





# 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 is well known as one of the leading suppliers of Reserves and Resources assessments, which are required for many purposes including statutory reporting, stock exchange listing, development planning, project finance, and asset valuation.



## Introduction (continued)

In addition, GaffneyCline offers a full range of upstream, midstream and downstream consultancy services. These include seismic interpretation, static and dynamic reservoir modelling, field development planning, facilities and pipeline engineering, gas monetisation, LNG/GTL, mergers and acquisitions, economics and project finance, unitisation and redetermination, and expert witness work. GaffneyCline operates worldwide from three main offices in London, Houston and Singapore, and from regional offices located in Buenos Aires, Sydney and Dubai.

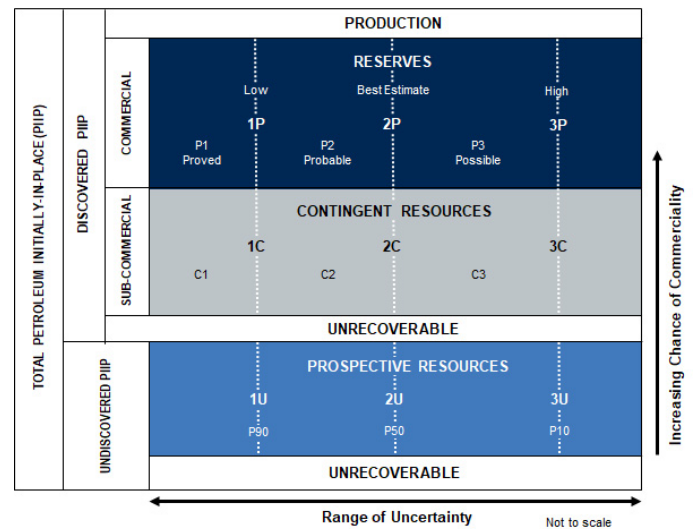
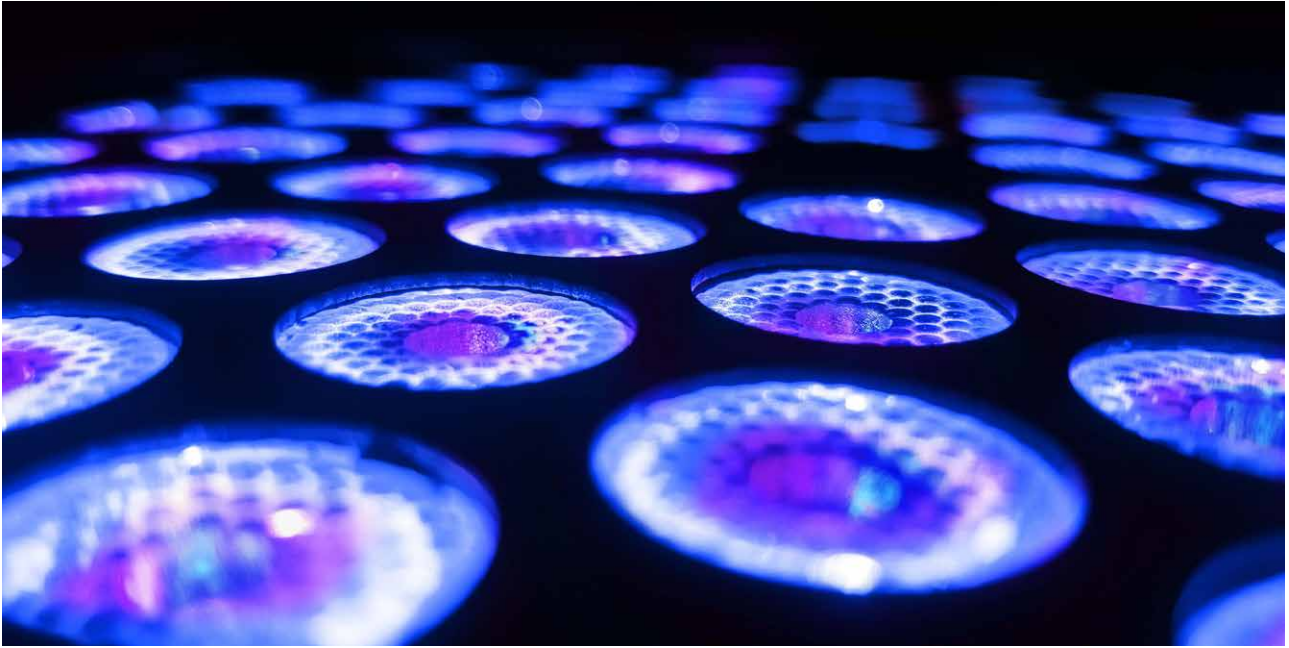


