

Exhibit 1.4

Qualifications of Contributors

Tenaska Qualifications



TENASKA[®]

Statement of Qualifications



Tenaska is an innovative power developer that is recognized throughout the energy industry for its creative approach to developing energy solutions, its tenacity and integrity, and its commitment to leading edge technology.

In its 23-year history, the company has developed approximately 9,000 megawatts (MW) of generation, representing more than \$10.2 billion in aggregate financing and capital investment. In addition to having ownership interests, Tenaska is a managing partner and provides operations services for about 6,700 MW of generation.

Tenaska's natural gas affiliate, Tenaska Marketing Ventures, and its power marketing affiliate, Tenaska Power Services Co., are considered to be among the largest marketers in the United States providing asset management products and services to the gas and power industries.

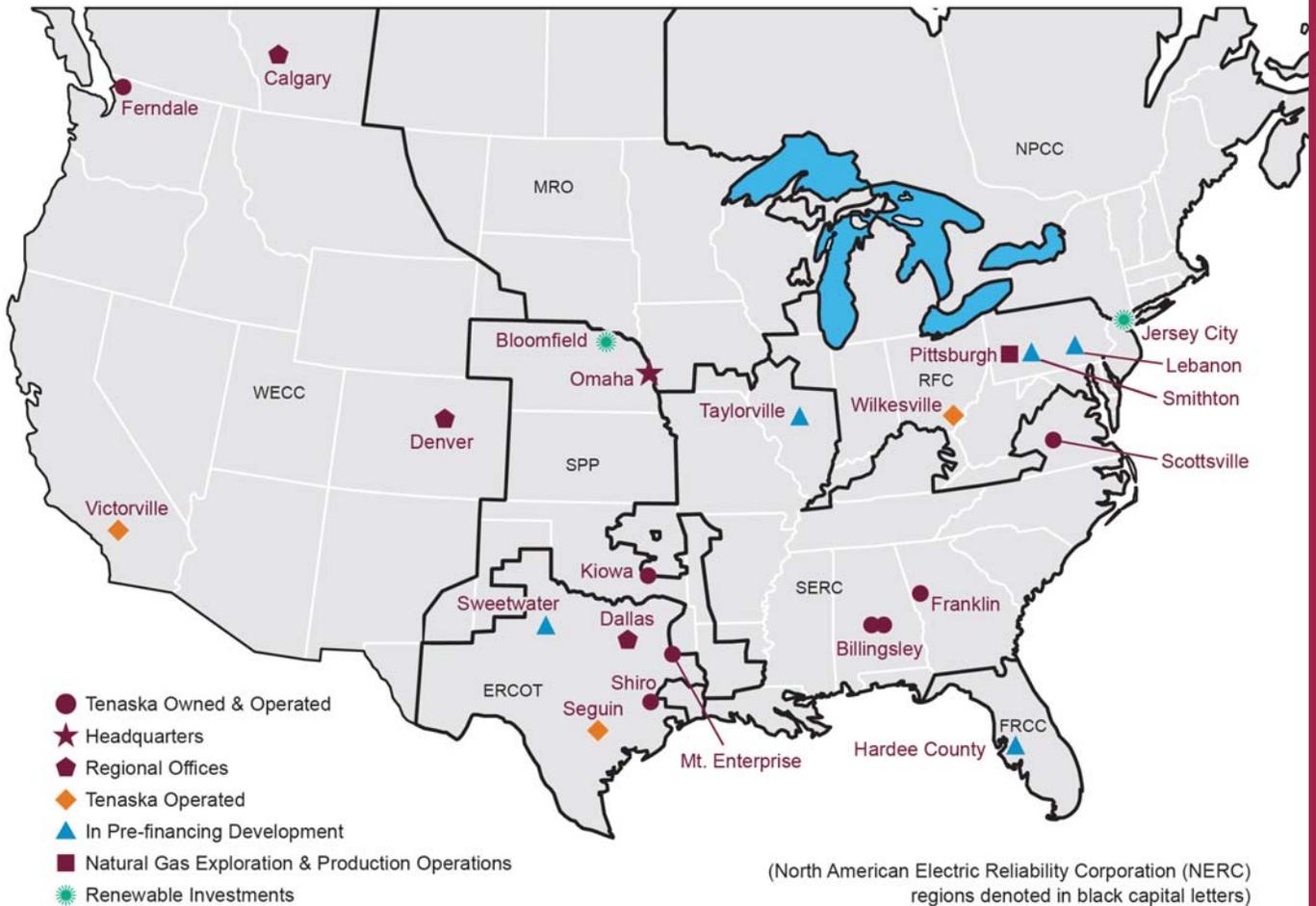
Tenaska BioFuels, LLC, uses its expertise to provide innovative solutions for helping customers market and move their bioproducts to consumers. Tenaska Exploration & Production (E&P) has acquired gas leases for drilling and production activities in the Marcellus Shale.

Tenaska also provides administrative and operations oversight services for nine generating stations, totaling more than 5,000 MW, owned by stand-alone private equity funds Tenaska Power Fund, L.P. (TPF I) and TPF II, L.P. (TPF II). Tenaska Capital Management, LLC (TCM) is the manager of TPF I and TPF II, and on behalf of TPF I and TPF II, is responsible for the evaluation, acquisition, operation, optimization and divestiture of opportunities in the U.S. energy industry.

Tenaska... an innovative power developer



Tenaska Offices and Projects



Independent Power Development

Tenaska's leadership and development expertise have been key to the success of developing approximately 9,000 MW of independent power projects, of which more than 6,700 MW are owned in partnership with other companies and operated by Tenaska.



Tenaska Ferndale Cogeneration Station

270-MW natural gas-fueled cogeneration facility, with fuel oil back-up

Located in Ferndale, Wash. (USA) in Whatcom County

Power purchased by Puget Sound Energy, Inc.

Steam purchased by ConocoPhillips Oil Refinery

Completed in 1994



Tenaska Frontier Generating Station

830-MW natural gas-fueled generating facility, with fuel oil back-up

Located near Shiro, Texas (USA) in Grimes County

Power purchased by Exelon Generation Company, LLC

Completed in 2000



Tenaska Gateway Generating Station

845-MW natural gas-fueled generating facility, with fuel oil back-up

Located near Mt. Enterprise, Texas (USA) in Rusk County

Power purchased by Shell Energy North America (US), L.P.

Completed in 2001



Tenaska Georgia Generating Station

944-MW natural gas-fueled peaking facility, with fuel oil back-up

Located near Franklin, Ga. (USA) in Heard County

Power purchased by Exelon Generation Company, LLC

Phase 1: Completed in 2001

Phase 2: Completed in 2002





Tenaska Lindsay Hill Generating Station

845-MW natural gas-fueled generating facility, with fuel oil back-up

Located near Billingsley, Ala. (USA) in Autauga County

Power purchased by B.E. Alabama, LLC

Completed in 2002



Tenaska Central Alabama Generating Station

885-MW natural gas-fueled generating facility, with fuel oil back-up

Located near Billingsley, Ala. (USA) in Autauga County

Power purchased by Shell Energy North America (US), L.P.

Completed in 2003



Tenaska Kiamichi Generating Station

1,220-MW natural gas-fueled generating facility

Located near Kiowa, Okla. (USA) in Pittsburg County

Power purchased by Shell Energy North America (US), L.P.

Completed in 2003



Tenaska Virginia Generating Station

885-MW natural gas-fueled generating facility, with fuel oil back-up

Located near Scottsville, Va. (USA) in Fluvanna County

Power purchased by Shell Energy North America (US), L.P.

Completed in 2004



Other Projects Developed By Tenaska:

Tenaska Paris Cogeneration Station

244-MW natural gas-fueled cogeneration facility
Located near Paris, Texas (USA) in Lamar County
Power purchased by TXU Energy Company
Steam purchased by Campbell Soup Company
Completed in 1989; sold in 2006.

Tenaska Cleburne Generating Station

263-MW natural gas-fueled generating facility
Located near Cleburne, Texas (USA) in
Johnson County
Power purchased by Brazos Electric Power
Cooperative
Completed in 1996; sold in 2000.

Uch Power Project

586-MW natural gas-fueled generating facility, with
fuel oil back-up
Located in Balochistan Province, Pakistan
Power purchased by Pakistan Water and
Power Development Authority
Completed in 2000; sold in 2008.

Tenaska Frederickson Generating Station

248-MW natural gas-fueled generating facility
Located near Frederickson, Wash. (USA) in
Pierce County
Power purchased by Bonneville Power
Administration (BPA)
Scheduled completion date: 1996.

Lakefield Junction Generating Station

534-MW natural gas-fueled peaking facility
Located near Trimont, Minn. (USA) in Martin County
Power purchased by Great River Energy
Completed and sold in 2001.

Hidroeléctrica Boliviana, S.A.

91-MW hydroelectric generating project
Located on the Taquesi and Unduavi Rivers
in Bolivia
Power sold to the Bolivia power grid
Phase 1: Completed in 1998
Phase 2: Completed in 2002
Sold in 2009.

ENERGY MARKETING COMPANIES

Tenaska's marketing companies – natural gas, electric power and biofuels – closely coordinate their activities to provide customers with complete energy management services. Together, they offer a customized teamwork approach to ensure maximum value and carefully managed risk.

Natural Gas Marketing

Tenaska markets and manages natural gas supplies through Tenaska Marketing Ventures and Tenaska Marketing Canada (collectively TMV). TMV is one of the 10 largest North American natural gas marketers and stands out as the only independent company among the top 10, which includes major international exploration firms and large U.S. utility holding companies. In 2009, the volume of gas sold or under TMV management totaled 2.0 trillion cubic feet. TMV provided fuel management for 9,219 MW of customer-owned generation, of which 4,950 MW are jointly managed with Tenaska Power Services Co. (TPS).

Power Marketing

Tenaska Power Services Co., a Federal Energy Regulatory Commission (FERC)-licensed power marketing company, focuses on physical power deliveries, asset management and optimization, and creative solutions to power requirements, with expertise in transmission and system operations to maximize opportunities for its customers. TPS has real-time marketers and schedulers available on the marketing floor 24 hours a day, seven days a week. TPS develops short-term solutions, intermediate strategies in the one-to-five-year range and long-term programs of five years or longer. In 2009, TPS sold more than 7,000 gigawatt-hours (GWh)

of electricity and managed approximately 17,500 MW of assets for utilities of all sizes, as well as cogeneration plants, independent power producers and industrial companies.

TPS is innovatively meeting the needs of the growing wind generation industry, as the largest third-party provider of management services for wind generation in Texas. The company has developed and patented a unique, proprietary wind scheduling platform.

Biofuels Marketing

Tenaska BioFuels, LLC (TBF) stands out as a provider of services to the agricultural products, ethanol and biodiesel industries because of its unique combination of energy, agriculture and financial expertise. TBF is a multi-commodity business that serves as a one-stop shop, offering marketing, offtake and procurement services for biofuels producers and agriculture processors.

