Baker & O’Brien is one of the most experienced energy consulting firms dealing with the technical and economic issues associated with petroleum refineries. Our assignments have ranged from litigation support and testimony to feasibility studies on modern "grassroots" refineries to studies of the costs involved in "mothballing" or permanently closing older, uneconomic facilities. We can analyze and recommend the optimum feedstock slates for individual refineries; compare competing process technologies; make recommendations for lowering operating costs and improving product yields; and undertake market studies to support investment. An important part of our petroleum refining practice involves the valuation of existing refining assets for a variety of purposes, including collateral for financing; insurance coverage; fair value in a public transaction; ad valorem tax value; and value in an acquisition or divestiture. Through our proprietary PRISM™ modeling system, we have immediate access to technical and economic models of virtually every refinery in the U.S., Australia, Canada, Singapore, and 70% of European refineries.

**PRIMARY CONTACTS**

**Gary N. Devenish**  
Consultant  
Houston

**Daniel R. Finelt**  
Consultant  
Houston

**RELATED SERVICES**

- PRISM™ Industry Modeling and Database
- Accident/Incident Investigation
- Asset Valuations
- Due Diligence and Advisor to Lenders and Investors
- Engineering, Procurement, and Construction (EPC)
- Markets and Strategy
- Merger and Acquisition Support
- Performance Improvement
- Property Damage and Business Interruption Insurance Claims
- Technology Assessment
RELATED EXPERIENCE

- **Refinery Air Pollution Dispute**
  Analyzed refinery and chemical plant air emissions data, categorized events, and explained how and why refinery and chemical plant operations air emission events occur.

- **Natural Gas Processor Superfund Tax Dispute**
  Reviewed the Superfund Tax legislation and its applicability to natural gas processors who produce natural gasoline at their facilities. Compared natural gas processing with crude oil processing in order to show whether the Superfund Tax was intended to be levied on gas processors.

- **Asbestos Exposure Litigation**
  Assisted a manufacturer of industrial equipment in defending personal injury claims related to asbestos exposure. Assisted in discovery, assessed the likelihood and degree of employee exposure to asbestos during maintenance activities, and reviewed equipment specifications, project histories, and maintenance records for various power generation units. Provided opinions regarding the potential for personal injury due to asbestos exposure in the course of normal work activities.

- **Asian Refinery Competitive Analysis**
  Assisted client in using **PRISM** refinery models to analyze Southeast Asian refineries competitive position.

- **Asphalt Market Study**
  Provided a financial institution with an assessment of the market for paving asphalt in California. Study focused on current and short-term future markets and included the results of interviews with California paving grade asphalt producers, contractors, and buyers.

- **Benzene Exposure**
  Reviewed plant operating history and emissions records and provided expert opinions regarding potential benzene exposure to refinery employees.

- **Benzene Production Economics**
Analyzed benzene production economics for inland refiner, including benzene price forecast and transportation cost to USGC. Reviewed benzene consumers and future market potential. Estimated the capital cost for benzene production and shipping facilities.

**Business Interruption Damages Claim by Concrete Supplier**
Provided an expert consultant business interruption loss estimate for damages to a concrete products producer as a result of an incident at an oil refinery.

**Biodiesel Plant Due Diligence**
Performed a site inspection and advised a potential investor on the commercial and technical risks associated with converting a chemical plant to biodiesel production.

**Bitumen Economics/Refinery Reconfiguration**
Using the PRISM refinery simulator, calculated the economics of replacing the current refinery crude slate with Canadian synthetic-bitumen (syn-bit) or condensate-bitumen (dil-bit) blends. Cases were considered with and without capital investments and potential investment costs were also estimated.

**Bitumen Processing Study**
Used our proprietary PRISM refinery model to determine the bitumen processing capability of several U.S. refineries.

**Bitumen Technology Evaluation**
Provided technical expertise in evaluating new technology for upgrading Canadian Oil Sands bitumen to saleable products. Reviewed technical reports and presentations, and prepared an assessment of the technical risks associated with developing a commercial scale unit.

**Bitumen Valuation**
Reviewed historical supply and demand of high TAN crude oil to the U.S. Gulf Coast refineries and addressed future trends which would impact a TAN discount. Estimated a TAN discount using two methodologies: Market based approach and Return on Capital investment approach. Calculated the impact on bitumen value as a result of asphaltenes content. Calculated the value added by a diluent recovery unit in a Canadian Oil Sands upgrader.

**Bitumen Valuation Study**
Developed a methodology using a marker crude oil to value bitumen at the production site. Methodology addressed differences in qualities (sulfur, acid number) and refining yields. Transportation costs from the valuation hub to the production site were developed. Blending methodologies were evaluated to develop bitumen blends for comparison to the marker crude oil.

**Business Interruption Claim and Root Cause Analysis**
Monitored rebuild engineering and construction of facilities damaged by fire and offered expert opinion on the appropriate construction period for the business interruption claim. Participated in the incident root cause analysis.

**California Crude Oil Market Study**
Developed a detailed California crude oil supply, demand, and transportation balance (by refinery) for a mid-size independent California crude oil producer. Results were used in client's annual report for shareholders and security analysts.

**Carbon Dioxide Impact of Refining Canadian Bitumen**
Using the PRISM refinery simulator, calculated and compared the carbon dioxide emissions for two processing options: (1) a bitumen upgrader in Canada combined with a refinery in the U.S. versus; (2) an integrated upgrader/refinery at the U.S. location.

**Caribbean Refinery Privatization**
Prepared a business plan and presentation brochure for privatization of a refinery on behalf of a group of international investors. Identified likely partners in the U.S. for marketing of the refinery's production of reformulated gasoline and distillate fuels. Identified
several potential crude oil suppliers and assisted in preliminary negotiations for term crude oil contracts. Presented project to major European investment banks.

- **Caustic Soda Contract Dispute**
  Reviewed caustic soda plant expansion and the ability of supplier to deliver the required volume of caustic soda under contract. Advised on the reasonableness of the expansion construction schedule based on review of environmental permits, public data, and internal documents on construction activities.

- **Class Action Environmental Litigation**
  Provided assistance in evaluating environmental issues which led to a neighborhood lawsuit. Reviewed plant operating and emissions history and provided preliminary opinions regarding the potential for future impact on local community.

- **Clean Fuels Studies**
  Modeled petroleum refinery operations to determine the impact of proposed ultra-low sulfur gasoline (ULSG) and diesel (ULSD) specifications on manufacturing costs. Provided reports to industry trade associations and government agencies.

- **Commercial Contract Litigation**
  Assisted in a force majeure claim related to the recommissioning of a facility after a hurricane. Examined conformance with standard industry protocols and applicable laws, standards, and regulations. Assessed whether the facility operator acted in a reasonably prudent manner with respect to the commercial and technical issues necessary to safely restart the facility as soon as possible.

- **Condensate Feedstock Contract Dispute**
  Assisted in a claim between: (1) a European refiner and ultimate condensate supplier, and (2) an intermediary company, concerning allegations that the intermediary company was prevented from obtaining condensate supplies for sale to the refiner. Studied the potential availability and quality of condensates in the producing region and elsewhere. Identified potentially suitable condensates for the refinery. Based on forecasts of oil and petroleum product prices, prepared an estimate of potential economic damages. Described how term feedstock contracts for condensate are typically concluded. Testified at an arbitration in London.

- **Contamination at Bulk Petroleum Storage Facility**
  Evaluated the potential long-term contamination at a bulk storage facility resulting from the sediment contained in incoming hydrocarbons.

- **Contractual Dispute - Property Tax**
  Prepared an analysis of property taxes relative to refining complexity for a number of refineries in a particular region, using public information, for hearings with a district appraisal board.

- **Cost Allocation Report**
  Following a refinery fire incident and rebuild, performed an analysis of all elements of the repair costs, and produced a report that assessed and allocated repairs into three categories: identical replacement, functional replacement, and upgrade.

- **Crude Oil and Refined Products Business Restructuring**
  Assessed the viability and financial prospects of a proposed business restructuring designed to eliminate refining operations and develop pipeline supply options. The analysis results facilitated the client's successful efforts to finance and implement the restructuring plan.

- **Crude Oil Contamination Dispute**
  Investigated a claim that refinery equipment damages were allegedly caused by a sour crude producer that injected high-metals crude into a ultra-sweet crude gathering pipeline. Case settled prior to deposition and trial.

- **Crude Oil Evaluation**
Evaluated several processing alternatives and combinations of various refining assets located in the Caribbean and on the U.S. Gulf Coast to process heavy Ecuadorian crude oil production.

**Crude Oil Evaluation**
Assisted an independent California crude oil producer in establishing a pricing formula for sale of its heavy oil production under a long-term contract. The analysis included a historical review of relative crude values and the key price drivers affecting the value differences between grades.

**Crude Oil Gathering System Evaluation**
On behalf of an independent U.S. refiner, conducted an in-depth study of its crude oil gathering and transportation system. Our study included reviews of physical assets and crude oil purchase and transportation agreements, and evaluation of the economics of retention versus disposition. Our results and conclusions were used by the client in its asset rationalization plans.

**Crude Oil Import Terminal Feasibility**
Examined the feasibility of a deep water import terminal to meet the domestic refining industry's needs for imported crude oil as West Coast crude production declines. The analysis included a review of the history of imported crude oil for West Coast refineries, the current outlook for domestic production declines, crude oil import trends, shipping logistics, refinery capabilities, and future opportunities for moving crude oils to refining facilities east of the Rocky Mountains.

**Crude Oil Market Studies**
Prepared several detailed assessments of West Coast crude oil markets for an independent California producer. Studies included preparation of detailed regional balances, identification of target refineries for client's crude oil, and estimation of its value relative to imported and domestic alternatives. Results were presented to client's executive management and at its banker and security analyst conferences.

**Crude Oil Marketing and Trading Reorganization**
Recommended organizational structure and operating practice changes to increase effectiveness, efficiency, and profitability in the European crude oil marketing and trading arm of a major international oil company.

**Crude Oil Marketing Study**
Assisted the U.S. General Accounting Office in evaluating the potential for marketing of Naval Reserve crude (Elk Hills) in markets east of the Rockies. Work included evaluation of breakeven refining values, assessment of yield and contaminant penalties, and analysis of the potential for supplying this crude to the Gulf Coast market.

**Crude Oil Pipeline Acquisition**
Due diligence for a Canada to U.S. crude oil pipeline acquisition including a crude oil supply/demand balance forecast.

**Crude Oil Processing Contract Dispute**
Served as expert witness concerning a dispute between an international oil trading company (Trader) and an independent refining company (Refiner), between whom there was a crude oil processing contract. The Trader alleged that the Refiner misappropriated products to its own account. Analyzed the refinery production and product disposition under each processing deal over a period of three years and calculated the damages under the alleged misappropriation. Prepared an independent detailed damages claim for insurance purposes and defended the claim at trial.

**Crude Oil Quality Dispute**
Acted as expert witness in a dispute between a major oil company and a small crude oil supplier that allegedly delivered "dumbbell" crude into the oil company's common carrier pipeline system. Prepared a report covering standard industry pipeline practices, crude oil quality acceptance, crude oil trading, and refining values of various crude oils. Calculated damages incurred as a result of the poor quality crude oil delivered and the impact on refiners receiving crude from the pipeline.
**Crude Oil Royalty Litigation**
Assisted in a lawsuit between an oil company and a royalty owner of oil company’s crude oil production for alleged underpayment. Work included identification of the various markets for this crude oil to establish whether its value in these markets was consistent with the price received.

**Crude Oil Sludge Accumulation**
Following a claim concerning sludge accumulation in crude oil storage tanks over a twenty-year period, advised as to the creation of sludge in crude oil tanks, its accumulation, the ways to prevent or control it, and the conventional ways of dealing with it.

**Crude Oil Terminal and Pipeline Study**
Assisted in the site selection study for a new crude oil terminal and a pipeline connecting the terminal to an existing refinery.

**Crude Oil Utilization Study**
Assisted an Australian crude oil producer in preparing and submitting a "brief" to the Australian Government regarding the impact of large new volumes of Australian crude oil on the domestic refining industry. Analyzed the crude oil supplies available to each refinery and estimated the new investment that might be needed to process crude oils containing increased volumes of light ends. Assisted in making recommendations to the Government on the framing of new regulations to lessen the impact on both the industry and the consumer.

**Crude Oil Valuation**
Conducted a valuation for a new grade of Atlantic crude oil production, likely to be marketed to refineries in the U.S. East Coast and U.S. Gulf Coast. The study used PRISM for several specific refineries to calculate refinery breakeven values for the target crude in comparison to several competing grades. The analysis also included a historical review of the calculated relative crude refining values and the key price drivers affecting the value differences between grades.

**Crude Oil Supply Study**
Assisted client in constructing a crude oil supply balance for PADD II and developed incremental crude oil valuations for refineries in PADD II using PRISM, Baker & O'Brien's proprietary refining industry analysis tool.

**Defend Wastewater Treater Air Emissions**
Requested to provide expert witness opinion of industrial standard of care for wastewater treater operations. Issue concerned volatile organic compound (VOC) emissions from a wastewater treater feed tank.

**Delayed Coker Fire Investigation**
Assisted client in investigating the cause of a coker hydrocarbon release and fire, which resulted in multiple fatalities. Visited refinery and reviewed procedures and events preceding the incident to identify potential areas of causation and liability. Operating experience and knowledge of technical and safety issues and of industry and management practices helped the client in addressing specific claims issues.