Figure 1: PRMS Framework

## Reserves & Resources Classification Systems

GaffneyCline has a comprehensive knowledge of all internationally recognised Reserves and Resources classification systems and considerable experience in the independent assessment of Reserves and Resources. GaffneyCline has a long standing commitment to the development and use of industry standard procedures, through direct involvement in major professional bodies. Indeed GaffneyCline currently has two members (including a past Chairman) on the Oil and Gas Reserves Committee (OGRC) of the Society of Petroleum Engineers (SPE), which is tasked with drafting revisions to the SPE Petroleum

Resource Management System (PRMS) framework (Figure 1). Utilizing its expertise, GaffneyCline regularly provides independent Reserves and Resources reports in line with the SPE PRMS, which is accepted by many Stock Exchanges including London (Main Board and AIM), Australia (ASX) and Singapore (SGX), the requirements of the US Securities and Exchange Commission (SEC), or Canadian National Instrument (NI) 51-101 as required for the Alberta and Toronto Stock Exchanges. GaffneyCline also has extensive experience of the former Soviet Union system and its various successors.



## Reserves & Resources Estimation and/or Audit Projects

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Over more than 50 years, GaffneyCline has undertaken many thousands of Reserves and Resources assessments covering all types of reservoirs and hydrocarbons and all the world's major petroleum basins. An assessment may take the form of an audit, which involves a review of estimates of Reserves and Resources proposed by the client in order to form an opinion on the adequacy of the data relied upon and the methods used, and ultimately on the reasonableness of the resulting estimates. Alternatively, GaffneyCline may undertake an independent estimation of Reserves and Resources based on the data supplied by the client. In addition

to assessments and reporting, GaffneyCline provides training courses and workshops in the application of the above standards. GaffneyCline's experience is too extensive to provide in detail here, and as most of GaffneyCline's work is confidential, it is not possible in many instances to name clients and specific fields. However, to illustrate further the breadth and depth of GaffneyCline's work, brief summaries of some projects recently undertaken by GaffneyCline have been provided on the following pages.



## Our Experience

GaffneyCline has 50+ years of consulting experience across the breadth of the energy industry in every major sedimentary basin worldwide. Reserve and Resource audit and assessment is the foundation from which GaffneyCline has built a truly comprehensive oil and gas consultancy. As it moves towards its 60th year, GaffneyCline continues to support its clients by providing unparalleled and independent technical and commercial advice.

### Annual Assessments – Angola

For many years GaffneyCline has provided year-end Reserves and Contingent Resources reports in Angola for Sonangol EP (the then Concessionaire) and Sonangol P&P (the Operating company). This has involved the independent assessment and audit of oil fields and discoveries, onshore and offshore in the Lower Congo and Kwanza basins. The Reserves and Contingent Resources reporting is in accordance with SPE PRMS. In addition to annual reporting, GaffneyCline has supported Sonangol EP and Sonangol P&P with training and workshops in the audit and independent assessment of Reserves and Resources. More recently GaffneyCline has also been auditing gas reserves in Angola on behalf of Angola LNG and its shareholders.

### Independent Assessments – Turkmenistan

GaffneyCline has been regularly retained by the Turkmen State Corporation, Turkmengeologiya and State Concern TurkmenGas to provide independent assessments of the Gas in Place, Reserves and Contingent Resources for the super giant onshore Galkynysh gas field as well as other fields in Turkmenistan. These projects have involved comprehensive subsurface evaluations including geophysical and petrophysical interpretations which were integrated into detailed static and dynamic reservoir models combining all available geoscience and engineering data.

