

NexantThinking™

Special Reports

**Natural Gas as a C₁ Chemicals
Feedstock – Supply and Pricing**

Brochure
February 2015



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1.1 INTRODUCTION

Natural gas is widely used in the chemical and petrochemical industries around the world both as a provider of energy to fuel the chemical processes and also as a raw material feedstock for conversion into chemicals for further processing. The rapid increase in low cost shale gas production in the United States and the discovery of vast reserves of natural gas offshore East Africa has led observers to question whether the traditional suppliers of gas as a feedstock can maintain their position in the market. This has been exacerbated by the prospect of rising costs of production and constrained development of reserves in a number of countries, which has increased the pressure to raise gas prices which could undermine the economics of using gas as a feedstock.

The report considers the availability, now and in the future, of natural gas as a C₁ chemicals feedstock both for the key existing markets and potential future markets, and look in detail at the pricing of gas in each of these markets. The current and prospective pricing will then be used to consider the comparative economics for methanol and ammonia/urea delivered to five key markets – USGC (Houston), Europe (Rotterdam), India (Cochin), China (Shanghai), and Japan (Yokohama).

The findings and conclusions of the report will provide guidance to clients on the future supply and pricing of natural gas as a feedstock on a country by country basis, and the comparative economics of delivering gas from each country to the five key markets. This enables the report users to undertake initial screening of countries for investment opportunities on a cost effective basis.

1.2 REPORT STRUCTURE

The report is split into a number of different Parts.

Section 1 includes the Report Highlights, the Introduction, and a description of the Reference Case Scenario, as well as the Table of Contents.

Sections 2 through 6 cover the Existing Feedstock Markets with each Part covering a specific region on a country by country basis. The regions are Americas, Former Soviet Union, Europe, Asia, and Middle East and Africa. Some 28 countries are included as Existing Feedstock Markets and were selected on the basis that they were in the top 30 countries in the world by volume of gas consumed (in billions of standard cubic meters) as Non-Energy Use, and that also has operating Methanol and/or Ammonia/Urea plants. By region the existing feedstock markets include:

- **Americas** – the United States, Canada, Mexico, Trinidad & Tobago, Venezuela, and Argentina
- **Former Soviet Union** – Russia, Ukraine, Uzbekistan, and Belarus
- **Europe** – Netherlands, Germany, Poland, and France
- **Asia** – China, India, Indonesia, Malaysia, Pakistan, Bangladesh, and Thailand
- **Middle East and Africa** – Saudi Arabia, Iran, Qatar, Oman, Bahrain, Egypt, and Algeria

Section 7 covers the Potential Feedstock Markets on a country by country basis. The selection of Potential Feedstock Markets has been based on Nexant's analysis of those countries with abundant reserves which can be developed over the next 15 to 20 years, with reserves of sufficient size that all potential demands for gas, both domestic demand and gas exported by pipeline and/or LNG, can be met with some ease, leaving sufficient available that gas could be used as a feedstock in large scale methanol and /or ammonia/urea plants. The Potential Feedstock Markets are Iraq, Turkmenistan, Myanmar, Tanzania, Mozambique, Brazil, and South Africa.

Section 8 includes the section on Comparative Economics which calculates the cost of production for methanol, ammonia and urea for each country for the spot years 2015, 2025 and 2035 and then the delivered cost from each country to each of the 5 key markets for each of the spot years.

Section 9 is the Conclusions for the whole report.

1.3 COUNTRY SECTIONS OUTLINE

Each country section covers the same topics.

- **Supply/Demand** - Historical analysis of gas supply and production, reserve estimates, discussion of unconventional gas prospects, gas demand by different sectors and gas trade – imports and exports.
- **Infrastructure** - Review of the existing and prospective infrastructure (pipelines, storage facilities, liquefaction and regasification terminals and distribution systems) to assess the ease with which gas can be delivered to end users.
- **Legal and Regulatory Framework** - Brief overview of the legal and regulatory framework as it affects the production, delivery and consumption of gas.
- **Gas Pricing** - Historic gas pricing at the wholesale and industry/feedstock level and discussion of changes.
- **Supply/Demand and Pricing Projections** - Projections of the supply and demand balance and gas prices at the wholesale and feedstock level through to 2040, based on the Reference Case Scenario.

1.4 OBJECTIVES OF THE REPORT

The findings and conclusions of the report will provide guidance to clients on the future supply and pricing of natural gas as a feedstock on a country by country basis, as well as the comparative economics of delivering gas from each country to the five key markets, using the Reference Case Scenario for gas pricing.

Each country section contains background information on a consistent basis which users of the report can use as a reference if they are interested in pursuing investments in specific countries. The gas price projections form the basis for the delivered cost analysis and these are combined with generic plant operating costs and freight charges. The focus is on looking at new build projects in each country and not on existing plants. Existing plants may be heavily depreciated and not necessarily state-of-the art technology. In addition, existing plants may benefit from gas supply agreements with lower costs than new plants either reflecting contractual arrangements or possible subsidies from the State.

The use of generic operating costs for plants and freight, combined with Nexant projections of unsubsidized gas prices, should enable the report users to undertake initial screening of countries for investment opportunities on a cost effective basis. Clearly specific investment opportunities in any country would need to be the subject of detailed specific analysis on actual cost estimates based on site location and, Nexant would recommend, a number of different gas pricing scenarios to fully assess project viability and the risks and uncertainties.

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3.1 GENERAL

Nexant will utilize its unique consulting skills and combination of global, regional and industry sector experience to bring readers real insight into the supply availability and pricing of natural gas as a feedstock for chemicals. The basic approach will consist of:

- Drawing on Nexant's in-house database on the specific gas markets in terms of understanding supply, demand, infrastructure, pricing and the regulatory framework
- Utilizing the *World Gas Model* to generate prospective supply – demand balances and pricing projections under different scenarios
- Discussions with Nexant's key contacts in the specific countries to add further insight to each gas market
- Additional research from the public domain
- Utilizing Nexant's bespoke economic and financial models and expertise to consider the comparative economics in each country for each product for the relevant end-use markets

3.2 GAS MARKET ANALYSIS

The market analysis for this report will be prepared drawing on Nexant's recent studies, both multi-client and single client, and the *World Gas Model* and its extensive database.

