Prospectus

Brazil's Biofuels Industry: Outlook for a Global Leader







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Outlook for a Global Leader

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Contents

Section Pag				
1	Intro	luction	1	
2	Study	Objectives	5	
3	Report Scope		7	
	3.1	POLICY	7	
	3.2	MARKETS	7	
	3.3	FEEDSTOCK COVERAGE	8	
	3.4	TECHNOLOGY	8	
	3.5	PRODUCTION ECONOMICS	8	
4	Meth	odology	10	
5	Company Experience		12	
	5.1	NEXANT	12	
	5.2	EXPETRO	18	
6	Contact Information		21	
7	Authorization Form			

Brazil is a global leader in ethanol production, with ambitions to dramatically expand into biodiesel and other fuels from biomass. Brazil is unique among major producers due to its long history of fuel ethanol use and the extent of its supporting infrastructure. For these reasons, Brazil's biofuels industry is a focus for stakeholders in both conventional and renewable energy, who are interested in developing commercial opportunities, technology developments, and insights into this major market.

Brazil and the United States hold the leading positions in ethanol production worldwide, as shown by Figure 1.1 below, with the two countries accounting for almost three-quarters of the world's ethanol production.



Brazil has also begun a major initiative to increase ethanol exports. Figure 1.2 shows the recent dramatic jump in U.S. imports from Brazil, driven by the sizeable increase in U.S. ethanol consumption which was created by the 2005 Energy Policy Act. The U.S. imported 1.64 million cubic meters (434 million gallons) of ethanol from Brazil in 2006, representing 66 percent of total U.S. ethanol imports. This provides an indication of the increasingly global nature of the biofuels business, where a change in one nation's foreign policy can have a direct effect on Brazil's biofuels industry. The same will likely apply as Brazil's biodiesel industry develops.





Figure 1.2 U.S. Ethanol Imports Million tonnes

Brazil has a long history of producing ethanol from sugarcane, dating back to the early 1900s. Five percent ethanol in gasoline was required as far back as 1931. The National Alcohol Program was implemented in 1973 in response to the worldwide oil crisis. Brazil began mass production of dedicated ethanol vehicles in 1979. Currently, Brazil's government mandates 25 percent ethanol blending in gasoline. Over the next decade, some projections show production increasing over 35 percent and consumption increasing by 25 percent. Figure 1.3 shows that while ethanol production has been growing steadily since 2000, export levels are also increasing due to growth in foreign demand and the favorable economics enjoyed by Brazilian producers.



Figure 1.3 Brazil - Ethanol Production and Export Million cubic meters/harvest year

90/91 91/92 92/93 93/94 94/95 95/96 96/97 97/98 98/99 99/00 00/01 01/02 02/03 03/04 04/05 05/06 06/07 0207_77807.05.001.01_Charts.xls.1.3

Increased demand for ethanol, both for domestic use and export, raises the question of whether current feedstock resources are adequate. Figure 1.4 shows that sugar production has generally climbed over the last fifteen years. A key issue over the coming decade is the potential competition for sugar resources between ethanol and food uses.



Figure 1.4Brazil Sugar Production and ExportMillion tonnes/harvest year

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Introduction

The Brazilian biofuels industry is vibrant, with a strong new focus on reaching significant biodiesel production goals, supported by the importation of biodiesel feedstock as required. Brazil is also making significant contributions to next generation biofuels technology, such as the hydroprocessing of natural oils in refineries (Petrobras' H-Bio process) and conversion of waste cellulosic substrates (in particular sugarcane bagasse) to ethanol.

Nexant will undertake this study in conjunction with Expetro, a Brazilian consultancy with extensive experience in the domestic biofuels industry, with the goal of providing stakeholders with the following:

- An understanding of feedstock options and issues
- An independent assessment and opinions on the direction of technology developments
- An analysis of the competitive position of Brazilian biofuels relative to other major global producers
- An understanding of Brazil's policy and regulations including an assessment of possible trends and changes over the next decade
- An understanding of the Brazilian biofuels industry from both a local and global perspective, covering investments, research, and strategy
- Insight into the direction of the biofuels market in Brazil and the role of sugarcane and ethanol over the next decade

The strengths, issues, and outlook for the Brazilian biofuels industry should be of interest to all players in the global industry, regardless of their specific intent with regard to Brazil.

