



Experts in the North Sea

**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 opened its first office in London in 1966, since this time GCA has looked at all sectors of the North Sea (UK, Norway, Netherlands and Denmark), as well as onshore, west of Britain, west of Shetlands, Norwegian Sea and up into Barents Sea. Studies have been undertaken on all hydrocarbon types in conventional and unconventional settings (from CBM through to heavy oil). The North Sea has found and produced hydrocarbons from the widest range of stratigraphic ages in the world and GCA has assessed them all. But it is not just about the hydrocarbons and the reservoirs; GCA has worked at all stages of the business from prospect development through to abandonment. Assistance has been provided, amongst other things, for acquisition due diligence, unitisation and redetermination, financing, field development planning, cost analysis, IPOs, LNG plants, infrastructure assessments, insurance claims, legal disputes and of course Reserves. Selected project summaries are presented below to give a flavour of our portfolio. Please contact us using details on the back cover to learn more.

Assessment of Future Work Programme, UK North Sea;

During 2014, GCA undertook an asset review of a major North Sea operator's activities and plans. This project assessed the current production, future production potential, development and exploration portfolio of the company. The aim was to develop an independent assessment of the potential, and to assess the technical "doability" of the work programme (capital unconstrained). The key findings of the study were:-

- Production forecasts often include assumptions on production efficiency that is not supported by historical data and would require significant investment to achieve.
- Whilst individual opportunities were often robust, that the aggregation of the activities was extremely challenging given technical, operational and commercial constraints.
- The desire to maximize production whilst having to undertake essential maintenance was an issue that consistently resulted in delays to the activities required to achieve the production forecasts.
- The potential developments and exploration opportunities were heavily dependent on success elsewhere, some deemed unlikely given historical activity.
- The study indicated that when choices are made it is not possible to access all of the portfolio, and that some opportunities would be forsaken in order to achieve others, and that it is very unlikely that the forecasts could ever be realised.
- CAPEX / OPEX discipline had been historically weak and internal processes were only starting to address these issues. This results (in part) to over valuation of opportunities.

M&A Due Diligence:

GCA reviewed the SNS portfolio of a major gas producer with a range of fields from late life to recent start-up. This involved subsurface review (static and dynamic models and supporting data), field development plans and production forecasts for operated and non-operated fields, and also CAPEX estimates for further development and OPEX for all the fields. The focus of the project was on the new operated developments where remaining reservoir uncertainty was addressed using a number of deterministic scenarios. For the more mature developments field (well) performance was the basis for production forecasting. In many of these assets the key factor in estimating reserves was the OPEX estimates and timing of the abandonment of nearby fields.

Abandonment Costs:

At the request of a bank and on behalf of their clients (a European utility), GCA were asked to perform a review and give an independent view on the abandonment costs of certain fields as estimated by the operator. GCA's letter report included details of

the current British Government Legislation, the taxation position and provided likely potential total abandonment costs. The likely options for abandonment of the relevant fields were also summarised and costs associated with the individual fields were reviewed in some detail.

Valuation of six North Sea Blocks:

On behalf of a major British independent GCA provided a Fair Market Value for six UK North Sea blocks based on a willing buyer/willing seller concept. Each block was valued separately and included fields likely to be developed and on production within the next 5 years, discoveries not yet sufficiently appraised to be on production within 5 years and exploration areas. Production profiles, investment and operating costs were prepared where appropriate and other areas were evaluated using risk assessment procedures.

Acquisition of UK Exploration Properties:

GCA was commissioned by an independent oil company to provide assistance in the evaluation of exploration acreage acquisition opportunities in the UK continental shelf. GCA prepared a summary of existing UKCS license holders, blocks held and exploration status and, by applying a number of screens, to highgrade and select targets to identified criteria. A second phase involved a more detailed review of the geological and commercial potential of the confirmed target list. The third phase covered a more rigorous evaluation of the companies with particular regard to the potential for acquisition.