**Estimate for Fire Rebuild**
Developed a cost estimate for replacing and/or purchasing new equipment and materials after damage from plant fire.

**Ethanol Impact on Refinery Margins**
Assessed the impact to U.S. refining margins that would likely result from aggressive growth in ethanol production in the U.S. The study examined the likely distribution of ethanol by PADD under an aggressive ethanol growth scenario, the resulting gasoline supply and demand balances, and the consequent impact on margins over a 10-year period.

**Ethanol Supply and Demand Study**
Studied and presented the effects of ethanol supply and demand scenarios on regional gasoline supply and demand for a small domestic refiner.
- **Ethanol Supply Demand Evaluation & Pricing Forecast**
  Prepared an evaluation of ethanol manufacturing business for a U.S. company considering major capital investments to enter that business. Developed an analysis which included ethanol supply/demand projections for key gasoline markets, forecasts of future ethanol pricing within those markets, and key sensitivities.

- **Ethylene Plant Construction Litigation**
  Assisted in a dispute concerning allegations that poor engineering work product contributed to a >$100 million cost overrun. Assisted with discovery, inspected plant, evaluated construction documents, analyzed the project critical path, and analyzed lost income due to delays in the project schedule.

- **Evaluation of New Crude Production**
  Evaluated potential markets and the value of a new crude oil produced from offshore platforms in the West Africa.

- **Evaluation of Refinery Competitive Environment**
  Assisted in a dispute between a major oil company and the Federal Trade Commission's claims regarding the anti-competitive nature of the company's proposed acquisition of a West Coast-based refining and marketing company. Prepared a detailed report analyzing the West Coast refining industry. Assessed the competitive position of each West Coast refinery processing Alaskan crude oil and how they might respond to changes in crude oil prices and/or availability.

- **Evaluation of Refinery Operating Procedures**
  Acted as independent advisor in a dispute between a refinery and the Environmental Protection Agency following a period of excess emissions.

- **Expert Consulting Services**
  Provided expert consulting services concerning a personal injury incident that involved a weld failure and a release of hydrocarbons.

- **Fair Market Valuation of Refinery for Ad Valorem Tax**
  Fair market valuation of a major US Gulf Coast refinery for the local appraisal district. Provided a critique of the valuation methodology used by the refinery as basis for lawsuit seeking reduced ad valorem taxes.

- **FCC NOx Allocation**
  Prepared a report of FCC regenerator nitrogen oxides (NOx) production that allowed allocation of FCC NOx from a combined refinery stack. The report was used to negotiate the allowable corporate average NOx limits with the EPA.

- **FCC Construction Litigation**
  Provided expert testimony regarding allegations that construction errors in the installation of an FCC catalyst cooler resulted in a significant business interruption claim. Assisted in discovery, analyzed operating data, evaluated design issues, calculated property damages and business interruption losses.

- **Feasibility and Economics to Produce CARB Phase 3 Gasoline and Diesel**
  Performed independent assessment of a refinery project to produce CARB gasoline and diesel. Assessment included feasibility, cost, and economics of the project. Study was performed for a prospective buyer of the refinery.

- **Fischer Tropsch (FT) Liquids Market Study**
  Evaluated potential markets for Fischer Tropsch products, and the logistical requirements to access those markets from a coal-to-liquids facility. The products included LPG, naphtha, jet fuel, and diesel, and the analysis included expected netback pricing (FOB the plant) to support financial modeling of the capital project.

- **Fischer Tropsch (FT) Market Study**
  Conducted a market study for intermediate and finished products resulting from FT synthesis of a gas source in West Africa. The
study assessed the best markets and projected netback prices for FT diesel, jet, and naphtha, as well as a review of the marketability of intermediate (unfinished) FT products.

- **Litigation - Fuels Terminal Operations Assessment**
  Performed expert advice on fuels terminal operations that focused on the practices and procedures with an emphasis on the filling of product tanks.

- **Gas to Liquids Feasibility Study**
  Prepared a conceptual design for a Fischer-Tropsch based gas-to-liquids unit using low value associated gas to produce LPG, gasoline, and zero sulfur diesel. Developed estimates of charge and yield, capital and operating costs, and project development and capital spending schedules.

- **Gasification Project Assessment**
  Assisted in the evaluation of a petcoke-to-substitute natural gas facility to support possible equity investment. Assessment included review of technology, commercial issues, and economics.

- **Gasoline Blending Compliance**
  Provided analysis for a refiner that does not produce finished gasoline on the prospects for producing gasoline that meets all API and ASTM requirements. Analyzed the options available to the refinery for blending reformate fractions and whether aromatics or benzene would likely be the constraining specification as it relates to the "anti-dumping" rule. Evaluated potential early compliance with the EPA's mobile source air toxics (MSAT2) program.

- **Gasoline Contamination Dispute**
  Provided expert report on refinery practices concerning caustic carryover in FCC gasoline mercaptan treaters. Class action plaintiffs, consisting of retail station owners, alleged underground storage tank damage due to gasoline contamination.

- **Gasoline Market Study**
  Provided an analysis of the gasoline market in several mid-continent cities, including a twenty-year price forecast for a client considering market entry.

- **Global Gasification Feedstock Analysis**
  Conducted an analysis of the potential low-cost carbon feedstocks for a grassroots gasification project to produce a combination of synthetic fuels and electricity. The study investigated sources and delivered costs for various feedstocks, including coal, petroleum coke, and low-valued refinery streams such as residuum and cracked fuel oils. Historical data was used to assess pricing mechanisms for world petroleum coke prices, including delivered coal prices to Japan and Western Europe.

- **Grassroots Refinery Feasibility Study**
  Conducted a feasibility study for a grassroots refinery project that included assessment of potential crude oil supplies, various refinery configurations, and a detailed analysis of target markets and product distribution logistics. The study also included an integrated coke gasification complex to supply hydrogen, power, and steam to the refinery. Capital cost estimates were prepared and project economics were developed for a range of scenarios.

- **Grassroots Refinery Study**
  Built a grassroots refinery model using our proprietary PRISM refinery modeling system. Our client (a PRISM licensee) then used the model to evaluate the economics of various refinery configurations.

- **GTL Diesel Blending Study**
  Performed several diesel blending studies in different refinery configurations using PRISM to calculate the Green House Gas benefits of using GTL diesel as a potential blendstock.

- **HF Alkylation Incident**
Investigated facts related to pump casing rupture where hydrofluoric acid was released. Reviewed refinery operations, training, and safety practices. Advised attorneys on generally accepted industry engineering practices and standards regarding design, operation, and maintenance of hydrofluoric acid alkylation unit.

- **HF Alkylation Restrictions Impact Analysis**
  Investigated and analyzed the impact of various potential restrictions on the use of HF alkylation technology in U.S. Refineries.

- **Historical Refinery Waste Generation**
  Provided expert report on the probable types and amounts of wastes produced by a refinery during its 50-plus year operating life. Study was part of litigation involving assignment of responsibility for an EPA superfund site.

- **Hurricane Rita Claim**
  A petrochemicals facility experienced a loss of steam supply from an outside steam supplier and a subsequent unscheduled shutdown which, in turn, resulted in production losses and major damage to the facility. The steam supplier attributed the steam outage to boiler damage caused by a hurricane, which had made landfall several months earlier. Assisted by investigating the link between the hurricane and the steam supplier boiler outages.

- **Impact of Gasoline Toxics Regulations**
  Quantified the impact of proposed changes in gasoline toxics regulations (MSAT-II) on each individual refinery in the U.S. Using our proprietary PRISM refinery modeling system, calculated investment costs, changes in operating costs and product yields. Our report was presented in testimony before the U.S. E.P.A.

- **Crude Import Facilities Study**
  Analyzed the adequacy of southern California port infrastructure to accommodate future crude oil import requirements.

- **Insurance Arbitration**
  Investigated the circumstances surrounding an oil spill at a Gulf Coast refinery following a hurricane. Work focused on whether the refiner acted as a "prudent operator" before and after the hurricane and whether the owner was entitled to a claim for damages based on an insurance policy's pollution exclusion clause. Prepared a written report for submission into evidence in an international arbitration.

- **Refinery Environmental Contamination Insurance Litigation**
  Provided expert witness testimony and analysis regarding liability and damages for petroleum refinery environmental contamination insurance claims across the U.S. based on the multiple insurance contracts for each site.

- **Investigate Refinery Heater Explosion**
  Performed root cause analysis of an explosion at a refinery heater and identified contributing factors. Performed a review of safe operating procedures, including shutdown and start-up of heaters. Provided expert testimony.

- **Isobutanol Valuation Study**
  In order to assess the potential value of isobutanol as a gasoline blending component, performed simulations of refinery operations at a select group of West Coast refineries to calculate isobutanol value relative to blending ethanol into gasoline.

- **Jet Fuel Contamination Dispute**
  Following product quality issues in major interstate product pipeline movements, reviewed product injection practices and analyses at pipeline injection point. Evaluated analyses at various points along the pipeline to assess possibility of quality degradation.

- **Jet Fuel Underpayment Claim**
  Assessed jet fuel supply contracts to the Defense Energy Supply Center to see if an overpayment claim was justified.

- **MTBE Litigation**
  Provided expert witness testimony regarding MTBE use in gasoline refinery supply, pipeline distribution, and retail marketing in
groundwater contamination litigation in multiple jurisdictions.

- **Litigation - Wastewater Treating**
  Provided expert consulting support for a refinery wastewater treating environmental criminal matter. The work required previous experience with and a solid understanding of the plant processes and equipment which are used in treating industrial wastewater.

- **Long-term Outlook - Global Refining and Light/Sweet Crude**
  Completed a study that examined longer-term developments of the worldwide refining industry and strategies for maximizing the sales value of light, sweet crude grades. The study identified and evaluated a long-term pricing strategy for light/sweet crude oil as a response to expected changes in crude oil quality, environmental legislation and mandates, and regional growth trends in petroleum demand.

- **LPG Pipeline Contamination**
  Evaluated pipeline contamination and potential sources of contaminants from various sources.

- **Lube Oil Market Assessment**
  Conducted a survey of the potential market for naphthenic lubricating oils in South and Central America. Analysis was used to complete a full feasibility study of a new Venezuelan-based refinery to manufacture these products.

- **Lube Oil Market Study**
  On behalf of a major oil company, prepared a forecast of the worldwide supply/demand balance for paraffinic lube oil base stocks to support the development of a new high technology manufacturing facility to be located in Saudi Arabia. Project was a joint venture between the company and the Saudi Arabian government. Output from the project was intended to serve the high growth areas of the Middle East and Far East.

- **Marine Cargo Contamination**
  Investigated causes for contamination of a cargo of gasoline delivered by ship to Ecuador. Work included review of contract requirements, gasoline blending practices, surveyor procedures, and issues related to laboratory testing of gasoline.

- **Market Analysis and Term Supply Contracting - Synthetic Crude Oil**
  Assisted a Venezuelan joint venture company in developing a marketing strategy for a new synthetic crude oil. The assignment included an evaluation of the potential market for the new production, modeling of refinery values for the new production, detailed assessments of potential supply agreements, and assistance in term contract negotiations.

- **Market Impact of Low Sulfur Fuels Regulations**
  Using our proprietary PRISM refinery modeling system, performed a refinery-by-refinery analysis of potential production of low sulfur fuels by U.S. refineries. Analysis included the seasonal productions of conventional and reformulated gasolines and ULSD and also included jet fuel and high sulfur diesel production.

- **Modular Refinery Conceptual Study**
  Performed a conceptual analysis of a small, skid-mounted refinery operating in the Middle East to serve local markets. Assessed the likely configuration and capital costs and yields, given an assumed crude slate.

- **Multi-Refinery Synergies**
  Analyzed the synergies and economic advantages of companies that operate multiple refineries on the U.S. Gulf Coast. Analysis included advantages in crude acquisition; turnaround and routine maintenance; feedstock and product transportation; efficient processing of intermediate streams; and optimal capital investment.

- **New Petroleum Products Terminal**
  On behalf of a major international construction company, prepared a preliminary feasibility study on a new petroleum products import terminal to serve the local market. Study included facility layout and size estimates for docks and storage tanks.
Crude Oil Quality Contract Dispute
Expert witness services regarding a high TAN (acid) crude oil supply contract and refinery construction and corrosion.

Oil Sands Downstream Integration Venture
Assisted a producer of Canadian oil sands in assessing potential joint venture partners and refinery acquisition targets for processing diluted bitumen in the U.S. Conducted modeling and analysis of prospective refineries and advised the client on likely capital expenditures required for processing increasing volumes of diluted bitumen. Performed technical due diligence, assisted with cash flow valuation analysis, and supported negotiations.

Refinery Evaluation
Prepared a study of the economics of various alternative operating modes, including expansion through addition of new processing units, for an independent refinery in the United Arab Emirates. Study included assessment and ranking of a variety of feedstocks and processing schemes and utilized a model specifically developed for the refinery.

Refinery Equipment Sales
Assisted the owner of a 60,000 BPD crude oil refinery in developing a marketing plan and finding potential customers for used process equipment. The assignment generated a sale of several major processing units to a local refiner for use in the manufacture of high-octane gasoline blending stocks.

Refinery Manufacturing Options Study
Prepared an investment strategy to manufacture transportation fuels. Evaluated yields, investment, and operating economics to produce gasoline and diesel fuel from residual materials. Presented conclusions for consideration by the company’s board of directors.