This proposed study will supplement Nexant's recently published landmark study, *Liquid Biofuels: Substituting for Petroleum*, which provides a global assessment of biofuels technologies and markets. Nexant and Expetro will expand on this study by developing an indepth analysis of Brazil's biofuels industry over the coming decade.

Nexant's study, *Brazil's Biofuels Industry: Outlook for a Global Leader*, aims to assess the technical, commercial and policy status of existing and anticipated biofuel and biofuels-related activities in Brazil. The study will draw conclusions on opportunities and challenges in the industry. It will also forecast changes to come, considering critical elements of the Brazilian biofuels supply chain. The study will examine related markets, such as flexible-fuel and dedicated ethanol vehicles, and distillers grains. It will also profile Brazil from a global perspective, highlighting local opportunities as well as key issues for companies considering investment options worldwide.

The objective of the study will be to answer the following critical questions. The broader scope of *Brazil's Biofuels Industry: Outlook for a Global Leader* is provided in Section 3.

Policy

- What are Brazil's current policies and mandates regarding biofuels, specifically ethanol and biodiesel?
- What policy changes are anticipated in the near-term, if any? How will policies evolve over the next ten years?
- What current or possible foreign policy development might influence Brazil's ability to become an exporter of biofuels to other countries?
- How are these current and future policies relevant to the various stakeholders in the biofuels industry worldwide, including investment opportunities?

Markets

- Relative to the current markets, what changes are anticipated for various biofuels and biofuels-related revenue streams, including byproducts and power generation, in Brazil?
- How are production and consumption of the primary biofuels, i.e., ethanol and FAME biodiesel, likely to change in the next 10 years?
- What are related markets in Brazil such as flexible fuel vehicles, dedicated ethanol vehicles?
- What is the position of current and anticipated markets relative to the global marketplace? What are the current import/export dynamics and what is anticipated for the future?



Feedstocks

- What are the strengths and weaknesses of sugarcane as a feedstock for fermentation ethanol in Brazil?
- Are there promising developments for additional feedstocks for ethanol in Brazil?
- What feedstocks are currently used in the production of biodiesel, and what are the issues with these feedstock options?

Production Economics

- How much does it cost to produce ethanol and biodiesel in Brazil? What factors affect the cost of production?
- Are liquid biofuels competitive with conventional petroleum fuels in Brazil? Are there conditions under which subsidies and other supports may be necessary?
- Are Brazilian biofuels competitive globally? What are the key factors to global competitiveness?

Technology Developments

- What technological developments can be expected for bioethanol and biodiesel in Brazil?
- What alternative biofuels and associated new technologies might be anticipated by 2015?

The scope of Nexant's *Brazil's Biofuels Industry: Outlook for a Global Leader* study will cover policy, markets, feedstocks, technology, and production economics. The profiles will include historical information, the current situation, and a forecast over the next 10 years. The assessment will be made from a local as well as global perspective.

3.1 POLICY

Nexant and Expetro will profile existing and developing policy, including an overview of policy drivers. Information about current policy will examine:

- Biofuels usage and blending mandates
- Brazil petroleum usage policy
- Sugarcane and sugar pricing and price controls
- Subsidization of biofuels
- Vehicle and fueling infrastructure

The study will also address possible policy developments and the drivers behind them.

3.2 MARKETS

The study will profile the markets for biofuels, biofuels byproducts, and related industries. It will include the following:

- Current and 10 year forecast for various biofuels including:
 - Ethanol, which is a relatively developed industry in Brazil
 - Biodiesel, which has been of recent interest in Brazil
 - A comparison of ethanol and biodiesel
- Markets for feedstocks as deemed relevant, including sugarcane
- Markets for byproducts of biofuel processing, such as distillers dried grains and solubles (DDGS) and biodiesel glycerine
- Export opportunities and goals
- The relationship between biofuels and petroleum



3.3 FEEDSTOCK COVERAGE

Nexant's study will focus on the primary feedstocks that have potential in Brazil. The study will detail the feedstocks currently in production for biofuels, as well as identify additional feedstocks that are not yet commercialized, but might serve as next generation feedstocks.