Nexant's World Gas Model is available for clients to use under license on their own systems and is also used by Nexant's Global Gas experts to support our consultancy assignments and multi-client studies and reports. Key elements of the model are shown in Figure 3.1. Nexant has used this modeling system to provide the underlying foundation for the market and pricing assessments presented in this report.

Figure 3.1 World Gas Model



WGM uses a powerful optimizer program, in conjunction with Microsoft Excel, which allows all inputs and outputs to be analyzed by users and linked to other in-house systems. The model projects global, regional and national gas supply demand balances, international gas trade by pipeline and LNG and both contracted and spot prices. Spot prices are estimated with reference to the cost of supply, competing prices and the “tightness” of the market. The model currently has an outlook period to 2040 and the model is balanced on a quarterly basis

3.2.1 Global Coverage

The model considers every country in the world which either consumes or produces natural gas. Large countries including the USA, Canada, Russia, China, Australia, Malaysia, and Indonesia are further segmented by regions. The focus is on the growing international trade of natural gas by cross-border pipeline and as LNG.

The model currently includes over 130 countries with space to add new countries as needed.

3.2.2 Gas Demand

Gas demand projections are exogenous allowing users to overwrite Nexant assumptions with in-house projections and scenarios.

The model itself will adjust demand levels using a Demand Side Response mechanism which simulates switching to alternative fuels arising from high cost of gas supply or infrastructure bottlenecks.

3.2.3 Infrastructure and Supply

The model includes detailed data on the gas infrastructure and supply needed to support international trade, including production fields and basins, pipelines, LNG liquefaction and regasification terminals and storage facilities, together with associated costs.

Project start and end dates can be varied allowing clients to develop alternative scenarios of specific interest.

3.2.4 Gas Contracts

The model includes information on long-term contracts on gas supply by both cross-border gas pipeline and LNG. Volumes are controlled within the range set by Annual Contract Quantity and take-or-pay volumes. Gas prices are simulated in relation to a basket of up to five escalators including oil prices and gas spot prices.

3.2.5 Cost Data

Cost data is included for all facilities in the model including production, pipelines, liquefaction and regasification terminals, storage facilities and LNG shipping. Capital costs for production and infrastructure are represented as unit costs (per MM Btu or per thousand cubic meters - mcm) on a Long Run Marginal Cost (LRMC) basis. Shipping costs are built up from shipping distances and assumed day rates and fuel costs.

3.2.6 Gas Prices

Contract prices are calculated within the model based on assumed oil and oil product prices in Europe and Asia. Spot prices are projected within a range determined by the cost of supply and price of alternative fuels. The position within this range depends on how tight the market is at any time.

3.3 DELIVERED COST ANALYSIS

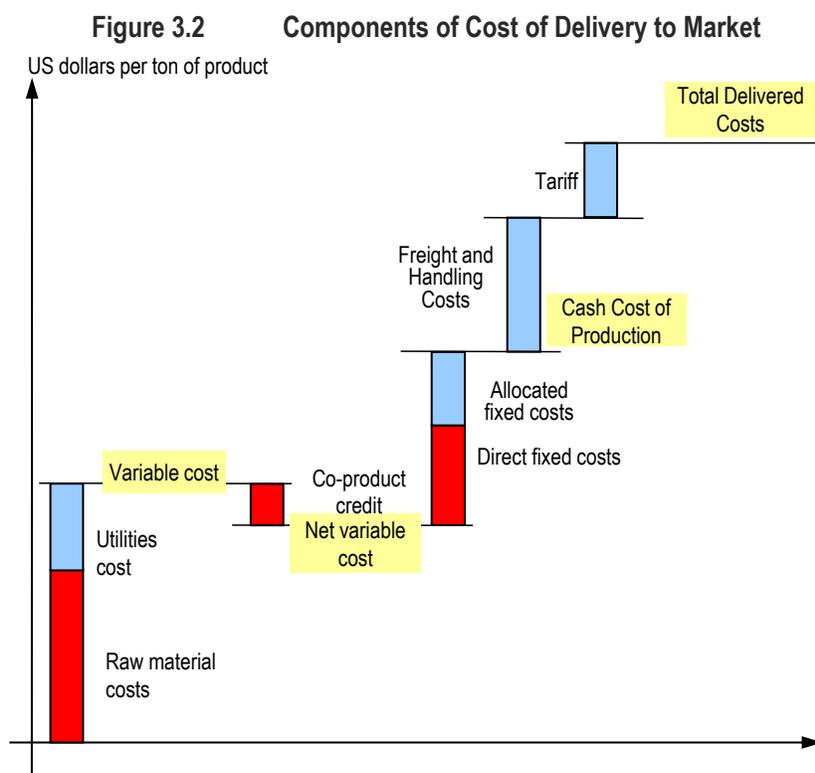
Nexant uses a standard pro-forma to calculate cash costs of production for methanol, ammonia and urea. As indicated in the figure below, the variable cost of production includes the costs of raw materials – feedstocks plus catalysts and chemicals – and utilities at cash cost or purchase cost, with a credit for co-products. The direct fixed costs shown in Figure 3.2 include:

- Salaries of operating staff plus associated on-costs such as holiday cover, social insurance, fringe benefits etc.
- Maintenance costs including materials and labor, with periodic maintenance costs such as two or three year shutdowns averaged over the period; maintenance costs are usually calculated as a percentage of process plant capital cost.

The allocated fixed costs are the site charges, which are necessary for production but which are not directly associated with the operation of the specified process plant. They include packing and warehousing, storage and workshops, site laboratories, safety and environment, security, site management, and on-site amenities for the workers. Insurance of the fixed assets is also counted under allocated fixed costs.

In addition to the derived total cash cost of production, Nexant takes into account the freight and handling costs as well as tariffs involved in delivering the product to a particular target market to calculate the total delivered cost.

As defined by Nexant for its analyses of production costs and its price forecasting, the cash cost does **not** include corporate overheads such as general marketing, company administration, and R&D. Nor does it include working capital.



4.1 OVERVIEW

Nexant uses multidisciplinary project teams drawn from the ranks of our international staff of engineers, chemists, economists and financial professionals, and from other Nexant groups to respond to the requirements of each assignment. Most of the consulting staff possesses credentials in both scientific and commercial disciplines plus substantial industrial experience. The collective talents of our staff are strategically located and closely linked throughout the world, resulting in valuable insights gained through a variety of perspectives.