Refinery Performance Test Evaluation
Investigated claims of poor performance of a $1 billion refinery project between a refiner and a major EPC contractor. Evaluated charge and yield, feedstock quality, and efficiency issues and assisted in documentation of response to claim.

Sulfuric Acid Storage Incident
Retained to assist in the investigation of a fatality incident at a sulfuric acid processing and storage facility. Reviewed equipment design, inspection and repair history, operating procedures, training of personnel, and industry practices. Assisted legal team with on-site investigation and interaction with local, state, and federal agencies. Reviewed conclusions by root cause analysis for consistency and factual support.

Refinery Profit Improvement with Advanced Control System
Evaluated potential refinery profit improvements based on installation of an advanced process control (APC) system using Baker & O’Brien proprietary PRISM refinery economic analysis tool. Developed a proposal for the project based on sharing of the profit improvement.

Refinery and Chemical Plant Feedstock Valuations
Provided expert witness evidence the financial damages of interplant feedstock and product transfer agreement non-compliance between a refinery and an adjacent chemical plant.

Thermal Radiation Exposure
Investigated an incident involving a claim of thermal radiation exposure during a refining unit fire. Engineering reports, videos, weather conditions, unit design drawings, and published literature on levels of heat exposure from large hydrocarbon fires were evaluated.

Planning and Scheduling Improvement
Assisted an integrated oil company in improving its processes and tools for crude oil pipeline scheduling, refinery short-term
planning and optimization, refinery scheduling, and performance measurement. The initiative was part of a large, company-wide implementation of SAP and focused on improving the processes and methods of integrating data between the decision support tools and the data warehouse (SAP BW). Tools included refinery LPs, refinery scheduling tools, assay systems, and batch pipeline scheduling software.

- **Refinery Best Practices**
  Analyzed multiple refineries of a major international petroleum firm to determine economic limitations and causes of performance gaps versus competitors. The study reports consisted of analyses of practices, performance targets, and recommendations for improvement initiatives. The work involved site visits, employee interviews, final reports, and presentations to company management and refinery personnel.

- **Project Feasibility and Start-Up Assistance**
  Retained by a financial institution to conduct an independent assessment of a refinery project to restart and expand idle equipment to produce transportation fuels and lube base oils. The feasibility analysis included review of project costs, a product price forecast and margin outlook, as well as an assessment of the competitive market environment. Provided assistance to the lender in structuring terms for loan agreement and establishing project milestones for the funding. Monitored construction and revamp progress for the lender and certified mechanical completion of the project. Following start-up of the units, attended performance test runs and provided certifications to the lender that the units met design throughput capacities and products met required quality specifications.

- **Refinery Finance Litigation**
  Economic damages were claimed by the sponsors of a refinery project in Russia due to a failure to obtain funding from a financial institution. Examined claim basis, economic assumptions relied on for the project feasibility study, and actual financial results that would have been realized if the refinery had been built. Provided testimony concerning the relationship between industry margins and the losses incurred by the project sponsors.

- **Supply/Demand Forecast**
  Constructed PRISM refinery models of all of the Australian refineries for use by a client for its strategic planning efforts.

- **Refinery Evaluation**
  Retained by a financial institution to conduct an independent assessment of an asphalt refinery. In addition to an analysis of the market environment, the assessment included a review of the general condition of machinery and equipment and projected operating performance of the refinery.

- **Supply and Distribution**
  Assisted in a dispute concerning the effects of Hurricanes Katrina and Rita on jet fuel prices for the Gulf Coast market. The sequence of events and impacts on individual suppliers were developed, as well as an allocation of outages and price differentials attributable to each hurricane. Our analysis of pricing activity also considered estimates of normalized versus event-based price movements in the overall market.

- **Refinery Valuation and Due Diligence**
  Prepared an analysis of refining and marketing assets for a company that was considering acquisition of shares of a refining and marketing business located in South Korea. The analysis included refining and marketing economics, and due diligence of the facilities.

- **Refinery and Expansion Project Valuation**
  Assisted a refinery owner in establishing a value for an existing refinery, the value of a large expansion project, and the additional value resulting from a guarantee clause associated with the expansion project. The analysis included cash flow modeling,
comparative sales assessments, and an evaluation of expansion project capital requirements and economics.

- **Technology Assessment**
  Working for potential investors, reviewed plans for a grassroots lube oil re-refining facility, and advised our client regarding technology and commercial risks.

- **Refinery Business Interruption**
  Prepared detailed analyses of property damage, business interruption, and demurrage claims resulting from a vessel allision with a refinery dock.

- **Refinery Feasibility Study**
  Performed a feasibility study for a small, skid-mounted refinery to be operated in Kurdistan to serve local markets. Reviewed contractor proposal regarding likely configuration, crude slate, capital costs, and yields.

- **Refinery Valuation Study**
  Provided an opinion as to the fair market value of a large European refinery that changed ownership during the 1980s. Party filed arbitration proceedings against its former partner, claiming that the refinery was sold for well below market value. Prepared several reports that were submitted as evidence.

- **Refinery Acquisition Study**
  Provided assessment of refinery technical and economic features for prospective buyer, including on-site inspection and projections of potential capital investments for refinery upgrades.

- **Planning and Economics Implementation Assistance**
  Made an assessment of the implementation plan and "change readiness" associated with a project to improve the short-term planning, optimization, and decision-making processes for a global refining and marketing company. Assessed key stakeholder impressions of the improvement project and provided feedback to senior management to ensure a successful outcome.

- **Refinery Gasification Study**
  Identified and ranked refineries as potential candidates for residue gasification projects. Screened refineries in terms of their crude capacity, crude slate, bottoms products, hydrogen users, and location to neighboring plants. Also, provided a macro level review of European countries that would potentially have a synergistic benefit from a gasification project.

- **Refinery Acquisition Planning**
  On behalf of an acquisitive client, developed a summary of the U.S. refining business to focus on the supply/demand and competitive forces within the market. Provided information regarding historical U.S. refinery M&A transactions and a summary of typical due diligence focus items. Screened several potential acquisition candidates and developed a shortlist of opportunities which appeared to best align with the strategic objectives of the client.

- **Refinery Restart Due Diligence**
  Performed a site inspection and advised potential investor regarding the technical and commercial viability of restarting a refinery that had been shut down for several years.

- **Refinery Feasibility Study**
  Studied the possible development of a grassroots refinery that included an assessment of the refinery's potential feedstock, refined product yields, operating costs, and earnings capability. Utilizing Baker & O'Brien's proprietary PRISM refining industry analysis software and data services, developed a ten-year outlook for refining margins/crack spreads, modeled alternative refinery configurations, and conducted a competitive assessment of the proposed refinery compared to key regional competitors.

- **RFS Infrastructure Study**
  Prepared a report for the American Petroleum Institute (API) that analyzed the potential logistics and infrastructure bottlenecks on
a year-by-year basis to 2012 that could result from the industry trying to meet the Renewable Fuel Standard from the Energy Independence and Security Act of 2007.

- **Refinery Competitiveness Study**
  Analyzed the relative competitiveness of a group of refineries in a specific region. The study included an analysis of the local supply and demand balance, and a forecast of product movements into and out of the region. Using our proprietary **PRISM** system, modeled each refinery in its current configuration and in its expected configurations eight years in the future. Profit margins were calculated for each refinery under three different product price scenarios.

- **U.S. Refining and Marketing Strategy**
  Advised a client on developing strategic options as it relates to future participation in the U.S. refining and marketing sector. Developed scenarios and assessed the medium term outlook for refining and marketing in the U.S. to support client objectives. Prepared short list of potential candidates for acquisition, and developed case studies and recommendations related to post merger integration activities. Advised client on appropriate timing for executing strategic objectives.

- **Refining Economics Course Development**
  Developed an outline and course material for a refinery and oil sands upgrading course to be given in-house by an operating company.

- **Refinery Oil Sands Processing Capability**
  Conducted refinery modeling and developed a preliminary assessment of the current and future capabilities of several U.S. refineries for processing diluted bitumen. Prepared initial screening estimates of likely "Phase 1" capital projects for significantly increasing the capability to process blended bitumen. Conducted analysis of likely future competitiveness of same refineries in the regions of operation.

- **Refinery Product Delivered Cost Data**
  Assisted a client with the historical analysis of refined product supply patterns and costs in the U.S., with a particular emphasis on delivered cost of supply for transportation fuels. Provided five years of delivered product volume and cost data (by calendar quarter), for all major gasoline and distillate grades, for 85 U.S. markets, as produced and transported from over 130 fuels refineries.

- **Transmix and Biodiesel Processor Valuation**
  Developed a business valuation for an entity engaged in transmix processing, biodiesel production, and ethanol terminaling. The engagement entailed analysis of historical, current, and projected cash flows from operations to generate an income-based value for the enterprise. The work included updates to valuations of operations previously assessed by Baker & O'Brien, as well as analysis of new facilities.

- **Pipeline Quality Bank Dispute**
  Assisted in a dispute involving crude oil quality bank payments demanded by a pipeline consortium transporting a company's oil through Central Asia. Studied the quality bank calculation procedure in order to demonstrate if the methodology described in the tariff had been properly applied. Provided examples of methodologies used in other quality banks. Prepared quality bank calculations based on application of the methodology. Testified at an arbitration in London.

- **Refining Strategic Analysis**
  Using **PRISM**, performed a competitor analysis of over 20 refineries that potentially competed with client refinery. Developed refinery cost curves under multiple crude oil and product price scenarios and identified key characteristics of those refineries which operated at the low end of the cost curve.

- **Refinery Analysis**
For a prospective investor, provided analysis and commentary on the relative competitiveness of a targeted refinery, explaining the fundamental basis for its competitive position.

- **Refinery Operations Snapshot**
  Provided client with an estimate of actual crude runs by grade, product yields, and operating costs for a European refinery in 2007 based on our proprietary PRISM refinery database and simulator.

- **U.S. Midcontinent Crude Valuation**
  Evaluated crude oil refining values and logistics for several targeted refineries in the U.S. midcontinent area. Evaluated expected price parity points for domestic crude oils versus competing grades delivered to the refineries via pipeline.

- **TEL vs. MMT Blending Study**
  On behalf of a chemical supplier, reviewed the use of tetraethyl lead (TEL) as an octane enhancing gasoline additive in a Middle Eastern country from 2000 to 2006 compared to using methyl cyclopentadienyl manganese tricarbonyl (MMT).

- **Product Supply Contract Review**
  Following the notice of cancellation of a product supply agreement based on crude processing, to be replaced with an agreement where refined product prices were to be supplied based on adjustments to posted prices, evaluated the economics of the proposed supply contract compared with the existing crude processing agreement. Determined the required level of discount to OPIS prices to match product cost under the existing crude processing arrangement.

- **TEL Usage in Southeast Asia**
  On behalf of a chemical supplier, reviewed the use of tetraethyl lead (TEL) as a gasoline additive in a Southeast Asian country from 1999 to 2005 compared to the technical requirement based on the quality of the country's base gasoline and the required octane target.

- **Refinery Competitiveness Study**
  Prepared a competitive positioning analysis for a Midwest Refinery that incorporates the impacts of the proposed Cap and Trade legislation in Congress. Addressed the potential financial impacts of Cap and Trade on the refining industry in PADDs 2 and 3.

- **U.S. Refinery Competitiveness Assessment**
  Assessed the expected future competitiveness of U.S. refineries in PADDs 1, 2, 3, and 5. Developed a base scenario and price outlook to evaluate future relative cash margin performance for over 90 refineries considering large expansion projects. Examined effects of key sensitivities, such as light/heavy crude oil price spreads, effects of carbon regulation, and the price differential between gasoline and diesel.

- **Refinery Integration Analysis**
  Using PRISM, investigated and analyzed the potential value that two refiners might capture through the consolidation of operations of two neighboring refineries. The analysis was performed under multiple price scenarios.

- **Refinery Equipment Evaluation**
  Evaluate suitability of surplus equipment from a shut down refinery crude unit being sold for rehabilitation and then installation overseas.

- **West Coast Refining Strategy**
  On behalf of a West Coast refining company, we estimated the cash margin of all PADD 5 refineries under four different price scenarios. These competitive margin assessments were presented for 2015, 2020, and 2025 and accounted for the cost of compliance with CO2 regulations and other environmental regulations that were applicable to each scenario.

- **Refining Industry Overview**
  Provided guidance as to opportunities within the U.S. petroleum fuels market for blending isobutanol. Developed a list of target
refineries for blending of isobutanol into gasoline. Provided isobutanol gasoline blend valuations versus ethanol for several Midwest refineries.

- **U.S. Gasoline Study**
  Performed an independent analysis to determine the potential supply and cost impacts of a new National Clean Gasoline Standard that would significantly lower the Reid Vapor Pressure (RVP) and sulfur allowed in gasoline. A refinery-by-refinery analysis was performed that considered each refinery’s compliance options accounting for technical, strategic, market, and economic factors, and then estimated a likely response based on this information.

- **Petroleum Refinery Dispute**
  Provided overview of turnaround practices and industry standards utilized in the United States and Europe. Evaluated decisions and practices utilized at the subject refinery to determine if those decisions were in compliance with standard practices and whether a decision to optimize the turnaround execution date was a factor in a plant incident.

- **Ultrafines Study**
  Provided an analysis of the economic impact of the presence of ultrafines in a Canadian mined bitumen upgrader operation. Quantified the capital and operating cost mitigation steps required by a mined bitumen upgrader operation to address the impacts associated with ultrafine solids present in the mined bitumen. Prepared a written report and presented results.