The primary feedstock that will be considered for ethanol will be sugarcane. The primary feedstock that will be considered for biodiesel is soybeans.

3.4 TECHNOLOGY

Brazil's Biofuels Industry: Outlook for a Global Leader will profile the current array of biofuels technology as well as those with high likelihood of commercialization and application in Brazil.

These fuels and process technologies will be evaluated from technical, economic and commercial perspectives. A review and assessment of representative process routes for each major technology will be performed. In addition, the stage of development will be characterized, with a list of actual and announced projects.

The types of liquid biofuels and routes considered in the study will include fermentation of sugar substrates to ethanol and conventional trans-esterification of natural oils and fats to biodiesel, including ethyl (FAEE) and methyl (FAME) esters.

3.5 **PRODUCTION ECONOMICS**

Nexant will calculate the cost of production for typical plants representative of current ethanol and biodiesel technologies in Brazil. Technical issues will be identified as appropriate, and estimates will be made for the costs and associated benefits of potential improvements along the value chains.

While the study will focus on the economics of biofuels production in Brazil, the production cost estimates will be profiled relative to relevant international production locales and feedstocks.

Figure 3.1 presents a representative chart of this type of competitive assessment for ethanol, and similar analysis will be provided for biodiesel.



 Figure 3.1
 Relative Global Production Economics for Ethanol

 Cost axis removed
 Cost axis removed

This study is scheduled to be completed by the end of the third quarter, 2007. For subscriptions received prior to June 30, 2007, the cost will be US\$9,500.00 (nine thousand five hundred U.S. dollars). After June 30, 2007, the cost will be US\$12,000.00 (twelve thousand U.S. dollars).



Nexant anticipates the program of work to require approximately four months from the beginning of study work to publication. Nexant and Expetro will undertake an intensive program of contacting industry stakeholders and government entities in Brazil to obtain current information regarding their biofuels industry. Discussions will be held with stakeholders along the entire biofuels supply chain in order to obtain support or adjust Nexant's existing views regarding the likely developments in Brazil over the next decade.

Specifically, the following approach will be undertaken for each element of the scope:

Policy

Information about policy will be gathered from various sources, including government groups and non-governmental agencies. They are likely to include an overview of different policies currently under implementation in Latin America, and a specific detailed description of the current governmental policies in Brazil. The legal and fiscal framework for both upstream and downstream segments in biofuels will be described, as well as the subsidy policies towards family agriculture and the incentives to certain feedstocks versus others. The study will also address the issue of foreseeable tax restrictions, possible impositions and regulatory issues regarding feedstock exports overseas.

Markets

Market information and forecasts will be developed from Nexant's extensive in-house databases, augmented with selected regional fieldwork. Market projections will be developed with the aid of Nexant's supply/demand models as well as extensive local data gathered by Expetro, including but not limited to the actual mapping and description of the current biofuel projects and feedstock suppliers in Brazil; the status of each project, their feedstock origin, processing technologies and equity composition; the feedstock suppliers available, per raw materials; the prices practiced for local market and for export, and the strategic/commercial fragilities and strengths of these players.

Feedstocks

The evaluations of existing and emerging feedstocks will be based on extensive internal intellectual capital and fieldwork as well as on information from licensors and other industry experts.

Production Economics

Production economics will be based on Nexant in-house models and data, augmented by current market information and technology developments.

Technology Developments

The evaluations of conventional technology will be based on Nexant's in-house information regarding process technology, augmented by contact with licensors, engineering contractors and other experts in the industry. Analyses of emerging technologies will be based on reviews of patents, public domain information, and discussions with the technology development companies and engineering contractors.