Nexant is an international consultancy and is dedicated to assisting businesses within the global energy, chemical, plastics, and process industries by providing incisive, objective, results-oriented management consulting. Over four decades of significant activity translates into an effective base of knowledge and resources for addressing the complex dynamics of specialized marketplaces. By assisting companies in developing and reviewing their business strategies, in planning and implementing new projects and products, diversification and divestiture endeavors and other management initiatives, Nexant helps clients increase the value of their businesses. Additionally, we advise financial firms, vendors, utilities, government agencies and others interested in issues and trends affecting industry segments and individual companies.

The Nexant Group was formed as an independent global consulting company in 2000, combining a number of companies that had a long history of providing consultancy services to the chemical and refining-related industries. Nexant's experience covers all aspects of project development relating to major refinery, petrochemical, and polymer investments, ranging from grassroots plants to revamps of existing process units. Nexant's key offices serving the petrochemical and downstream oil sectors are located in New York, Houston, London, Bangkok, and Bahrain, and locations for other offices are shown in Figure 4.1.

Figure 4.1 Nexant Office Locations



From major multinationals to locally based firms and governmental entities, our clients look to us for expert judgment in solving compelling business and technical problems and in making critical decisions.

Nexant's clients include most of the world's leading oil and chemical companies, financial institutions, and many national and regional governments. Nexant, Inc. is active in most of the industrialized countries of the world, as well as in most of the developing areas including the Middle East, Africa, and East and Southeast Asia.

Major annual subscription programs are:

- Process Evaluation/Research Planning (PERP)
- Petroleum & Petrochemical Economics (PPE)
- Polyolefin Planning Service (POPS)

The PERP program covers technology, commercial trends, and economics applicable to the chemical industry. The program has more than 40 subscribers, including most of the major international chemical companies. Many of the processes to be analyzed in this multi-client study have been assessed in the PERP program.

The PPE program provides historic and forecast analysis of the profitability, competitive position, and supply/demand trends of the global petroleum and petrochemical industry. The program includes capacity listings and analysis, global supply, demand and trade balances, profitability, competitiveness, and price analysis and projections for all the major petrochemical value chains. The PPE program is supported by an internet-based planning and forecasting tool that provides online access to the database behind the reports of the PPE program.

The POPS program provides reports on the global polyethylene and polypropylene industry. It is recognized globally as the benchmark source for detailed information and analysis on current commercial, technical, and economic developments in the polyolefins industry. Coverage includes: capacity listing and analysis, detailed consumption, supply/demand, trade, operating rates, price forecasts, technological developments, new products, inter-material substitution, and regional competitiveness.

4.2 GLOBAL GAS EXPERTISE

Nexant's gas specialists have considerable experience and an established track record in every area of the gas business, ranging from the initial investment strategy and planning stage through to the provision of institution and capacity building services for gas sector development, as well as assessing the impact of natural gas on overall energy sector development. Nexant has provided extensive advisory support for the development of natural gas export/import projects, LNG markets, gas to power projects, and cross-border gas pipeline projects.

Nexant assigns expert multi-disciplinary teams who can provide a broad range of services and draw on the resources of Nexant's other sectors of expertise, such as power, petrochemicals, liquid petroleum products, clean energy, and energy technology, to deliver integrated energy solutions.

Its consultants offer a wide range of experience that has been gained through operational and management positions with international and national oil & gas companies; major engineering companies; management consultancies and international development banks.

Nexant's range of services includes:

Market Analysis

- Market analysis and forecasts, supported by Nexant's proprietary World Gas Model, including gas supply and demand, LNG and gas pipeline trade flows, and wholesale gas prices.

- Gas market studies covering the full value chain, for countries and regions, as well as studies focusing on markets for new or incremental LNG and gas pipeline supplies.

Advisory Services

- Advisory services on gas business strategies, gas project development, contractual arrangements and mergers and acquisitions.
- Commercial analysis of projects, including due diligence services on new gas investment projects.

Market Development

- Studies supporting gas market development in emerging gas markets, including gas monetization studies and gas master plans.
- Development of gas regulatory frameworks, gas pricing mechanisms, and transportation tariff studies.
- Economic and financial evaluations of gas projects for bilateral and multilateral development agencies.
- Pre-feasibility studies to develop LNG and gas pipeline infrastructure projects.

Nexant's consulting services cover all areas of the natural gas business and its Global Gas team is excellently qualified to assist on assignments throughout the gas chain.

4.3 SPECIFIC EXPERIENCE RELATIVE TO NATURAL GAS AS A FEEDSTOCK

4.3.1 Methanol

Market Feasibility Study, Russia

Nexant reviewed methanol, ammonia and urea markets, pricing, delivered cost competitiveness, market entry strategy and technology options for a potential new entrant.

Methanol Feasibility Study

Nexant has recently completed a feasibility study for a 5,000 ton per day methanol unit in the PARS economic zone, Assaluyeh, Iran, for a foreign investor. This included market dynamics, price forecasts, cost competitiveness, marketing strategy, project execution and implementation definition and economic evaluation.

MTO Commercial and Technical Risk Assessment

Nexant was retained by the sponsor and its financial advisor to review market dynamics and pricing outlooks, perform risk assessments for the air separation unit (ASU), methanol, methanol to olefins (MTO) with olefin cracking process (OCP) and polyolefin process technologies, critical equipment risk assessment for the methanol, MTO-OCP and ASU plants and also a high-level social and environmental awareness overview.

Evaluation of Gas Monetization Options

Nexant analyzed markets, pricing, capital and operating costs, delivered cost competitiveness and financials (including sensitivities) for nine gas monetization options including methanol, methanol to DME, methanol to olefins (with and without olefin conversion) and methanol to propylene. A SWOT analysis was performed and the options were ranked by various financial measures.

Methanol Existing and New Potential Markets for an African Project

Nexant reviewed methanol and DME market dynamics, with a special focus on African and Indian opportunities, and developed pricing projections and a market entry strategy. New and emerging methanol markets included DME, gasoline blending, gasoline/synfuels, propylene, biodiesel, power, fuel cells. A value chain analysis (including cost of production and cost to market estimates) for each was performed to identify segments which were most attractive to an African location.