### Reserves and Resources Audit Middle East

For a Middle Eastern Wealth Fund, and for four consecutive years, GaffneyCline audited the client's Reserves and Contingent Resources estimates in a large, undeveloped, fractured carbonate oil reservoir in Iraq, for year end reporting purposes. In the most recent case, additional wells and a significant volume of production testing had been performed since the previous audit. The new work integrated static and dynamic reservoir models which were used to estimate STOIP and production profiles. GaffneyCline audited the models and the resulting estimates, as well as costs and economic limit calculations. Reserves and Contingent Resources were reported in accordance with the definitions and guidelines of SPE PRMS.

### Independent Assessments – India

For a major Indian operator, GaffneyCline undertook a detailed analysis and independent assessment of the Reserves for a major development offshore Eastern India. GaffneyCline's Reserves opinion was based on all available geoscience, reservoir engineering and production data. This analysis confirmed a reduction in ultimate recoverable volumes of gas, and highlighted the importance of onshore gas compression to continued field life. Following this assessment, GaffneyCline evaluated other nearby gas discoveries that the client is considering for tie back to the field infrastructure. GaffneyCline estimated In Place volumes and Contingent Resources for these discoveries.

### Technical Specialist Report (CBM) Australia

For an independent operator, GaffneyCline prepared a Technical Specialist Report for a Target Statement to shareholders, following an acquisition of shares. The report included an assessment of the Reserves and exploration potential in and around Coalbed Methane assets in Queensland, Australia.

### Reserves Evaluation – China

GaffneyCline evaluated the Reserves for an onshore Chinese oil development. A comprehensive analysis of the development plan was undertaken, including steam injection plans and associated capital and operating costs. The certified Reserves were input into a Competent Person's Report which was used for a stock exchange listing. The field is analogous to a deep (more than 3,200 m) heavy oil reservoir which was previously assessed for Reserves by GaffneyCline for a national oil company.

### Year End Reserves Update – North Sea

GaffneyCline recently prepared a comprehensive year end Reserves update for a portfolio of fields in the UK North Sea operated by the client, a mid sized independent company with a strong UKCS focus. This assessment led to an overall increase in Reserves.

### Reserves Report – USA

On behalf of a mid sized international independent oil company GCA was engaged to provide a detailed written report estimating proved and probable Reserves in addition to future revenue for a number of tight oil and shale gas properties located in the Barnett Shale in North Texas.

### Reserves and Resources Report Middle East

On behalf of an independent Middle Eastern oil company GaffneyCline prepared a report on the Reserves and Contingent Resources of an Egyptian onshore Eastern Desert asset which contained several producing oil fields. The majority of the fields are very mature; however opportunities for infill drilling and water injection were identified. Production profiles were estimated predominantly through decline curve analysis and the Operator's reservoir models were used to underpin the estimates for the water injection project. Reserves and Contingent Resources were estimated in line with the SPE PRMS and GaffneyCline prepared cash flows and Net Present Values for each Reserves case.

### Reserves and Resources Audit Vietnam

GaffneyCline audited Reserves, Contingent and Prospective Resources for two fields in the Cuu Long Basin, offshore Vietnam, for a company listed on the London Stock Exchange, using the SPE PRMS guidelines. The larger of the two fields had been in production for four years and comprised more than 100 separate oil accumulations in stacked reservoir sands, deposited in fluvio-lacustrine environments, in a series of adjacent fault blocks. Extensive good quality seismic, log and production/pressure data were available permitting detailed modelling of the field; all of which was reviewed and cross checked by GaffneyCline during its audit. The principal reservoir in the smaller field, which had been producing oil for more than six years, was in fractured zones in the pre Tertiary igneous basement. Reserves and Resources were assessed on the basis of reservoir modeling, decline curve analysis and analogue field information.



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

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