- **U.S. Gulf Coast Isobutanol Study**
  Evaluated the gasoline blending economics for isobutanol versus ethanol for a U.S. Gulf Coast refinery. Calculated the value difference between isobutanol and ethanol in a low vapor pressure conventional gasoline.

- **Refinery Valuation Dispute**
  Assisted in a dispute between minority shareholders and company management concerning claims that certain refinery assets were improperly valued when the group’s ownership interests were purchased by the company’s management. Prepared a detailed valuation of the refinery assets in question and showed how their location, processing capability, and access to feedstocks contributed to their value relative to the competition. Prepared an expert report and testified in Federal Court.

- **Refinery Business Interruption**
  Determined the economic damages suffered by a refiner as a result of multiple incidents which eventually led to reduced feed to the refinery. Project required the analysis of all refining units, including their actual and planned operations and maintenance. Alternative utilizations of feedstock and supply of products were also investigated.

- **Refinery Integration Study**
  Undertook a comprehensive study of the local Venezuelan refining industry to identify potential areas of synergy between individual refineries and the possibility of closer cooperation to maximize overall industry profitability.

- **Refinery Feasibility**
  On behalf of a major Indian industrial organization, prepared a feasibility assessment for a world-scale "grassroots" refinery on the western coast of India. The refinery started up in 1999.

- **Refinery Fair Market Value Dispute**
  On behalf of one of the interested parties in a bankrupt oil refinery, conducted a technical and economic evaluation of the facility to determine if the plant was economically viable and had value as a "going concern." Study was submitted into evidence before an international arbitration tribunal established to determine the ultimate disposition of the facility.

- **Refinery Feasibility Study**
  On behalf of a financial institution considering the financing of a "grassroots" refinery project, prepared a detailed feasibility study for the refinery. The proposed facility was to be based outside of Phoenix, Arizona, where it was to serve the fast growing
Phoenix/Tucson area with new "clean burning" fuels. Analyzed regional product markets, existing and potential competition, alternate crude oil sources and availability, optimum refinery configuration, and by-product disposition. Attended meetings with potential crude suppliers and product customers. Feasibility study was also used in negotiations with equity participants.

**Refinery Crude Oil Supply**
Identified and evaluated feedstocks for a proposed new refinery in eastern Russia. Assessment included contacting potential suppliers and shippers.

**Refinery Construction Dispute**
Engaged to assess claims that poor EPC performance resulted in significant cost increases and schedule delays in the construction of a residue catalytic cracking unit. Case centered around whether the prime contractor had fulfilled all of its obligations under the sub-contract and had taken all agreed steps to contain identified potential cost overruns and other factors impacting the schedule. Prepared an expert report on the project and provided evidence at the hearing.

**Refinery Reactivation and Upgrading**
Worked on behalf of a major investment banking group to evaluate the plans of an independent refiner to upgrade and reactivate its 200,000 barrels per day refinery. Conducted "due diligence" on the company's plans and specifications, evaluated likely economics, and assessed competitive forces in the marketplace. Upon closing of the financial transaction, monitored the construction progress, schedule, and budget over a period of four years. Reviewed all invoices for labor and materials and approved draw down of construction funds in accordance with the contractual agreements.

**Valuation of Refineries**
Performed valuation of three Russian mini refineries located in Western Siberia. Work involved market analysis for crude oil and products, logistics infrastructure, refinery configuration and yield, and construction costs.

**Refinery Construction Dispute**
Assisted law firm representing Russian refiner in dispute with U.S. engineering firm that provided a refinery for a location in Russia. Ascertained construction status of units and reviewed issues in dispute regarding design basis, scope of work, and costs for a modular refinery constructed in the U.S.

**Petroleum Products Terminal Expansion**
On behalf of a worldwide independent storage group, undertook a marketing study to support the expansion of an existing petroleum products and chemical storage terminal. Study addressed the potential growth in Southeast Asian products trade, the demand outlook for independent storage, and likely future terminal rates. Expansion proceeded to successful completion based on study results.

**Petroleum Products Market Study**
Based on visits to major markets in the Southwest Pacific area, estimated the future market demand for petroleum products, including residual fuel and asphalt. Also estimated the potential margins that could be obtained through supplying these small market areas versus larger volume customers. Study was used by a major international oil trading company to establish a long-term strategy for greater market penetration in this fast-growing, high-margin area.

**Refinery Feasibility Study**
Directed a feasibility study into a joint venture "grassroots" export refinery in the People's Republic of China. Advised the Western partner during several "rounds" of negotiation with the Chinese partner over a period of two years. Prepared estimates of anticipated rates-of-return for both parties under different economic and cost-sharing scenarios. Assisted in negotiations with local tax and regulatory authorities. Project was shelved following Gulf War.

**Refinery Feasibility Study**
On behalf of a crude oil transportation company in Western Australia, investigated the feasibility of establishing a small refinery to process local crude production. Evaluated the technical and economic considerations involved in a range of alternative projects to refine crude oil and market products to local industries and other consumers throughout the region. Conducted negotiations with crude oil suppliers and commercial customers. Project was eventually terminated due to inability to obtain satisfactory financing.

- **Retail Marketing Business Development**
  Assessed Mid-Continent petroleum retail markets and competitive environment on behalf of a prospective retail market entrant. Pro forma economics were prepared for various retail business configurations to determine entry strategy options and assess the client's development objectives.

- **Refining and Supply Strategy**
  Assisted the European division of a major integrated oil company in the development of a refining and supply strategy for its refining and marketing business in Western Europe. The assignment included the benchmarking of the client's current performance versus competitors, development of future market scenarios, and projections of financial performance for various strategic initiatives that could be implemented by the refining business unit.

- **Refining and Marketing Performance Benchmarking**
  Developed and maintained a quarterly benchmarking service for a consortium of refiners and marketers with operations in the U.S. The publication reported key financial and productivity benchmarks on a quarterly basis to subscribers for use in competitive analysis and strategy formulation.

- **Refinery Feasibility Studies**
  Assisted an engineering and construction firm in preparing feasibility studies for two projects in Russia. One of the projects was a new "grassroots" refinery project, and the other project was to build a new FCC gasoline complex in an existing refinery. Work included modeling of refinery operations and yields, analysis of feedstock and products markets, and evaluation of project economics.

- **Refining Market Forecast**
  Investigated business interruption claims from fuels refineries, lube refineries, cement plants, fuels distributors, and chemicals manufacturers due to the closure of marine access following the release of oil into the waters surrounding the plants.

- **Crude Oil Valuation and Marketing Plan**
  Identified target markets, coordinated the assay evaluation, assessed market values, and developed a marketing plan and marketing brochure for a new crude oil to be produced in offshore West Africa. The initial crude oil sales price was estimated, based on quality and location, and was presented in terms of global crude price benchmark grades.

- **Arbitration - Refinery Valuation**
  In support of a valuation dispute, developed an economic model to assess the value of a fuels refinery. Submitted an expert report and provided testimony.

- **Refinery Force Majeure Claims**
  Prepared expert reports and testified in an international arbitration involving multiple product supply disputes between a refinery and an adjacent chemical plant. Reviewed force majeure claims related to catalytic cracking technology, product supply contracts, and utility supply interruptions.

- **Asphalt Refinery Valuation**
  Concerning an owner's capability and obligation to pay a prior arbitration award, determined a retrospective fair market value of an asphalt refinery and provided testimony regarding the estimated value of the refinery assets.

- **Study of Planning Processes**
Assessed the monthly planning and optimization process and identified recommendations to address significant limitations to profitability improvement. Reviewed the linear program model and conducted interviews of key personnel involved in the planning process, including crude selection, refinery processing, LP optimization, product distribution, and product marketing.

- **Fall Protection Evaluation**
  Investigated circumstances concerning the injury to a person who fell from a loading dock. Provided opinions regarding general safety requirements, industry practices, and fall protection requirements for this type of activity.

- **Gasoline Pricing Dispute**
  Analyzed gasoline price anomalies that developed after a major hurricane made landfall on the U.S. Gulf Coast. Provided technical support for the use of Gulf Coast spot market pricing as the basis for gasoline sales contracts.

- **Crane Accident Claim Analysis**
  Analyzed business interruption and property damage insurance claim by a refinery operator resulting from a crane accident. This included analysis of the cost to repair the physical damage from the accident, the impact to schedule and cost of a process unit turnaround that was in progress at the time of the accident, and valuation of lost production due to the accident.

- **Refinery Lost Profits Claim**
  Developed an opinion of reasonable lost profits, resulting from a crude oil supply force majeure and refinery downtime after a fire. Reviewed testimony and refinery linear program files.

- **Terminal Facility Due Diligence**
  Conducted financial and operational due diligence on behalf of lenders for a large regional petroleum terminal facility with associated transmix processing and commercial waste treatment operations. Tasks included inspection of facilities, assessment of competitive market position, evaluation of financial performance, and estimation of potential market value for the facilities.

- **Tennessee Gasoline and Ethanol Blending**
  Provided an expert report and expert testimony on the production and distribution of ethanol and gasoline, particularly branded gasoline, in the state of Tennessee. Provided a refiner perspective of the impact of the Renewable Fuel Standard on gasoline blending, distribution, and marketing operations.

- **Refinery Off-Gas Recovery Project**
  Provided independent assessment and due diligence for a proposed refinery offgas treating facility in the USGC. Advised the client on requirements related to schedule, documentation, and technology selection for project financing.

- **Refinery Construction Dispute**
  Evaluated dispute between a mechanical subcontractor and owner on a refinery expansion project in the Middle East. Evaluated issues related to delay and disruption caused by material delivery delays.

- **Refinery Contractor Indemnification Dispute**
  Provided expert opinion concerning an indemnification dispute between a refiner and contractor, as well as the standard of care and practice in the industry concerning the design and construction of a piping relief system. Also opined on the refinery owner’s responsibilities concerning the acceptance and maintenance of completed piping systems.

- **Lube Oil Re-Refining Assessment**
  Prepared an assessment of lube oil re-refining plant to determine causes of problems related to reliability and operating performance.

- **Review Refinery Feasibility Study**
  Conducted a detailed review of a feasibility study to construct a new refinery (oil sands feedstock) in Canada. Reviewed capital costs, crude oil and product pricing assumptions, and several other key inputs that were used in an integrated financial model.
- **U.S. Gasoline Study**
  Performed an independent analysis to determine the potential supply and cost impacts of a new National Clean Gasoline Standard that would significantly lower the Reid Vapor Pressure (RVP) and sulfur allowed in gasoline. A refinery-by-refinery analysis was performed that considered each refinery’s compliance options and likely response considering technical, strategic, market, and economic factors.

- **Refinery Explosion, Subrogation of Insurance Claim**
  Assisted in a dispute concerning a rebuild estimate, which was the subject of subrogation, for an oil refinery process plant damaged by an explosion.

- **MTBE Litigation**
  Provided expert report that evaluated and discussed the issues concerning why MTBE was chosen over ethanol to the federal oxygenate requirements in the early 1990s. Also included was a discussion of how gasoline was supplied to the local region in California over the 1990s and early 2000s.

- **Preliminary Refinery Value Assessment**
  Established a preliminary valuation assessment of a refinery for a local taxation district. Assessment was used in initial discussions with the taxpayer.

- **Refinery Marketing Study**
  Surveyed existing and potential customers regarding proprietary slurry oil separation. Evaluated responses to determine the industry's perception of the technology and quantified the potential value for refinery customers.

- **Petroleum Terminal Valuation**
  Updated valuation of petroleum terminal and trans-mix processing facility completed previously in order to reflect changes in the business environment, and to reflect specific transaction scenarios designated by the client.

- **Refinery Strategy Meeting**
  Conducted a kick-off session for a day-long senior level strategy meeting. Discussed the client's competitive position and the attributes of top performers.

- **HF Alky Study Sensitivity Case**
  Investigated and analyzed the impact of various potential restrictions on the use of HF alkylation technology in U.S. Refineries.

- **Review Insurance Claim**
  Reviewed a petroleum refinery business interruption insurance claim resulting from a dock closure because of an oil spill.

- **Dispute Support - Groundwater Contamination**
  Provided expert witness support regarding a groundwater contamination claim at a closed refinery. Provided opinions regarding the standards of care and operation of the former refinery. Prepared a written expert report.

- **Refinery Economics Update**
  Utilized Baker & O'Brien long-term price forecast to update the project’s economics. Our analysis considered various options for refinery size and petcoke gasification.

- **Isobutanol White Paper**
  Evaluated the economic impact of blending isobutanol in place of ethanol for finished gasoline in various U.S. markets. Also evaluated isobutanol as a substitute for purchased alkylate in gasoline blending. Determined the highest value options for blending isobutanol into gasoline. Summarized the results in a White Paper style report.

- **Petroleum Refinery Due Diligence**
  Prepared a due diligence report on a full conversion refinery, including a review of regional crude oil supply and regional products
markets. Reviewed refinery operations, including high level assessments of refinery safety and environmental performance. Developed economic model of refinery and estimated market value.

- **Shale Oil Market Study**
  Prepared market study for upgraded shale oil in several refining centers over extended project life. Estimated refining value and ocean freight in selected refineries to yield netback value at upgrader dock. Compared estimated refining value for upgraded shale oil to estimated refining value of typical swing crudes for each region.