Methanol Markets and Pricing

Nexant was retained by Europe's leading methanol producer to analyze historic market and pricing trends and develop future projections, with a special focus on the European market.

Market and Pricing Projections

Market dynamics and pricing were reviewed and projected for methanol, formaldehyde, urea, melamine, amino resins, UF85, hexamine and paraformaldehyde.

Lenders' Independent Engineer

Nexant is the lenders' independent engineer for the Salalah Methanol project in Oman. Activities performed include reviewing the projects: methanol process technology, execution and management, agreements, cost and schedule, environmental, health and safety, completion testing regime for lenders, financial model, and operating parameters.

Russian and East European Cost Competitiveness

Nexant profiled producers in this region, including any horizontal and vertical site integration, and analyzed methanol delivered costs, including the outlook for the key cost factors of natural gas and freight costs.

Lenders' Independent Market Consultant

Nexant was retained as the independent market consultant by Mitsubishi Gas Chemicals, Itochu, and Petroleum Brunei for the Brunei Methanol project. Historic and projected methanol market dynamics, price and profitability, delivered cost competitiveness and marketing strategy were reviewed for the project.

Lenders' Independent Technical Consultant

Nexant is the independent technical consultant for the following Saudi Formaldehyde projects: methanol, formaldehyde, pentaerythritol, methylamines and DMF. Activities performed include reviews of facility design, project performance, site assessment, project schedule, capital cost estimate, licensing agreements, contracting process and contracts, environmental status, economic analysis as well as ad hoc technical advisory services and certifications. During the construction phase, Nexant has been conducting site visits to review project progress, expenditure and has prepared a reliability test for the new complex.

Lenders' Independent Market Consultant

Nexant was retained as the independent market consultant by Samba for this Saudi Formaldehyde methanol project. Historic and projected methanol market dynamics, price and profitability, delivered cost competitiveness and marketing strategy were reviewed for the project. Market dynamics and pricing were also reviewed and projected for the company's existing businesses of formaldehyde, hexamine, paraformaldehyde and concrete additives.

Methane to Polyolefins Feasibility Study

Nexant was retained to develop an independent feasibility study for this project, including detailed market and price analyses and forecasts; market strategy and off-take agreement development; gas feedstock

analysis and agreement formulation; technology analysis and selection (for methanol, olefins via MTO or MTP, and polyolefins); configuration and product optimization; capital and operating cost estimation and forecasts; detailed economic and cash flow evaluation; and investment recommendations.

Methanol Feasibility Study

Analysis of markets, pricing, delivered cost competitiveness, technology selection and financial attractiveness of a large scale project in Iran.

Lenders' Independent Technical Consultant

Nexant is the independent technical consultant for the EMethanex methanol project at Damietta in Egypt, a joint venture between Methanex and EChem. Activities performed include reviews of facility design, site assessment, permits and licenses, project execution and plan, capital cost estimate, operating and maintenance costs, project performance, contracting process and contracts, economic analysis, project risk analysis as well as ad hoc technical advisory services and certifications.

“New Paradigm” Methanol Pricing Outlook

Changing market dynamics in the methanol industry have caused many plants to close in North America. Once the final U.S. gas-based plant closes, the historically strong influence of U.S. gas costs on global methanol prices will cease and a “new paradigm” price-setting mechanism will emerge. This study projected future methanol prices under this new paradigm with some sensitivity cases also considered.

Methanol Feasibility Study

Assessment of markets, pricing, delivered cost competitiveness, technology selection and financial attractiveness of a large scale project in Egypt.

Strategy Plan Development

The development of a 10-year strategic plan for margin enhancement for a major Russian chemicals and fertilizer company whose portfolio includes four methanol plants, incorporating conventional natural gas reforming and also acetylene off-gas technologies. The strategy was based on technology and manufacturing assessments of the sites, market characterization and a profitability assessment of each business versus the wider global industry. Businesses and projects were identified within the substantial portfolio for expansion/investment and others for exit.

Methanol Market Study

In this study for an acetic acid producer, historic and projected methanol market dynamics, price and profitability plus delivered cost competitiveness were reviewed for a new potential methanol investment. Special attention was paid to likely future alternative price-setting mechanisms if all price-influencing capacity in North American and Europe were to close.

Production of Methanol from Oil Residue in Germany

In this study for a major global methanol producer, the alternative value of heavy fuel oil to German refineries was determined and the cash cost of production of methanol was calculated for each of the three German methanol producers using this feedstock, taking due account of the integration with the refinery and with associated hydrogen and ammonia plants.

Feasibility Study Assessment and Ranking

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 methanol and/or ammonia production. The company retained Nexant to carry out an independent due diligence of these studies and to recommend investment

priorities. Nexant undertook market opportunity studies, price forecasts, financial modeling, and other project assessments, and rated and ranked the projects.

Market Study

Independent market consultant to WestLB as Joint Lead Arranger for a proposed methanol plant in Western Australia reviewing the supply/demand and pricing prospects for methanol, the delivered cost competitiveness of the plant and the marketing strategy for the product.

Techno-Economic Feasibility Study

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.

Methanol Marketing Study

A review of global markets, pricing, delivered cost competitiveness and marketing strategy for a Qatari company wishing to invest in a methanol project.

Market Study

Independent market consultant to lenders considering investing in a proposed methanol plant in Western Australia including a market study which reviewed the supply/demand and pricing prospects for methanol under several different scenarios, the delivered cost competitiveness of the plant, regional cost curves and the marketing strategy for the product.

Methanol Market Consultant

A review of global markets, pricing and delivered cost competitiveness for a Saudi Arabian company wishing to invest in a methanol project in the Kingdom.

Technical and Market Advice for New Methanol Project

Technical and market consultancy services to Société Générale making assessments and recommendations from the standpoint of potential lenders to a proposed methanol plant in Western Australia including technology selection, project development, review of gas supply, EPC, O&M and offtake contracts and a market study reviewing 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

A pre-feasibility study including pricing prospects and cash flow analysis for a prospective large-scale methanol plant in Nigeria.

Global Methanol Business Outlook

A study considering the likely change in U.S. 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.

