffneyCline established a regional and robust candidate seismic chronostratigraphic framework to allow the relative dating of the leads and to understand critical sedimentological and tectonic interactions within the petroleum system of an undrilled and unproven frontier area. Extensive research helped to substantiate the GaffneyCline scheme which relied on a regional analysis of the rift and drift succession of the southern Atlantic.

## Gas Market Study for Selected Provinces, South Africa

For an international energy company, GaffneyCline undertook a detailed gas market study for likely gas finds in the Republic of South Africa (RSA). The study determined the market potential for gas in the RSA and examined the extent to which gas discovered could be economically accommodated in that market. This included the direct use of gas in industrial (both as fuel and feedstock), commercial and residential markets and the additional use of gas to produce electricity. Competing natural gas options were reviewed and the influence of restructuring the RSA electricity industry on future gas demand was evaluated.

## Development Scenario Costings and Resource Evaluation

GaffneyCline undertook an independent evaluation of two offshore gas-condensate South African assets for a Private Company to evaluate the robustness of the development plan including CAPEX and OPEX programme, economics and NPVs, in addition to a resources estimate for the fields.

## Gas Reserves Audit – Angola

For ALNG and its shareholders, GaffneyCline has audited associated gas reserves, for delivery to the liquefaction plant at Soyo, annually since 2018.

## Reserves & Resources Angola

GaffneyCline has been auditing oil Reserves and Contingent Resources for the National Oil Company for some 20 years. As an integral part of the annual process, GaffneyCline works closely with the Reserves Committee and provides detailed training for the client staff. Each update is undertaken in accordance with SPE PRMS definitions.

## Gas Conceptual Development & Utilisation – Angola

GaffneyCline undertook a conceptual development and gas utilization study for a group of gas reservoirs and prospects. GaffneyCline first reviewed the potential options for use of the gas, including power generation, chemical production and LNG. The subsurface data were reviewed and used to make estimates of the range of recoverable gas volumes and the number of wells required. Two end-point scenarios were retained to bracket the range of possibilities; a low case corresponding to the currently discovered reservoirs only, and a high case assuming that additional prospects would be successfully drilled. Conceptual phased development plans were proposed for both scenarios, out-lining options for platform or sub-sea developments, sizing, location and timing of processing facilities, etc. Preliminary economic estimates were made showing condensate yield to be a key parameter. Recommendations were made for future appraisal of the reservoirs, for future studies as more data become available, and on the need to firm up options for gas utilization.

## Onshore Assistance Angola

For a private local company that had been offered operatorship of an onshore licence, GaffneyCline reviewed all available data, in a dataroom in Angola, to provide an initial opinion on the prospectivity of the block. As well as reviewing seismic and well information to identify leads, GaffneyCline provided a work programme to cover the first three years' activities and the drilling of an initial exploration well.

## Gas Reserves, Angola

GaffneyCline reviewed and certified the gas resources plus the potential in a series of offshore blocks to enable plans to be developed for a gas conservation program, leading to possible export options. The work also included the development of long term production forecasts for associated and non-associated gas to assist the client's planning for the exploitation of these gas resources.

# Our Experience

## Review of Offshore Block – Angola

For a non-operating partner, GaffneyCline conducted a review of the potential for redevelopment of shallow water block. The work involved public domain searches of production history and known data regarding the condition of equipment and the state of developments at the time of shut in, and then proposed a potential redevelopment scheme with initial costs and economics.

## Probabilistic Production Profile Generation – Angola

GaffneyCline undertook an analysis of production, at concession or group of field level, to establish the production history, decline rates and forecasts. Facilities performance were analysed from historical production, in order to generate reliability and throughput data. All these data were used to populate a Monte Carlo Analysis that provided time-sequence estimates of probable production at block and country level, over a 20 year horizon.

## LNG Project Development, Angola

For the national oil company, GaffneyCline provided support and technical/commercial input to the development of a major LNG project in the country. In addition to guiding the client with its ongoing discussions, GaffneyCline's represented the client during partner meetings, to review key aspects of the project's development. During these meetings, GaffneyCline helped to guide the overall project development process towards major decision points, while ensuring that the client's interests were effectively represented.