Nexant uses proprietary and commercial state-of-the-art software tools to develop the technology and economic estimates. These are well established engineering tools in the process chemical industry and are used by major engineering contractors.



5.1 NEXANT

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

ChemSystems is an international consultancy that is now part of Nexant, Inc., 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 translate 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. Whether identifying opportunities, managing change or confronting competitive challenges, we adhere to the highest ethical and professional standards.

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 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 programs are:

- Process Evaluation/Research Planning[®] (PERP)
- ChemSystems Online[®] (CSOL)/Petroleum and Petrochemical Economics (PPE) United States, Western Europe and Asia

The PERP Program covers technology, commercial trends, and economics applicable to the chemical industry. The program has more than 50 subscribers, including most of the major international energy and chemical companies. Many of the processes to be analyzed in this multiclient have been assessed in the PERP program.

CSOL/PPE covers the market and manufacturing economics for major petrochemicals.

Over the past four years, the program has been completely overhauled and upgraded. The models and databases that run the analysis have been replaced with a start-of-the-art industry simulation

program that has taken the 40-plus years of industry knowledge and experience of our consultants and enhanced it to a proven new level of forecasting expertise.

The new simulation model is used to generate the PPE reports and also an internet serviced brand, *ChemSystems* Online[®], that provides global data, analysis and forecasts of:

- Plant capacity
- Production
- Consumption
- Supply/demand and trade
- Profitability analysis
- Forecast
- Price forecast
- Techno-economic analysis

A subscription to *ChemSystems* Online[®] includes both written reports (the PPE program) on the petroleum and petrochemical industry and internet access to all data analysis and forecasts. Your subscription may be tailored to meet your specific company requirements and the fees reflect the value brought to your business. Insightful analysis and a reliable forecasting methodology provide the means to significantly improve your business performance though better investment decisions and improved competitive position.

Nexant is exceptionally qualified to perform this comprehensive analysis based on our multidisciplinary business approach and has been carrying out studies of this type throughout our more than 40 year history.

NEXANT MULTICLIENT AND PERP PROGRAM REPORTS

Relevant recent reports include:

Liquid Biofuels –Analysis of current, emerging, and potential future technologies to produce biogasoline and biodiesel, considering key elements of the value chain, including agricultural, logistics, and processing, and emphasizing techno-economic modeling.

Ethanol – Analysis of fuel ethanol production by dry corn milling fermentation.

Biodiesel – Including production technologies (commercial and developmental) and economics, feedstock issues, regulatory and market drivers, supply and demand.

Glycerine – Comparison of the natural oil and synthetic-based production routes – considering production technologies, economics, feedstocks, and global markets.

Methanol – Nexant has done a number of PERP as well as other multiclient and single client reports on methanol and its derivatives.

Plants as Plants – A study of the emerging biotechnology, processing technologies and economics of producing and recovering polyhydroxyalkanoates (PHAs) - natural polyesters – by alternative routes of fermentation and in crops, including analyses of agricultural production economics, PHA extraction costs, byproduct biomass fuel utilization, and potential PHA markets.

Biotransformation Routes to Specialty Chemicals – Includes consideration of conversions of natural oils, fatty acids, fatty acid esters, fatty alcohols and fatty amines, and fermentation technologies and commercial overviews of many bio-based product markets.

Refinery of the Future as Shaped by Environmental Regulations – Reviews issues of supply and quality of crude oil feeds to refineries, trends in quality and volume requirements for refined products, and environmental drivers for both refinery operations as well as fuel specifications.

Biodesulfurization of Petroleum Fractions – Compares various versions of conventional refinery hydrodesulfurization with developments in fermentation based biodesulfurization.

INDIVIDUAL CLIENT STUDIES

A partial list of relevant projects includes:

Global Biofuels Strategy - For a leading U.S.-based multinational firm grounded in the agricultural sectors, Nexant performed a comprehensive analysis comparing technological, supply chain, and geographic options for involvement in the biofuels sector.