QAFAC Methanol/MTBE Market Due Diligence

A study carried out on behalf of the banks arranging the loan facility for the Qatari 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.

Methanol Market and Technical Due Diligence

Assistance to venture capitalists supporting the acquisition of a methanol producer. Activities included assessing the status of the plant and providing price and market forecasts.

Methanol Plant Technical Review

A review of a producer's gas consumption against that when the plant was originally built and the state of the art to assess the scope for future improvements and to identify the disadvantage compared to new world-scale plants.

Methanol Benchmarking Study

A technical review of the operating performance of a group of methanol producers, identifying the most significant factors responsible for below average plant availability and output.

The Prospects for Diesel/Methanol Emulsions

An assessment of the potential for methanol use, as an emulsion in diesel, considering the global use of diesel, the possible impact on refiners, etc.

U.S. Methanol Price Forecast

A global methanol market and U.S. price forecast for a potential methanol producer.

Crude Methanol Markets

An analysis of the technical feasibility of selling crude methanol into chemical grade methanol markets for a potential methanol producer.

Short Term Methanol Analysis

An analysis of the global methanol business, in light of 1994 developments in the United States. CAA implementation, for a major international oil company.

Methanex Due Diligence

A study relating to the re-financing of Methanex Corporation. This included a technical review of the operations of Methanex's Waitara Valley and Motunui plants in New Zealand, Cabo Negro plant in Chile, Kitimat plant in British Columbia, Canada and a review of the status and estimated cost and schedule for completing the Fortier Methanol joint venture in Westvaco, Louisiana.

Methanol Market and Pricing

A review of the likely growth in demand for methanol and a price forecast on behalf of an existing small methanol producer contemplating a major expansion.

Methanol Business Opportunity Study

A detailed study for a would-be methanol producer detailing methanol markets and pricing mechanisms as well as a forecast of the producers likely competitive position in the major global markets.

Natural Gas Utilization

A natural gas utilization study for Argentina, including:

- Gasoline octane enhancement - preliminary licensor information
- MTBE production and use pre-feasibility study
- Economics, pricing and project financing
- Study of the optimum use of natural gas in transport.

Methanol Competitiveness and Business Valuation Study

A comparison of the production economics of a major methanol producer with its major competitors and then a valuation of the business based on a forecast of its methanol margin.

Methanol Production Economics

An economic evaluation of the costs of methanol production for a major gas utility.

Methanol Technology

An update on methanol technology for a European chemical major.

Methanol Project - Trinidad

Retained by Citicorp to provide project finance-related consulting services for the Caribbean Methanol Company's plant at Point Lisas, Trinidad with input focused on the following:

- Review of lump-sum turn-key (LSTK) contractor services,
- Participation in contract negotiations to complete the contractor LSTK agreements and the product offtake agreements.

Methanol Technology Analysis

A methanol technology analysis for an American oil company.

Methanol/MTBE Price Projections

Methanol/MTBE price projections for a Middle Eastern project for the banking consortium.

Evaluation of Methanol Sourcing Options

An evaluation of methanol sourcing options for a Latin American Oil Company.

Methanol Market and Competitor Analysis

A methanol market and competitor analysis for an Indonesian company considering a new project.

Indonesian Methanol Project

Consulting assistance to evaluate the East Asian and U.S. methanol markets, including a competitor analysis focusing on existing methanol plants in the Asian region, the U.S. Gulf Coast and other major exporting regions for a client considering a natural gas based methanol project in Indonesia.

The U.S. Methanol Industry

An analysis of the historical and future U.S. methanol industry for a potential purchaser of a major U.S. methanol facility.

Methanol from Biomass

An assessment of cost of production of methanol from biomass for the Solar Energy Research Institute - SERI.

Contractor Evaluation

A review of contractors' proposal for Petroquimica Austral's 2,000 MTPD Argentine Methanol Project for an American investor.

Methanol Market Review/Forecast

A methanol market study for the Heidrun Unit (DuPont/Conoco, Statoil, Arco, Norsk Hydro), with subsequent update for presentation to the Norwegian Parliament.

Liquid Phase Methanol Plant

The design of a two stage liquid phase large-scale methanol plant for EPRI. Liquid phase methanol process development unit: installation, operation and support studies for the United States Department of Energy and Air Products and Chemicals.

The Development of the Global Methanol Industry

A report chronicling the historical development of the global methanol industry for the United States Department of Energy.

Floating Methanol Plant

Evaluation of the feasibility of a floating methanol plant in south-eastern Asia for a project sponsor.

Point Lisas Methanol Project Assistance

A series of studies including evaluation of the project, assessment of the global markets for methanol and the evaluation of engineering contractor submissions for a 1 200 tons per day methanol plant for the National Energy Corp of Trinidad and Tobago Limited.

4.3.2 Ammonia/Urea

Pricing Study, Iraq

Nexant has performed an in-depth pricing study for a client in Iraq. The study covered a broad range of chemicals including ammonia and urea. Market Dynamics, pricing projections and formulas as well as a competitive analysis of potential plants to be located in Iraq have been delivered to the client.

Feasibility Study for an Ammonia/Urea Plant, Brunei

Nexant has provided a full feasibility study to its client for a prospective ammonia/urea plant to be located in Brunei. The study included a market analysis as well as profitability and pricing forecasts, CAPEX estimations and an economic evaluation of the project.

Pre-feasibility for an Ammonia/Urea Plant, Tanzania

Nexant has conducted a pre-feasibility study for potential nitrogenous fertilizer plant to be located in Tanzania. The study included capacity and cost estimations as well as a regional market analysis.

Feasibility for a Fertilizer Plant, Kazakhstan

Nexant has provided its client with diligent support in evaluating an opportunity to build a fertilizer production plant in Kazakhstan. The study included the main products urea as well as phosphates and consisted inter-alia of a market and pricing analysis and addressed regulatory issue for developing a project in the respective region.

Urea Formaldehyde (UF) Slow-Release Fertilizers

Nexant conducted primary research on the slow release fertilizer value chain to characterize the attractiveness and profitability of the market. Study examines manufacturers (e.g., Agrium) and users (golf courses, nurseries).

