Adding Value to Methane – Strategic Opportunities for the Middle East

A Multi-Client Evaluation designed to deliver genuine Competitive Advantage to Subscribing Organisations

GOIC
منظمة الخليج للاستشارات الصناعية
Gulf Organization For Industrial Consulting

Nexant ChemSystems

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A Multi-Client Evaluation designed to deliver genuine Competitive Advantage to Subscribing Organisations

September 2006

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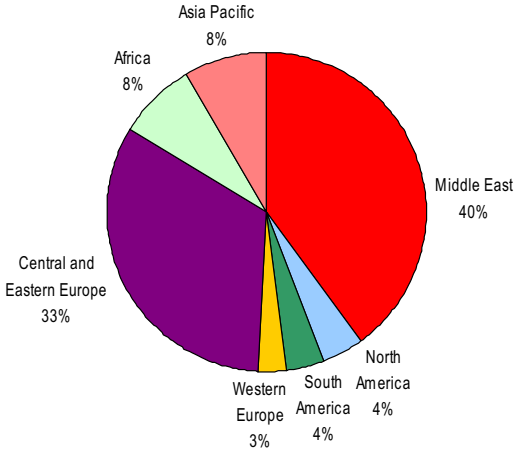
1. Introduction

The rapid development of the petrochemical industry in the Middle East has been based on the desire to add value to its substantial exports of crude oil. Associated gas, which was produced with crude oil and was re-injected or flared at the well-head, was transformed as the main feedstock for production of basic petrochemicals. Owing to a limited alternate value, the corresponding pricing structure for this feedstock was based entirely on the cost of extraction of natural gas liquids (NGL), especially ethane. This low feedstock cost base, aided by a number of fiscal incentives, acted as a primary impetus towards development of a robust petrochemical industry in the region.

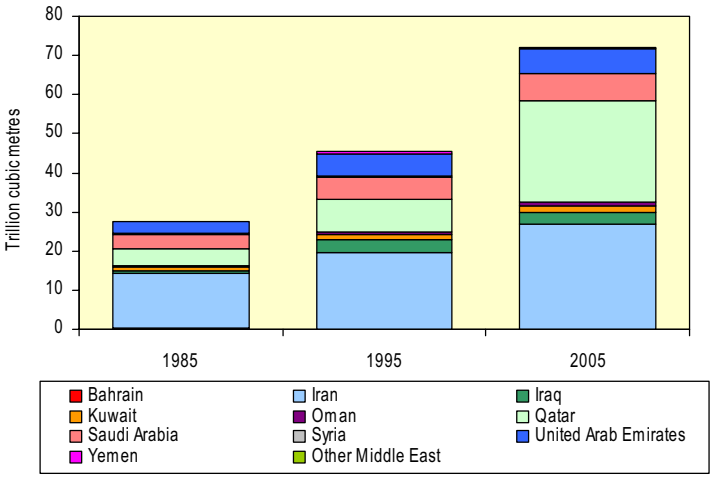
However, further increases in ethane supply from associated gas are likely to be limited as OPEC limits crude oil supply to achieve its price stabilisation targets. Thus attention is focussing increasingly on sourcing ethane for petrochemical projects from non-associated gas but this necessarily results in the need to find attractive uses for methane, which constitutes around 95 percent of non-associated, or natural, gas.

Distribution of Proven Natural Gas Reserves, 2005

(Global Total = 180 Trillion Cubic Metres)

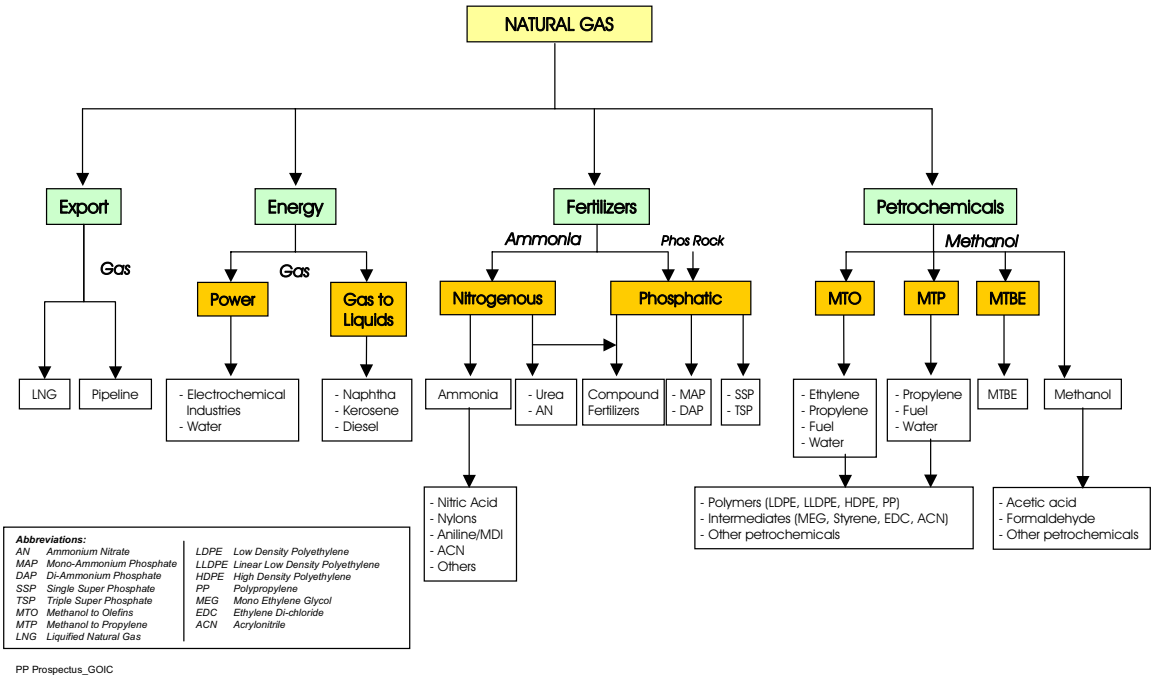


Middle Eastern Proven Natural Gas Reserves, 2005



The Middle East has been endowed with over a third of the world's proved natural gas reserves, as shown above, and both States and private sector companies are currently evaluating means of exploiting this gas optimally. Natural gas has a number of potential uses as summarised below. This strategic analysis thus aims to provide an insight into ways of adding value to natural gas. This will be essential to all planners involved in the industry, as well as for those who perceive this as a potential opportunity to expand into the region/industry.