TBF is geographically situated in the heart of the prime ethanol and biodiesel production areas and is uniquely positioned to play a significant role in the market segment for developers, producers, retail groups, terminal operators, oil companies, exporters and marketers. The company can help producers navigate the financial, energy and agricultural commodity markets and provide risk management, credit security, arbitrage, marketing services, transportation and storage.



EXPERTISE FOR EVERY STAGE OF PROJECT DEVELOPMENT AND MANAGEMENT

For more than 20 years, Tenaska has excelled in developing innovative energy products and services for a wide range of customers. From the development and operation of complex, large-scale electric generating facilities to natural gas, power and biofuels marketing, Tenaska employees have the energy-related skill sets and dedication required to meet and exceed its customers' expectations. And Tenaska's status as a privately-held, employee-owned company allows it to make sound decisions that are focused on customer needs instead of short-term market expectations.



Tenaska possesses a proven record of success and capabilities in the areas of:

Project Development

- Site Selection
- Interconnection Negotiations
- Regulatory Compliance
- Community Relations

Fuel/Technology Selection

- Natural Gas
- Coal
- Hydro
- Wind
- Solar

Project Engineering and Construction

- System Concept Design
- Engineering and Construction Management
- Performance Monitoring
- Transmission Design and Construction

Project Customization

- Plant Design Features
- Plant Operational Flexibility
- Power and Fuel Flexibility

Plant Operations and Maintenance

- Management and Operation
- Customer Coordination
- Asset Optimization
- Maintenance
- Performance Testing

Financing

- Equity Sponsorship
- Construction/Term Financing
- Interest Rate Protection
- Recognized Financing Experience

Natural Gas Marketing

Power Marketing

Biofuels Marketing

Fund Management Services

Gas Exploration & Production

- Midstream Facility Development and Pipeline and Construction



PROJECT DEVELOPMENT

Tenaska has earned its national reputation for developing successful and innovative electric generating plants through its diligent preparation at every stage of the process – from selecting a site to working with the community.

Site Selection

Tenaska's employees are experienced in selecting project sites that minimize impacts on the environment and are compatible with existing land use. Early in the development process, Tenaska carefully evaluates key infrastructure considerations such as availability of pipeline or fuel transportation facilities, access to adequate water supplies, proximity to high voltage transmission lines, zoning regulations and ordinances, community acceptance, adequate surface transportation and, where required, a market for thermal energy.

Tenaska also performs a critical flaw analysis, which allows the company to identify significant



negative factors that could adversely affect the construction, permitting or financing of a power generating project early in the development process.

Interconnection Negotiations

Tenaska employees are skilled at resolving interconnection issues to meet key infrastructure requirements such as electric, gas, rail and water.

Regulatory Compliance

Tenaska's staff is experienced in all phases of the permitting and regulatory process, including air and water quality permits, sound management, solid waste disposal and land use requirements.

Tenaska was listed by the Natural Resources Defense Council in 2008 benchmarking studies as having the best record among companies in the U.S. that generate power from fossil fuels for controlling emissions of carbon dioxide and as one of the top performing companies for controlling emissions of nitrogen oxide and sulfur dioxide.

Tenaska maintains a culture of state, federal and regulatory compliance. In 2009, Tenaska initiated a companywide campaign to re-emphasize employee awareness of Tenaska's commitment to conducting its business with the highest ethical standards and in compliance with all federal and state regulations, as well as procedures for identifying and handling potential compliance issues. This ongoing program is designed to reinforce Tenaska's long-standing commitment to compliance and ethics.

Tenaska retains Washington, D.C., firms for counsel on issues related to such federal agencies as the Federal Energy Regulatory Commission



(FERC), the Environmental Protection Agency, the Securities and Exchange Commission (SEC). Additional counsel is retained in each state where a power generating facility is proposed. These firms advise Tenaska's legal and regulatory personnel on issues related to local and state permits and land acquisition regulations, as well as providing certification process guidance.

Community Relations

Tenaska believes that attention to social and environmental concerns is a key component in the successful development of power generating plants. Tenaska works to cultivate relationships and communicate with local community leaders, concerned citizens and environmental groups and agencies. Tenaska regularly reviews plant design and construction plans with local citizens and continues to maintain a good community relationship after a facility is completed.

FUEL/TECHNOLOGY SELECTION

Tenaska personnel have developed and constructed a diverse portfolio of environmentally responsible power facilities.



Natural Gas

Tenaska has successfully developed 15 natural gas-fueled generating stations, domestically and internationally, and currently operates more than 6,700 megawatts (MW) of natural gas-fueled electric generating capacity.

Tenaska has been honored nationally and internationally for every phase of natural gas-fueled electric generating project development and its plants have been recognized by industry publications for their exceptional performance. The company has demonstrated expertise in plant siting and permitting, engineering design and optimization, financing, construction contracting and management, fuel procurement and handling, commissioning, and operations and maintenance.

Coal

Tenaska employees have experience in all types of large-scale coal-fueled generation, including pulverized coal, fluidized-bed, waste coal and

lignite facilities. Before joining Tenaska, many of the company's current engineering and project development personnel held management positions on coal projects for several of the largest construction firms and coal companies in the United States. Their experience has included project development and management, design, engineering, construction, fuel supply, fuel transportation logistics, operations and environmental affairs.



Today's supercritical pulverized coal plants produce only a fraction of the emissions produced by the last generation of coal plants built in the 1970s and 1980s. However, they continue to release carbon dioxide, a greenhouse gas often associated with global climate change. Tenaska believes it is essential to develop projects with cutting-edge carbon capture and storage capabilities that will allow the continued use of coal as a generating fuel in a carbon-constrained regulatory or legislative environment. To that end, it is developing projects that incorporate two different clean coal technologies.

Tenaska is leading the development of the Taylorville Energy Center (TEC), an IGCC project in central Illinois that is expected to



become one of the first commercial-scale coal gasification power facilities in the United States. TEC will be designed to remove and capture emissions, including most carbon dioxide (CO₂), before combustion, making it significantly cleaner than conventional coal projects. TEC is among the first commercially sized IGCC project in the United States to receive a PSD (construction) permit, a key milestone in the project's development.

To encourage development of environmentally advanced plants, the Illinois General Assembly passed Senate Bill 1987 (SB 1987), the Clean Coal Portfolio Standard Act. SB 1987 requires large utilities to enter into long-term, cost-based contracts to purchase up to 5 percent of their electricity from clean coal facilities that capture at least 50 percent of their greenhouse gas emissions.

In 2009, the project was selected to enter into term sheet negotiations with the U.S. Department of Energy for a \$2.579 billion loan guarantee. That process, including development of an environmental impact study, is underway.

At the proposed Tenaska Trailblazer Energy Center in Texas, pulverized coal and supercritical steam technology are wed with state-of-the-art emissions control equipment to create a clean conventional electric generating station. In addition, the facility will be among the first new conventional coal-fueled plants to capture, on a commercial scale, 85 to 90 percent of the CO₂ that would otherwise be emitted. The captured CO₂ would be used to recover at least 10 million barrels of oil from the Permian Basin each year through enhanced oil recovery.

In 2009, the Tenaska Trailblazer Energy Center received its draft PSD (construction) permit, which is proceeding through a contested case hearing, and began preliminary engineering.

Hydro

In 2002, Tenaska completed the development of a two-stage 91-MW hydroelectric generating station in a mountainous region near La Paz, Bolivia. The company refurbished an existing 830-kilowatt (kW) facility and built two run-of-the-river hydroelectric units. Tenaska managed the project through concept, design, engineering and construction and operated the hydro facility until selling it in 2009. The project increased the country's power supply by approximately 12 percent by using a clean, renewable generating resource.

Wind

In 2008, employee-owners of Tenaska became one-third owners of Elkhorn Ridge Wind, LLC a company formed to develop and operate the 80 MW Elkhorn Ridge Wind Farm in Nebraska. As such, Tenaska lends its expertise in development and operation of the facility, which is the largest wind generation facility in the state. Tenaska also supports much of the wind energy industry in Texas through its Tenaska Power Services Co. affiliate, which is the largest third-party provider of scheduling, marketing and asset management services to the wind industry in Texas, the nation's leader in wind generation.

ENGINEERING AND CONSTRUCTION

Tenaska provides a comprehensive offering of transmission and power plant design and construction services.



System Concept Design

Tenaska creates and refines the conceptual design for each project to assure that it can effectively serve the particular needs of a project's power and steam (if applicable) customers. Tenaska engineers conduct detailed heat and mass balance analyses utilizing state-of-the-art computer models. These analyses integrate the needs of the power purchaser, the thermal (steam) customer (where appropriate) and the equipment performance characteristics.

The results of conceptual design studies provide a basis for Tenaska's engineers to prepare technical design specifications, equipment performance criteria and system test procedures and criteria. These results also provide data for project financial pro forma modeling. They are also incorporated in the permitting analysis, engineering procurement and construction contracts, and the operations and maintenance contracts.

Engineering and Construction Management

Tenaska typically contracts for detailed engineering services as part of a comprehensive Engineering, Procurement and Construction (EPC) agreement. Contractors are prequalified firms that have demonstrated competence and success in engineering and constructing utility-grade power generating plants and can guarantee plant performance and construction schedules.

Tenaska provides owner's engineering oversight services (i.e. owner's management) to monitor progress, review, approve and direct the EPC contractor's home office and field engineering. This service is provided from contractor release through the commercial operation dates of the facilities.

Tenaska staffs and maintains an engineering office at the project site, and stays in close contact with the contractor, including attending regular design review meetings.

Performance Monitoring

To assure that plants and facilities perform in accordance with specifications, Tenaska engineers maintain ongoing programs of performance testing, data analysis and evaluation. Results from these programs are used to correct or improve plant performance and to refine the analysis techniques for the conceptual design process. In addition, Tenaska engineers maintain a close rapport with key equipment vendors to stay abreast of the latest equipment performance enhancements and improvements in equipment technology.



Transmission Design and Construction

Tenaska follows the same disciplined approach to transmission development, design and construction as it uses with its power projects. Tenaska developed, and coordinated the design and construction of, additional interconnection facilities to allow one of its plants to serve two power grids at once. These additional interconnection facilities consisted of an expanded switchyard at the power plant site in Oklahoma, an 84.4-mile, 345-kilovolt, double-circuit radial transmission line, and additional substation facilities necessary to connect with transmission facilities in Texas. Completed in two years, the additional transmission facilities allow Tenaska's Kiamichi Generating Station in Kiowa, Okla., the option to deliver power to either the Southwest Power Pool or the Electric Reliability Council of Texas (ERCOT), an electrical grid that operates separately from Oklahoma and the eastern United States.



PROJECT CUSTOMIZATION

Tenaska's experience in and knowledge of electric utilities and fuel and electricity markets provide a power purchaser a full range of performance options, operating flexibility and contracting structures. Tenaska has a demonstrated record of tailoring the design and operation of a power generating plant to meet customers' special needs.