Integrated Fertilizer Complex Independent Engineer Study, USA

Technical due diligence for lenders to a fertilizer plant in the United States to develop, build, own and operate a new state-of-the-art nitrogen-based production facility. The plant will produce ammonia, urea, urea ammonium nitrate (UAN) and diesel exhaust fluid (DEF).

Coal to Ammonia/Urea Fertilizer project, Turkey

Nexant evaluated the feasibility of a coal based ammonia/urea plant to be located in West Turkey. The study included technology evaluation and competitive- as well as market- and pricing analysis.

Strategic Growth: Assessing New Market Opportunities alongside America's Shale & Oil Revolution

To help its client find opportunities for growth, Nexant analyzed the impact of low cost shale gas and oil on chemicals, plastics and other industries in NAFTA. The report included a screening study to identify and rank opportunities and an examination of the regional market size, expected growth rates, product offerings, key applications and market structures of the four targets that best match the client's capabilities.

Preliminary U.S. Ammonium Nitrate Market Study, North America

The study evaluated a coal-based fertilizer project in the Texas panhandle. The ammonia it produces might be converted to ammonium nitrate. The study included historical and forecast AN prices and demand, AN capacity by location, AN supply, and trade forecasts. The study furthermore includes an overview of the global demand and supply with an emphasis on Canada.

Trend Survey of Shale Gas/Oil Industry and Marketing Survey of Various Products in North America as well as a Shale Gas & Tight Oil Outlook

The study consisted of several phases which included: a North America Shale Gas & Tight Oil Outlook, covering history, E&P Processes, Environmental Issues & Water Handling; a Shale Gas & Tight Oil Value Chain Analysis including value chain step profiles, oil field supplier profiles, market segment rankings and a short list of attractive market segments; an Identification of Opportunities for Nexant's client by organic growth through R&D or by acquisitions or partnerships.

Technical Due Diligence: Fertilizers and Chemicals, Romania

Technical due diligence assessment of a fertilizer and chemicals complex in Romania.

Ammonia and Methanol PWR, Trinidad & Tobago

A study of the components of the cost of production of ammonia and methanol, plus depreciation and ROI.

U.S. Urea Market Assessment

The lender of an integrated gasification combined cycle fertilizer and power plant in Texas asked Nexant to project likely prices for granular urea and assess the overall domestic market for nitrogen fertilizers: supply/demand; trade; consumption by region and crop. The study discusses urea producers, global and U.S. trends, and pricing.

C₁ Value Chain Analysis

For a large IOC Nexant provided a study that profiles 32 chemicals in the C₁ value chain: process technologies, feedstock consumptions, production economics, major producers, technology licensors, market size, market growth forecasts, and end-uses.

Fertilizer Project, Gabon

This report has been prepared to support the Lenders' activities in the financing of a fertilizer project in Gabon. The report reviews the global market prospects and the cost competitiveness of the proposed facility, and provides commentary on future urea pricing and profitability, as well as critiquing the marketing plans for urea into the marketplace.

Nitrogen Fertilizer Production Opportunities in the U.S.: Search, Screening and Feasibility

Nexant reviewed the status of nitrogen fertilizer demand and supply, and production and logistics infrastructure, as well as natural gas market dynamics in the United States, and of the regulatory and economic development landscape relevant to new or expanded N-fertilizer production in the United States. Nexant identified feasible, permitted, logistically and politically advantaged production sites with a focus on the USGC and Mississippi Basin and Sarnia, ON. Nexant visited a short list of qualified sites, developed contacts with regional and local authorities and other stakeholders

Marketing and Techno-Economic Study – Purge Gas Ammonia and Carbon Dioxide Recovery Based Urea

Subsequent to a Nexant study on purge gas ammonia in Oman a report was issued on the potential integration of a urea plant into the industrial cluster. The final report covered a complete techno-economic feasibility study on the entire complex including capex estimation, financial models and sales and marketing plans.

Lenders' Independent Market Consultant, Nigeria

Nexant is the independent market consultant for an ammonia and urea project in Nigeria. Historic and projected urea market dynamics, ammonia and urea prices and profitability, delivered cost competitiveness and marketing strategy reviewed for the project.

Lenders' Independent Market Consultant, Gabon

Nexant is the independent market consultant for an ammonia and urea project in Gabon. Historic and projected urea market dynamics, price and profitability, delivered cost competitiveness and marketing and off-take strategy reviewed for the project as well as ongoing ad hoc market advisory services.

Feasibility Study –Ammonia/Urea, Iraq

For a company in Iraq Nexant prepared a full project feasibility study for an integrated ammonia, urea project. The report included historical and forecast regional market and price data, CAPEX estimations and technology evaluations. Nexant examined the profitability of the project and put the competitiveness of the project into perspective with other regional and international competitors.

Marketing and Techno-Economic Study – Purge Gas Ammonia, Oman

Nexant was appointed to conduct a feasibility study for a potential ammonia plant in Oman including economic and technology evaluations and defining potential plans and targets.

Lenders' Independent Market Consultant, Nigeria

Nexant is the independent market consultant for an ammonia and urea project in Nigeria. Historic and projected urea market dynamics, price and profitability, delivered cost competitiveness and marketing strategy reviewed for the project as well as ongoing ad hoc market advisory services.

Lenders' Independent Technical Consultant, Nigeria

Nexant is the independent technical consultant for an ammonia and urea project in Nigeria, which entails the dismantling and relocation of the ammonia and urea plants from Alaska. Activities performed include reviews of the existing equipment and how it operated in the past, facility design, projected performance, capex, schedule, operations and maintenance costs, financial model and financing documents, EPC contractor, contracts, approvals and permitting, performance testing, environment and Equator Principles compliance, key construction and operation risk matrix as well as ad hoc technical advisory services and certifications.

Gas Monetization Study, Tanzania

Nexant reviewed several gas monetization options before shortlisting methanol, ammonia and urea for which markets, pricing, delivered cost competitiveness, market entry strategy and technology options were reviewed as well as site suitability and developing the financial model.

Market Feasibility Study, Russia

Nexant reviewed methanol, ammonia and urea markets, pricing, delivered cost competitiveness, market entry strategy and technology options for a potential new entrant.

Lenders' Independent Market Consultant, Australia

Nexant is the independent market consultant for a coal-based urea project in Western Australia. Historic and projected urea market dynamics, price and profitability, delivered cost competitiveness and marketing strategy reviewed for the project as well as ongoing ad hoc market advisory services.