Ways of Adding Value to Natural Gas



The region will represent a significant investment opportunity for many, and a potential threat to others. How this region develops and how it takes advantage of its sources of competitive advantage, should be of prime importance to planners globally. The challenge of how best to exploit the considerable reserves of methane in the Middle East has created the need for this strategic analysis. This study has been designed to be of benefit to all such organisations in meeting the challenges they face in participating or dealing with the fast-developing industries based on methane. It provides the necessary insight required by:

- States and companies with substantial methane resources
- Regional Producers and Consumers of methane derivative products
- Global companies intending to invest in the region
- Banks, Financial Institutions, and Agencies responsible for addressing regional policy issues.

In this environment of change and opportunity, Nexant *ChemSystems* and Gulf Organisation for Industrial Consulting (GOIC) are offering an in-depth analysis of adding value to methane. This synergistic teaming of Nexant *ChemSystems* and GOIC will ensure that both regional "on the ground" issues, and their impact on the overall global industry are examined.

2. Report Objectives

The Report provides a valuable aid for strategic planning purposes, at a time of both opportunity and challenge for methane exploitation. Key issues addressed include:

- What will be the future availability and cost of feedstock (methane)? Will pipeline and infrastructure investment prove adequate to meet demand?
- What is the market outlook for methane and its major derivatives?
- How will technology and capital cost developments impact these industries?
- How competitive will these products produced in the Middle East be with those from other regions? How attractive will investing in the Middle East be compared to elsewhere?
- How do potential methane exploitation options rank in major gas producing countries in the region? How do technical and commercial risks impact upon the potential attractiveness of these options?
- What will be the impact of strategic issues within the region such as WTO membership, the increased role of the private sector, logistics, financing options, and the potential reintegration of Iran and Iraq?
- What will be the impact of global strategic issues such as the growth of global markets, future prices and margins and the global strategies of multinational companies?
- What is likely to be the future investment direction for methane exploitation in the Middle East?

The challenge of how best to exploit the considerable reserves of methane in the Middle East has created the need for this strategic analysis. This study has been designed to be of benefit to all such organisations in meeting the challenges they face in participating or dealing with these opportunities and challenges.

These are just some of the business issues that will be addressed by the Report. Moreover, an understanding of the fundamental issues that will challenge the industry in the future will allow strategic planners to make the best use of the opportunities at their disposal.

3. Coverage

The coverage of this Report has been carefully formulated to address the critical information requirements of key players from all segments of the industry. Specifically the research parameters will embrace:

3.1 Geographic Coverage

The report considers the market dynamics of feedstock and products within the following Middle Eastern countries:

Saudi Arabia	Iran	Qatar
Kuwait	Turkey	Egypt
United Arab Emirates	Oman	Iraq
Bahrain	Others	

In addition, the impact of Middle East production on global trade and on net importing regions are examined as are the drivers for global growth. The delivered cost competitiveness analysis reflects the delivered costs of Middle East products to Asian and European markets, and compares these costs with those of Asian and European domestic producers as well as those of other potential exporters to these markets.

3.2 Product Coverage

The report reviews the major existing or potential uses for methane. The main products covered are outlined in the table below.

Product Coverage

	Regional Market Dynamics	Impact on Global Net Trade	Technology + Capex	Cost of Production	Delivered Cost Competitiveness	Netback Analysis
Ammonia & Fertilizers						
Ammonia	✓	✓	✓	✓	✓	✓
Urea	✓	✓	✓	✓	✓	✓
Ammonium Nitrates (AN, CAN, MAN)	✓	✓	✓	✓	✓	✓
Ammonium Phosphates (MAP, DAP)	✓	✓	✓	✓	✓	✓
Compound Fertilizers (NPK)	✓	✓	✓	✓	✓	✓
Methanol & Derivatives						
Methanol	✓	✓	✓	✓	✓	✓
Formaldehyde	✓	✓	✓	✓	×	✓
Acetic Acid	✓	✓	✓	✓	×	✓
Methyl Tertiary Butyl Ether (MTBE)	✓	✓	✓	✓	×	✓
Methanol To Olefins (MTO)	×	✓ *(for LLDPE)*	✓	✓	✓ *(for LLDPE)*	✓
Methanol To Propylene (MTP)	×	✓ *(for PP)*	✓	✓	✓ *(for PP)*	✓
Methanol To Gasoline (MTG)	×	✓	✓	✓	×	✓
Energy and Fuel Applications						
Power	✓	×	✓	✓	×	✓
Gas To Liquids (GTL)	✓	✓	✓	✓	×	✓
Di-Methyl Ether (DME)	×	✓	✓	✓	×	✓
Exports						
Liquefied Natural Gas (LNG)	✓	✓	✓	✓	✓	✓
Pipelines	✓	×	✓	×	×	✓

✓ = Covered × = Not Covered

3.3 Time Period

Historical data is provided for the years 1999-2004, estimates for 2005, and forecasts for the period 2006-2016.