Plant Design Features

When developing its 223-MW cogeneration plant in Paris, Texas, Tenaska worked with customer TXU to ensure that the utility's dispatch operation requirements would be compatible with the Electric Reliability Council of Texas (ERCOT) system. Design and operation enhancements were included in the Paris plant to provide load-following capability; unit back-down during low-load periods; area voltage regulation; and spinning reserve that is released automatically in response to system frequency deviations. All of these operating enhancements were designed to take place while still providing a wide range of steam supply to the thermal host. The Paris plant also included “black start” capability to energize the plant and supply power to the transmission system in the event of a large-scale regional outage.

Plant Operational Flexibility

Puget Sound Energy needed Tenaska's 270-MW cogeneration plant near Ferndale, Wash., as a hydro-firming resource. The Ferndale plant's operating procedures were tailored to allow the utility flexibility to coordinate plant operation with hydroelectric operations in the Pacific Northwest.

Power and Fuel Flexibility

Tenaska can offer innovative operating flexibility to handle the sometimes conflicting requirements of the power purchasing customer and the suppliers of fuel and fuel transportation services to the power generating plant.

Tenaska has secured fuel contracts for power projects under terms that match the corresponding terms of the project's power sales obligations.

During early design discussions with a power purchaser, Tenaska works to identify special needs and to incorporate value-added features such as black start, frequency control, voltage regulation, spinning reserve and automatic generation control. Most of Tenaska's plants have dual-fuel capability. Tenaska can also assist a utility in power marketing and area load control services, if required.

The Tenaska Frontier Generating Station near Shiro, Texas, and the Tenaska Gateway Generating Station near Mt. Enterprise, Texas, are two of Tenaska's unique facilities. They can deliver power into two grids: the Electric Reliability Council of Texas (ERCOT) and the Eastern interconnected grid. They are believed to have been the first power facilities in the nation with that capability. The Frontier facility, the first to employ dual grid capability, received *Power Engineering* magazine's “Plant of the Year” award in 2001. A third facility,



the 1,220 MW Tenaska Kiamichi Generating Station in Oklahoma, has dual-grid interconnection capability to the Southwest Power Pool (SPP) and ERCOT via an 84.4-mile radial transmission line. It is the first power plant outside Texas to be interconnected to the ERCOT transmission grid.



OPERATIONS AND MAINTENANCE

Tenaska is well regarded in the industry for its ability to achieve maximum use of its assets. Every process and procedure, from an operations, maintenance, performance and coordination standpoint, are scrutinized and improved to optimize every plant asset.



Management and Operation

Tenaska-managed plants have consistently achieved or exceeded performance goals for capacity and availability, and their records for safety and environmental compliance are among the highest in the industry. Tenaska has won numerous awards from leading energy industry publication, Combined Cycle Journal, for best practices in power plant management, operations and maintenance, safety and environmental responsibility.

Tenaska, through its wholly-owned subsidiary Tenaska Operations, Inc. (TOI), provides operations and maintenance (O&M) services for U.S. projects in which Tenaska and its affiliates have ownership interests and three plants owned

by private equity funds Tenaska Power Fund, L.P. (TPF I) and TPF II, L.P. Tenaska also oversees O&M at six additional plants owned by TPF I and TPF II. TOI supplies the skilled personnel and management services necessary for the safe and reliable start-up, commissioning, operation and maintenance of power generating and related facilities.

Customer Coordination

Tenaska's goal is to be responsive to the specialized needs of the power purchaser. Tenaska is responsible for maximizing the availability and efficient production of each plant and coordinates operations and maintenance with the needs of the power purchasing entity. Generating schedules are transmitted electronically between the plants' control rooms and utility system dispatch centers with the same daily schedule format as is issued to utility power plants. Power off-takers use dedicated communication lines to advise Tenaska's plants of system emergencies and changes in dispatch and to monitor changes in plant availability.

Asset Optimization

Tenaska optimizes the operating efficiencies, profitability, and customer and partner relationships of its plants through its Asset Management Group. Asset Management examines ways to create value for Tenaska and its partners and customers through cost control, revenue enhancement and efficient use of assets.

Tenaska's Asset Management Group worked with Tenaska's Engineering & Operations Group and engineers from seven Tenaska plants to develop a state-of-the-art performance monitoring program



for critical plant processes to reduce operating costs, help identify potential problems and increase overall consistency among the plants. These efforts earned Tenaska Operations, Inc. a 'Best of the Best' Practices award from *Combined Cycle Journal*, a leading energy industry publication.

Maintenance

Tenaska's Engineering & Operations Group maximizes plant availability by working with the power purchasing customer to develop predictive, scheduled and corrective maintenance programs that are integrated with the scheduling needs of the customer. For example, in 2009, the Tenaska Gateway facility in Mt. Enterprise, Texas, used an extended outage due to unforeseen work scope on the steam turbine generator to conduct a major inspection on a gas turbine and electric generator six months early. The modified maintenance plan avoided an extended outage later in the year and left the plant more available to meet customer needs. In 2006, the Tenaska Frontier facility in Shiro, Texas, completed a major scheduled maintenance outage ahead of schedule in order to provide additional electricity to its customer.

Tenaska's Engineering & Operations Group also works closely with subcontractors and regulatory agencies to help ensure compliance with environmental permit requirements concerning air emissions and water discharge.

Performance Testing

Tenaska's power sale agreements assure power purchasers that Tenaska's plants can meet contractually stated performance benchmarks on a continuing basis. Results of performance tests designed to demonstrate the plant's ability to



generate power at a specified capacity are provided to its customers, and Tenaska also uses them to monitor and analyze key operating parameters of both total plant and principal subsystems (e.g., gas turbines, steam turbine, condenser, cooling tower, etc.).

Tenaska uses automated systems to monitor performance on-line and in real time. This improves performance data acquisition and processing and more accurately and reliably ascertains the thermal efficiencies of critical subsystems and tracks degradation of plant heat rate and output. The results assure continuing optimum performance and provide useful data for improving future plant designs.



FINANCING

Tenaska has extensive experience in developing and financing cogeneration and power projects and has secured more than US \$10.2 billion in energy-related project capitalization.



Equity Sponsorship

The commitment of the equity sponsors is one of the most important requirements in successfully developing and financing a project. Site acquisition, plant design, environmental studies, permitting and regulatory approvals require substantial equity commitments before any debt financing for a successful project is obtained. Tenaska commits extensive time, expertise and financial resources to developing a project to the point that project financing can be arranged and construction started.

Construction/Term Financing

At close of construction financing, lenders join the equity sponsors to create a combination of debt and equity commitments designed to provide financing for the construction and operation of a project.

Tenaska strives to create a competitive market environment within which to finance its projects. Three Tenaska-sponsored transactions have been

named “Deal of the Year” by Euromoney's *Project Finance* magazine and Project Finance International in various financing categories and several others have been considered for the honor.

Tenaska has developed relationships with various lenders who provide construction financing, long-term financing and refinancing for cogeneration, independent power and build-own-transfer projects such as:

- Commercial lenders, which are very active in the market, including Crédit Agricole, BNP Paribas, DZ Bank, Hypo Vereinsbank, Barclays, Bank of Tokyo-Mitsubishi, Union Bank of California and others;
- Institutional investors, insurance companies, pension funds, and the private and public debt markets;
- Wall Street investment banks that provide assistance and underwrite private placements of debt with institutional lenders, including Credit Suisse, Goldman Sachs, Morgan Stanley, Citigroup and others.

Tenaska typically follows a strategy whereby a small number of financial institutions fully underwrite a financing to ensure a successful and timely closing so construction can commence. Tenaska becomes integrally involved in the syndication process with the institutions underwriting the financing to ensure they succeed in selling participations to other institutions and reach their desired hold levels.

Tenaska strives to optimize the financial structure of a project by using the most appropriate sources of debt financing available, given the size and characteristics of the project. For example,

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commercial banks traditionally have been ideal lenders during construction, providing cash draw downs that correlate with the progress of construction. This minimizes the interest cost during construction, improving the overall competitiveness of the project. Private placement institutional lenders (insurance companies, pension funds, etc.) and Rule 144A and public debt markets, which are fixed-rate lenders, are typically used for term financing. A variety of interest rate hedging techniques is also incorporated in project financing to protect the project from interest rate risk.

Tenaska enjoys an excellent reputation in all financial markets, including the commercial bank market, the institutional market, as well as with bond rating agencies. Tenaska has always been realistic in what it promises lenders and customers and has earned very high marks in the financial community. Tenaska's reputation has remained strong even during difficult times in the industry.

Interest Rate Protection

Tenaska is experienced in protecting projects from the volatility and variability of interest rates by structuring financings to maximize the benefits of products available in the marketplace. Tenaska has used a variety of short-term and long-term swaps, caps, floors, collars, options, futures and combinations thereof. Tenaska strives to achieve an appropriate level of interest rate protection while implementing the simplest and lowest cost hedging structure possible.

Recognized Financing Experience

Tenaska, through its affiliates, has completed many major project financings that have been

recognized by the financial industry. These financings include:

- Tenaska Virginia Partners, L.P., an 885-MW facility in Fluvanna County, Va., in 2004 was financed on a permanent basis. *Project Finance International* (PFI) magazine honored Tenaska as Sponsor of the Year in 2004, citing the Virginia financing as a major reason for granting the honor. A \$497.2 million non-recourse construction and term loan financing for the Virginia plant in August 2002 earned Tenaska the “North America Single Asset Power Deal of the Year” in 2002 by Euromoney's *Project Finance* magazine.
- Kiowa Power Partners, LLC (KPP), owner of the 1,220 MW Tenaska Kiamichi Generating Station near Kiowa, Okla., completed two bond sales in November 2004 to replace a mini-perm loan scheduled to mature in 2010. *Project Finance* magazine honored KPP with its Deal of the Year Award in 2004, and PFI named it the Bond Deal of the Year for 2004. The deal also was a major factor in PFI's selection of Tenaska as Sponsor of the Year in 2004.
- Tenaska Alabama II Partners, L.P., owner of the 885-MW Tenaska Central Alabama Generating Station near Billingsley, Ala., permanently financed the project in October 2003 through a \$410.5 million sale of senior secured bonds. *Power Finance and Risk* magazine called the deal “a textbook example of how a mini-perm loan should be refinanced.” PFI made the financing its “North American Bond Deal of the Year,” and *Project Finance* magazine named the transaction the “2003 Single Asset Deal of the Year.”



NATURAL GAS MARKETING

Success in the independent power industry depends upon the ability to aggregate adequate supplies of fuel on a timely basis to meet power supply needs. Tenaska Marketing Ventures and Tenaska Marketing Canada (collectively TMV) has been ranked by Platts Gas Daily among the top 10 natural gas marketers in the United States and Canada for 26 consecutive quarters and excels in securing long-term fuel and transportation contracts and long-term, dedicated natural gas supplies.