## Audit of Economic Model, Angola

GaffneyCline was commissioned by an independent oil company to carry out the review and assessment of an economic model of an Angolan offshore field plus prospects. The client required an opinion on whether the economic model, accurately reflected the development, PSC and JOA terms. Additionally, GaffneyCline built its own economic model for the Block in order to benchmark the original and to establish whether there were significant discrepancies.

## Abandonment Planning, Angola

For the National Oil Company, GaffneyCline undertook a technical, financial and management audit of an Abandonment Plan and subsidiary documentation prepared by an Operator of an offshore concession. The work included development of a template for the preparation of abandonment plans (for issuing to Operators), construction of economic models to assess financial aspects of abandonment, and the secondment and training of client staff, within GaffneyCline, in the methodology of auditing.

## Mozambique – Deepwater Gas Field Development Plans

On behalf of MIREME (Ministry of Mineral Resources and Energy – Mozambique) GaffneyCline undertook two separate reviews of the FDPs of deep water gas fields in two blocks in the Rovuma Basin to determine if the FDPs provided the best solutions. GaffneyCline reviewed the strategy and the development models, geological and reservoir engineering aspects, projected production schedules including an evaluation of the impact of connections of existing or planned facilities and fields, subsea systems (gathering systems plus trunk pipelines, etc.). The reports also presented associated project economics and monetisation considerations.

## 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 and commercial evaluation: LNG Market Analysis and Industry Trends, Domestic Regional and International Gas Supply/Demand, Domestic Gas Market Obligations, 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.

## Additional Development Requirements for two Gas Fields in Mozambique

For an African client, GaffneyCline assessed the Reserves in two fields plus the additional developments required to meet the Gas Sales Agreements to which it had committed, and the volumes potentially available for further sales agreements. GaffneyCline estimated the Proved, Probable and Possible Reserves to SPE PRMS definitions. Additionally, GaffneyCline estimated the 'Remaining Volumes' as defined by the first GSA, thus fulfilling the obligation within that GSA for an independent assessment, once cumulative production from the field reached ten percent of the pre production Reserves.

## Gas-Fired Power Generation Economics & Potential Natural Gas Demand

GaffneyCline examined the economics of new coal-based and gas-based power generation facilities in South Africa. GaffneyCline forecast sales volumes and the price at which natural gas could be sold to such a facility under a number of different scenarios.

# Our Experience

## Reserves Estimation, Mozambique

GaffneyCline provided an estimation of the Reasonably Certain Recoverable Gas (Proved) for a production area onshore Mozambique. The Reserves were estimated according to the methodology and definitions required by the Gas Sales Agreement and original approved development plan. GIIP was estimated using a deterministic methodology for one field while dynamic data was used for another. GaffneyCline conducted a probabilistic evaluation of GIIP to constrain the ranges and compare to dynamic data. An extensive existing data base of well and seismic data was provided and was used by GaffneyCline in the analysis.