4. Approach

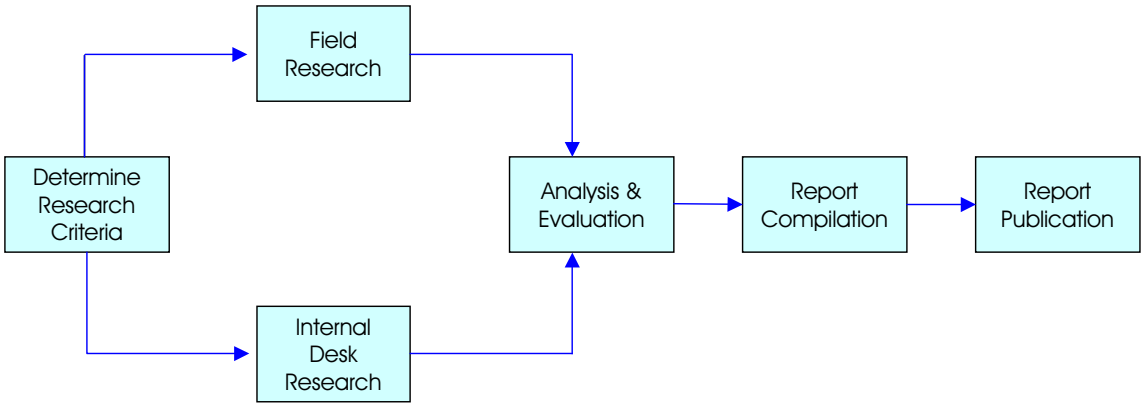
The study was managed and conducted by staff from Nexant *ChemSystems* and GOIC with extensive industry experience in natural gas, power and gas-based chemicals as well as direct experience in the GCC and the rest of the Middle East industry.

The Report was prepared using a conventional mix of both desk and field research. At the outset, the project team assembled for the project used the internal databanks held and maintained by both companies. These unique databanks have been developed over many years of operation and they were interrogated in order to extract all information that is relevant to the project. In addition, all relevant external sources were accessed in order to validate and build on the information held by Nexant *ChemSystems* and GOIC.

Commercial information and forecasts were developed from the joint extensive in-house databases, augmented by a programme of regional fieldwork. Discussions were held with key industry and government officials in the region to provide a thorough understanding of the dynamics of the current and future industry in the various countries.

The insights were supplemented by experience gained from previous single and multi-subscriber studies carried out by GOIC and Nexant *ChemSystems*.

Approach to the Study



PP Prospectus_GOIC

The full written Report containing all of the findings has now been completed and is available in both hard copy and electronic format to subscribers.

5. Report Contents

This comprehensive 755 page report embraces:

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	1.2 INTRODUCTION
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	1.3.1 Key Findings/Issues
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Appendix

A Cost Competitiveness
B Cost of Production

6. Costs of Subscription

The cost of the Report – **"ADDING VALUE TO METHANE – STRATEGIC OPPORTUNITIES FOR THE MIDDLE EAST"**– is £16 500 (sixteen thousand five hundred pounds sterling only).

Each of subscriber will receive two (2) copies of the Report accompanied by a Compact Disc (CD-ROM), with all the sections of the Report presented in PDF format. Additional copies of the Report can also be ordered for a cost of £400 per copy, which represents the costs associated with producing and delivering additional copies.

7. Nexant *ChemSystems*/GOIC Credentials

7.1 Nexant *ChemSystems*

Nexant

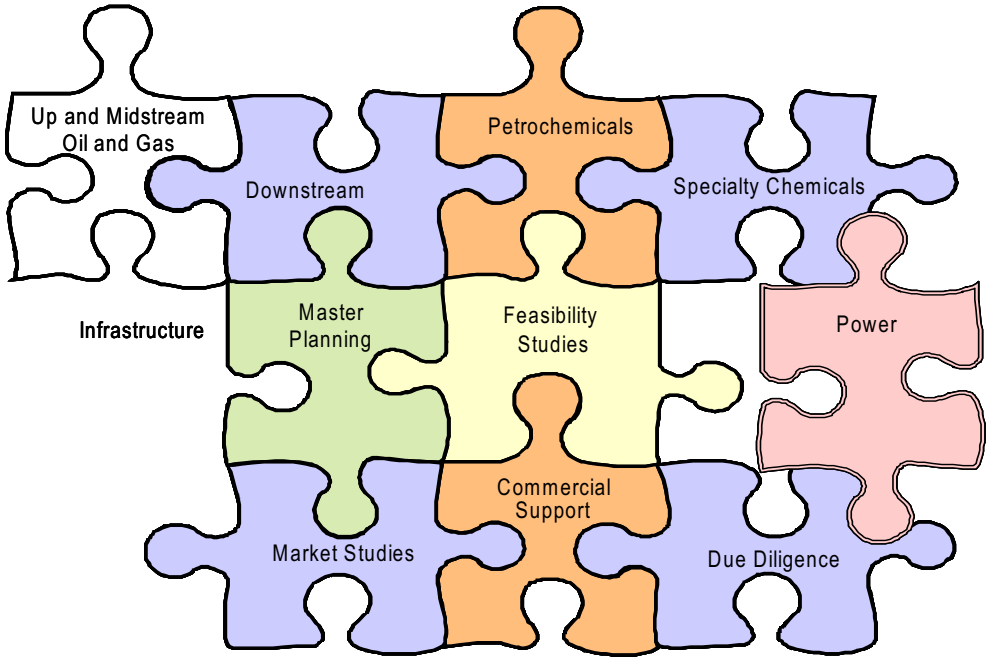
Nexant, a leading, global provider of consulting services to the energy industry, was established on 1 January 2000. Originally formed from a core group of approximately 130 professionals drawn from Bechtel's Technology and Consulting Group, the company has since grown organically and through acquisitions and now totals over 350. As an independent company with a number of shareholders, Nexant provides impartial advice to clients in the energy sector.

Nexant's global headquarters are in San Francisco. The company provides a range of services to the energy industries, as detailed in our literature and on our website at www.nexant.com.