TMV was formed in 1991 with headquarters in Omaha, Neb. An office in Calgary, Alberta, Canada was opened in 1995, and offices since have been opened in Dallas, Texas, and Denver, Colo.

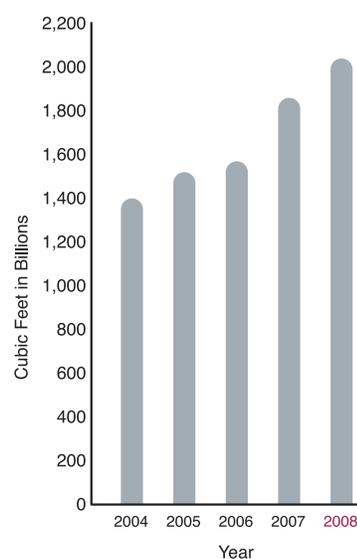
TMV's staff consists of more than 140 professionals with experience in working with utilities, pipelines, gatherers, producers and other marketers.

In 2009, TMV sold or managed more than 2.0 trillion cubic feet. The company contracted for approximately 5.5 bcf/day of natural gas supplies to satisfy the requirements of assets TMV

manages for electric and gas utilities, independent power plants and industrial customers. TMV also provides natural gas storage, balancing, transportation management and administration services. TMV's experience in natural gas procurement is vital to arranging long-term fuel contracts that provide the firm and reliable energy source required by electric utility purchasers, lenders and plant owners. Its supply procurement policy includes targeting natural gas suppliers who have a strong ability to deliver over the life of the gas purchase contract.

TMV serves customers throughout most of the United States and Canada, transporting gas on most U.S. pipeline systems. In 2009, TMV held capacity commitments on 133 major interstate and intrastate pipelines. These firm transportation arrangements ensure delivery of natural gas supplies to the electric generating facility to meet the dispatch requirements of the electric utility customer. TMV also holds interruptible natural gas transportation contracts on a variety of

TMV Annual Gas Sales



pipelines to provide additional flexibility and reliability.

In addition, TMV holds significant gas storage capacity in many of the strategic storage facilities in North America, and its suppliers include virtually all major natural gas suppliers in the United States and Canada. In 2009, gas storage capacity under contract grew to 111 bcf.

TMV also provides complete energy management services to customers. These services include:

- Purchase and sale of natural gas and ancillary services
- Acquisition, management and optimization of natural gas transportation and natural gas storage capacity
- Supply or demand swing management
- Risk management and financial and physical hedging
- Scheduling, nominations and market operations
- Customized accounting, settlement, invoicing and reporting
- Seven-day a week trading and scheduling operations

Types of Energy Marketing Services Offered by TMV:

POWER MARKETING

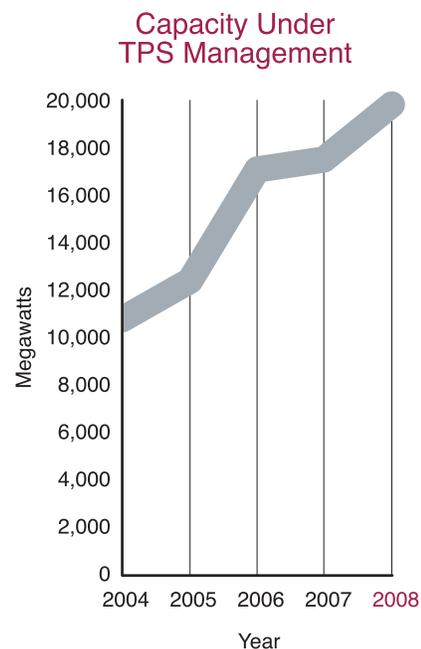
Tenaska Power Services Co. (TPS), a Tenaska affiliate, is a power marketing company licensed by the Federal Energy Regulatory Commission (FERC). TPS focuses on designing creative custom energy solutions to meet its customers' needs, using its expertise in system operations, transmission and physical energy transactions, and Tenaska affiliate expertise in power plant development and acquisitions.

Power Marketing Services Offered by TPS:

- Purchase and sale of electric capacity, energy and ancillary services
- Acquisition, management and optimization of electric transmission rights
- Energy risk management and financial and physical hedging
- Scheduling, bidding, and market operations
- System operations, dispatch, Supervisory Control and Data Acquisition (SCADA), and Emergency Management Services (EMS)
- Customized accounting, settlement, invoicing and reporting
- Around-the-clock trading operations

TPS has forged strategic relationships with many utility and non-utility companies for which it supplies a portfolio of services. TPS was the first independent power marketer to manage off-system sales and purchases for an electric utility (the Public Utilities Board of Brownsville, Texas). In 2009, the company sold more than 7,000 gigawatt hours (GWh) of electricity and managed approximately 17,500 MW of electric generating assets for customers of all sizes – including municipal utilities.

Tenaska and its affiliates can construct or acquire resources to satisfy a customer's full or partial power requirements. In addition to offering long-term options, the company is active in the short-term and real-time power markets. TPS has real-time marketers and schedulers available 24 hours a day, seven days a week. TPS marketers use their knowledge of system operations and transmission to focus on moving power in the physical markets, using financial products to minimize risk, and enhancing opportunities. TPS offers an array of physical products, and a significant portion of its marketing activity occurs in non-standard products (e.g., unit-specific energy, large or small blocks of energy, off-peak periods, etc.).



Through short-term and real-time marketing efforts, TPS has managed a growing number of megawatts for electric generating assets.

TPS's power marketing focuses on several electric reliability regions including Midwest Independent System Operator (MISO), Electric Reliability



Council of Texas (ERCOT), Southwest Power Pool (SPP), SERC Electric Reliability Corporation (SERC), and PJM Interconnection.

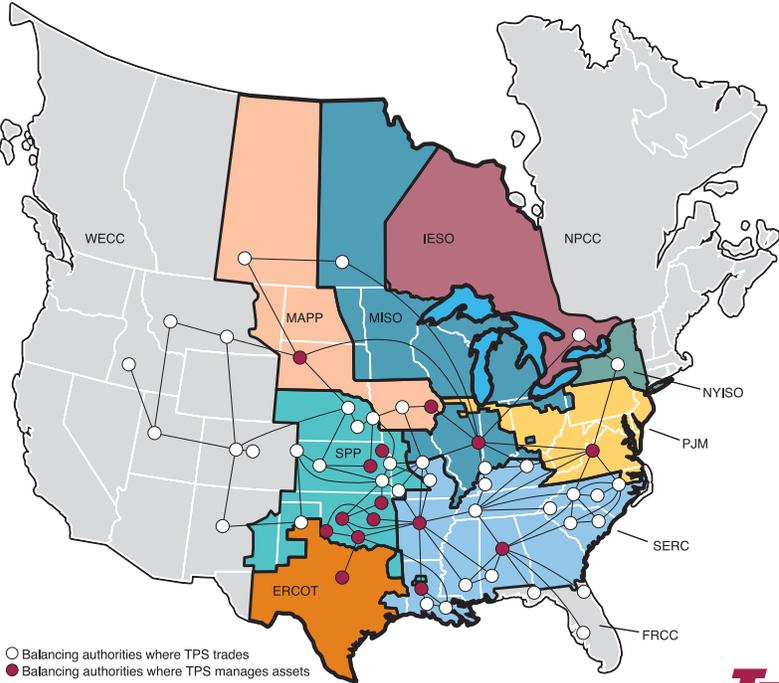
Supplying capacity and energy to satisfy a customer's power requirements often requires the separate purchase of ancillary services, which TPS acquires and sells on behalf of utilities and independent power producers. TPS, through Tenaska-affiliated development and acquisition companies, can also provide certain ancillary services from Tenaska facilities when appropriate.

The company is a major player in the growing wind generation industry. TPS continues to be the largest third-party provider of scheduling, marketing and asset management services to the wind industry in Texas, the nation's leader in wind generation, and has expanded its wind management services to the SPP and MISO regions. It has developed and patented a unique, proprietary wind scheduling platform.

TPS experts use their knowledge and insight into transmission and operations to reduce or eliminate transmission wheeling and loss charges through the creative use of exchanges and other mechanisms. TPS employees serve on the boards and planning committees of several regional reliability councils and are actively involved in each of the Regional Transmission Organizations where TPS is engaged in business.

Tenaska's extensive experience in both the electric power and natural gas industries makes it uniquely qualified to maximize the arbitrage opportunities between electric power and natural gas. TPS, through fuel tolling arrangements, can index the price of power to the price of gas for both the seller and/or the buyer of the power. Tenaska can also offer combination gas/electric utilities the opportunity to accept electric power or natural gas, depending on their relative value to the customer at the time.

TPS AREAS OF OPERATION



BIOFUELS MARKETING

Tenaska BioFuels, LLC (TBF), with headquarters in Omaha, Neb., is a multi-commodity business that serves as a one-stop shop, offering marketing, offtake and procurement services for biofuels producers and agricultural processors. TBF also provides transportation and storage services for all industry participants, as well as the credit support so vital in today's economy

TBF applies the skills and expertise of Tenaska's gas and power marketing affiliates to the ethanol, biodiesel, and agricultural processing industries to help customers find the best solutions to financial, credit and risk issues; storage and transportation alternatives; and marketing options.

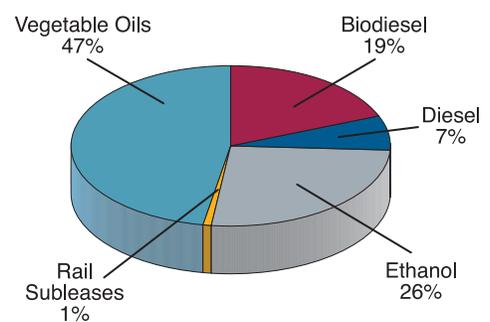
Among services provided are:

- Offtake sales agreements for biofuels producers
- Crush margin management
- Tolling arrangements
- Rail, truck and barge transportation logistics
- Jobber and refiner procurement arrangements
- Feedstock procurement contracts
- Storage solutions
- Renewable Identification Numbers (RINs) facilitation and reporting

In 2009, TBF entered into an agreement with two producers to provide the kind of tolling services that are common in the electric generation industry, but relatively new to agriculture. Tenaska experience with electric generating tolling agreements has been valuable in applying the concept to soybean processors and ethanol



TBF Sales Volume by Customer



producers. Through its relationship with TMV, TBF can also provide natural gas supplies and management services to production plants and help locate plants near gas lines for efficient, economical delivery.

TBF builds on Tenaska's reputation for providing efficient and cost-effective services to energy partners in the nationwide and internationally. The company has developed productive relationships with alternative fuels producers, marketers, blenders and retailers in the U.S., as well as Canada, Mexico, South America, Europe and Africa.

TENASKA

Statement of Qualifications

FUND MANAGEMENT SERVICES

Tenaska is one of a few fully integrated energy companies with the broad knowledge and resources needed to capitalize effectively on asset acquisition opportunities in the energy marketplace.