- **Refinery Valuation**
  Provided an assessment and valuation for potential U.S. refinery candidates for a client considering a refinery acquisition. Analysis included price scenario development and financial modeling to determine indicative offer price.

- **Due Diligence of a Lube Re-Refining Facility**
  Conducted a due diligence analysis of technical and economic features of a lube oil re-refining plant involving a potential acquisition.

- **Refining Margin Forecast**
  Prepared a ten-year price forecast for a petroleum refiner for use in its long-range plan development. Reviewed current downstream refining industry trends, including supply and demand balances, environmental regulations, and shifts in regional crude oil pricing to develop a future downstream industry outlook.

- **Refinery Acquisition Study**
  Provided client with five years of operating and financial data from the *PRISM* refinery database for use in evaluating a potential acquisition.

- **Refinery Economic Analysis**
  Prepared due diligence analysis of refinery technical and economic performance to support a potential working capital loan.

- **Refinery and Pipeline Systems Valuation**
  Provided values of a refinery, crude oil gathering, and products marketing system to be recorded as fair values for purchase price allocation purposes.

- **Refinery Technical Review**
  Provided a technical review and forecast of cash flows for a refinery acquisition candidate.

- **Refinery Cash Margin study**
  Provide a comparison of cash refining margins for PADDs 1 through 4 versus expected cash refining margins when inland crude oil transport bottlenecks to the USGC have been relieved.

- **Monterey Shale Oil Study**
  On behalf of a California refiner, reviewed the potential for production of Monterey shale crude oil in the San Joaquin Valley and the accessibility of this crude to the client's refining system.

- **Price Forecast - Northwest Europe**
  Prepared a five-year price forecast for Northwest Europe, considering global and regional supply/demand fundamentals and the relationship between oil and gas pricing, among other factors.

- **Market Study for Crude Oil Rail Unloading Terminal**
  Provided an update to a previous report on U.S. light crude oil supply/demand and implications for a new crude oil unloading terminal in a large refining center on the USGC. Supplemented the report with an analysis of heavy crude oil rail transport opportunities.

- **Hurricane Damage Insurance Dispute**
Assessed the impact of a hurricane to a refinery and its impact on turnarounds being executed at residue upgrading process units. Support included investigating failures incurred to a flare and to a heater, their relationship to the hurricane, and subsequent shutdowns of process units.

- **PADD 1 Refining Study**
  Provided a competitiveness analysis of refineries located in U.S. PADD 1, U.S. Virgin Islands, and Eastern Canada. Developed a price forecast and historical supply and demand balance. Provided a competitive ranking of a prospective acquisition of a refinery in the region being considered by the client.

- **Refinery Risk Assessment**
  In support of questions relating to company stock valuation, assessed the technical and commercial risks inherent in several refineries owned by a U.S. refining company.

- **Canadian Downstream Petroleum Outlook**
  Evaluated the cumulative effect that regulations and policies may have on the Canadian downstream petroleum sector over the next 20 years.

- **Refinery Due Diligence**
  Assisted financial client with a due diligence study of a European Refinery. Visited the site and received briefing from refinery management. Developed cash flow model of historic and projected operations. Tuned cash flow model to match past four years of operations and cash flow results. Developed five year price forecasts for crude oil and refined products in Europe. Reviewed operating and maintenance expenses.

- **Crude oil and Product Price Forecast**
  Developed a crude oil and product price forecast for a client's use in evaluating an investment in a new refinery.

- **Refining Market Forecast**
  Prepared a ten-year price forecast for a petroleum refiner for use in its long-range plan development. Reviewed current downstream refining industry trends, including supply and demand balances, environmental regulations, and regional crude oil pricing to develop the outlook.

- **Refinery Valuations**
  Prepared annual property values for several major refineries amounting to several billion dollars. Assisted with discovery, inspected each of the plants, and analyzed refinery operations and profitability. Assisted in negotiating settlements. Testified in public hearings before appeals boards.

- **Refinery Venture Development**
  Performed economic evaluation and developed comprehensive financial models for a West Coast refinery restart and upgrade program. The engagement included market analysis, evaluation of investment options, and support of project financing efforts.

- **Refinery Yield and Hydrogen Balances**
  Provided client with yield and hydrogen balance estimate for a group of Canadian refineries using our proprietary PRISM modeling system.

- **Refining and Marketing Privatization**
  Assisted a state-owned integrated oil company in Central Europe in completing a strategic planning study for its downstream refining and marketing business. The study considered potential markets and pricing for crude oil and refined products. Opportunities to optimize the operation and logistics of the company's refining and marketing system were evaluated in view of maximizing the value of the assets prior to privatization.

- **Refining Assessment**
Analyzed the profit improvement potential for an asphalt and naphthenic lube specialty refiner, which focused on the existing operating and planning practices of several refineries in the network. Recommended several zero capital cost improvements to be implemented.

**Reformulated Gasoline Study**  
Provided a large independent Southern California refiner an assessment of their existing processing equipment, outside feedstocks to be purchased, and new capital investment necessary to produce reformulated gasoline for consumption in the most regulated gasoline market in the world.

**Reorganization of Crude Oil Trading Business**  
Analyzed crude trading business for potential reorganization.

**Strategic Sourcing: Refining Materials and Services**  
Assisted a major, integrated oil and gas company in implementing a strategic sourcing initiative for its refining and petrochemical businesses. The initiative focused on developing a strategic and low cost supply of sulfuric acid, process chemicals, and maintenance services to the client's various refining and petrochemical facilities, which achieved cost savings of up to 25%.

**Supply/Demand Forecast**  
Prepared a forecast of U.S. refined product consumption and production using our proprietary PRISM refinery modeling system for the year 2012.

**Terminal Facility Valuation**  
Reviewed the operating results and management projections for a terminal and transmix processing facility to develop an income-based valuation for the business enterprise. This engagement was one of a series of valuations prepared by Baker & O'Brien to support the financing requirements for this business since its inception.

**Trans-Alaskan Pipeline (TAPS) Quality Bank**  
Provided expert testimony before extended hearings of both the Federal Energy Regulatory Commission (2004) and the Alaskan Public Utilities Commission (2007) with respect to the methodology used to value various Alaskan crude oil streams entering TAPS. Issues included how to calculate the refining values of such crude oils in U.S. West Coast refineries and how changes in the indicated market values of crude oils should be handled from a retrospective basis.

**Wholesale Trade Practices**  
Assisted a South American national oil company in reviewing trade practices for the wholesale marketing of petroleum products. Advised the client on wholesale price formation and marketing practices in free markets.

**Independent Planning Consultant**  
In the early 1990s, a major oil company agreed to purchase a former Soviet block country’s refining and marketing assets. Additionally, there was an agreement to build a state-of-the-art grassroots refinery. Until the streaming of the grassroots refinery later in the decade, the oil company operated the existing refining assets on behalf of the national office of privatization. The role of the independent consultant was to ensure that the operation was not “optimized” at the expense of the country’s taxpayers. Participated in the preparation of monthly operating plans with the operating company and presentations to the national office of privatization over a two-year period.

**Performance Improvement Initiatives in Worldwide Refineries**  
Helped design and direct a consulting project to identify the most successful profit improvement initiatives at top performing worldwide refineries. Audited and examined company culture, energy usage, refinery losses, personnel training, safety practices, environmental controls, process operations, technical services, administration, planning and economics, capital investments, maintenance, and reliability factors. Identified and documented those initiatives, which proved most successful, including their
duration, need, and value added. Assignments were in the U.S., U.K., Romania, Korea, and West Africa.

- **Maintenance and Reliability Improvement Program**
  Managed the development of a client’s routine maintenance and reliability improvement program that identified areas of concern and implemented new work practices aimed at improving competitiveness. Efforts reduced maintenance costs and improved operating performance.

- **Turnaround Optimization Studies**
  Performed numerous turnaround optimization studies and execution reviews for refineries and petrochemical companies worldwide. Areas of focus included analyzing the work selection process, reviewing work execution schedules, evaluating the facilities preparedness to perform the turnaround, and optimizing turnaround cycles or start dates.

- **Maintenance Contracting Strategies**
  Worked with international clients to analyze existing maintenance and turnaround contracting strategies, contractor availability, and local cultures to identify areas of concern and develop strategies for improvement.

- **Reliability and Maintenance Continuous Improvement Initiatives**
  Improved efforts to eliminate equipment defects and unscheduled outages by developing and incorporating the use of reliability indices to identify problem equipment. Reliability teams were then able to prioritize concerns to focus reliability improvement initiatives in areas of highest risk to safety, operational performance, and profits. This defect elimination program was utilized as the cornerstone for the plant’s continuous improvement initiatives.

- **Marine Accident Investigation**
  Investigated causes for contamination of a cargo of residual fuel aboard a barge that exploded and sank.

- **Gasification Process: Unauthorized Use of Proprietary Trade Secrets**
  In support of a dispute between a technology owner and a start-up company, provided an opinion regarding the extent to which the start-up company may have relied on confidential and proprietary trade secrets, know-how, and other specific process information. In developing an opinion, reviewed all pertinent technical information, including experimental results and plant data, design details, and drawings from each party. Engineering and design experience provided the background needed to understand if proprietary information had been incorporated in a new design.

- **Acetic Acid Process: Intellectual Property Infringement**
  Using chemical engineering expertise, process design background, and experience in operations and manufacturing, provided an opinion on the likelihood of another firm’s ability to produce the same organic acids with comparable quality and value as the original product without utilizing trade secrets learned from the intellectual property owner.

- **Jet Fuel Supply Contract Dispute**
  Provided expert consulting services and opinions in a hurricane-related, jet fuel supply contract force majeure claim. Assessed the supply conditions, transportation, and other parameters related to the case.

- **Refinery Fire Damage Assessment and Rebuild Costs**
  Assisted in a dispute concerning fire damages and estimated rebuild costs at a petroleum refinery, as well as monitored the rebuild project.

- **Alberta Bitumen Valuation Study**
  Evaluated various approaches to valuing Canadian Oil Sands bitumen blends (DilBit). Approaches for valuation at a Hardisty, Alberta basis included: differential to a marker crude oil, refinery return on investment, parity to Mexican Maya and other approaches, including statistical regression. Evaluated approaches and potential marker crude oils and provided recommendations to client.
Independent Engineer for New Refinery in Egypt
Technical due diligence for financing of a 200,000 B/D merchant export refinery in Egypt. Our review included opinions on site selection, owner's development plan, supply agreements, offtake agreements, EPC Contracts, refinery unit technologies including sulfur recovery, 'over-the-fence' utility interface, crude oil supply and product export terminal facilities. Our review also included opinions on environmental compliance, licenses and permits, CAPEX, construction schedule, completion risk, OPEX and technical comment to the financial model.

Evaluated Crude Trading Organization
Evaluated a refining company's crude oil supply group's effectiveness in disposing of crude oil that had been scheduled for delivery after a fire caused an extended refinery shutdown.

MTBE Contamination Litigation
Supported several oil company clients in defense of claims that the inclusion of MTBE in gasolines supplied to the State of New Hampshire caused contamination of water wells in the state. Provided information on the supply of MTBE-blended gasolines to the State and assessed availability of other oxygenates (primarily ethanol) to meet EPA requirements for oxygenated fuels. Testified at trial.

Isobutanol Value in Gasoline
Prepared initial screening study to assess the potential benefits and issues associated with marketing isobutanol as a gasoline-blend component within the U.S. Provided isobutanol gasoline blend valuations versus ethanol/alkylate for a list of target refineries.

Dock Collision Business Interruption Claim
Assisted in a dispute concerning a refinery business interruption claim and lawsuit after a marine vessel allision with a refinery dock. Analyzed need for extraordinary refined product marine and pipeline movements, as well as trading activity and demurrage claims.

Alaska Refinery Evaluation
Assisted our client in evaluating the profitability of one of the refineries in Alaska. The evaluation provided inputs that were instrumental to the client in its ongoing discussions with a refiner regarding a long-term crude oil supply contract.

Refinery Construction Dispute and Arbitration
Following previous arbitrations regarding liability for change orders and delays associated with a refinery expansion/upgrade, Baker & O'Brien was engaged to estimate the "quantum" amounts associated with over 400 individual claims that had been addressed by the arbitration tribunal and its technical advisor. We testified regarding our estimates at a final arbitration hearing.

Hot Fuel Class Action Claim
Provided expert witness testimony and litigation support in a class action lawsuit claiming that sales of retail gasoline should be temperature corrected at the pump. Evaluated seasonal gasoline property variability, among other key factors.

Ethanol Class Action Litigation
Assisted a major Florida fuel marketer in Florida in defense against class action claims that ethanol-blended fuels had resulted in damaged boat engines, fuel tanks, and other marine/recreational equipment. Reviewed terminal blending and quality control practices, the actual quality and formulation of gasolines delivered to Florida consumers, and state specifications controlling the quality of such gasolines.

MTBE Litigation - East Coast
Supported joint defendants in litigation involving alleged MTBE contamination in groundwater. Analyzed gasoline supply issues to the New York Long Island area over the period 1980 to 2006 and submitted expert report.
- **Hydrogen Pipeline Construction Cost Dispute**
  Assisted client in a dispute concerning settlement costs in regards to a canceled construction contract for a hydrogen pipeline.

- **North Carolina Gasoline and Ethanol Blending Analysis**
  Provided an expert report on the production and distribution of ethanol and gasoline, particularly branded gasoline, in the state of North Carolina. Provided a refiner's perspective of the impact of the Renewable Fuel Standard on gasoline blending, distribution and marketing operations, considering the options, alternatives and risks of selling gasoline without ethanol.