Biodiesel Glycerine Derivatives – For a major U.S.-based chemical company, Nexant evaluated uses for glycerine and glycerine derivatives including evaluation of developing technology in upgrading of crude glycerine to propylene glycol and other derivatives

Technology, Company, Finance, and Project Due Diligence in Biofuels – Nexant has performed a number of recent due diligence assignments for financial institutions assessing the feasibility and value of technologies, companies, businesses, or proposed projects focused on bioethanol or biodiesel.

Chemicals from Corn – This is a broad-based study for the National Corn Growers Association (NCGA), funded by the U.S. DOE, to identify and screen chemicals that could be feasibly produced from corn. The study considers a wide range of potential sugars, and fermentation-derived acids, alcohols, and other building blocks, but emphasizes fuel ethanol derivatives, including basic petrochemicals, solvents, intermediates and specialties, and application of the Reactive Distillation technology sponsored by the NCGA. The basic economics of ethanol production and potential improvements, economies of scale, logistics, and other production and value chain issues, are addressed in the study.

Biodiesel Glycerine Byproduct - Market Dynamics – For a major U.S.-based multi-national agricultural and food company with a growing stake in biofuels, Nexant analyzed the market demand/price elasticity (with a growing glut of biodiesel glycerine byproduct), existing uses of glycerine, potential substitutions for other polyols such as propylene glycol and sorbitol, and potential future applications, including reaction derivatives of glycerine in various applications and fuel uses. Nexant considered the near term and emerging and long-term market outlets for USP and other refined grades of glycerine, as well as for crude biodiesel glycerine byproduct, which is of a more problematic quality than soap and oleochemical byproduct. The study required developing views of biodiesel growth, and pricing scenarios under various assumptions. This subject was also addressed in two recent papers presented at international conferences.

Biobased Fuel Cells – At the BIO World Congress on Industrial Biotechnology and BioProcessing, Orlando, FL, April 20-22, 2005, Nexant presented a paper on biofuels use in fuel cells based on a study of Stationary Fuel Cells for Nexant's PERP program, and also chaired a panel on Bio-based Fuel Cells, which included discussions of enzyme-based fuel cell membrane and electrode technologies to utilize hydrogen or biofuels.

Ethanol vs. MTBE – Litigation Support – Nexant advised the U.S. Department of State in an action defending California against methanol interests for claims of losses in the phase-out of MTBE and use of ethanol as a substitute gasoline oxygenate. This work included a detailed analysis of the ethanol production and distribution infrastructure in the United States and addressing practical, environmental, safety, and issues of using ethanol in gasoline.

Ethanol Market and Cost Competitiveness Evaluation - Nexant was retained by an ethanol producer and its financial advisor to provide an independent market study and evaluation of project cost competitiveness to help raise funds to convert an existing sugar- and corn-based ethanol plant in Louisiana to process organic waste (biomass) as a feedstock.

Biomass Ethanol Process Evaluation - Nexant performed a detailed technical and economic analysis of a commercial scale plant for the production of fuel grade ethanol from wood biomass via fermentation, a process developed by a national energy laboratory. Among the goals of the program was the incorporation of the latest R&D developments into the design. The results from this study were compared against earlier designs.

Biomass Ethanol Development Technical Support - Under a multi-year program, Nexant provided technical support for the SERI program to develop viable alcohol fuels production technology based on cellulosic feedstocks. Activities included: investigation of prototype cellulose to ethanol via hydrolysis plant designs for capacities of 50 MM to 250 MM gallons per year; detailed design and capital cost estimate for an anhydrous ethanol plant based on enzymatic hydrolysis of hardwood chips; and techno-economic evaluation of proposed processes including biomethanation of biomass pyrolysis gases and liquid fuels from cellulosic biomass.

Ethanol Project Management - A Midwestern U.S. ethanol producer of corn-based gasohol retained Nexant to assist in the implementation of its 40 million gallon per year project. This

included a review of the process technology and hardware provided by technology licensors and vendors. Nexant's study assisted the client to obtain Federal loans and secure bank financing.

