



Experts in The Middle East

**Gaffney,
Cline &
Associates**

Who is Gaffney, Cline & Associates?

Gaffney, Cline & Associates (GCA) is a global consultancy that has been offering technical, commercial, and strategic advice to the oil and gas sector for over 50 years. GCA's reputation demonstrates that advice, along with its insight, is high-quality, impartial, technically based, and commercially astute. GCA is often referred to as one of the leading Reserves consultants within the industry, but in reality, GCA 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 monetization, LNG/GTL, mergers and acquisition, economics and project finance. GCA operates worldwide from three main offices in London, Houston and Singapore, and from regional offices located in Dubai, Argentina and Australia.

The Middle East

Claiming >38% of the World's Proved Oil reserves and >24% of the Proved Gas reserves, The Middle East has been a region in which GCA has conducted significant business. Our clients range from small exploration companies to major oil companies, NOC's and Banks. GCA has undertaken 229 projects in the region over the past ten years. These have been varied in nature; from Independent Reserves Estimations and Asset Reviews to Evaluation Studies, Field Development Plans through to Contractual advice, Arbitrations, Acquisitions and Gas Utilization.

Economic Evaluation of NOC Projects: GCA undertook an economic evaluation of a Middle Eastern National Oil Company at the request of the Company's management. The objective was to demonstrate the value of further investment in the Company by the government. GCA estimated the Net Present Value (NPV) of a "no further investment" case and the NPV, Risked NPV or Expected Monetary Value (EMV), as appropriate, of four projects involving further capital investment. These included an EOR (miscible gas injection) project. The estimates of NPV and EMV were based on production and cost forecasts provided by the Company.

Technical and Economic Audit of the Oil Reserves Middle East: For an independent operator, GCA carried out a technical and economic audit of the oil Reserves for a number of carbonate reservoir fields in the Middle East. Some of the fields had been on stream for several decades, while one was a new development. The operator had built Petrel and Eclipse models for all the fields, including one with over 20 different Eclipse models to simulate the different reservoirs. All models were reviewed, with a more detailed review carried out on one of the reservoirs in order to verify the modelling strategy and results. The operator did not present low cases for the fields on production, and hence decline curve analysis was carried out and the results employed for GCA's low estimate of technically recoverable volumes. For the field development, a number of independent interpretations of the seismic data were performed to verify the best case presented by the operator and, more importantly, to assess the low case volumes. An Economic Limit Test was performed in order to categorise the profiles into Reserves and Contingent Resources. GCA used the SPE PRMS as the basis for the classification and categorization of hydrocarbon volumes.

Petroleum Contracts and Licensing Directorate, Iraq: GCA was engaged by the PCLD of Iraq's Ministry of Oil to assist in the development of the Nasiriya Integrated Project – a project to develop a 4+ billion barrel field in conjunction with a new-build 300,000 bopd refinery. This followed GCA's

successful design and implementation of the country's first four upstream licensing rounds that resulted in seventeen contracts contemplating over US\$150 billion in investment. GCA was tasked with a wide range of technical and managerial responsibilities, from preparing data packages and communications with prospective bidders to assisting PCLD in determining appropriate contractual terms, award criteria and bidding procedures.

Audit of Reserves and Resources and Economic Evaluation of NOC Projects: For the fifth successive year, GCA audited the methodology used by a Middle Eastern National Oil Company in estimating and reporting its Reserves, Contingent Resources and Prospective Resources. The company's Reserves and Resources lie mostly in mature, offshore oil fields, for which decline curve analysis was used to estimate Reserves. Some further development projects, including EOR schemes and an unconventional oil pilot project, fell into the Contingent Resources class. Over the years, the company had been developing and improving its methodology, taking on board advice from GCA, to bring it into line with industry best practice and the definitions and guidelines of the SPE PRMS. GCA also undertook an economic evaluation of the company's development projects. The objective was to demonstrate the value of further investment in the Company to the government. GCA estimated the Net Present Value (NPV) of a "no further investment" case and the NPV or Expected Monetary Value (EMV), as appropriate, of five major projects involving further capital investment.