Nexant Petroleum and Chemicals Division

The foundations of Nexant's Petroleum and Chemicals (P&C) Division are based on more than 20 years of experience in the oil and gas industries as part of Bechtel's consulting business. In 2001, Nexant acquired the ***Chem Systems*** operation from IBM. Now fully integrated with the Nexant P&C Division, ***Chem Systems*** has been providing management consulting services to the petroleum and chemical industry since 1964. Our consolidated expertise and experience is unrivalled by any other specialist consulting firm in the industry.

Our P&C Division services span the entire industry value chain, from oil and gas production through the downstream sub-sector to chemicals, including speciality chemicals. Our range of services is illustrated in the diagram below. These services complement Nexant's other divisions, which provide a comprehensive range of consulting services and software to the electric power and advanced energy sectors.



Nexant's P&C Division offers its clients **Insight and Understanding** – Our sharp focus on the petroleum and chemical industry gives us an unrivalled **insight** into the current issues and opportunities; the shifting landscape and changing fortunes that affect the sector. We **understand** our clients businesses - the challenges they face and the competitive pressures which shape their thinking.

This can only be achieved through an unrivalled combination of:

- **Industry knowledge -** we consult on the petroleum and chemical industry; our consultants are all experts in the industry, who work fulltime on the challenges facing the industry.
- **In-house data -** we have an unrivalled database on the industry and its markets, and employ teams of researchers to continually update this resource. Our *ChemSystems Online* product, which can be accessed by subscribers, contains the core of this knowledge base covering the commodity chemicals and polymers.
- **Proven and tested methodologies -** we have developed a range of methodologies to cover different types of assignments, such as feasibility studies, project finance support, privatisations, due diligence studies for acquisitions and financings, market and technology review, and selection studies. All of these have been tailored and continuously improved to suit the needs of the industry.
- **Technical competence -** we constantly track the technical improvements in the industry and frequently review new process improvements for clients. Our Process Evaluation/Research Planning (PERP) product encapsulates some of this work and is available to subscribers.
- **Global -** our permanent offices in London, New York (White Plains), Houston, Tokyo, and Bangkok provide comprehensive coverage. In addition, we have long-term relationships with representatives or registered branch offices in most major locations, including Beijing, Singapore, Seoul, Delhi, Moscow, Abu Dhabi, Amman, Rio de Janeiro, Caracas, and Paris. Nexant professionals have extensive experience in emerging markets such as the former Soviet Union and China, and our team of industry experts can work fluently in over ten languages.
- **Strategic consulting -** we have been on the leading edge of many of the strategic initiatives in the industry, including consolidations, restructuring, and privatisations. We pride ourselves on our thought leadership in strategy consulting in the sector.
- **Breadth** across all relevant sectors. Our team can provide clients with a complete and holistic view of the sector and its place in the overall economy covering the entire value chain.

Nexant P&C has unrivalled experience:

- Each year Nexant advises on tens of billions of dollars of petroleum and chemicals projects, in most of the major global supply and demand centres, covering the full hydrocarbon production, processing and transportation supply chain.
- Our team routinely works for almost every major multinational corporation in the petroleum and chemical business and for many national companies, governments, and international organisations. Nexant's view is often quoted by major corporations as an authoritative view on the industry.

We are recognised for our quality and industry thought leadership:

- Nexant is often quoted in the petroleum and chemical press on its views on markets and developments.
- Our team members are called on to give expert papers at major conferences.
- Our team of experienced vice presidents is responsible for the quality of our work in their individual areas of expertise. They are expected to provide inputs to and supervise every assignment we undertake.
- Our UK-based group has twice been honoured with the "Consultant of the Year" by The Times newspaper/BCCB. The first time in 2000 for work on the cost implications of the European Commission's programme of automotive fuel specification improvements and again in 2002 for the innovative ChemSystems Online® product.

We have extensive resources to fulfil any assignment in the industry:

- Nexant P&C employs over one hundred staff, making us the largest specialist consultant in the sector. We are the only industry specialist consultant to offer a fully comprehensive in-house service from well-to-wire and to downstream chemical.
- All staff are experienced in the industry and have typically worked previously for a multi-national industry company or a major contractor/technology company. More than half of our staff have worked for Nexant and the predecessor organisations for more than ten years.
- Staff qualifications include chemists and engineers as well as economists and legal specialists. A very high proportion of staff has advanced degrees - PhD or MBA.
- We can staff projects anywhere in the world from our global network of offices.
- Our data resources are the best in the industry and are continually updated.

The methane-derivative industries are areas of particular specialisation by Nexant *ChemSystems*, having performed hundreds of engagements for most of the significant global and regional players and numerous new or would-be new operators, as well as financial or governmental organisations. The following notes describe a few major projects undertaken in recent years. Details of the many others engagements are available on request. In many cases, the nature of Nexant *ChemSystems* work is confidential, and we are not free to identify the client with the project. For this reason, some of the typical projects listed below do not identify the client.

Fertilizers Experience

Feasibility Study Assessment and Ranking – Ammonia/Methanol, Asia: An Asian national oil and gas company was seeking new domestic investment opportunities to add value to its natural gas resources. It had received a number of project proposals from global companies in the form of detailed feasibility studies for ammonia and/or methanol production. Nexant *ChemSystems* carried out an independent review of these studies and to recommend investment priorities. Nexant *ChemSystems* undertook market opportunity studies, price forecasts, financial modelling, and other project assessments, and rated and ranked the projects.

Business Valuation - Ammonia/Nitric Acid/AN/Urea/DAP/Potash, United States: Prepared a recent valuation of a major U.S. fertilizer supplier to support refinancing. The scope of the project included demand and supply forecasts, price forecasts, and valuations under alternative scenarios of each segment of the fertilizer business.

ChemSystems Online® is a registered trademark of Nexant, Inc.