Tenaska Capital Management, LLC (TCM), a Tenaska affiliate, is the manager of stand-alone private equity funds Tenaska Power Fund, L.P. (TPF I) and TPF II, L.P. (TPF II), and on behalf of TPF I and TPF II, is responsible for the

evaluation, acquisition, operation, optimization and divestiture of opportunities in the U.S. energy industry. TCM uses Tenaska's proven operating, technical, marketing and financial expertise to analyze the value of assets, operating efficiencies, market opportunities, and fuel agreements to pursue these opportunities.

Total assets under TCM's management now approach \$5 billion and include approximately 5,400 MW of power generating plants; national providers of transmission and pipeline construction and maintenance services; and natural gas storage and midstream assets.



GAS EXPLORATION & PRODUCTION

Until recently, gas trapped in deep underground shale formations was largely unattainable. Today, new horizontal drilling and hydraulic fracturing methods are unlocking enormous new gas reserves in the United States.

In 2008, formed a trio of stand-alone exploration, production and midstream companies – Tenaska Resources, LLC; Tenaska Drilling Services, LLC, and Tenaska Midstream Services, LLC (Gas Exploration and Production or E&P). The group is focused on the vast Marcellus shale formation that underlies much of Pennsylvania, New York and West Virginia.

The gas exploration and production units' business plan calls for leasing acreage and drilling enough wells to prove the existence of recoverable gas reserves. The leases then will be sold to producers attracted by the proven productivity who will complete the gas recovery.

By the end of the first year of operation, 47,000 acres in West Virginia and Pennsylvania had been leased and seven of nine permitted wells in West Virginia had been drilled.



WorleyParsons Qualifications



WorleyParsons

resources & energy

EcoNomics™

Gasification

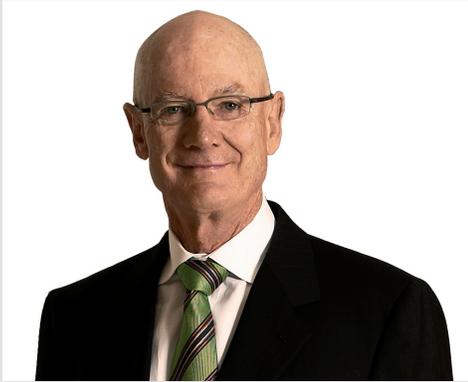
Capability and Experience





WorleyParsons

resources & energy



“There is no task so important or so urgent in our business, or our customers’ businesses, that it overrides the need to work safely...”

John Grill, WorleyParsons CEO

Zero Harm is our corporate vision for health, safety & the environment (HSE).

We are committed to our vision; it applies to all of our operations, at all times, in all locations, and at all levels of responsibility.

We will actively work to align our expectations and behaviors with those required to achieve our vision through a dedication to continuous improvement.

The launch of our HSE framework, OneWay™, enables us to further align and consolidate our global systems and procedures and continue to work with our personnel to reinforce a culture that underpins our drive to achieve our corporate differentiator of industry leadership in the HSE performance.

OneWay™
to zero harm

Corporate Overview

WorleyParsons is a leading global provider of professional services to the resources & energy sectors, and the complex process industries.

We cover the full asset spectrum, both in size and lifecycle, from the creation of new assets, to services that sustain and improve operating assets.

Our business has been built by working closely with our customers through long-term relationships, anticipating their needs and delivering inventive solutions through streamlined, proprietary project delivery systems. Strong growth continues to characterize our performance both through organic development and through strategic acquisition as we strive to provide tailored services wherever our customers need us.

- Power
- Minerals & Metals
- Hydrocarbons
- Infrastructure and Environment

37
countries

120
offices

28,800
personnel

EcoNomics™ Delivering profitable sustainability

EcoNomics™ is our range of services and technologies that profitably embed environmental, social and financial sustainability into project delivery, across the asset lifecycle. It is a seamless extension of our established project delivery capability in the key areas of Assessment, Efficiency, and Treatment & Mitigation. We are committed to working with our customers to create solutions to meet the green challenge while staying in the black.

Gasification

WorleyParsons is a forerunner in all aspects of advanced coal technologies including integrated gasification combined cycle (IGCC), oxyfuel combustion, ultrasupercritical steam, supercritical CFB, carbon capture and deep geological storage, as well as a range of gasification-based facilities for natural gas and chemical production.

Gasification economically and environmentally fuels new generation requirements for load growth as well as produce chemicals for refinery, transportation fuels, and fertilizers. It can also refuel existing combined cycle plants that suffer from low dispatch due to high natural gas prices. With the addition of CO₂ capture and deep geological storage, this clean coal technology can provide a solution for future power generation demands.

WorleyParsons has extensive experience in the design and construction of gasification process units, CO₂ capture, compression and pipeline transport, and the range of issues for deep geological storage or enhanced oil recovery. We have provided coal gasification plant design, carbon capture plant design, and support contractor services for over 27 years to our energy customers and national research organizations including the U.S. Department of Energy and the Electric Power Research Institute. WorleyParsons also has substantial qualifications and experience in materials handling, infrastructure, environmental compliance, permitting, and operations which provides our clients a full scope capability to assure project success from concept through commissioning.

WorleyParsons has the capability to work with all major gasification technologies such as Siemens, GE Energy, Shell, ConocoPhillips and British Gas/Lurgi. Our *Select* group utilizes an in-house proprietary process and economic models to conduct feasibility studies and front-end engineering and design (FEED) packages.

WorleyParsons provided engineering, procurement, and construction services for major gasification projects, including Valero (formerly STAR) at Delaware City, Delaware and ExxonMobil at Baytown, Texas. WorleyParsons also conducted numerous process design packages, feasibility studies, and front-end design projects for global power and chemical gasification applications, engineering over 100 million cubic meters per day (nominal) of syngas production.

Our current engineering and design support for the ZeroGen IGCC project with carbon capture and storage maintains WorleyParsons' leadership role as a provider of innovative solutions in the global power markets.

4

Large-scale Gasifiers Installed

60

Gasification System Studies

235

MW of IGCC Installed Capacity



WorleyParsons' experience covers all five phases of the asset lifecycle. In each one of these phases we understand the critical issues and apply our specialist business lines, *Select*, *Deliver* and *Improve* to enable our customers to achieve their business objectives.

Our phased approach enables consistent project delivery worldwide and WorleyParsons' project systems are fully aligned to this process.



Project: Delaware City Repowering Project

Customer: Valero (originally STAR, a joint venture between subsidiaries of Texaco and Saudi Aramco)

Phases: IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

United States of America

WorleyParsons provided EPC services for this IGCC repowering project.

The Valero refinery produces approximately 2,000 tons per day of petroleum coke as a by-product. This coke is gasified using twin train 900 cubic-foot GE Energy (formerly ChevronTexaco) gasifiers to fuel two 90 MW combustion turbines and HRSGs that in turn supply 530,000 pounds per hour of 1250 psi steam to 55 MW of existing steam turbines. The plant supplies both electric and steam energy to the refinery, with excess electric power being sold into the power grid.



Project: Baytown Syngas Project

Customer: ExxonMobil Chemical

Phases: IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

United States of America

WorleyParsons provided front-end engineering and design and detailed engineering services, procurement, and construction management for this critical ExxonMobil project. The deasphalting rock (DAR) gasification facilities consist of two gasification trains with a common gas cooling section. The facility was designed for a nominal combined train capacity of raw syngas (H₂ + CO) equal to 95 MMscfd. This is consistent with a 200 gpm feed rate of hot DAR rock. Each train is designed to produce 75 MMscfd of raw syngas when one train is down. This is consistent with a 160 gpm feed rate of hot DAR.



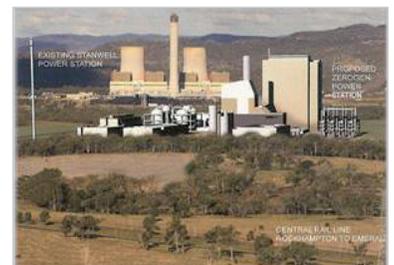
Project: ZeroGen Feasibility Study

Customer: Queensland Government

Phases: IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

Australia

WorleyParsons is completing the FEED phase for the first Australian-based clean coal power demonstration project. We are assisting the ZeroGen project to meet its goals to create cleaner power and demonstrate the viability of integrating coal-based gasification, with carbon capture and storage to achieve deep cuts in carbon dioxide emissions. The ZeroGen gasification plant is planned to be located near the existing Stanwell Power Station in Queensland, Australia. WorleyParsons' design includes the potential to reduce CO₂ emissions in excess of 75 percent, which can be scaled up to 90 percent in a full-scale commercial plants.



Project: EPRI CoalFleet for Tomorrow

Customer: Electric Power Research Institute (EPRI)

Phases: IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

United States of America

EPRI's CoalFleet for Tomorrow ("CoalFleet") is an industry-led, broad-based collaborative research program founded with the goal of making a portfolio of advanced coal technologies more accessible and affordable for power producers and society. WorleyParsons is assisting EPRI in providing guidance on technologies covered by CoalFleet which include integrated gasification combined cycle ultra-supercritical pulverized coal, and supercritical circulating fluidized-bed combustion.



Project: Coal Gasification for SNG Production**Customer: Confidential****Phases:** IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

WorleyParsons is providing engineering and design to determine the optimum technical approach and configurations for the production of substitute natural gas from lignite and other fuels. WorleyParsons is developing process designs, heat and material balances, system designs, and capital and O&M costs.

The British Gas Lurgi (BGL) gasifier is the technology basis for these applications. WorleyParsons has been supporting our client for several years in evaluating the design and feasibility of using the BGL gasifier in industrial gasification and the production of syngas, substitute natural gas, hydrogen, and electrical power.

United States of America

**Project: Coal-to-Ammonia and Coal-to-Liquids Plant****Customer: Rentech Energy Midwest****Phases:** IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

WorleyParsons completed the FEED services for the coal gasification conversion of Rentech Energy Midwest Corporation (REMC) natural gas fed ammonia fertilizer facility in East Dubuque, Illinois and the production of ultra-clean fuels based on Rentech's patented and proprietary Fischer-Tropsch (FT) coal-to-liquids (CTL) technology. The design uses the ConocoPhillips E-Gas™ Technology for clean coal gasification to produce syngas initially for use in the production of ammonia and ammonia-based fertilizers and ultra-clean FT fuels. The FEED contract for the first phase of the project included the conversion of the ammonia plant feedstock to coal-derived syngas and the installation of FT liquids production. The results of the FEED work will be used to advance the project and provide a basis for an Engineering, Procurement, and Construction (EPC) contract.

United States of America

**Project: FutureGen Site Selection****Customer: Confidential****Phases:** IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

WorleyParsons evaluated fourteen potential sites to determine the best locations for siting the federally proposed 275 MW FutureGen Plant. FutureGen was the first near-zero pollution power plant intended to demonstrate coal-to-power with carbon capture and geological storage. Our team used geologists with specialized capability to evaluate the characteristics of deep geologic formations to permanently capture and store CO₂. Key work completed during this project included acquiring land options, infrastructure development requirements, carbon sequestration target formation and plume definition, and impact evaluation.