Development Feasibility Iraq: For a European oil company, GCA undertook an initial review of the available data and documentation to assess the development feasibility of a discovery in northern Iraq. This work was undertaken in conjunction with engineers and geoscientists from both the client and the Iraqi Ministry. GCA's report reviewed the interpretation of all the re-processed seismic data, the interpretation of the digital well logs and of the well test results. These interpretations were integrated to produce an assessment of the oil in place, recoverable oil and recommendations for future work.

Exploration Block Evaluation, Oman: For an Asian operator, GCA attended a data room together with the client and staff and led the evaluation of all geological data. Advice was also provided to assist in a more detailed geological assessment, the outlining of potential future work plans and the costing of such plans. The client proceeded with the acquisition of this asset.

Technical/Economic Analysis of Prospective LPG Joint Venture: On behalf of a national organisation, GCA conducted a study of relevant economic, technical and strategic factors to assist in assessing the merits of a prospective LPG Joint Venture. GCA's findings assisted in negotiations between the parties and enabled the client fully to judge the merits of such participation.

Comparative Economics and Artificial Lift, Saudi Arabia: For an independent oil company, GCA reviewed the comparative economics of alternative artificial lift schemes. Gas lift and submersible pumps were considered and the relative economics of each scheme were evaluated over a 5-year period to ascertain the most economical and practically feasible method for the particular field. Sensitivity runs were carried out to test the effect of each scheme over the full field operating life to determine the optimum artificial lift system requirements.

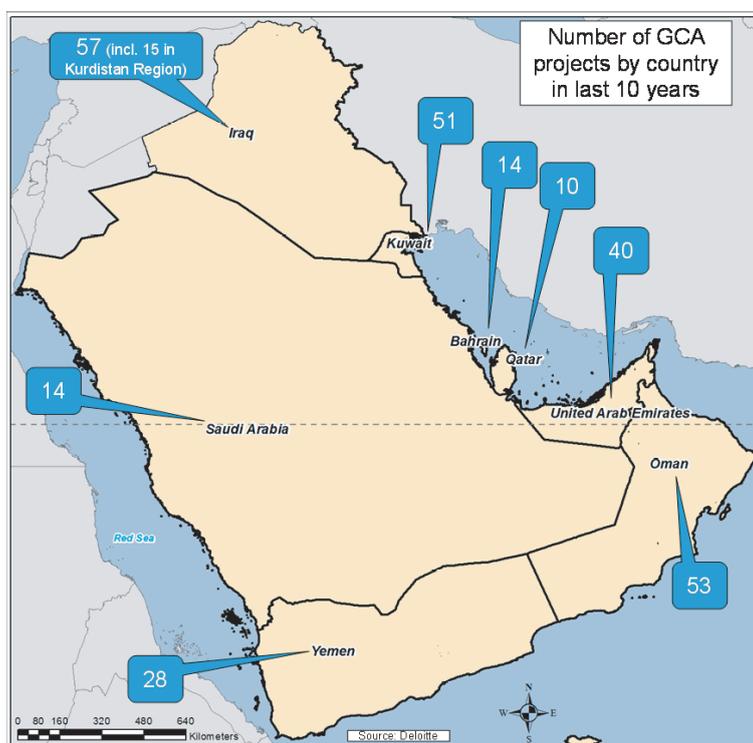
Development Feasibility, Yemen: For a North American company, GCA carried out an outline feasibility study and provided strategic development planning assistance in respect of their Middle East interest. GCA assisted in the planning and execution of technical studies and preparation of the documentation required to comply with the Declaration of Commerciality.

Independent Resource Assessment, Iraq: For an independent Asian oil company, GCA prepared a Reserve, Contingent Resource and Prospective Resource report on its oil and gas assets in Kurdistan. GCA audited the client's geological models plus production statistics and budget estimates (Capex & Opex) for a full field development.

Steam Flood Review, Oman: For a major investor, GCA conducted a detailed audit and analysis of a major Omani steam flood project for the purposes of project finance. The project included visits to the operator, the field facilities, detailed analysis of Petrel models, production performance and type curve matching of steam flood performance. A significant volume of work was conducted on water processing, steam raising, capital and operating cost trends and the final product comprised a large integrated report documenting the basis for a series of production and cost forecasts reflecting the range of uncertainty as the field approached the end of the first main phase of development.