Technical Due Diligence - Ammonia/Nitric Acid/AN/SSP/TSP/NPK/STPP, Algeria: Technical due diligence support was provided during the privatisation of Asmidal. For each plant at each site, the technology, plant operations, asset condition and future capex requirements were assessed. Cost competitiveness was benchmarked and marketing channels reviewed. A SWOT analysis was performed for each site and business area.

Market Consultant – Ammonia/Urea, Oman, Arab Gulf: Arab Banking Corporation, on behalf of the project lenders, again required market (Global and Indian) and price projections, and competitiveness analysis, for the OMIFCO ammonia and urea project. Additionally the shipping plan and marketing strategy were reviewed.

Market and Technical Advisor – Ammonia/Methanol, Arab Gulf: Feasibility study for a regional producer as to the best options for developing its gas based chemicals business, i.e. additional ammonia or methanol capacity, using what technology, etc.

Conceptual Business Outlook Study – Ammonia/Urea, Arab Gulf: A strategic development plan for an Abu Dhabi based company which reviewed existing operations and identified an economically viable "road map" to optimise the company's business potential for the next 20 years. The study included analyses of the global market for ammonia and urea, the feasibility of expansion/debottlenecking and the potential for new products including methanol, melamine, UF resins, sulphur-coated urea and hydrogen.

Ammonia/Urea Benchmarking Study, Arab Gulf: A regional producer required performance and operational benchmarking assessments of its ammonia/urea operations versus those of other producers in the region. The results of the study were shared between all the participants (without revealing identities).

Feasibility Study – Ammonia/Urea, QATAR: Appointed sponsor's market consultant to provide the initial assessment of the feasibility of the proposed expansion. The study focused on markets, pricing and competitiveness.

Industry Privatisation/Restructuring Study, Poland: The Polish Government/World Bank required Nexant *ChemSystems* to appraise Poland's fertilizer industry, assess its competitiveness and development potential and to recommend on strategic direction and major actions at both the sub-sector and the enterprise level. The products covered included ammonia, urea, ammonium nitrate, calcium ammonium nitrate, UAN solutions, ammonium sulphate, SSP, TSP, DAP and NPK's (8:24:24 and 17:17:17).

Competitiveness Study, Europe: A major study into the competitiveness of the European industry for the European Fertilizer Manufacturers Association (EFMA). The analysis examined competitive position both within the industry and of the industry as a whole within the global business. A detailed audit was made of European current and projected supply costs for ammonia, urea, ammonium nitrate, calcium ammonium nitrate, urea ammonium nitrate, phosphoric acid and NPK's (via granulation processes including the nitrophosphate route).

Methanol and its Derivatives Experience

Methanol Feasibility Study, Qatar: An evaluation of current and prospective large-scale technologies, capital and operating costs for a Qatari client considering investing in a large-scale methanol project. A financial evaluation of the project was performed and various sensitivity cases considered. Project development and implementation strategy was also reviewed. Global markets, pricing, delivered cost competitiveness and marketing strategy were also analysed.

Methanol Market Consultant, Saudi Arabia: A review of global markets, pricing and delivered cost competitiveness for a local company wishing to invest in a methanol project in the Kingdom.

Technical and Market Advice for New Methanol Project, Western Australia: Technical and market consultancy services making assessments and recommendations from the standpoint of potential lenders to a proposed methanol plant including technology selection, project development, review of gas supply, EPC, O&M and offtake contracts and a market study reviewing of the supply/demand and pricing prospects for methanol, the delivered cost competitiveness of the plant and the marketing strategy for the product.

Large-Scale Methanol Pre-Feasibility, Nigeria: A pre-feasibility study including technology, pricing prospects and cash flow analysis for a prospective large-scale methanol plant.

Global Methanol Business Outlook: A study considering the likely change in US demand for MTBE and potential growth of fuel cell usage. The study included global and regional supply/demand outlook, price forecasts and an analysis of the competitiveness of the Middle Eastern client's proposed plant against international competition.

Formaldehyde Feasibility Study, Middle East: This confidential study evaluated a potential formaldehyde project and reviewed the global market dynamics and those within the region in more detail. A technical valuation of several of the major licensors was also performed. A financial model was constructed to evaluate the attractiveness of the project for investment.

Formaldehyde Feasibility Study, Middle East: A full feasibility study to evaluate formaldehyde and urea-formaldehyde pre-condensate for a major Gulf petrochemical producer. The study reviewed the supply/demand balance in the Gulf Region as well as projections of prices for formaldehyde versus methanol. A technical valuation of several of the major licensors was also performed. A financial evaluation incorporating cash flow statements on total costs including tariffs, production costs and commercial costs was constructed.

QAFAC Methanol/MTBE Market Due Diligence, Qatar: A study carried out on behalf of the banks arranging the loan facility for a methanol/MTBE project. The study included global and regional supply/demand analyses and forecasts, price forecasts, an analysis of the project's potential competitiveness in its key markets and a review of feedstock and off-take agreements.

Acetic Acid/VAM Market Studies, Saudi Arabia: A project reviewing global market dynamics, the outlook for pricing and the project's delivered cost competitiveness. Potential customers were identified, a potential market entry strategy was developed, key competitors were profiled and overall project SWOT analysis performed.

Acetyls Feasibility Study, Middle East: For a West European acetyls producer, a feasibility study for a new investment combining integrated megamethanol, acetic acid and vinyl acetate production. Markets by end-use and region for acetic acid and vinyl acetate were reviewed together with supply/demand and trade analysis. Price and profitability forecasts and preliminary project financials were also provided as well as competitive cost benchmarking on a delivered basis.

Acetyls Feasibility Study, Canada: For a major producer of acetyls a feasibility study for a new investment on the Canadian West Coast combining retrofitted existing methanol assets, acetic acid and vinyl acetate production. The engagement covered markets by end-use and region for acetic acid and vinyl acetate together with supply/demand and trade analysis. Price and profitability forecasts were also provided as well as competitive cost benchmarking on a delivered basis. Preliminary project financials were also provided. In addition a commercial and technical assessment of new acetyls technology was undertaken.