## Review of Development Options, Mozambique

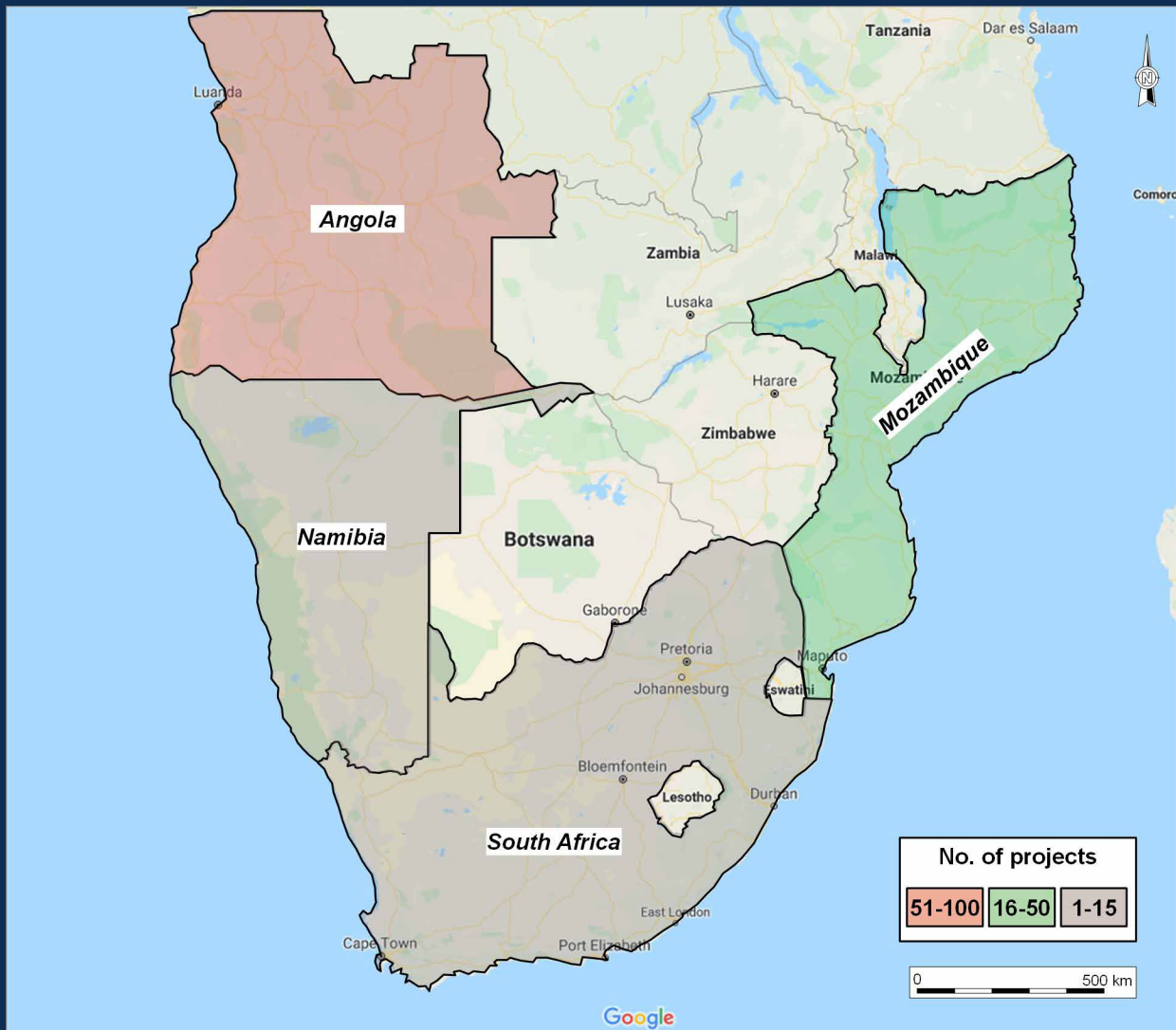
GaffneyCline was requested by an integrated energy company to provide a review of development options to sustain gas production from two currently producing fields. GaffneyCline provided an independent evaluation of the sustainment programme required to deliver a specified plateau production rate. Volumes were estimated using deterministic and probabilistic methodology on a large data set of well data for both fields. In addition, dynamic data P/Z were used to determine gas in place range for one of the fields. Different scenarios were modelled to determine duration of plateau for different levels of GIIP and additional development wells required to meet sales contracts.

## Independent Audit and Certification of Contingent Gas Resources, Offshore South/West Africa

For a South/West African national oil company, GaffneyCline carried out a Certification of Contingent Remaining Gas Resources on selected offshore properties. The gas resources were assessed on the basis of technical information supplied by both the national oil company and the operator.

## Gas Reserves Audit, Namibia

On behalf of a utility company and partners, GaffneyCline undertook a comprehensive gas study in order to determine the proven gas reserves for direct use in a project for a potential new gas-fired combined-cycle power station. The study included the costs and economics of the upstream development project and the non-power market for gas, both locally and in an adjacent country.