- **RFCC Arbitration Expert Report**
  Arbitration expert witness opinion on residual fluid catalytic cracking (RFCC) operations, prudent operating procedures, and force majeure claims related to an RFCC incident.

- **MTBE Litigation - West Coast**
  Supported joint defendants in litigation involving alleged MTBE contamination in groundwater. Analyzed gasoline supply issues to the Los Angeles basin over the period 1980 to 2006. Expert report submitted and deposition taken, however case settled prior to trial.

- **Refinery Business Interruption - Marine Spill**
  Conducted an assessment of business interruption damages stemming from downtime caused by an oil spill which disrupted marine traffic at several adjacent manufacturing facilities.

- **Refinery Valuation and Synergy Analysis**
  On behalf of two international refining companies, investigated and estimated the potential value of synergies that might be realized upon the combination of the two refineries. Provided indication of value capture, based on criteria provided by companies.

- **Coker Incident and Design Assessment**
  Reviewed project management procedures and facilities design of an oil refinery project after a subsequent structural failure. Provided written report and oral deposition regarding design responsibility and failure liability.

- **MidWest U.S. Crude Oil Study**
  Identified the factors that likely contributed to a significant widening of the price differential between Light Louisiana Sweet Crude oil (LLS) at St. James, LA and WTI crude oil in Cushing, OK. Developed a three-year outlook for U.S. PADD 2 crude oil supply and disposition, and the expected price differential between LLS and WTI crude oil.

- **MTBE Litigation and Expert Report**
  Provided expert report on behalf of a joint defense group of gasoline marketing companies that discussed the many issues concerning why MTBE was chosen over ethanol to meet the federal gasoline oxygenate requirements in the early 1990s. Also included was a discussion of how gasoline was supplied to the local region in California over the 1990s and early 2000s.

- **Isobutanol Valuation Versus Ethanol**
  Prepared isobutanol vs. ethanol valuations for gasoline blending at several U.S. refineries. Assessed blend values for refineries producing reformulated gasoline, low vapor pressure gasoline, and California Air Resources Board (CARB) gasoline.

- **Shale Oil Market Study**
  Developed target markets, estimated values for upgraded shale oil in various U.S. refineries, and expected price netbacks to the project site. Developed crude oil supply and demand balances to determine which crude oils would be displaced and the expected pricing impacts.

- **Heat Exchanger Failure Investigation**
  Investigated circumstances concerning a heat exchanger failure that resulted in a fire and explosion, fatally injuring several employees. Investigation included evaluating relevant operating records and comparing these with design specifications to...
evaluate whether exchanger was operated, inspected and maintained in accordance within design parameters and industry practices. Prepared expert report.

- **Refinery Valuation Dispute and Arbitration**
  Developed an opinion of the value of a joint venture company that owned and operated a large petroleum refinery in Eastern Europe. Evaluated the refinery's financial performance, capabilities and competitive position, as well as other valuation metrics, such as replacement cost and comparable refinery transactions. Provided testimony at international arbitration.

- **Refinery Valuation: Ad Valorem Tax Support**
  Developed income and cost indications of value for a refinery in an ad valorem tax dispute.

- **Process Plant Fire Protection Review**
  Advised client regarding API and NFPA process industry fire protection standards.

- **Refinery Risk Assessment**
  Assessed the technical and commercial risks inherent in each of several refineries owned by a U.S. refining company.

- **Refinery Business Interruption Assessment**
  Estimated the lost profit (business interruption claim) stemming from a contractor incident which caused an extended refinery outage.

- **Confined Space Incident and Dispute**
  Provided support in a wrongful death dispute regarding a confined workspace incident. The incident involved nitrogen asphyxiation where two maintenance contractors died. Investigated the cause and origin of the incident, including work procedures and practices.

- **Refinery Repair Costs Dispute**
  Provided expert assistance and a written report for a dispute concerning reasonable contractor repair costs for an oil refinery unit after it had been damaged by fire.

- **Contractor Tripping Incident**
  Investigated circumstances concerning the personal injury of a contract employee. Provided opinions regarding general safety requirements, industry practices, contractor training and safety expertise and utilizing contractors for the activity being performed.

- **Shale Oil Prefeasibility Study**
  Assisted client with determining the economic optimum product quality for Synthetic Crude Oil (SCO) to be produced from retorted shale oil. Determined the potential impact of various SCO qualities on refining customer process units and estimated the potential revenue changes that would result from adjustment of these qualities.

- **Storage Tank Spill Incident**
  Developed an expert witness report associated with a spill from a sour naphtha storage tank. Reviewed numerous documents and depositions to develop opinions associated with the event. Provided expert opinions on the standards of care and operation of a petroleum refinery.

- **Refinery Feasibility and Economics Study**
  Conducted an economic feasibility study for a proposed refinery in Central America. The study evaluated indigenous crude oil supply and imported crude oil, as well as expected product netback prices compared to the status quo of imports.

- **Equipment Demolition / Fire Investigation**
  Investigated circumstances of a large refinery fire related to a hydrocarbon release from a partially demolished open-ended pipe. Developed expert report of findings and provided opinions concerning industry practices and standards of care for the demolition of decommissioned facilities. Provided deposition and arbitration testimony.
- **Refinery Competitive Assessment**
  Conducted a refinery assessment for a natural gas supplier that was considering investing in infrastructure to enable one of their refining clients to increase capacity. The assessment included a refinery competitive analysis and cash flow forecasts under multiple scenarios.

- **Bitumen Valuation Dispute**
  Initial meeting with attorneys to provide B&OB background on previous bitumen valuation studies.

- **Fall-Related Injury Investigation**
  Investigated circumstances concerning the personal injury of a contract employee who fell inside a flue gas system during a refinery turnaround. The investigation included evaluation of: (1) refinery safe work practices compared to industry standards; (2) utilization of fall arrest systems to mitigate the presence of fall hazards; (3) the responsibilities of both operating companies and contractors to recognize and develop plans to mitigate fall hazards; and (4) responsibilities of both parties to execute and communicate turnaround work plans.

- **Prepare Northwest Europe Price Forecast**
  Prepared a five year price forecast for crude oil, refined products and petrochemicals in Northwest Europe.

- **Refinery Due Diligence**
  Evaluated the condition of refining assets for a potential acquisition. Addressed potential "fatal flaws" regarding the acquisition of a topping refinery. Provided support in evaluating the potential cash flow for the refinery.

- **Refinery Olefins Production Model**
  Developed a refinery olefins model that has the capability to predict propylene and butylene production and consumption for the U.S., at the individual refinery level. The model provides the user with an ability to toggle between different FCC conversion levels and to adjust several other key parameters.

- **Storage Tank Foundation Failure**
  Following the failure of a storage tank foundation, we reviewed the applicable documentation and prepared an affidavit concerning the standard of care used during its construction.

- **Refinery Screening and Evaluation**
  Provided cash flow forecasts and indicative transaction values for select target refineries using PRISM charges and yields and client price forecasts.

- **Owner's Engineer for New Refinery Project**
  Reviewed key project assumptions and provided guidance on various aspects of project development, including: transportation infrastructure; refinery design basis; EPC strategy and contract; refined product markets and pricing basis; crude oil sources, quality, and pricing assumptions; project financial model and economics.

- **Strategic Review of Refining Portfolio**
  For a large integrated refiner and marketer, assessed the historical performance of each refinery in the company's system, and evaluated key benchmark metrics against various selected peer groups. Reviewed each refinery's competitive position and highlighted the key factors that differentiated its performance. Quantified the performance gaps on a dollar-per-barrel basis, attributed the gaps to controllable or structural factors, and made recommendations for improving the controllable gaps.

- **Refinery Operating and Emissions Data**
  Provided detailed PRISM refinery operating and emissions data on individual refineries to a government agency.

- **Wyoming Refinery Appraisal**
  Fair market appraisal of a refinery including connecting crude and products pipelines and storage assets to support debt financing.
Project included income valuation with forecast prices, discounted cash flows, and replacement cost estimates for the refinery as well as the pipeline and storage assets.

- **Refinery Valuation for Ad Valorem Taxes**
  Developed a cost approach estimate for the valuation of process units at a U.S. Gulf Coast Refinery. Calculated a replacement cost new for the process units and adjusted for physical depreciation, functional obsolescence, and economic obsolescence to arrive at a physical asset value for the refinery's process units.

- **Used Refinery Relocation**
  Conducted an initial review to identify the status of a proposed refinery project (North Africa) and comment on the potential to utilize the surplus process equipment from a U.S. refinery that had been shut down.

- **U.S. Crude Oil Study**
  In response to increasing production of U.S. light crude oil, estimated a range of light crude oil prices that would be required in order for moderately complex refiners to break-even versus processing medium crude oil. Developed a forecast for North American crude oil production by major producing basin in order to understand the point in time at which essentially all light crude oil imports would be displaced from the North America market.

- **PRISM Refinery Data**
  Provided refinery capacity, throughput, product yield, and cash flow estimates for two European refineries in support of preliminary acquisition discussions.

- **Refinery Strategic Review**
  Provided a strategic review of a client's refinery with a focus on the potential opportunities and threats related to evolving crude oil supply dynamics and competitor expansions.

- **Crude Oil Market Study**
  Provided a forecast of North American crude oil production through 2030 by quality and by major producing region. Evaluated the extent to which the North American refining industry could accommodate a lighter crude oil slate. Identified expected change in crude flow patterns and imports.

- **Refinery Acquisition Study**
  Assisted client in screening refinery acquisition targets using PRISM operating and profitability data. Evaluated options to process Eagle Ford crude oil at one refinery and building a distillate hydrocracker at another.

- **Refinery Hydrogen Demand Forecast**
  Forecasted individual refinery hydrogen supply balance changes due to Tier 2 and 3 gasoline sulfur regulations using the PRISM refinery modeling system.

- **Utica Shale Oil Market Analysis**
  Identified target refineries for a Utica shale oil marketer using the PRISM refinery database. Provided reports on their current crude slates and profitability.

- **Lawsuit Settlement Analysis (Refinery Metrics)**
  Provided client with an analysis of key refinery operating data that helped evaluate their liability in an environmental contamination lawsuit. The analysis formed the basis of the client's settlement offer.

- **Hydrotreater Balance**
  Developed a charge and yield material and volumetric balance for a simple refinery containing a naphtha hydrotreater/catalytic reformer and diesel hydrotreater. Summarized feedstock and product properties.

- **Hot Tap Incident**
Evaluated and incident involving a "hot tap" on processing pipeline and resultant leak. Assisted refinery owner and outside counsel in action brought against maintenance contractor.

- Refining Margin Forecast
  Prepared a ten-year price forecast for a petroleum refiner for use in their long range plan development. Reviewed current downstream refining industry trends including supply and demand balances, environmental regulations, and WTI/LLS pricing to develop a future downstream industry outlook.

- Thermal Cracker/Lube Unit Yields
  Prepared yields for a thermal cracker unit and lube oil extraction unit. Used PRISM unit models to assist in developing the yields and stream properties.

- Refinery Scenario Development Workshop
  Facilitated a workshop with the senior management of a refining company to develop scenarios which would be used in deciding whether to install a hydrocracker or retrofit an existing FCC. Developed crude oil and refined product price sets corresponding with each of the scenarios.

- Refinery Competitiveness Study
  Conducted a study of the competitiveness of a refining company’s three refineries for a client contemplating the establishment of a partnership with the refining company.

- PADD 4 Products Supply/Demand Study
  Forecasted PADD 4 refined products supply and demand through 2020 considering potential refinery expansions, refining economics, logistics and product consumption trends. Outlined the potential implications of changing supply/demand patterns on PADD 4 refined product prices.

- High TAN Crude Oil Refinery Study
  Identified U.S. Gulf Coast refineries processing high TAN crude oil. Estimated capital cost to convert heavy sour crude refineries currently processing low TAN crude oil to high TAN refineries. Considered a Canadian bitumen/diluent blended crude oil as the basis. Calculated the metallurgy and light ends processing costs associated with refinery conversion to high TAN crude oil.

- Refinery Acquisition Screening and Valuation
  Provided refinery modeling, valuation and M&A support for a client that was considering a refinery acquisition.

- Refinery Due Diligence Support
  Provided due diligence support for potential refinery acquisition. Developed cash flow models for valuing the refinery. Developed price forecast used in cash flow model. Evaluated key drivers and their impact on the refinery valuation.

- Isobutanol Blending Study
  Evaluated the gasoline blend value of isobutanol versus ethanol for a Midwest refinery. Calculated isobutanol blend values for summer and winter and for constrained and unconstrained gasoline production.

- Crude Oil Valuation Study
  Estimated the value of various crude oil grades in a number of refineries that compete for the acquisition of local crude oil production in the U.S. mid-continent.

- Asbestos Insulation Litigation
  ADVISED client of typical engineering standards regarding the use of asbestos insulation prior to the early 1970s.

- Northwest Europe Price Forecast
  Developed a five year outlook for crude oil, refined products and petrochemical prices for a European refining company.

- Refinery Hydrogen Demand Study
Quantified the hydrogen demand impact due to Gasoline Tier 3 regulations, the changing crude supply, and product demand in the USGC over a ten-year horizon.

- **Gasoline Blending Data**

- **Refinery Sulfur Study**
  Quantified the cost impact for Canadian refiners to comply with a 10 ppm average gasoline sulfur specification to comply with the U.S. Tier 3 gasoline regulation.