Power Sector Experience

Master Plan for Power and Water, Abu Dhabi: Nexant provided comprehensive planning for power and water facilities for the Abu Dhabi Water and Electricity Department (WED) and the Privatisation Committee for the Water and Electricity Sector. The Master Plan is an integrated resource plan covering: detailed demand forecasts by locality, a review of power and desalination technologies, development of a state-of-the-art optimisation model to determine the least-cost mix of power and water production technologies, and the implementation of commercial models for generation reliability analysis, transmission planning, transmission engineering and water transport. In addition, detailed transmission and distribution system planning and engineering were undertaken, as well as a review of operations and maintenance practices via inspection of all major power facilities, operations and maintenance record review, and development of maintenance recommendations.

Power Sector Support II Power Pooling (Power Pool), Egypt: Nexant formulated and implemented a Power Pool mechanism in Egypt for USAID and the Egyptian Electricity Holding Company. Work included a comprehensive situation review; training to develop skills to implement and operate the Pool; planning the framework; and developing an action plan to establish the power pool. Current policies, legal and regulatory framework, description of the physical system and operations, load forecasting, market rules and grid code, financial issues, and information technology issues were evaluated.

Reengineering of the Alexandria Electricity Company (ALEXCO), Egypt: Nexant is advising on how to bifurcate the Alexandria Electricity Company into separate generation and distribution companies, and has to-date accomplished the following objectives: developed process mapping at generation and distribution for various processes, developed training plans for staff, introduced predictive maintenance and scheduling, and reviewed alternate revenue sources for the production and distribution companies.

GTL Experience

Nexant has extensive experience of GTL Projects, with recent/ongoing projects including:

- The technical advisor role on behalf of Lenders for the QP/Sasol GTL project.
- A confidential review of the current GTL Project development status on behalf of a US oil major. The review focused on identifying the critical success factors for the successful scale-up from its semi-commercial demonstration unit and on the contractual aspects to facilitate the adoption of a project finance approach.
- Various market studies relating to products from a Middle East GTL plant, including a detailed review of potential end-users in key consuming regions for GTL naphtha and GTL diesel and the impact of base oils for GTL plants on the global lubricant sector
- A confidential review of the opportunity for FT conversion using refinery based fuels as part of a strategic refining technology and investment study for a Latin America oil major.
- Prepared market study for specialty hydrocarbon products, including synthetic lubricant base oils, normal paraffins and drilling fluids, from a planned GTL project.
- Evaluated the potential for C16-C18 GTL paraffins as synthetic drilling fluids.
- Performed an independent review of a process design and scale up program for Statoil's GTL technology.
- A major technical assessment of technologies to upgrade remote gas reserves, including GTL technologies and other emerging technologies: Mega Methanol process, Methanol to Gasoline (MTG), Dimethyl ether (DME) production and Methanol to light olefins.

LNG Experience

South Asia Regional Initiatives (SARI) in Energy, South Asia: Determined the feasibility of gas supply to India including: development of the preliminary pipeline and LNG options and their evaluation, pipeline engineering and routing, conceptual engineering of LNG marine infrastructure, receiving and re-gasification facilities and LNG shipping arrangements.

Integrated Terminal and Power Plant, Korea: a review of a DEC study for an integrated LNG/Power Generation project and to prepare a feasibility study. Our team reviewed the supply and demand forecast for LNG and electricity in Korea and the Electric Power Development Plan, prepared by Korea Electric Power Company (KEPCO). A review of the investment plan and cost estimates prior to preparing the project financing scheme was conducted. The study used detailed economic and financial analyses of the project, which allowed for a thorough sensitivity analysis of the various technical options, different financing schemes and other relevant variables.

Energy Sector Strategy Development, Macau SAR, China: Regional sources of gas supply either by LNG or pipeline were analysed and the cost of supply for each of the different sources determined. A list of potential supply projects was identified and screened for technical and economic feasibility. Nexant used proprietary models for establishing LNG and pipeline project costs and the economics for each sector of the delivery chain from the well head, liquefaction, transportation and regasification.

LNG Transport Study, India: A feasibility study for GAIL to determine the economic viability of transporting LNG to India from the Middle East against alternative fuel sources from other parts of the world. Feasible locations for LNG imports were identified. The economics of various projects were determined taking account of the full economic cost of the various fuel options, which included imported coal. The analysis of LNG also considered the options available to the Middle East gas producing countries, e.g. LNG exports to Japan and Korea.

Natural Gas Pipeline Experience

West Africa Gas Pipeline - West Africa, USAID: The West African Gas Pipeline project is a $500 million, 600 km offshore pipeline running parallel with the West African coastline, originating from Nigeria's gas fields and terminating in Ghana. Nexant is the lead advisor to the four participating governments (Nigeria, Benin, Togo and Ghana), and continues to provide direct support to their negotiating teams at all meetings with the project developers. Among the activities covered in this support was the evaluation of gas producer cost curves and pricing profiles, and development of gas transmission tariffs for the pipeline.

Gas Pipeline Infrastructure and Power Generation Study, Pakistan: A techno-economic study to assess the transmission capacity of the existing gas pipeline systems and to analyse market potential in Pakistan. The existing southern and northern gas pipeline systems were modelled to determine capacity constraints and the potential for increased throughput. A review of the gas and electricity energy sub-sectors was conducted followed by an analysis of the potential for use of natural gas by existing and planned power plants. Commercial terms for use of the existing and new gas pipeline infrastructure by international oil and gas companies were reviewed.