"Forest Refinery" Industry Evaluation - A U.S. national laboratory retained Nexant to assess the technical and economic feasibility of a forest refinery designed to manufacture chemical products from trees. The analysis screened a variety of biomass conversion technologies and compared the production costs and energy consumption levels of each route to conventional routes. Processes evaluated included fermentation, lignocellulose separation, lignin conversion and gasification.

Cellulosic Ethanol Feasibility Analysis - A synfuels company retained Nexant to determine the technical and economic feasibility of using cellulosic feedstocks to produce commercial quantities of fuel grade ethanol. Alternatives feedstocks (corn and other grains) and byproducts were included in the evaluation.

Enzyme Process Assessment - Nexant assessed the impact on process economics and energy consumption resulting from substituting immobilized cells of *Zymomonas Mobilis* for conventional yeast in a commercial corn-based ethanol facility.

Fuel Ethanol Opportunity Analysis - A major oil/chemical company interested in developing fuel grade ethanol facilities in the Midwest retained Nexant to assess the competitive aspects of ethanol/gasohol. Factors evaluated included state incentive programs and change prospects, freight costs to prospective markets and the current level of penetration of unleaded gas by ethanol.

European Ethanol Markets Analysis - A study for a Japanese client reviewed the Western European ethanol business including synthetic and fermentation sources. Demand, pricing, grades, end-uses, ethanol production by location and production economics were provided. In another study for this client, Nexant compared the economics of the four plants producing synthetic ethanol with the most efficient (molasses) fermentation ethanol producer.

Ethanol Drying - For a Japanese client, Nexant reviewed the methods used in Western Europe to dry ethanol (including fermentation sources), discussed the merits of newer technologies and investigated international legislative actions to restrict the use of benzene or cyclohexane in azeotropic distillation.

Ultra Clean Fuels Study – For Conoco, under U.S. DOE sponsorship, Nexant performed a comprehensive review of the future for ultra low sulfur diesel and other petroleum distillates in transportation: considered regulatory and market drivers, production technology and economics, petroleum refining impacts, environmental/resource depletion impacts, vehicle engine and performance, consumer acceptance, distribution and refueling logistics, diesel and gasoline ICE operational issues, stationary combustors, and fuel cells. The objective was to determine the feasibility of using GTL fuels – Fischer-Tropsch distillate and naphtha and methanol (comparisons to hydrogen, ethanol and biodiesel included). At issue was the use of biodiesel as a lubricity additive to counter the reduced lubricity with loss of sulfur in ULSD and GTL.

Synthesis Gas (Future Sources) - This report reviewed the technology for production of synthesis gas (H_2 , CO mixtures) from a number of sources. Most emphasis was devoted to coal and biomass (municipal solid waste and wood) gasification and new gasification technology. The report discussed downstream processing requirements and examined coal and biomass properties and their impact upon gasifier design. The economics of producing industrial fuel gas (gasifier effluent after acid gas removal) via different routes were compared to the direct use of natural gas and low sulfur fuel oil.

LNG Competition with Clean Diesel – For a multinational industrial gas company with a stake in technology for LNG as an alternative vehicle fuel/CNG refueling strategy, Nexant studied the current status of "clean diesel" (e.g., engine modifications along with ultra low sulfur diesel fuel enabling use of particulate traps and catalytic tailpipe controls to reduce soot and NOx emissions), and assessed the competitiveness of biodiesel in this context.

Global Finished Automotive Lubricants Market Drivers – For a leading U.S.-based multinational lubricants additives maker, Nexant studied the current and projected global market dynamics for finished automotive lubricants for the next two decades. Market segments/products included passenger car and diesel/heavy-duty crankcase, gear oil, automatic transmission, tractor, off-road and small engine lubricants. Fleet growth in various regions, ultra low sulfur diesel, and trends to "dieselization" of fleets in various regions were relevant issues examined. In this and other related work, Nexant has opined that a key vector for use of biodiesel, aside from as a fuel per se, will be as a lubricity additive to ultra low sulfur diesel. Also key will be demand for biodegradable, non-toxic biodiesel fuel in small boats in place of other marine fuels.