Review of Field Model for Equity Determination, North Sea:

For one of the Partners in a large offshore oil and gas field, GCA undertook an audit of the Operator's reservoir model and its tabled variations in preparation for a redetermination of equity. Deliverables included sensitivities of the Partner's equity share to the different forms that the final proposed Operator's model might take.

Preparation for Redetermination, North Sea:

For a major IOC holding non operating equity in a large North Sea oil field, GCA undertook a year long independent analysis to support preparation for a possible equity re-determination. The work used the methods specified in the field's Unit Operating Agreement (UOA) and involved rigorous data management and quality control of all information and data. The UOA procedures had not been re written since the early 1980's and many of the specified procedures used were obsolete when compared with current industry best practice. This required GCA to develop methods and routines which complied with the UOA requirements, whilst still incorporating up-to-date concepts and ideas. In parallel, GCA used the same dataset and

current industry best practice methods (geocellular modeling) to derive alternative STOOIP estimates for the field. This allowed GCA to develop a clear understanding of the effect on the STOOIP (and therefore the Tract Participation) associated with the UOA method versus current industry best practice methods.

UK North Sea E&P Strategy Evaluation:

For the energy division of a giant European conglomerate, GCA prepared an evaluation of the current state of the UK North Sea E&P industry. This included technology factors driving both exploration and development success and future upside, plus tax, tariff and other non-technical components of the strategic investment environment. A review of selected companies' past entry strategies and outcomes was complimented by an overview of the competition and a look at the client's capabilities compared with requirements for success.

Review of Late-Life Potential for Selected Oilfields:

GCA was commissioned to carry out a review of certain UK North Sea oilfields to determine which, if any, have potential for increased reserves beyond that which were currently recognised. GCA reviewed 23 fields which were highgraded according to their late-life development potential and provided comments on four undeveloped fields at the request of the client.

Field Review Update:

For a lead bank, GCA carried out a complete review of the oil in place and reserves estimates for a major new oilfield development in the North Sea. The study covered a detailed assessment of the structure mapping and petrophysics to estimate the in-place hydrocarbons. Engineering work included an overall review of the development plan, estimation of the recoverable reserves, and a detailed assessment of the project schedule, capital/operating expenses and progress.

Review and Valuation of a North Sea Field for Sale Purposes:

GCA carried out an independent review and assessment of the reserves of an oil field for a major oil company seeking to dispose of its interest in this field. Based on an audit evaluation, the study confirmed estimates of oil in place and provided estimates of recoverable resources. Work was based on a review of the company's volumetric estimates, the operator's full field reservoir simulation, consolidation of well tests results and discussion with the client about the most likely development of the field and its potential for infill drilling and gas injection.

Evaluation - Legal Dispute:

GCA was commissioned by disaffected investors to prepare an independent report evaluating the most likely reserves and development costs for a property containing three fields in the UK. GCA conducted detailed volumetric work and audited the reserves/costs as part of this study to provide support in a legal dispute related to the major shareholder's purchase of the minority holding. Advice was also given to the attorney during depositions.

Comparison of North Sea Economics:

For a European Government agency, GCA reviewed a range of typical oil and gas field sizes, costs and economics for each North Sea national sector (Denmark, Holland, UK, Norway and Germany). Comparative commercial outcomes were developed for each 'type' field within each sector, to enable the client to assess its commercial attractiveness to additional investment.

Field Performance Review:

On behalf of a national oil company, GCA reviewed and commented on state-of-the-art technology being applied to a North Sea heavy oil development. The field development included innovative use of horizontal well completions, artificial lift and surface oil processing.

Development Plan Review, UK North Sea:

The project entailed review of the detailed development plan for a non-operating partner, for financing purposes. The emphasis of the review was on the production and project elements of the FDP, but with a review of subsurface and reservoir dynamic modelling. The scope of work included evaluation of hydraulic submersible pumps, flow assurance, separation of high water-cut heavy oil, FPSO systems design. The deliverable covered low and mid case evaluations and comment on schedule, capital and operating costs of an unusual project and FPSO configuration.