Gasfield Development and Pipeline Study, Oman: A study to determine the feasibility of gas field development, production and the transport from central Oman to various export markets. The team analysed and reviewed reserves and market demand and undertook a detailed study of upstream and gas processing economics from different fields. In depth pipeline studies were conducted evaluating the most appropriate routing and tariffs for various destinations.

Gujarat Gas Grid, India, Gujarat State Petroleum Ltd (GSPL): A techno-economic feasibility study of a proposed gas transmission pipeline system. Nexant's input included: analysis of projected imported and indigenous gas supply options; evaluation of potential gas uses in the state of Gujarat State; modelling of the required pipeline system and facilities; gas pricing/tariff analysis; and financial and economic evaluations of the selected gas grid development option.

Multi-Client Reports

The **Process Evaluation/Research Planning (PERP)** programme provides valuable insights and information to research planning and marketing personnel. It examines existing, developing and embryonic technologies, aiming to provide early identification of commercially significant technical developments. Economic evaluations and commercial assessments are also made. Recent PERP topics relating specifically to methane derivatives have included:

- Developments in Syngas Production
- Ammonia
- Urea
- Nitric Acid
- Methanol
- Developments in Methanol Production Technology
- Methanol to Olefins
- Formaldehyde
- MTBE
- TAME
- Alternative Uses of MTBE Facilities
- Impact of MTBE Phase-out on Chemical Markets
- Cost/Performance of Fuel Oxygenates
- Acetic Acid/Acetic Anhydride
- Acetic Acid Directly from Ethylene
- Acetic Acid via Ethane Oxidation
- Vinyl Acetate
- Fluidized Bed Vinyl Acetate Process
- Polyvinyl Alcohol
- Ethyl and Butyl Acetate
- Methyl Methacrylate
- Dimethyl Ether (DME)
- Liquefied Natural Gas
- Developments in Natural Gas to Liquids Fuels Conversion Technology

Stranded Gas Utilization: Steps to Commercialization: This study provided an in-depth quantitative and qualitative analysis of the various end-uses and production processes for converting large, remote natural gas reserves to viable commodity products.

Stranded Gas Utilization: Methane Refineries of the Future: This study provided an in-depth analysis of the manufacturing processes, and economics for converting large, remote natural gas reserves to viable products.

7.2 GOIC

GOIC is an intergovernmental industrial development organization, funded by the six Arab Gulf Cooperation Council (AGCC) states:

- Bahrain
- Kuwait
- Oman
- Qatar
- Saudi Arabia
- U.A.E.

GOIC was established in 1976 to provide professional and independent advice to the public and private sectors on industrial development. GOIC operates from its headquarters located in Doha, the capital of the State of Qatar. Its governing council [equivalent to board of directors], consists of representatives of the Ministries of Industry from each GCC State.

GOIC's mission is to assist its Member States to expand their manufacturing activities through appropriate research, information dissemination and consultancy services. The following website gives more information on GOIC's activities: http://www.goic.org.qa

An expert, multi-national staff of over 100 persons has been built-up to provide industrial consultancy and information services to the GCC Ministries of Industries, other public sector institutions and private sector clients.

This expert staff are distributed in four technical departments:

Industrial Investment Promotion Department
◈ Project identification
◈ In-depth project research
◈ Key sector monitoring
◈ Consultancy assignments

Economic Analysis & Industrial Research Department
◈ Macro-economic studies
◈ Strategy & policy studies
◈ Sectoral overviews
◈ Consultancy assignments

Industrial Market Intelligence Department
◈ Database management
◈ Information systems
◈ Specialist library
◈ Consultancy assignments

Information Technology Department
◈ Coordination meetings
◈ Publications
◈ Conferences & Training
◈ Consultancy assignments

Through its work, GOIC has built-up unrivalled knowledge and contact networks covering the GCC region, and its industrial sectors. GOIC has become an established source of information on the GCC countries. This has been achieved through maintaining good contacts and effective institutional relationships with ministries, official bodies and organisations, existing industrial establishments, as well as other regional Arab and international organisations.

Consultancy assignments are tackled by specially created task forces drawn from the four technical departments, as needed, in order to provide the most comprehensive reports and appropriate advice, in-house task forces often work in conjunction with outside expert organisations.

From its inception, the Petrochemicals Sector has featured prominently in GOIC's work, and many specialized assignments have been completed.

GOIC's independence and success is enhanced by its ability to provide complete confidentiality for both its public and private sector clients.

GOIC is well-equipped and experienced to conduct, jointly with Nexant *ChemSystems,* this important multiclient study.

Relevant Proect Experience

The following list indicates the depth and breadth of GOIC's work in the petrochemical/chemical sector.

No.	Study
1.	Petrochemicals Marketing Strategies Study
2.	Construction, Production & Distribution Costs for Petrochemical Projects
3.	Prefeasibility Study for Carbon Black Plant in the GCC
4.	Petrochemical Projects – Product Marketing
5.	Prefeasibility Study for a Petroleum Coke Project in the GCC
6.	The Potential for Manufacturing Compound Fertilizers in the GCC
7.	An Assessment of the Viability of Aromatics Production in the GCC
8.	The Industrial Uses of Associated Gas
9.	Production of Polymer Grade Propylene
10.	Acetic Acid-Vinyl Acetate Monomer-Polyvinyl acetate Complex in the GCC
11.	Petroleum Coke Project – Feasibility Study
12.	Prefeasibility Study for Soda Ash
13.	A study of Industries Consuming Petrochemical Products in the GCC
14.	Techno-economic Feasibility Study of a Soda Ash Project
15.	Techno-economic Study for a Crude Oil Petrochemical Refinery
16.	Manufacturing Opportunities for Oil & Gas Drilling & Production Chemicals
17.	The Petrochemical Refinery Study – Market Study
18.	Comparison of GCC Petrochemicals production costs with other world regions
19.	A Report on Lube Oils in the GCC
20.	A report on the Feasibility of Establishing a Regional Bureau for the Markets and Marketing of Petrochemical Products in the GCC
21.	Market Study – Acetic Acid, Vinyl Acetate Monomer, Polyvinyl acetate Complex in the GCC
22.	A Preliminary Study for the Production of Calcium Carbonate
23.	A Preliminary Study for Alkyd Resins in the GCC
24	The Synthetic Rubber Industry in the Arab Countries
25	Plastic Alternatives for Paper Cement Bags
26	A Preliminary Study on the Solvents Industry in the GCC