United States of America

**Project: Coal Based Solid Oxide Fuel Cell Power Plant****Customer: FuelCell Energy****Phases:** IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

WorleyParsons is working with FuelCell Energy to develop a coal gasification based Solid Oxide Fuel Cell (SOFC) power plant. The first phase of the project is separated into tasks: the development of preliminary engineering for a baseline commercial scale power plant, anticipated to be at least 100 MW and up to 600 MW, and the development of basic engineering for proof of concept power plant, anticipated to be approximately 15 MW.

United States of America





WorleyParsons

resources & energy

Project: Weyburn Field CO₂ Enhanced Oil Recovery Program

Customer: Encana Resources

Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

Canada

The Weyburn CO₂ enhanced oil recovery (EOR) program is one of the largest CO₂ injection, recovery, and storage projects in the world.

WorleyParsons Canada was retained to provide a broad range of engineering services for the Weyburn, Saskatchewan oil field. This included complete engineering support for the EOR program using CO₂. The CO₂ is supplied by a 400 km pipeline from Dakota Gasification Company's Great Plains Synfuels Plant. The CO₂ is distributed to numerous injection wells via a CO₂ distribution pipeline network. CO₂ in the produced fluids is separated and re-circulated for injection; however, a significant portion of the CO₂ remains within the target formation, providing the added benefit of carbon storage. Engineering services covered all phases of field development and EOR program design and implementation, including scope development, execution plan, cost estimating, scheduling, front-end engineering design (FEED) and detailed design, permitting, construction management and field operations.



Project: Geo-Sequestration Compression and Pipeline Study

Customer: Macquarie Generation

Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

Australia

Delta Electricity, Macquarie Generation, and Eraring Energy contracted WorleyParsons to determine the costs and viability of piping CO₂ released from power generation to saline aquifers, depleted oil and gas reservoirs, and unmineable coal seams. WorleyParsons completed pre-FEED conceptual engineering of a 623 km CO₂ pipeline in the Darling Basin in New South Wales. The scope was to study and cost a 36" pipeline and compression system. Three separate extraction technologies were considered with varying degrees of water content. The work included route selection, process modeling, materials and corrosion studies, conceptual design of the pipeline, compressor / pumping stations, valve stations, and pigging facilities as well as a capital cost estimate.



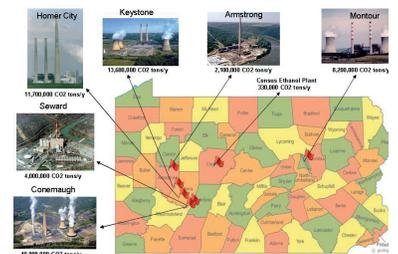
Project: Large Scale Integrated CCS Network

Customer: Commonwealth of Pennsylvania

Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

United States of America

WorleyParsons is collaborating with The William J. Clinton Foundation, Commonwealth of Pennsylvania, and utility/industrial generators to develop a Business Plan to serve as the blueprint for a proposed Commonwealth-supported system to capture, compress, transport, and store carbon dioxide emissions from coal-fired electric plants and industrial facilities. The ultimate goal of the initiative is to establish a working demonstration of a state-wide Carbon Capture and Sequestration (CCS) network. This network will provide a more economically viable transport option with a smaller environmental footprint.



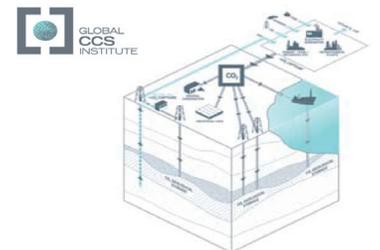
Project: Strategic Analysis of the Global Status of Carbon Capture and Storage Projects

Customer: Global Carbon Capture and Storage Institute

Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

Australia

The Global Carbon Capture and Storage Institute commissioned WorleyParsons, with Schlumberger, Baker & McKenzie, and EPRI, to complete a strategic analysis of the global status of carbon capture, transport, and storage projects and technologies. This comprehensive baseline report covers the technical, regulatory, costs, economic, geographical, and research/development issues, together with an assessment of the status of announced CCS projects.





WorleyParsons

resources & energy

Our Vision

WorleyParsons will be the preferred global provider of technical, project and operational support services to our customers, using the distinctive WorleyParsons' culture to create value for them and prosperity for our people.

Leadership

- Committed, empowered and rewarded people
- EcoNomics™ - Delivering profitable sustainability
- Integrity in all aspects of business
- Energy and excitement
- Minimum bureaucracy

Agility

- Smallest assignment to world-scale developments
- Local capability with global leverage
- Responsive to customer preferences
- Optimum solutions customized to needs

Relationships

- Rapport with all stakeholders
- Open and respectful
- Collaborative approach to business

Performance

- Zero harm
- Results for our customers and other stakeholders
- World-class resources, capability and experience

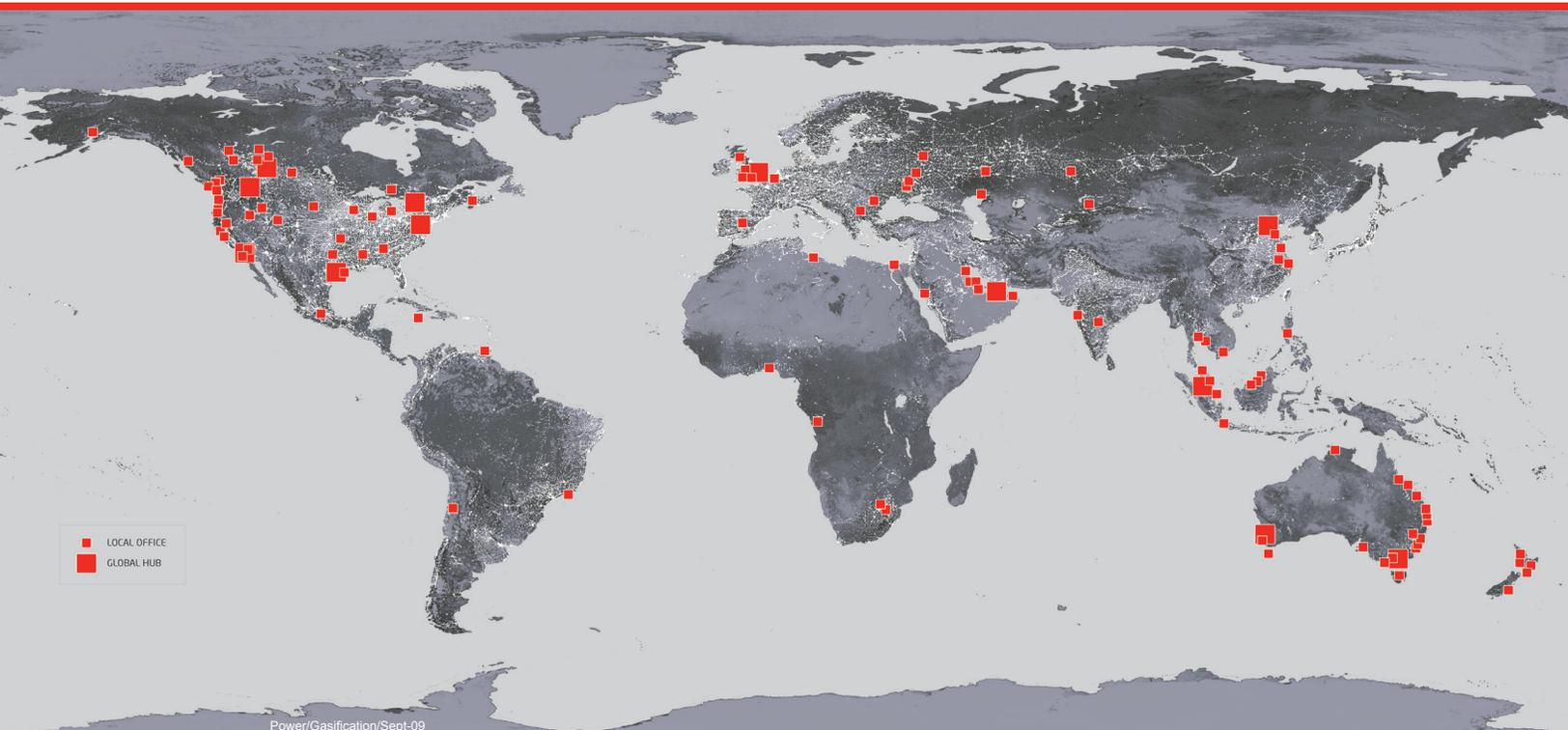


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For further information about
our global capability email:
Gasification@worleyparsons.com

www.worleyparsons.com





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EcoNomics™

Power

Capability and Experience





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OneWay™
to zero harm

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- Infrastructure and Environment

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EcoNomics™ Delivering profitable sustainability

EcoNomics™ is our range of services and technologies that profitably embed environmental, social and financial sustainability into project delivery, across the asset lifecycle. It is a seamless extension of our established project delivery capability in the key areas of Assessment, Efficiency, and Treatment & Mitigation. We are committed to working with our customers to create solutions to meet the green challenge while staying in the black.

Power

WorleyParsons has been providing a comprehensive range of professional services to the power industry for over 100 years.

During this time we have worked with our customers to develop and execute effective solutions to a diverse range of energy challenges facing the industry such as meeting growing demand, improving performance of existing assets, and reducing carbon footprint. WorleyParsons has delivered outstanding service in the energy industry for hundreds of power, industrial, commercial, and government customers across all phases of the asset life cycle all over the world. Our global expertise is captured through centers of excellence and coupled with our local knowledge of regulations and infrastructure, to ensure the right technical resources are utilized during the project execution regardless of geographic location.

Our *Select* group provides consulting services to asset owners, operators, investors, financial institutions and governments by bringing extensive real world experience in the front-end, value adding phases to maximize investment return and underlying confidence. Our EcoNomics™ initiative enables our customer to quantify the social, ecological, and community impacts of existing and planned facilities during the planning phase of a project. WorleyParsons has developed a suite of proprietary technologies to provide customers with strategic decision making support through the quantification of project sustainability.

WorleyParsons takes a full-service approach to project delivery providing engineering, procurement and construction management (EPCM) services for a project from detailed engineering, through vendor quality assurance, construction management, start-up and operations. Our flexibility, capability and partnering culture means that we can act as the prime contractor or work as a member of a team to deliver the most effective service to meet our customers' needs. Our global procurement group uses its global networks and localized equipment manufacturers to prequalify vendors in various areas of the world to provide quality, cost effective solutions.

Our *Improve* business supports and improves customers' assets throughout the operating lifecycle. *Improve* specializes in improving output and efficiency of plants, emission reduction projects, project portfolio management and execution, and plant support services including operations and maintenance.