- **Refinery Feasibility Study**
  Evaluated the economic feasibility for constructing a new grassroots refinery in the U.S. Mid-Continent. Developed a forecast for the feedstock and product prices. Utilized preliminary process design data to construct an economic model for two different refinery configurations. Identified the major variables which impacted the refinery economics.

- **Residual Fuel Oil Valuation**
  Provided an assessment of the quantity, quality, and value of fuel oil recovered during demolition of storage tanks at a power plant.

- **Black Wax Crude Oil Market Study**
  Reviewed qualities of Utah Black Wax crude oil versus other sweet crude oils to determine key criteria which would lead a refiner to process to Utah Black Wax crude oil. Used criteria to screen existing U.S. refineries for their ability/incentive to process the Utah Black Wax crude oil.

- **US Crude Oil Market Analysis**

- **European Refinery Competitiveness**
  On behalf of a large industry participant, evaluated the relative competitiveness of refineries operating in Western Europe. Utilized our proprietary PRISM modeling and database system to extract individual refinery margin and cost metrics and projected the likely future positions of the client's refineries on the cost and margin curves.

- **Refinery Fire Insurance Claim**
  Assisted in a dispute concerning a rebuild estimate, which was the subject of subrogation, for an oil refinery process plant damaged by fire.

- **Contract Company, Bankruptcy Dispute**
  Supported client in a contractor bankruptcy case by providing opinions concerning (1) industry practices plant operators (owners) take to vet industrial contractors for consideration to perform work at their site; (2) impact to operations following the suspension of work by a contractor during turnaround without prior notice; and (3) efforts owners may take to mitigate the impact of work suspension. Developed expert report and provided deposition testimony.

- **Refinery Business Interruption Assessment**
  Assisted in a dispute concerning factors which may have contributed to an explosion and prepared an estimate of lost profits stemming from the resultant loss incident.

- **Propane Pricing Analysis**
  Evaluated the historical development of propane prices in a key North American market, and developed a report that assessed propane supply-demand dynamics and price response, given the increasing availability of supply. Evaluated the evolution of company price postings and compared independently-assessed, third party prices to these postings. Provided opinions on the best propane price reference points to be used in commercial supply contracts.
- **Refinery Fire Claim**
  Provided litigation support for a valve supplier with regards to an insurance subrogation claim associated with a refinery fire. Determined extent of damage, cost and time to repair, and estimated business interruption if refinery facility had been designed per normal industry standard.

- **Pipeline Quality Bank Dispute**
  Reviewed claims by a crude oil refiner to adjust the valuation of the residuum cut in the TAPS Quality Bank. Reviewed the residual fuel markets and the delayed coking capacities and operations for several West Coast refiners. Provided written and oral testimony before a FERC Administrative Law Judge.

- **Tank Collapse Assessment**
  Assessed contractor work practices associated with the collapse of a storage tank that occurred during cleaning operations.

- **Refining Company Financial Analysis**
  Prepared a financial analysis of an independent U.S. Refiner and Marketer in support of a valuation for a prospective buyer.

- **Needle Coke Price Dispute**
  Provided an opinion on the market price of needle coke in connection with a dispute submitted to the International Centre for Expertise of the International Chamber of Commerce.

- **Faulty Equipment Claim**
  Assisted refinery operator with an insurance claim concerning the delivery and operations of a faulty air cooler. Reviewed documentation and supported client to determine roles and responsibilities of the equipment supplier to design, fabricate and deliver equipment free from manufacturing defects.

- **Refinery Equipment Valuation**
  Determined the estimated market value of idle refinery equipment that was designated as loan collateral. Prepared a report valuing the equipment under different sales scenarios including as an entire refinery, by individual process units, by individual equipment item and as scrap value.

- **Refinery Turnaround Dispute Arbitration**
  Investigated the cause/origin of a leak that developed on a process unit after a turnaround, leading to an extended shutdown. Evaluated various damage models used to estimate the value of loss of use of the process unit and the reduced operation of the refinery. Submitted an expert report on the leak liability issues and the estimated value of loss of use of the process unit and its effects on refinery operations.

- **Condensate Splitter Due Diligence**
  Conducted asset due diligence activities: inspected facility under construction; provided market incentives, operating costs, risk overview, and staffing recommendations for successful acquisition of condensate splitter and associated logistics.

- **GTL Screening Model**
  Developed a gas-to-liquids project screening model for potential North American sites.

- **Asphalt Refinery Due Diligence**
  Performed due diligence on behalf of a financial institution for funding the startup of an idle asphalt refinery. Advised client on technical issues related to running black/yellow (Uinta) wax crude in the asphalt refinery. Work included evaluation of the condition of the process units and infrastructure, assays of feedstocks, analysis of yields, and evaluation of process bottlenecks.

- **Crude Oil Marketing Study**
  Evaluated options for marketing light tight crude oil (LTO) including calculating the breakeven refining value in specific refineries and its value as diluent in a diluent-bitumen blend.
- **Refining Margin Forecast**
  Provided a 10-year refining margin and price forecast for use by client in developing their long-range plan. Provided historical trends and identified drivers which could impact future refining margins.

- **Refinery Due Diligence Assessment**
  Provided an initial assessment of a Gulf Coast refinery for possible acquisition by the client. Provided estimated refinery yields and profitability.

- **Environmental Impact Support - Rail Terminal and Refinery**
  Prepared an expert report on behalf of a local government agency, as part of an environmental impact process, to address the key technical changes resulting from a project to construct a crude oil rail terminal and modify an existing refinery to allow it to process increased amounts of light domestic crude oil.

- **Gasoline Supply Analysis**
  Prepared several regional maps showing sources of gasoline supply to various states including refineries, pipelines and waterborne routes.

- **New Refinery Fatal Flaw Analysis**
  Provided an initial assessment to a local government body regarding the development of a 20,000 B/D refinery in North America. Interviewed the project team and reviewed project documents and identified potential concerns for the project progressing as envisioned. Preparing a written report of the key findings and concerns.

- **Debutanizer Tower, H2S Incident**
  Developed an expert witness report associated with an incident concerning an H2S release during the scheduled turnaround activities involving a debutanizer tower.

- **Refinery Economic Losses Due to Fire**
  Prepared an assessment to quantify the economic damages resulting from a refinery fire that caused damage to equipment and a lengthy shutdown of a refinery distillation and conversion train. Prepared a detailed report that documented both business interruption losses and repair costs for damaged equipment. Provided testimony in deposition and district bench trial.

- **Asphalt Refinery Dispute**
  Provided analyses on locating an asphalt refinery on a property and expert witness deposition testimony involving the construction of an asphalt refinery.

- **Condensate Splitter Due Diligence**
  Conducted asset due diligence activities: (1) inspected facility under construction; (2) provided market incentives; (3) operating costs; (4) risk overview; and (5) staffing recommendations for successful acquisition of condensate splitter and associated logistics.

- **Condensate Splitter Market Study**
  Developed market study and economics for a “grassroots” Eagle Ford condensate splitter located in Corpus Christi. Evaluated alternate locations and presented to CEO and management.

- **Oil Disposition Study**
  Developed economics of crude disposition alternatives for producer's growing production of light tight oil. Alternatives included local and distant refining values with appropriate logistics costs.

- **GTL Commercialization Study**
  Performed due diligence on a new GTL process to evaluate possible routes to commercialization. The work program included the following steps: (1) verification of mass balance; (2) comparison of laboratory and pilot plant yields; (3) evaluation of alternative technologies; (4) assessment of scale-up issues; (5) review of preliminary commercial design; (6) estimate of capital costs; and (7)
the development of an economic model that included sensitivity analyses for capital costs, yields and prices.

- **Waste to Liquid Process Evaluation**
  Performed an economic and technical screening evaluation for a client-provided process for conversion of animal waste to hydrocarbon products. Researched current patented technology as well as investigated theoretical mass balances for feed/products.

- **Refining Alternative Crude Study**
  Prepared an evaluation of the economics of processing alternative crude oils in a Midwest refinery.

- **Light Tight Oil (LTO) Refining Capacity**
  Conducted a study to assess the ability of the United States (U.S.) to absorb incremental light tight oil (LTO) production. Evaluated potential for crude oil import substitution, refinery expansions, heavy oil blending and other means for increasing U.S. absorption of LTO. Results were compared to various forecasts of domestic oil production growth.

- **Jet Fuel Market Study**
  Analyzed historical jet fuel prices in PADD 1 to show how interruptions in supply impact the market price. Prepared a supply and demand balance for jet fuel in PADD 1. Developed a jet fuel supply curve for Gulf Coast and PADD 3 refiners into PADD 1.

- **Refinery Feasibility Study**
  Prepared a feasibility study for a client considering a greenfield refinery investment. Developed a price forecast and expected product netback prices and crude oil costs. Calculated the cash flow, NPV, and IRR for the project. Evaluated a crude oil railcar loading facility option for the refinery.

- **PRISM Refinery Data**
  Provided historical refinery cash flow estimates for use by the client's credit department in assessing counterparty risk.

- **Post-incident Equipment Preservation Review**
  Assisted client by assessing preservation techniques and "mothballing" efforts following the catastrophic failure of a vessel at a specialty products company. Incident resulted in an insurance claim for damaged equipment and idled equipment in the vicinity of the vessel failure. Efforts included assessing preservation techniques utilized at the plant compared to industry practices, developing an expert report, and providing expert testimony.

- **Refinery Due Diligence**
  In support of a potential acquisition and start-up of a topping refinery that had been shut down for an extended period, addressed any "fatal flaws" and provided support for evaluating order-of-magnitude costs required to inspect, repair, staff, and start-up the facility.

- **Litigation Support for Asbestos Claim**
  Asbestos Litigation—provided expert input and litigation support for trial preparation on refinery/chemical personnel's exposure to asbestos gaskets and equipment insulation materials.

- **Refinery Business Interruption Dispute**
  Following an unplanned shutdown, caused by extensive equipment damage, evaluated the refinery operation to confirm that all mitigation steps had been taken and also confirm the claimed business interruption losses.

- **Power Outage Cause and Origin**
  A refinery suffered an unplanned shutdown due to a power outage. At the time of the incident, the power source was from the grid via a third-party cogeneration station. Analyzed facilities and procedures to determine which parties: the grid, the cogeneration station, and/or the refinery, contributed to the outage.

- **Gasoline Supply Analysis**
Analyzed gasoline supply logistics to a specific state, including refineries, pipelines, and waterborne routes and prepared demonstratives.

- **Refinery Environmental Review**
  Reviewed and reported on potential environmental solid waste issues associated with a large idled refinery in support of a client's bid for the facilities. Performed an on-site inspection of the refinery to identify potential environmental risks.

- **GTL Facility Due Diligence**
  Performed due diligence for a company evaluating an equity investment in a GTL facility under construction. Reviewed project budget and schedule for completion. Evaluated the amount of contingency included in the budget, confirmed the status of payments to contractors and other service providers, and interviewed project representatives regarding mechanical completion and commissioning plans.

- **Marine Dock Business Interruption Claim**
  Reviewed documents and provided analysis concerning a marine collision with the crude oil unloading dock, which resulted in a business interruption claim for a Gulf Coast refiner.

- **Refinery Acquisition Assessment**
  Prepared an initial profitability assessment of two refineries for possible acquisition. Identified key drivers to profitability and the strengths and weaknesses of each refinery.

- **Refinery Business Interruption Claim**
  Provided technical support for a business interruption claim associated with a refinery fire. Evaluated refinery linear program model used to develop the "but for" cases. Prepared a report with recommended corrections to the linear program model "but for" case output.

- **Crude Oil Storage Support**
  Surveyed industry sources to develop an estimate of the current crude oil storage costs in the Texas Gulf Coast area. Developed an estimate of the current crude oil storage capacity and petroleum refinery capacity in the Houston area.

- **Pacific Northwest Market Study**
  Prepared a market study of the Pacific Northwest U.S., which included the refined products supply and demand balance and logistics systems. The emphasis of the study was on current and future jet fuel supply and demand in the region. Evaluated jet fuel logistic systems for Pacific Northwest.

- **Business Interruption Claim Analysis**
  Reviewed preliminary business interruption calculations related to a ship collision incident at a refinery dock. Developed a revised business interruption estimate, which resulted in a claim settlement.

- **Refining Margin Forecast**
  Provided a ten year refining margin and price forecast for use by client in developing their long-range plan. Provided historical trends and identified drivers that could impact future refining margins.

- **Refinery Yield Data**
  Provided refinery yield data and variable operating costs for developing generic refining margins. Refinery yield data sets included generic refineries located in the Midwest, U.S. East Coast, and U.S. Gulf Coast, with varying configurations.

- **Refinery Design Review**
  Grassroots refinery was to be a modular-fabrication with an on-site assembly on a greenfield site in North East Africa. Due to the characteristics of the crude oil (heavy, waxy and high naphthenic acid content), process design included Visbreaker-type technology. An evaluation was made of the process design and the project economics.
- **IPP/Refinery Power Generation Outage Dispute**
  Assessed the cause(s) of supplier's steam and electricity generation failure and mitigating actions by the refinery/petrochemical customer. Preliminary findings and a document request were provided to the client.

- **Lender's Engineer - GTL Plant**
  Served as Independent Engineer on behalf of a major Australian bank for the construction of a GTL plant. Prepared a technology assessment, analyzed feedstock supply, and reviewed contracts. Inspected equipment and confirmed permits were in place prior to authorizing draw-down certificates. Monitored construction progress, confirmed expenditures, and compared these expenditures against budget.