No.	Study
27	A Preliminary Study for Organic and Inorganic Pigments in the GCC
28	Prefeasibility Study for the Production of Polyurethane Raw Materials in the GCC
29	Polyethylene film for medical uses
30	Prefeasibility Study for producing Basic Lube Oil from residues in a GCC refinery
31	Sodium Sulphate – A Preliminary Study
32	Preliminary Study for Printing Inks Markets in the GCC
33	Prefeasibility Study for the Production of Formaldehyde and Derivatives in the GCC
34	Prefeasibility Study for Producing Lubricating Oil Additives in the GCC
35	Preliminary Study for the Production of Phthalic Anhydride in the GCC
36	Preliminary Study for the Production of Phenol, Bisphenol, Epoxy Resins in the GCC
37	Production of Aromatic Compounds from Naphtha in the Arab Countries (Part One – Market Study)
38	Prefeasibility Study for the Production of Propylene Oxide – Polyol in the GCC
39	A Report on the Techno-economic Feasibility for the Production of Acetic Acid and Derivatives
40	Prospects for the Petrochemical Industry in the GCC
41	Prefeasibility Study for the Production of Alpha Olefins in the GCC
42	A Study on the Possibility of Producing Specialty Chemical Products in the GCC
43	Production of Aromatic Compounds from Naphtha in the Arab Countries (Part Two – Caprolactam, BTX Complex, Unsaturated Polyester Resin)
44	Techno-Economic Study of Woven Plastic Bags in a GCC country
45	Prefeasibility Study of OXO Alcohol Production in the GCC Countries
46	Study of Recycling Lubricating Oils
47	Study of Epoxy Resins Production in the GCC States
48	Study of Maleic Anhydride Production in the GCC States
49	Prefeasibility Study for the Production of Sodium TriPoly Phosphate (STPP) in the GCC Countries
50	Vision Report on propylene and its derivatives
51	Pre-feasibility study for GCC natural gas network
52	Study of downstream polyethylene products in Oman
53	Study of downstream natural gas products in Oman
54	Petrochemical Multiclient Study
55	Petrochemical Industrial Integration Between KSA and Bahrain
56	Petrochemicals Map for Bahrain
57	Sector Study Plastics Industries in Bahrain
58	Study on Activating the Role of Private Sector in Desalination Technology

Major Clients

GOIC's major clients are the Industry Ministries of its Member States. Numerous studies and services have been requested from GOIC over the years, ranging from major industrial policy studies to reports on specific industries and products. In addition GOIC has served the private sector through its MIOP program, consultancy services and other programs and activities. These services include expert opinion on industrial matters, data provision, project evaluation and various studies.

8. Questions Regarding this Proposal

Any questions regarding the proposal or for further information please contacting the following personnel:

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Address: **Nexant Limited** Griffin House, 1st Floor South 161 Hammersmith Road London W6 8BS United Kingdom	*Address:* **Gulf Organisation for Industrial Consulting (GOIC)** P.O. Box 5114 Doha Qatar
Fax: + 44 207 950 1550	Fax: + 974 483 1465

9. Order Form *

Subscriber Data

Full Name : _____

Title : _____

Company : _____

P.O. Box : _____ City: _____ Country : _____

E-mail address : _____

Tel. : _____ Fax : _____

Agreement

We wish to subscribe to the Nexant-GOIC study "Adding Value to Methane: Strategic Opportunities for the Middle East" and understand that:

1. The cost of the study is GBP 16.500 (sixteen thousand five hundred pounds sterling).
2. We shall pay GOIC the applicable fee stated above.
3. Payment terms are 30 days from date of invoice.
4. We will receive two (2) copies of the report. Additional copies will be available at GBP 400 (four hundred pounds sterling) per copy. We will also receive the report in a PDF format on a CD-ROM.
5. We nominate the person named in the Subscriber Data above to whom the Report should be sent.
6. Except for information that is or becomes generally available to the public in a printed publication, or is already in our possession or developed independently by us or is received by us in good faith from a third party, any information in the subject study is for the sole and confidential use of our Company and our affiliates in which we possess more than 50 percent share. Said information may be used in our research and commercial activities on a confidential basis.
7. We agree to use reasonable care to protect the confidential nature of this Report. Our foregoing obligations shall, in no event, continue beyond three (3) years from the date of publication.

Payment Method

☐ **BANKERS DRAFT**

Bankers Draft/Cashier's Check made payable to "Gulf Organization for Industrial Consulting" for the amount of GBP 16.500. **Please return the completed form with bankers draft to the address below.**

☐ **DIRECT TRANSFER**

Direct Wire Transfer of GBP 16.500 to:
Account Name: Gulf Organization for Industrial Consulting
Acc No: 0050734-3/002/0030/000
Bank Name: Doha Bank, PO Box: 3818 Grand Hamad Avenue - Doha, Qatar
Swift Code: DOHBQAQA

☐ **CREDIT CARD**

Please charge GBP 16.500 to my ☐ Visa ☐ MasterCard

Card No. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Expiry Date: ☐☐/☐☐

Please include cardholder's address if different from the delivery address:

_____

Signature: _____ **Date:** _____

*** Please complete the form and fax it to: Mr. Shambu Prasad, Head of Industrial Sensing Unit, GOIC, P.O. Box 5114, Doha, Qatar. Fax: +974 – 4831465 / 4836278**