740

Power Generating Units

18

Nuclear Units
Engineer of Record

192,800+

Total MW of Capacity



WorleyParsons' experience covers all five phases of the asset lifecycle. In each one of these phases we understand the critical issues and apply our specialist business lines, *Select*, *Deliver* and *Improve* to enable our customers to achieve their business objectives.

Our phased approach enables consistent project delivery worldwide and WorleyParsons' project systems are fully aligned to this process.



Capability

Coal

WorleyParsons has well-established and comprehensive approaches to planning, permitting, engineering, procurement, construction management, and start-up of coal-fired generating facilities. Our Reference Coal-fired Plant designs are tailored to match the specific needs of our clients and allow flexibility in a pre-engineered package that incorporates key elements of a fossil project saving time and money.



Nuclear

WorleyParsons currently provides a full range of nuclear engineering services to customers all over the world. These services include design and analyses programs for new and existing nuclear power plants, licensing, project and program management, owner's engineer, construction management, radiological analyses, and decommissioning planning and support. Based on our 55 plus years of experience, global presence, and current activities, WorleyParsons is able to maintain the most experienced and technically qualified personnel available in the industry.



Gas Turbine-Based Power Plants

For decades, WorleyParsons' project teams have participated in leading edge applications using the newest gas turbine generation technology. Our worldwide projects include more than 34,000 MW of simple and combined cycle installations for more than 120 gas turbine units. Experience includes cogeneration, conversion of simple cycle plants to combined cycle plants, and repowering of existing plants.



Renewable Energy

WorleyParsons provides a complete suite of professional services covering all phases of renewable energy: wind, geothermal energy, solar (CSP and Photovoltaic), biomass, biofuels, remote power, and hydro-electric. Current projects include 3,000 MW of CSP, run-of-river hydro in Canada and leader of a group developing an Advanced Solar Thermal Plant in Australia.



Environmental

Expertise in environmental management related to the production, transmission, and use of electricity is a business imperative given today's environmental challenges. WorleyParsons assists at every stage of the project life-cycle — from project planning and permitting through operations and eventual decommissioning. Our services include environmental and social impact assessments, facility siting, transmission corridor selection, environmental economics, sustainability, water supply, waste and wastewater management, and carbon management consulting services.



Advanced Coal

WorleyParsons has extensive experience in all aspects of advanced coal including the design of IGCC plants employing all major gasification technologies and gas turbine suppliers. We are the global leaders for sulfur recovery and acid gas removal from process gas streams. WorleyParsons is a forerunner in other new coal generation technologies which include Oxyfuel combustion, Ultrasupercritical steam, supercritical CFB, carbon capture and deep geological storage, and a range of gasification-based facilities for synthetic natural gas and chemical production.



Transmission Networks

With more than a century of experience, WorleyParsons' worldwide system planning experience includes engineering, design, licensing, power system analysis, and construction management of overhead, underground, and submarine electric power lines and substations up to 765 kV AC and 450 kV bipolar DC worldwide. In total, WorleyParsons has over \$10 billion of capital projects, over 24,000 km of new and upgraded transmission line projects, and over 50,000 mega volt amperes (MVA) of new and upgraded substations.



Operations & Maintenance

WorleyParsons has extensive international experience in operations and maintenance of power plants. Our experienced staff has started up over 30 combustion turbine combined cycle and simple cycle and coal-fired power plants in the last 25 years. We have also worked on more than a dozen operations and maintenance contracts for combustion turbine and steam turbine power plants in the last 15 years.

Part of our *Improve* services



Air Quality

WorleyParsons knows precisely what it takes to develop and implement comprehensive, technologically sound, and environmentally compliant strategies. This ensures the shortest project schedules, with the most beneficial life cycle results. We use our "best-in-class" automated design systems to engineer and design air quality systems. Air quality retrofit projects are typically associated with existing generating facilities, necessitating the utmost attention to plant outage scheduling and control.

Part of our *Improve* services



Long-Term Service Contracts

Long-Term contracts is the basis of our *Improve* services and a WorleyParsons' core competency for brownfield operations. We specialize in improving output and efficiency of plants, emission reduction projects, project portfolio management and execution, and plant support services including operations and maintenance. Leveraging the knowledge from over 100 alliances globally or long-term contracts we developed a culture and a suite of unique tools, systems, and delivery methodologies for integrated teams of WorleyParsons' and customer's personnel to utilize for successful project delivery.

Part of our *Improve* services





WorleyParsons

resources & energy

Coal

Responsible for the design of 38,000 MW of successful coal-fired projects worldwide, WorleyParsons is an industry leader and continues to provide full-service consulting, engineering and design, procurement, construction management, and start-up to hundreds of customers.

Our experience and expertise was developed through the design of hundreds of coal-fired units from 25 to 900 MW and stations as large as 2,700 MW that burn all types of coal. We have demonstrated industry commitment and capability to successfully deliver coal-fired power generation projects of all technologies and configurations to ensure the right contemporary solution for our client's generation needs.

We lead the industry in supercritical power plant technology and are recognized globally as a leader in solid-fuel plant design as well as owner's engineers. WorleyParsons has extensive experience, technical and management capability, tools, and knowledge in solid fuel designs. We are involved in virtually every aspect of project execution from engineering, design, procurement, construction management, startup and testing to Owner's Engineer. Our *Select* services include feasibility and technology studies; sustainability analysis; facility permitting expertise; condition assessment; heat rate and availability improvement; carbon management consulting; cooling system optimization; and environmental regulation and compliance assistance in the areas of water, waste water, and air quality.

Our *Improve* services include asset management services which encompass all aspects of project integrity such as: certification and compliance; safety and business improvement projects (which include cost savings and revenue enhancing improvements such as process control upgrades); ash and fuel management; and outage management.

Current coal projects in design at WorleyParsons include supercritical pulverized coal and circulating fluidized bed boilers with the latest pollution control technology for SO₂, NO_x, particulate, mercury, and all other regulated pollutants.

38,000

MW Coal-fired Projects
Engineer of Record

2700

MW Largest Coal-
fired Station

4,100

MW Currently in
Design



Project: Pee Dee Unit 1**Customer: South Carolina Public Service Authority (Santee Cooper)****Phases:** IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

United States of America

South Carolina Public Service Authority (Santee Cooper) selected WorleyParsons for a professional services contract for Santee Cooper's 600 MW supercritical coal-fired generation facility in Florence County, SC.

This is the fourth project of similar scope awarded to WorleyParsons by Santee Cooper. The other projects were Santee Cooper's Cross Station - Units 1, 3, and 4. Each unit will primarily fire bituminous coal in a pulverized coal low NOx supercritical boiler, steaming a single reheat tandem compound supercritical steam turbine generator. Air quality controls are comprised of selective catalytic NOx removal, electrostatic precipitator dust removal, and wet limestone flue gas desulfurization with wallboard quality gypsum production. Fly ash is sold to Portland cement manufacturers and bottom ash is sold for lightweight block, concrete masonry units manufacture.

**Project: Cross Generating Station - Units 3 & 4****Customer: South Carolina Public Service Authority (Santee Cooper)****Phases:** IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

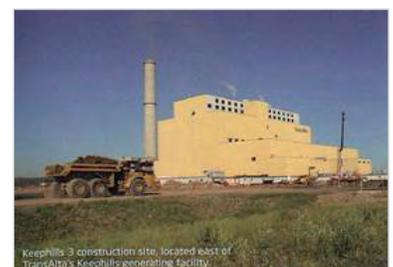
United States of America

WorleyParsons is providing project management, engineering, procurement, construction management, start-up, and testing for Cross Generating Station Units 3 and 4, two 600 MW coal-fired units at the South Carolina site. Services also included preliminary site surveying and site layout to support construction planning, permitting, and preliminary design. WorleyParsons provided engineering, project management, procurement, construction management, start-up, and testing for Cross Unit 1, which was completed in 1995.

**Project: Keephills 3 Power Plant****Customer: TransAlta/EPCOR****Phases:** IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

Canada

Working in an integrated team with the owners, WorleyParsons has completed the front-end development including preliminary engineering, project planning, CAPEX estimation and construction strategy planning. Additionally, WorleyParsons was awarded the detailed engineering for the balance of plant and construction management for the entire facility. Keephills 3 power plant is a 450 MW two unit plant that features supercritical boiler technology and will emit 24% less CO2 and reduce emissions of sulfur dioxide (SO2), nitrogen oxides (NOx) and mercury (Hg) compared to the units TransAlta is retiring.

**Project: Maritza East 2 TPP****Customer: Maritza East 2 TPP EAD, Ministry of Economy and Energy****Phases:** IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

Bulgaria

WorleyParsons is working as a consultant to the owner for the rehabilitation of Units 1 to 6 (turbines and generators) and for the construction of flue gas desulfurization facilities for Units 1 to 4 of Maritza East 2 - the largest thermal power plant in Bulgaria. Responsibilities assigned to WorleyParsons cover assessment of the compliance of the investment projects, construction supervision, consultancy services on environmental protection, risk control and management, quality assurance management, control of equipment factory acceptance tests, supervision during tests and commissioning, services in warranty/guarantee period, review of technical documentation, consultations on financial and contract-legal issues.





Nuclear

WorleyParsons has been a provider of professional technical, construction and project management services to the nuclear industry for over 50 years.

WorleyParsons supports each phase in the lifecycle of nuclear projects. Whether enhancing your nuclear operations with radiological design basis, safety analysis, and emergency management support, or supporting your new plant feasibility, development, design, construction or commissioning, WorleyParsons keeps your nuclear plants in compliance, online and operating at peak performance. We have the demonstrated industry commitment and capability to deliver outstanding support service from new plant development to deactivation and decommissioning, with the global presence and local project capabilities to assist customers in all phases of an asset's life cycle. WorleyParsons unique capabilities in all aspects of "D4" – Deactivation, Decontamination, Decommissioning and Demolition – of nuclear facilities make possible a full range of support in this area. WorleyParsons has the experience and know-how to manage and support all aspects of nuclear facility operation.

Services include:

- Full-service design analysis
- Modification engineering
- Extended power uprate
- License renewal
- Licensing support
- Decommissioning engineering
- Construction management
- Owner's engineer
- Feasibility studies and services
- Equipment qualification
- Project management, estimating and project controls
- Due diligence reviews and evaluations
- Applied engineering analyses
- Radiological analyses
- Program development and updates
- Process and procedure development and improvement programs
- Supplemental resources
- Nuclear site evaluations and licensing
- Emergency management support
 - Accident offset dose calculations
 - Assessment of emergency planning zone (EPZ) effectiveness
 - Protective action strategies
 - Emergency management planning, process and procedures
- Technology evaluations

60+

Serviced Nuclear Units

18

Generating Units Engineer of Record

40+

Safety Analysis Performed



Project: Virgil C. Summer Project
Customer: South Carolina Electric and Gas

Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

United States of America

WorleyParsons, as the A/E of Record, provided detailed design and engineering for this 900 MW pressurized water nuclear power plant.