- **Refinery Economic Study**
  Evaluated various strategic options for a small Rockies area refinery, including an evaluation of a new diesel hydrotreater, refinery crude and product slate optimization, operating cost evaluation, and exit strategy and shutdown costs. Refinery was shut down due to the small refinery ULSD exemption that was expiring. Client wanted to evaluate the impact on the competitiveness of the refinery of adding a new diesel hydrotreating unit.

- **Refinery Acquisition Assessment**
  Provided initial due diligence for a potential refinery acquisition. Evaluated refinery profitability and strengths and weaknesses. Developed forecast for future refinery profitability.

- **Refinery Construction Dispute**
  Provided expert consulting support assessing EPC contractor's responsibilities, project execution, and start-up issues associated with the construction and start-up of a refinery expansion project. Assisted client in two areas: (1) assessed circumstances associated with a piping failure to determine if failure was due to poor engineering design; and (2) organized retained materials to assist with insurance claim.

- **GTL Facility Due Diligence**
  Performed due diligence for a company evaluating an equity investment in a GTL facility under construction. Reviewed project budget and schedule for completion. Evaluated the amount of contingency included in the budget, confirmed the status of payments to contractors and other service providers; interviewed project representatives regarding mechanical completion and commissioning plans.

- **Crude Oil Quality Bank Study**
  Recommended a crude oil quality bank methodology for the different types of crude oil to be stored in a new USGC crude oil storage facility. Reviewed other existing quality banks and developed recommendations and methodology for managing a crude oil quality bank.

- **Gas Recovery Unit Valuation**
  Prepared a fair market valuation assessment of a leased refinery gas recovery process unit located within a refinery. Visited the site and assessed the overall condition of the asset. Applied a cost approach to value the asset. The valuation was used by the client to negotiate a buy-out of the leased process unit.

- **Refinery Assessment for Acquisition**
  Developed a cash flow model for valuation of a potential refinery acquisition. Used PRISM data to estimate the refinery yields and operating costs. Evaluated several refineries as part of acquiring the entire refining assets.

- **Refiner Acquisition Study**
  Developed cash flow models of a U.S. refiner for a client interested in a potential acquisition. Developed a price forecast and cash flow model for each refinery under consideration. Utilized PRISM and publicly available data to model the charge and yield and
economic performance of each refinery. Cash flow models were used for valuation of the potential acquisition.

- **Transmix Facility Due Diligence**
  Completed technical, financial, and operational due diligence analysis on behalf of lenders for an existing transmix processing facility and associated terminal. Tasks included inspection of facilities, assessment of competitive market position, and an evaluation of a new hydrotreater project for ULSD production.

- **Refinery Acquisition Study**
  Developed a cash flow model of a U.S. refinery for a client interested in a potential acquisition. Utilized PRISM and publicly available data to model the charge and yield and economic performance of the refinery. Cash flow model was used for valuation of the potential acquisition.

- **Canadian Refinery Competitiveness Study**
  Evaluated the competitive position of several Canadian refineries located in Eastern Canada and Ontario. Evaluated refinery configurations, crude oil slate and product yield, and profitability versus a group of regional competitor refineries. Presented the crude oil and product logistics systems for each of the Canadian refineries being studied.

- **Terminal Due Diligence**
  Performed a technical due diligence of a Gulf Coast refinery tank farm and associated transfer pipelines for a prospective investor. Reviewed inspection and maintenance records of the assets during a site visit. Reviewed numerous operating performance documents from a data room. Prepared a technical due diligence report outlining our findings.

- **St James Louisiana Crude Supply Study**
  Analyzed crude supply sources and pipeline flows for the Southern Louisiana refining market in conjunction with a potential pipeline acquisition. Forecasted crude supply availability by grade in the St. James trading hub and analyzed impact of new crude oil pipelines in the market.

- **Refinery Acquisition Screening Study**
  Developed a refinery acquisition matrix comparing quantitative and qualitative aspects of various refineries. Utilized PRISM data to compare relative profitability and charge and yield results for various refineries under consideration.

- **RIN Balance Study**

- **Refinery Fair Market Value**
  Provided expert witness testimony and assisted client during negotiations regarding the fair market value of a shutdown refinery in bankruptcy.

- **Refinery Valuation**
  Provided expert witness testimony and reports regarding the fair market value of a multiple refineries in New Jersey over multiple years.

- **Refinery Valuation**
  Provided expert witness testimony regarding the fair market value of a shutdown refinery in bankruptcy and assisted during negotiations.

- **Mexican Refinery Construction Dispute**
  Served as consulting and testifying experts in an ICC arbitration involving an upgrade and expansion of a large refinery complex in Mexico. Evaluated over 400 separate claims by the owner for alleged improper design and invalid extra work orders for refinery
and pipeline projects. Assignment included preparation of an expert report and testimony before the International Court of Arbitration in Mexico City.

- **Refinery Flare Incident**
  Following a fire during a scheduled flare system maintenance turnaround, retained to assess the feasibility of safely hot tapping the flare header to install a stopple and allow removal of a large gate valve upstream of a flare knock-out drum. In consultation with other parties, assessed: (1) the flare system equipment, (2) the refinery hot tap procedures, and (3) evaluated if the activities could be performed safely.

- **Crude Oil Rail Terminal Study**
  Provided an overview of the Chicago market in terms of crude oil pipeline logistics, refinery crude oil slates, and refinery profitability. Provided supporting information for client considering an investment in a crude oil rail terminal. Supporting information included a Canadian crude oil takeaway outlook and Chicago area refineries crude oil slate outlook.

- **Refinery Environmental Consent Decree**
  Investigated the causes of exceedances of permitted emissions levels at a petroleum refinery in relation to a proposed consent decree to resolve excessive notices of violation. Evaluated the causes, frequency, and levels of sulfur dioxide exceedance incidents. Correlated exceedances with refinery operations and capabilities of emissions control equipment. Prepared a strategy to eliminate exceedances under most operating scenarios, which was much lower in cost than the remediation proposed by the consent decree. Presented findings to regulatory agencies for approval.

- **Refinery Incident Claim**
  Assisted in the investigation of a refinery leak and fire. Coordinated the collection of information related to the incident and disseminated it to the relevant parties. Helped audit incident related retained materials and developed inventory documentation.

- **Appraisal Services**
  Provided appraisal services for industrial properties. The three standard methods of valuation used were: cost, income, and market approaches.

- **Refinery Process Unit Damage Dispute**
  Evaluated the circumstances leading up to and contributing to equipment damage and fires following initial start-up of a new process unit. Provided an independent analysis to the Operator’s management.

- **Shale Crude Processing Evaluation**
  Provided economics and expected operating costs of a grassroots light crude oil distillation facility. Facilitated meetings with future customers of intermediate products.

- **Oil Refinery Valuation**
  Conducted a valuation of an oil refinery and associated pipelines for a commercial bank in support of a significant debt refinance package.

- **Condensate Splitter Investment Analysis**
  Analyzed a proposed condensate splitter investment for a large midstream company. The study included feed and product supply/demand, economics, staffing, operating costs, and export ban lift scenarios.

- **Condensate Splitter Operating Plan**
  Assisted a large midstream company with preparation of a condensate splitter operating plan, including staffing, maintenance, quality assurance, planning, and related items.

- **Natural Gas Measurement Dispute**
  Assisted with evaluating a claim for natural gas billings that may have exceeded actual usage. Investigated and evaluated
purchased natural gas metering and material balancing at refinery site and natural gas supply metering stations.

- **Analysis of U.S. Gasoline Prices and Crude Oil Prices**
  Analyzed the correlation between U.S. and global crude oil prices and regional prices of U.S. gasoline during periods of steep crude oil price discounts (2011-2013). The study analyzed the portion of the West Texas Intermediate price differential that was captured by refiners and the amount passed on via lower spot gasoline prices. The study, which was made public, concluded that a portion of the crude oil price discount was passed through in gasoline pricing, and this effect was most pronounced in U.S. PADDs 2 and 3.

- **Louisiana Crude Oil Supply Study**
  Analyzed crude oil supply and distribution for a potential pipeline acquisition. Evaluated refinery crude slate preferences and capabilities, along with access to domestic and foreign crude oils. Reviewed production trends, crude oil flows, new pipeline construction, and changes of service to estimate future utilization and profitability.

- **Splitter Performance Review**
  Provided guidance on test run procedures regarding a new condensate splitter start-up. Reviewed operating and lab data to be obtained during the test run and provided input into additional information to be collected.

- **Refinery Economic Analysis**
  Provided analysis of potential economic losses due to rupture of natural gas pipeline supplying a refinery.

- **Dispute Support - Groundwater Contamination**
  Provided expert report related to the standards of care for U.S. refineries operating prior to 1960, including typical maintenance practices employed at the time. Reviewed very limited historical records of the refinery and depositions taken of the workers at the refinery during its time of operation. Reviewed the hydrocarbon leak detection technology that existed during the operating life of the refinery and compared it to present technology available today.

- **Hurricane Product Shortage Claim Assessment**
  Assessed a product shortfall by a chemical producer following Hurricane Harvey. Provided volume and revenue estimates, taking into consideration port closures and the timing of force majeure declarations.

- **Plant Reliability Dispute**
  Assessed plant operating shutdowns and production losses related to force majeure claims. Evaluated if these outages were reasonably the result of a force majeure event, or were related to poor maintenance practices and/or reductions in cost associated with process reliability programs.

- **Hazardous Remediation Costs Allocations**
  Assisted client with a claim related to remediation of property associated with a pipeline corridor and the surrounding petrochemical and terminal industrial complex. Assignment included evaluating pipeline and tank fabrication requirements, inspection, and maintenance practices during the history of the pipeline and surrounding industrial complex; and, specifically, the practices of the client during its ownership of pipelines and facilities involved in the dispute. This information was used to assess the client's responsibilities and the cost allocations between all parties during the history of this industrial site.

- **Refinery Strategic Review**
  Provided 10-year market outlook for a U.S. East Coast refinery. Evaluated scenarios related to regional supply, shifting commodity flows, demand adjustments, and alternative tax regimes.
to estimate the profitability impact to refinery. Analysis culminated in evaluation of strategic options for refinery.

- **Refinery Power Failure**

A power supply failure at a refinery resulted in a complete and extended outage of the refinery, as well as long-term impacts to refinery operation. Opined on the duration of the outage, the refiner’s actions, and refinery procedures during the restart effort with respect to typical refinery restart efforts. Also calculated the economic damages suffered by the refinery as a result of the power outage.

- **Refinery Flaring Dispute**
  
  Reviewed several flaring incidents associated with litigation at a refinery. Opined on refinery actions taken, maintenance practices, and operating procedures in place related to refinery flaring. Developed an expert report and provided deposition testimony.

- **Contractor Injury**
  
  Following a contractor injury during a plant turnaround, engaged to: (1) assess activities of contractors associated with the turnaround; (2) determine if activities were associated with the vessel where the contractor was reportedly injured; and (3) evaluate if these activities affected the incident. Developed an expert report.

- **Refinery Company Acquisition**
  
  Developed and presented a multi-refinery acquisition package to the CEO of a large refining company. Using PRISM models, developed a 10-year cash flow of heavy crude refining economics. Presented economics of extensive marketing supply chain through numerous company terminals. Provided economics of company owned pipelines and lubes business. Discussed organization structure, company culture, and pros/cons of each refinery.

- **IMO 2020 Oil Refinery Study**

  Performed a study on the benefits of IMO 2020 to the U.S. economy. Leveraged general refinery industry expertise and our PRISM™ refining and marketing supply chain modeling system to provide in-depth analysis of the oil refinery sector.

  - **Refinery Acquisition Study**
  
  Developed cash flow models for regional refineries in conjunction with a potential acquisition target. Utilized PRISM yields and operating costs to evaluate the potential profitability of the target refinery. Also developed a price forecast for input into the cash flow model.

  - **Refinery Due Diligence - Rocky Mountains**

  Assisted a prospective buyer and commercial bank advisor in a technical and market due diligence study for a refinery. Prepared a pricing outlook, reviewed technical inputs to a financial model, and visited the site. Prepared a summary report of findings including, among other factors, maintenance program status, tank inspection schedule conformance, reliability, utilization, and fixed costs.
- **Crude Oil Valuation Study**  
  In support of an investment decision, analyzed how a specific crude oil would be valued at various refineries. After identifying the top prospects based upon the crude oil valuation, provided guidance on potential logistical and processing limitations.

- **Re-Refining Technology Assessment**  
  Conducted a technical “fatal flaw” analysis on a used motor oil re-refining technology for the purpose of informing a debt investment decision by investors. Reviewed design basis information, including, but not limited to, a heat and material balance (H&MB); pilot plant operating data, and laboratory results. Opined on the ability of the technology to meet required specifications for lube base oils.

- **Regional Fuel Study**  
  Evaluated the fuel balance for a region, including production and imports. Analyzed the competitiveness of each of the regional fuel suppliers.

- **Catalyst Financial Projection Review**  
  Evaluated catalyst sales and financial forecasts for select business lines for various industry applications. Evaluated market sizes and competitors.

- **Personal Injury Liability Investigation**  
  Investigated a personal injury claim following a petroleum refinery process incident. Provided expert opinions on refinery conformity with the latest available industry technology, regulations, standards, and practices.