Synthetic-Based Drilling Fluids (SBFs) – For a multinational specialty chemicals company with a stake in oleochemicals and GTL, Nexant studied market issues and projected markets for SBFs in deepwater drilling, as driven by recent U.S. EPA regulations for these oil-based systems with respect to disposal of drilling spoils (especially in the Gulf of Mexico, but in other seas as well). The only systems allowed, by consensus in a stakeholders-involved regulatory development process, are those based on Internal Olefins (IOs) and vegetable esters (essentially, "biodiesel"). These alternatives strike a balance in meeting both toxicity and biodegradability limits.

Biodigestion of Food Wastes – Nexant performed technology audits and market studies for MOM-ECAP, and another, Kuwait-based developer of projects in New York City, New Jersey and Kuwait to ferment food wastes to produce liquid and solid fertilizer/fungal disease suppressant products by the (aerobic) EATAD process of IBRC of Vancouver, BC. This also included analyses of competitive anaerobic based biodigestion technologies.

M2M Feasibility for Developing Economies – For USAID, Nexant studied the feasibility of capturing various streams of fugitive methane and bringing them to market ("methane-to-market", or M2M), including anaerobic biodigestion of agricultural waste biomass.

Fatty Alcohols from Coconut Oil Project – (**Cebu**, **The Philippines**) – this was an extensive technical and market due diligence for a bank on the client's proposed new fatty acids/fatty

alcohols plant, which involved visiting the client on Cebu, and a number of experts and oleochemicals sites in the Philippines, meetings with the process technology vendor, Lurgi AG, in Cebu and in Frankfort, Germany to review technology, flowsheets and project budget, and performing a competitive market study (Asia and global supply/demand, prices, competition, etc.). The study included consideration of byproduct glycerine purification and disposition.

Oleochemicals Feasibility Study - For London-Sumatra's proposed new production in Indonesia, Nexant surveyed the global oleochemicals industry and markets, focusing on palm and palm kernel oils, glycerine, fatty acids, and fatty esters compared to other natural oil-based products and competition with food markets.

Surveys of Global Oleochemicals Markets and Technologies - Nexant addressed natural and synthetic-based oleochemicals markets for Dow Chemical.

5.2 EXPETRO

Expetro is a leading Brazilian consulting group that operates in an integrated manner through specialized teams in all oil, gas and fuels industry segments in Brazil (including biofuels), covering strategic, commercial, regulatory, technical, and financial issues. Expetro actively participated in all steps of the construction of the new operational and regulatory environment of the oil and gas industry in Brazil. It has advised the federal government, the ANP, professional associations of the industry, state and municipal governments, as well as more than 70 private companies, both national and foreign. Throughout 15 years of work and excellence, Expetro has expanded and now provides integrated consulting services to: upstream (oil), gas/energy, downstream (fuels), and biofuels. Expetro's experience record (including biofuels) is profiled below:

- For Brazil's House of Representatives (Câmara dos Deputados), Expetro provided assistance to the congress commission in charge of drafting and first approval of the Biodiesel Bill of Law, which ultimately became Law No. 11.097 2005, and now regulates the sector.
- For the National Petroleum Agency (ANP), Expetro performed multiple assignments at the period of the creation and implementation of the new regulatory framework for the oil and gas sector (1998), including but not limited to the drafting, discussion with players, consolidation of the ANP Ordinances issued to regulate the fuels market, and the drafting of the official E&P Concession Contract as well as the Presidential Decree on royalties.
- For the Ministry of Mines and Energy (MME) during 1997, Expetro provided assistance for the creation, structuring, organization and implementation of the new regulatory board, the National Petroleum Agency (ANP), inaugurated in 1998.
- For Petrobras, Expetro performed the validation of the entire E&P partnership round of 1997-2000 ("Round Zero blocks"), involving the company's selection, negotiations, technical work programs and joint venture contracts with major international companies such as Texaco (ChevronTexaco), Shell, Enterprise (Shell), Elf (Total), Exxon, Mobil

(ExxonMobil), Anadarko, Kerr McGee, Encana, Devon, Hess, YPF Repsol, among others.