Lenders' Independent Technical Consultant, Australia

Nexant is the independent technical consultant for a coal-based urea project in Western Australia. Activities performed include reviews of facility design, projected performance, capex, schedule, operations and maintenance costs, financial model and financing documents, EPC contractor, contracts, approvals and permitting, performance testing, environment and Equator Principles compliance, key construction and operation risk matrix as well as ad hoc technical advisory services and certifications.

Feasibility Study – Ammonia/Urea, Uzbekistan

This engagement evaluated the attractiveness of a large-scale ammonia plant to replace older units at an existing complex plus a new urea unit to supply local and international markets. It reviewed local markets and logistics, global market dynamics, pricing outlook, delivered cost competitiveness to various markets, technology evaluation, project definition, contracting strategy and financial attractiveness.

Organic Fertilizers Market Analysis

For Boubyan Petrochemical Company, Nexant performed a study on several aspects of the market in the United States and Canada for the solid and liquid "soil fertility products" or "organic based fertilizers" to be made in a proposed plant in Kuwait using a process developed by International Bio-Recovery Corporation (IBRC) of Vancouver, British Columbia, Canada.

Pricing of Petrochemical Fertilizer Feedstocks in the GCC Countries

The European Commission approached Nexant to evaluate whether petrochemical/fertilizer feedstocks in the Gulf Cooperation Council (GCC) countries are priced fairly and to evaluate the competitiveness of GCC petrochemical/fertilizer production and its likely evolution in comparison with the Economic Community situation.

Feasibility Study – Ammonia/Urea, Azerbaijan

The viability of developing an ammonia and urea complex in Azerbaijan was assessed in this study. Work carried out included a review of the market opportunities and price forecasting of the products of the proposed complex, technology assessment and cost competitive analyses. The findings from these aspects of the study contributed to an economic evaluation to determine the feasibility of the project.

Technical and Commercial Due Diligence – Ammonia, HNO₃ and Technical AN, Peru

The attractiveness of relocating an ammonia plant and building new nitric acid and technical ammonium nitrate plants was assessed for the JV partners. Capital costs and schedules were reviewed, markets and pricing forecast and a financial model built to enable venture assessment.

Market Study – Ammonia/Urea, Libya

Review of market dynamics, pricing outlook and delivered cost competitiveness to European markets.

Feasibility Study – Ammonia/Urea, Turkmenistan

Study of the attractiveness of a Turkmen ammonia/urea investment opportunity including market dynamics, pricing outlook, delivered cost competitiveness, technology evaluation, site assessment, contracting strategy and an economic evaluation.

Feasibility Study – Ammonia/Urea, Pakistan

Assessment of market dynamics, pricing outlook, delivered cost competitiveness to various markets, technology evaluation, project definition, contracting strategy and financial attractiveness of an ammonia/urea project.

Lenders' Independent Market Consultant, Algeria

Nexant is the independent market consultant for an ammonia and urea project. Historic and projected ammonia and urea market dynamics, price and profitability, delivered cost competitiveness and marketing strategy were reviewed for the project as well as ongoing ad hoc market advisory services.

Lenders' Independent Technical Consultant, Algeria

Nexant is the independent technical consultant for an ammonia and urea project. Activities performed include reviews of facility design, site assessment, permits and licenses, environmental, health and safety performance, project execution and plan, capital cost estimate, operating and maintenance costs, project performance, contracting process and contracts, economic analysis, project risk analysis as well as ad hoc technical advisory services and certifications.

Technical Audit – Ammonia/Nitric Acid/AN/CAN/Urea/Ammonium Sulfate, Ukraine

An evaluation of a major Ukrainian fertilizer and chemical producer on behalf of its financial owners. For each product, the technology was reviewed and the cost competitiveness determined at various gas price sensitivities. Strategic options were identified for improvement.

Feasibility Study – Ammonia/Urea, Iran

Assessment of market dynamics, pricing outlook, delivered competitiveness to various markets, technology evaluation, project definition, contracting strategy and financial attractiveness of a large scale ammonia/urea project.

Strategic Plan Development - Ammonia/Nitric Acid/AN/Urea/UAN Solution, FSU

The development of a 10-year strategic plan for margin enhancement for a major Russian fertilizer company based on technology and manufacturing assessments of its sites, market characterization and a profitability assessment of each business versus the wider global industry. Businesses and projects were identified within the substantial portfolio for expansion/investment and others for exit.

Price Forecasts – Ammonia, Qatar

Ammonia prices forecasts under several scenarios, including a new paradigm whereby there is complete closure of the North American production capacity.

Price Forecasts – Ammonia, Latin America

A study for evaluating various scenarios to consider the potential impact of global oil/gas pricing, changing market dynamics and shipping costs.

Technical Due Diligence - Ammonia/Nitric Acid/AN/Urea/UAN Solution, Russia

Technical due diligence support was provided for a banking syndicate, which was considering making a substantial loan to a major Russian fertilizer and explosives producer. For each plant at each site, the technology, plant operations, asset condition and future capex requirements were assessed. Cost competitiveness was benchmarked and a SWOT analysis was performed for each site.

Asian Price Forecasts – Ammonia/Urea, Vietnam

A long-term price forecast was developed in support of the Phu My Fertilizer project in Vietnam for the Vietnam Oil and Gas Corporation.

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. The company retained Nexant to carry out an independent due diligence of these studies and to recommend investment priorities. Nexant undertook market opportunity studies, price forecasts, financial modeling, 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.

Technical Due Diligence - Ammonia/Nitric Acid/AN/SSP/TSP/NPK/STPP, Algeria

Technical due diligence support was provided for Sterling Merchant Finance, which was mandated with the privatization 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.

Preliminary Assessment – Ammonia/Urea, Africa (Confidential Location)

A brief assessment of the global market with special focus on Latin America together with a Latin American market delivered cost competitiveness analysis.

Market Consultant – Ammonia/Urea, Oman, Arab Gulf

Arab Banking Corporation, on behalf of the project lenders, 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 GPIC in Bahrain 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 Fertil in Abu Dhabi which reviewed Fertil's existing operations and identified an economically viable "road map" to optimize 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, sulfur-coated urea and hydrogen.