Review of EOR Potential of Middle East Reservoirs: GCA undertook a review of the potential for enhanced oil recovery using CO₂ injection in a portfolio of eight Middle East reservoirs. GCA carried out a comprehensive literature survey of EOR projects worldwide and compared key reservoir characteristics that determine the success of EOR via CO₂ injection of the eight reservoirs with those of existing projects. GCA used a variety of published techniques to screen the reservoirs and to rank them against each other, and against other projects worldwide. GCA developed an equation of state, matched against laboratory experimental results, for the highest ranking reservoir fluid. This was used in an analytical slimtube model to estimate the minimum miscibility pressure between reservoir crude and CO₂ as well as between reservoir crude and various mixtures of CO₂ and hydrocarbon gases. The proposed development plan was reviewed and estimates were made of potential volumes of enhanced oil recovery, net and gross CO₂ utilisation factors and CO₂ retention factors.

Well Test Analysis, U.A.E.: GCA provided well test analyses on six wells in the Margham Field, Dubai. The results of the analysis were later incorporated into a report on Margham Field Simulation and Economic Analysis Study.



Reserves Management System, Kuwait: GCA was retained to advise the State of Kuwait with respect to its Reserves Management System. The State of Kuwait has approximately 10% of the world's oil reserves and this very significant project involved the application of a technical understanding of conditions faced in the different reservoirs, and the quantitative methodologies required to assess and improve management and economic performance of the reserves base.

Full Reservoir Study, Iraq: For an Iraqi Regional Oil Company, GCA carried out a reservoir study of the Nahr Umr Reservoir in one of its partially developed fields. The scope of work comprised, seismic interpretation, reservoir characterization, static and dynamic modeling, the design of a horizontal side track from an existing well and forecasting for a set of field development scenarios to identify the optimum development option for the field.

Gas Study, Qatar: For a consortium investigating potential export markets for natural gas from the Middle East, GCA examined the prospects for regional gas export from Dubai, Kuwait, eastern Saudi Arabia and Bahrain. GCA's study included determination of the netback gas price required for the gas to be competitive with other fuels in the market; an assessment of the competition in these markets; and quantification of the optimum timing for gas export opportunities. Potential domestic demand, gas transportation costs and prices were determined for each of the subject countries, together with a comprehensive assessment of gas market competition from other Middle Eastern countries.

Regulatory Advice and Negotiation Assistance, Middle East: GCA was retained by the Ministry and National Oil Company of a major Middle East oil producing nation, to provide assistance in connection with the attraction of foreign investment for the development of its natural gas industry. This work covered technical, commercial, financial and contractual advice on both upstream and midstream regulatory issues. It also involved support in negotiations and counter-party discussions, together with a significant level of work with, and presentations to, senior corporate executives and ministers from a number of government ministries. Work has been performed both in GCA's UK offices, and through a significant on-the-ground presence in the client's offices. The work involved extensive training sessions, including workshops, to address major regulatory, technical and strategic issues.

Gas Reserves Estimation: GCA assisted a Middle East-based National Oil Company to estimate the Reserves of its largest gas field. The project involved a review of all field data plus recent technical studies. A reservoir simulation model was constructed to forecast the future performance of the field, assuming several scenarios defined by GCA and the client.

Waterflood Management for the Recovery of Hydrocarbon Resources: At the request of a major Middle East state oil company, GCA undertook a review of international best practice in the waterflooding of carbonate and clastic reservoirs, based on public domain information. This considered reservoir characterisation, depletion mechanisms, reservoir and production surveillance, reservoir simulation, decision-making, project implementation and knowledge management, particularly in relation to the dissemination of lessons learned within the operator organisation. Key performance indicators were identified, and used to compare a wide range of fields, in terms of size, reservoir type, fiscal conditions, and developmental and operational methodologies. This enabled the client to assess its position and address issues within the overall waterflood management process, covering both technical and organisational matters.

Investor Advice for IPP, Middle East: GCA assisted Middle Eastern investors in connection with the pre-feasibility evaluation of an engineering, procurement and construction project for a gas fired power plant, including discussions with potential IPP.

Additional Information

For more information about GCA's integrated services, please contact your local GCA office.

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