Numerical Simulation for Miscible CO₂ Flooding of Large North Sea Oil Field:

GCA carried out simulation studies for a partner in a large, mature North Sea oil field to evaluate a CO₂ flood. A compositional simulation model had been constructed by the operator, and GCA's client required a view on the reliability of the forecasts. GCA carried out detailed analyses of the basic input data, including fine scale numerical simulation of the slimtube experiments. This was used to understand the chemical processes that could occur in the reservoir under a WAG (water alternating with gas) injection scheme. The full-field model was reviewed, and the limitations of the model's ability to reproduce the chemical processes were quantified. Further uncertainties in the full-field model were quantified through multiple sensitivity runs, and an overall envelope of forecasts capturing the range of uncertainty was generated.

Valuation of Gas Processing Operation:

GCA provided an independent opinion on the value of the shares of a gas processing operation in the UK. GCA was subcontracted by the Lender as part of its consideration of the options associated with its outstanding debt. GCA's work entailed a review of the value of both the existing contracts plus those of possible future contracts.

Crude Oil Valuation:

On behalf of the Operator of two blocks in the Irish Sea, GCA evaluated the crude oil planned to be produced to enable an evaluation of the field development economics and the marketability of the crude from the field. GCA's report discussed the crude oil quality in terms of refined product quality, provided an analysis of expected refining yields, discussed the logistics of export/disposal and provided an assessment of the crude oil value compared to Brent crude.



Comprehensive Downstream Company Review Prior to Acquisition:

GCA reviewed and valued the downstream activities of a U.K. acquisition by a large European oil company. GCA's comprehensive review covered the refinery, supply and non-retail marketing divisional activities. Refinery analysis included detailed process description, plant maintenance, fire and safety practices, environmental impact, employee and industrial relations, product quality, relationship with the company's operating partner and future investment requirements. Typical product yields were also provided for a variety of operating constraints and feed conditions. Supply Division analysis included an examination of costs associated with inland distribution and product exchanges, and a review of third party processing agreements. Marketing Division analysis covered the potential international markets for the bulk disposal of product including achievable netback values, and a review of sales to the commercial and industrial sector of the domestic market. A brief analysis of the retail operation was also provided in order properly to assess the value of the assets for sale.

LNG Regasification Terminal Technical Due Diligence (UK):

GCA was engaged by a Japanese gas company to perform technical due diligence services on a LNG Regasification Terminal under construction in the UK. The Japanese gas company was looking to acquire a stakehold in the business. The appraisal included a review of electronic data room technical information and site visit, where detailed data were collected and technology and design features were assessed. GCA held meetings with construction contractors and operations management to assess the schedule and project risks. A final report was delivered within four weeks of kick-off.

Valuation and Restructuring of the SDFI:

GCA provided both technical and strategic input to the valuation and restructuring of the State's Direct Financial Interest (SDFI) for the Ministry and NPD. The project was completed in three phases. Throughout these processes, GCA was directly involved in an analysis of how the Norwegian regulatory structure influences project economics and how imbalances in the ownership distribution of the production and transport infrastructure impacts the potential value creation process.

Selected Formal Stock Market Reports



In connection with its acquisition of interests in the Orlando oil field and the Trent and Tyne gas fields in the UK North Sea and its amalgamation into the listed Northern Lights Acquisition Corp, GCA prepared an Independent Reserves report according to Canadian regulatory requirements.



Following the merger of Bridge Energy Norge AS and Silverstone Energy Limited, Bridge Energy ASA was created and listed on the Oslo Bors. GCA provided a Competent Person's Report on certain properties owned by Silverstone in the UK North Sea.



GCA undertook a review and audit of the offshore UK oil and gas assets that EnQuest acquired from Lundin Petroleum AB and Petrofac Ltd., and prepared a Competent Person's Report which was used by EnQuest in its prospectus and submitted for admission of its shares to the official list of the London Stock Exchange and secondary listed on NASDAQ OMX Stockholm.



GCA audited the petroleum interests owned by Ithaca in the U.K. North Sea and provided a Competent Person's Report.

In connection with Serica's entry onto the AIM market, GCA provided a Competent Person's report on its North Sea assets.

Additional Information

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

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