Fertilizers and Methanol Market Analysis – Ammonia/Urea, U.S.

Market and pricing analysis and forecasts for Terra and Citibank together with a discussion of likely future price-setting mechanisms.

Market Study – Ammonia, Egypt

Market and price projections, competitiveness analysis, and a review of marketing practices for a potential project for the licensor/contractor, MW Kellogg. Both local/regional and international markets were reviewed.

Ammonia/Urea Benchmarking Study, Arab Gulf

A national GCC petrochemical company 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).

C₁ Value Chain Analysis

Nexant performed this study which profiles 32 chemicals in the C₁ value chain: process technologies, feedstock consumptions, production economics, major producers, technology licensors, market size, market growth forecasts, and end-uses. The study covered ammonia value chain – ammonia, urea, phosphate, and NPK fertilizers.

Ammonia and Urea Price Forecasts

For Petrochemical Industries Company Kuwait Nexant provided price projections for the products methanol, ammonia and urea.

Market Consultant – Ammonia/Urea, Venezuela

Pequiven, on behalf of the FertiNitro joint-venture, required market and price projections, and competitiveness analysis, for its ammonia and urea project.

Market Consultant – Ammonia/Urea, Argentina

The Profertil joint-venture required market and price projections, and competitiveness analysis, for its ammonia and urea project.

Market Consultant – Ammonia/Urea, Oman, Arab Gulf

JP Morgan, on behalf of the project lenders, required market and price projections, and competitiveness analysis, for the OMIFCO ammonia and urea project.

Feasibility Study – Ammonia/Urea, Qatar

Appointed sponsor's market consultant to provide the initial assessment of the feasibility of the QAFCO IV expansion. The study focused on markets, pricing and competitiveness.

Feasibility Study – Ammonia/Urea, Latin America

For an international sponsorship partnership, Nexant teamed with a major engineering organization to provide a full-scope feasibility study for a proposed grassroots world-scale ammonia/urea complex. The study included technology selection, market feasibility, transportation cost modeling, preliminary engineering, capital cost estimates and economic performance modeling.

Ammonia/Urea Project Planning, Arab Gulf

An Arab Gulf producer required input to its project planning. This consisted of a global and regional view of ammonia and urea markets, with particular reference to India and China, together with competitiveness assessments and price projections for both products.

Ammonia/Urea Market Opportunities in Selected Asian and Latin American Countries

A major U.S. chemicals producer required a market analysis for methanol, ammonia and urea, and an assessment of relative attractiveness for selected countries, including China and India.

Export-Orientated Urea Producer Strategic Plan

A major strategic planning study for an export-orientated petrochemical producer. The product range of the producer included ammonia and urea. The study screened potential global market opportunities in petrochemicals, projected target markets, pricing and profitability of new projects, and ranked the attractiveness of ammonia/urea among the petrochemical opportunities available.

Ammonia and Urea Pricing from an Export-Orientated Joint Venture

Assisted a client in formulating ammonia and urea pricing agreements for a joint venture with a foreign partner. The assignment involved negotiating pricing formulas to be used and provisions for utilizing the formulas.

Construction Contract Practices

A survey of engineering contractors and financing agencies was conducted to establish current conventional practices in construction contracts for ammonia and urea plants. The study covered the nature of completion and plant performance guarantees with respect to lump sum turn key projects, performance testing, remedies, mechanism of acceptance, and provision for damages.

Analysis of the Fair Market Value of a Major Urea Plant, U.S.

The fair market value of a 1,000 ton per day urea plant was estimated for a major United States producer under three bases:

- As an operating in-place urea production plant, under an ongoing business concern
- As a urea production facility sold in an orderly liquidation sale
- As miscellaneous chemical process equipment sold piecemeal in an assumed distressed situation.

North American Nitrogen Markets and Outlook

North American ammonia and urea demand, supply, and trade was analyzed and prices were projected based on the outlook for North American natural gas pricing and other cost factors, compared to imported products. The study was for a major North American fertilizer producer.

Investment Opportunity Study – Ammonia/Urea/AN/AS, Arab Gulf

A pre-feasibility study for a Middle East client to investigate opportunities for ammonia/urea, ammonium sulfate/nitrate, plus non-fertilizer related products, and involving global and regional market analyses, price projections, cost competitiveness comparisons versus other regions, and preliminary financial evaluations, for each product.

Acquisition Analysis – Ammonia/Urea, Western Europe

Assistance to a West European client regarding his prospective acquisition of an ammonia/urea producer. The analysis included global, regional, and country specific markets studies, product and natural gas price forecasts, and cost competitiveness comparisons versus other regions.

Ammonia Marketing Prospects, UAE

Abu Dhabi National Oil (ADNOC) asked Nexant to review prospects for ADNOC marketing ammonia west of Suez, specifically in the West European/Mediterranean and North America markets and to provide economics of production and shipping of the ammonia.

Ammonia / Urea Market Outlook, Oman

Nexant prepared a market analysis for ammonia and urea in the Near East, Southern Africa and several Asian regions in line with a possible fertilizer production plant in the Sultanate.

Merchant Market Study

Nexant to describe operations of gas, metals, chemicals, coke and fertilizers producers in the three countries Saudi Arabia, Egypt, and Korea.

Industry Restructuring Study

Regional fertilizer producers required Nexant to appraise the producers' competitiveness and potential restructuring options. The options were evaluated against Nexant's forecasts of global and regional markets and prices, and producers' volumes.

Industry Privatization/Restructuring Study, Poland

The Polish Government/World Bank required Nexant to appraise Poland's fertilizer industry (and other sub-sectors of the heavy chemicals 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.

Strategy Review, Western Europe

A major West European producer engaged Nexant to review its strategic plan in fertilizers. The company is a significant nitrogen producer and importer.

Competitiveness Study, Europe

The European Fertilizer Manufacturers Association (EFMA) engaged Nexant to undertake this major study into the competitiveness of the European industry. The analysis examined competitive position both within the industry and of the industry as a whole within the global business.

Competitor Review, Western Europe

A major West European fertilizer producer engaged Nexant to review its competitors. The study analyzed capacities, production balances and financial performance, and provided assessments of the positions and strategies of the individual companies.

For more information and to place an order, contact as follows:

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