# Our Experience

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## Gas Supply Agreements for LNG

As part of ongoing assistance to a major African national oil company, GaffneyCline provided advice and assistance on gas supply agreements for a planned LNG project. GaffneyCline reviewed the status of the supply agreements and presented its initial views and opinions. Subsequently, consolidation was provided through a report which addressed the key issues around the proposed gas supply arrangements and provided thoughts and conclusions on the most appropriate way forward.

## Gas Utilisation Plan

For an investment bank, GaffneyCline reviewed a gas strategy document which had been previously developed for the Ministry of Energy in South Africa. The document addressed internal and external gas sources, the gas market, timescales to implementation and likely landed gas prices. Enabling legislation was addressed as was the need to establish a viable gas industry within the country. GaffneyCline's critique highlighted optimism in the plan regarding the availability of shale and pipeline gas, and the disconnected nature of the gas market development recommendations.

## South Africa LNG and Gas Advice

GaffneyCline investigated potential LNG import facility sites and gas delivery systems to certain South African power plants, and a GTL plant. The consortium investigated onshore and floating regas facilities, sites and delivery systems including onshore and offshore pipelines, LNG trucking and CNG shipping. Commercial advice centred around LNG price scenarios in the light of increasing supply, on LNG supply contract commercial terms, volumes and contract mechanisms. Other work included financial and economic modelling and investigation of the pricing mechanisms likely to be on offer.

## Appraisal of Ammonia Plant

On behalf of the national energy company, GaffneyCline assisted in the appraisal of the potential development of a world-scale ammonia plant, proposed by a third party entity for location in the client's home country. The proposal was being considered as one of a number of options to monetize future natural gas resources. GaffneyCline offered analysis and opinion on future prospects for the global ammonia industry (supply/demand, pricing, ammonia technologies, likely supply competitiveness of the proposed project), as well as commentary on project specifics (including suitability of the third party as a partner), so that the feasibility and attractiveness of the third party's proposals could be assessed. In addition GaffneyCline offered relevant views on the ammonia market and the robustness of the proposed project.

## Offshore Pipeline FEED

GaffneyCline was requested to review the FEED basis of design for a gas pipeline network in Angola. The pipeline network provided gas supplies to an onshore LNG liquefaction plant, using gas transported in the dense phase from contiguous deep water fields. The review highlighted several inconsistencies in the design basis, including an inflexibility to satisfy client demand requirements; this resulted in the client negotiating modifications to design basis.

## Monitoring/Review of Studies Assessing Gas Monetisation and Gas Delivery Options

On behalf of an African National Oil Company, GaffneyCline acted as the 'eyes and ears' of the client during the review of a study assessing the practicality of a gas monetisation project. This project was to form the second gas utilisation project in the client's country and was intended to integrate as much as possible with the primary gas monetisation project that was already being planned. On an ongoing basis, GaffneyCline reviewed the study's draft conclusions as they were issued, and offered constructive comments on behalf of the client for subsequent addressing by the study team. GaffneyCline also acted as the client's representative during presentation of the study's results at the Draft Report stage, again raising appropriate comments and queries regarding the conclusions being drawn.

## Asset Valuation, Offshore South Africa

GaffneyCline was retained to carry out an independent audit of the offshore hydrocarbon assets held by its client and partnering company. The audit involved a review of the client's in-house work and an evaluation based on existing sales agreements and potential market opportunities. GaffneyCline also provided guidance and suggestions to assist the client in completing its own valuation and thereby maximize the value of the assets.

## Audit of Operator's Abandonment Plan

At the request of a state oil company, GaffneyCline undertook an audit of an Operator's Abandonment Plan for wells and facilities within an offshore concession area. The client sought assurance that the timing of abandonment in each Development Area, projected abandonment costs and procedures, and funding of these costs beforehand through a cash-call mechanism, were appropriate. GaffneyCline reviewed the legal, contractual and industrial framework relevant to abandonment in the country, visited the offshore installations, analysed the inter-dependence of these, and critically reviewed the Abandonment Plan document, itself.

# Gaffney Cline

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

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