- For a Brazilian soy export complex, Expetro performed a feasibility study of their biodiesel plant, including feedstock, commercial, technical, location, environmental, logistics, and financial analyses, as well as partner identification.
- From 1991 to present, for international companies such as Shell, Texaco, Repsol, Murphy, Tesoro, Hunt, CanOxy (Nexen), Coastal (El Paso), Marathon, and Canadian former operators such as Ranger, Suncor, Norcen, Expetro performed multiple assignments for the companies and their financiers covering the regulatory, strategic and technical aspects of their projects in Brazil, including assistance in setting up joint venture agreements, conceiving and reviewing the strategic plans, and providing technical analysis and recommendations on exploration acreage and producing or development fields.
- For national and international investors/operators in marginal fields, Expetro performed integrated services covering the selection, evaluation and acquisition of producing assets and re-exploration acreage, technical and economic feasibility studies and updates on prices and profit margins.
- In alliance with UK Robertson Research, Expetro produced 4 multiclient geological/geophysical studies on the potential of specific Brazilian sedimentary basins.
- In alliance with Canada's Ziff Energy Group, Expetro is performing an ongoing multiclient market and strategy study on the South American Natural Gas Markets and Infrastructure.
- In alliance with the Federal University of Campinas and the Ministry of Mines and Energy, Expetro is evaluating Petrobras' retained and relinquished areas and fields in 1998 for the beginning of ANP's licensing rounds.
- For international companies such as Anadarko (USA), RigNet (USA/Norway), Bolland (Argentina) and Encana (Canada), Expetro has provided direct assistance at multiple levels: Board of Directors, Board of Administration, interim managers, and/or senior advisors.
- For the U.K. Department of Trade and Investment, Expetro performed an extensive assessment of the specific business and investment opportunities for U.K. suppliers to the Brazilian upstream and downstream segments.
- For the Canadian Government (Federal), Expetro performed the assessment and project description of business opportunities and strategies for the entrance of Canadian suppliers in the Brazilian oil and gas sectors.

- For international companies such as BG and Willbros, Expetro performed the evaluation of gas infrastructure assets, of local gas distribution companies being privatized, and the full assistance (technical, economic and regulatory) during the bid or negotiation process.
- For city administrations such as Mossoró-RN, Macaé-RJ, Vitória-ES, Magé-RJ, Guamaré-RN and others, and for state governments of Rio Grande do Norte and Rio de Janeiro, Expetro provided the technical and economic audit of royalties and special-take, as well as the assistance in the conception, structuring and implementation of industrial, energy, infrastructure and offshore supply projects to maximize the benefit of the royalties income to the cities and states.
- For a French investment group, Expetro performed a study of Brazil's internal and external trade, logistics, costs and future demand sites of ethanol.
- For the Government of the state of Rio Grande do Norte, Expetro performed a study on the economic, financial and social impact that a new refining complex would have in its region. This included employment (during construction and for plant operations), estimated increased taxes, infrastructure benefits, and the potential to attract new petrochemical and fabrication factories.
- For the Japanese National Oil Corporation (JNOC), now JOGMEC, and for the Japanese Trading Dept JETRO, Expetro performed multiple regular reports and updates on oil, gas, fuels and biofuels market developments in Brazil (1998-present).

Expetro is currently involved in providing commercial, technical and other assistance regarding new grassroots biodiesel and biorefining complexes in Brazil.

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Ms. Noreen O'Connor Nexant Limited Griffin House, 1st Floor 161 Hammersmith Road London, W6 8BS United Kingdom Tel: 44-20-7950-1524 Fax: 44-20-7950-1550 e-mail: noconnor@nexant.com The undersigned (hereafter "Client") hereby subscribes to purchase from Nexant, Inc. ("Nexant"), Nexant's study, *Brazil's Biofuels Industry: Outlook for a Global Leader*, in accordance with the following terms and conditions.

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