The project incorporated a complete design control program with full quality assurance and extensive licensing support. After commercial operation, WorleyParsons continued to provide full-service engineering support including multi-discipline design modifications, regulatory and licensing services, configuration management, thermal hydraulics, HVAC, environmental qualification, seismic analysis, fire protection, and Appendix R compliance.



Project: Susquehanna Steam Electric Station (SSES)

Customer: PPL Susquehanna

Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

United States of America

WorleyParsons has been providing design modification packages and general engineering services for SSES since it has been licensed. The design modification packages included work scopes, design inputs, safety assessments, safety evaluation reports, analysis, calculations, equipment specifications, bills of material, drawing change mechanisms, equipment qualifications document and PPL's binder change notices, construction work packages, test procedures and reports. The general engineering included such services as extended power uprate, SSES or general industry event evaluation, setpoint calculations, environmental and seismic qualification issues, and root cause investigations.



Project: Kozloduy Nuclear Power Plant

Customer: Kozloduy Nuclear Power Plant (KNPP)

Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

Bulgaria

WorleyParsons, as Owner's Engineer, is assisting KNPP with the modernization and upgrade of the Kozloduy Nuclear Power Plant, Units 5 and 6, 1000 MW each. These upgrades are designed to improve the safety, equipment availability and reliability, expected technical lifetime, and performance of each unit, as well as ensure the units align with established performance levels to meet current industry and continental requirements. Services include project management and engineering.



Project: Belene Nuclear Power Plant

Customer: Natsionaina Elektricheska Kompania (NEK)/ Ministry of Energy and Energy Resources

Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

Bulgaria

WorleyParsons is the Owner's Engineer for this two 1000 MW power plant. Overall responsibilities include developing the EPC vendor solicitation and evaluation criteria; assisting in obtaining project financing; evaluating vendor tender documents; developing the draft contract for the EPC services; providing document management and planning/scheduling hardware, software, services, and training for NEK; and ongoing technical support, evaluation, studies, and review of vendor designs and technical documentation.





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Gas Turbine/ Combined Cycle

WorleyParsons helps customers achieve their business goals in today's competitive gas turbine power generation market. We deliver successful life cycle projects through full-service engineering and consulting.

For decades, WorleyParsons' project teams have participated in leading edge applications using the newest combustion turbine generation technology. Our worldwide projects include more than 34,000 MW of simple and combined cycle installations for more than 120 gas turbine plants, including cogeneration, conversion of simple cycle plants to combined cycle plants, and repowering of existing plants. We have designed in excess of 20,000 MW of installed gas turbine capacity during the last 10 years. This includes a multi-project EPC contract to install three 700 MW, 2-on-1 501G merchant plants.

For large capacity machines, our design and implementation experience is unparalleled in the industry. Our project references feature machines from all major gas turbine OEMs such as General Electric, ALSTOM, Siemens, and Mitsubishi Heavy Industries.

In addition, WorleyParsons has designed the first 60 Hz single-shaft 107H units for General Electric, as well as their single-shaft 109FB 50 Hz combined cycle reference plant.

Our reference plant approach aids in meeting today's aggressive project objectives to facilitate design and shorten schedules, yet allows flexibility to accommodate client-specific conditions. We excel as our clients' single point of accountability for the simplest to the most complex gas turbine power projects.

34,000+

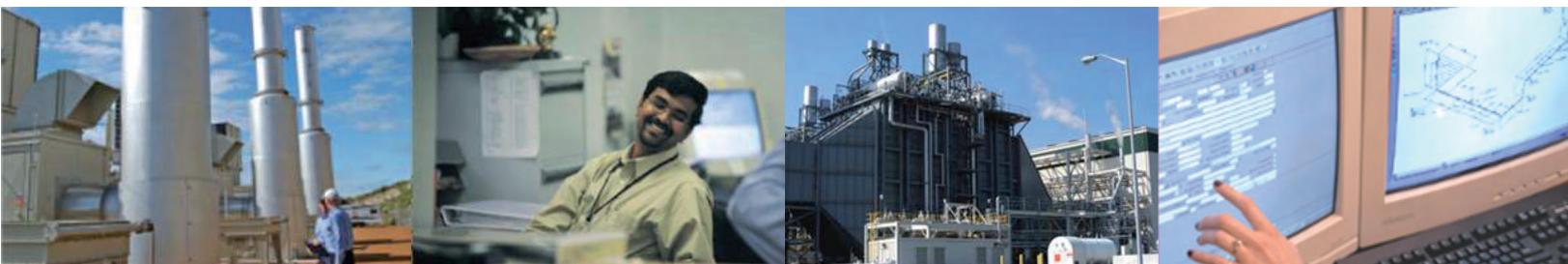
MW

120+

Gas Turbine Units

20,000

MW Installed Gas
Turbine Capacity in
Last 10 Years



Project: Tractabel Multi-Project

Customer: Suez Energy Resources (formerly Tractebel Power, Inc.)

Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

United States of America

WorleyParsons, under an established alliance agreement, provided engineering, procurement, construction, and start-up for Tractebel’s multi-project merchant plant program.

The gas-fired combined cycle plants are based on a 2-on-1 configuration using Siemens Westinghouse (SWPC) 501G combustion turbine generators for an aggregate output of over 2,100 MW when completed. A reference plant was designed as a metric to measure successive efficiency gains.



Project: Tuas Stage II Development - 4 x 360 MW Combined Cycle Power Plant

Customer: Tuas Power Ltd, Singapore

Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

Asia

WorleyParsons was the owner’s engineer of this \$750 million greenfield project at Tuas Power Station in Singapore. The project required the construction of four blocks of 360 MW single-shaft combined cycle power plants (CCPP). Mitsubishi M701F gas turbine was selected as the prime mover with dual-fuel (natural gas and diesel oil) capability. Each block of CCPP has a configuration of one gas turbine, one heat recovery steam generator (HRSG), and one steam turbine. The power plant has a water treatment plant with a net throughput of 1,000 cubic meters per day. The project also included the installation of 400 kV switchhouse equipment to export power to the grid. WorleyParsons administered and integrated a total of three separate contracts for this project.



Project: Simba and Kallpa Projects

Customer: Siemens Power Generation, Inc.

Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

South America

Siemens has awarded WorleyParsons the engineering phase for the installation of two SGT6-5000F simple cycle units in Peru. The first unit is the Simba Project for EnerSur, a subsidiary of Suez Energy International. The project is located in Chilca, 37.3 miles (60km) south of Lima. The second installation is the Kallpa Unit II Project for Kallpa Generacion S.A, where Siemens previously installed a SGT6-5000F unit. Both project sites are geographically situated within one kilometer of each other. WorleyParsons’ Chattanooga Office design team, with support from ARA WorleyParsons in Chile, will complete both projects on an economically-structured concurrent basis.



Project: 117 MW Cogeneration Facility

Customer: Greater Toronto Airports Authority (GTAA)

Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

Canada

WorleyParsons, as the Owner’s Engineer for the Greater Toronto Airports Authority (GTAA), is providing conceptual engineering, project management, and construction management services to ensure the technical integrity, safety, cost, and schedule compliance by a design/build, operate and maintain contractor. This facility consists of a 117 MW combined cycle cogeneration power plant that is fully integrated with GTAA’s existing Central Utilities Plant. The scope includes a three-turbine (two gas and one steam) configuration for simultaneous production of electrical power and thermal energy. Two General Electric LM 6000 PD units firing natural gas will generate the electricity.





Renewable Energy

WorleyParsons is on the forefront of the rapidly expanding field of renewable power generation. Supporting this expertise is a global company with resources and professionals that can handle all aspects of your organization's power needs.

Change in today's power industry is motivated by rapidly increasing power demand, growing public resistance to conventional power sources, and fuel price instability. This change has spawned a wave of state-mandated requirements such as renewable energy portfolio standards and carbon emission caps. As greenhouse gas issues continue to make the headlines, this trend is destined to continue.

The WorleyParsons Renewable Energy Program provides the capability and experience to adapt to changing power generation needs by providing comprehensive services to the power industry in all aspects of renewable project execution, including:

- Renewable portfolio management support
- Project feasibility studies
- Plant site evaluation and selection
- Technology evaluation consulting
- Conceptual plant design
- Plant cost estimates
- Cost/benefit analysis
- System modeling
- Performance prediction
- Environmental impact studies
- Permitting and licensing
- Preliminary plant design
- Specification preparation
- Substation and transmission design
- Detailed plant design
- Procurement services
- Construction management
- Operation and maintenance services
- Owner's engineer

Our staff of renewable technology experts is backed by WorleyParsons' world-renowned capabilities and expertise in fossil-fired power generation and environmental engineering, providing the most comprehensive team available to assure the success of your renewable energy projects. Including WorleyParsons on your team to help navigate the changing power generation landscape can make the difference from being a trend follower to an industry leader. Our capabilities span the entire spectrum of renewable energy technology, including solar (CSP and Photovoltaic), wind, biomass, geothermal, ocean power, hydroelectric, and off-grid applications.

3,000

Total CSP MW in Design



Project: Ivanpah 400 MW Solar Electric Generating Station

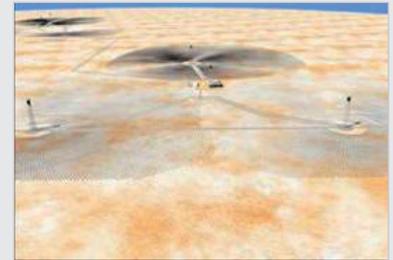
Customer: BrightSource Energy, Inc.

Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

United States of America

WorleyParsons is the owner's engineer for BrightSource Energy, Inc. in Oakland, CA. The project in Ivanpah, CA is the development of three concentrating solar thermal central receiver power plants totaling 400MW electrical generating capacity.

When the project is complete, it will be the first commercial solar central receiver system in the United States. WorleyParsons' scope of work includes engineering support for the California Energy Commission (CEC) Application for Certification, conceptual design of the powerblock, solar tower, and high voltage transmission interconnections, and far field noise and air emissions modeling.



Project: Wind Farm

Customer: Confidential

Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

Bulgaria

WorleyParsons is providing engineering support to a confidential customer for the erection and connection to the grid of 53 towers with wind generators with total capacity of 159 MW in Bulgaria. The scope of services includes project due diligence, development and management of project schedule, preparation of technical specifications and tender documentation for equipment suppliers, evaluation of technical offers and bid comparison, recommendations for selection of potential suppliers, technical supervision during project execution.



Project: Sugar Mill Biomass Project

Customer: Sunshine Energy - Australia

Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

Australia

WorleyParsons determined the viability of using biomass waste from the sugar mills and other sources as fuel for a cogeneration plant. The study included concept designs, calculation of mass and energy balances, and the assessment of preliminary capital and operating costs. WorleyParsons is developing tenders received for the construction contractors and is now assisting Sunshine Energy with the development of these projects toward financial close. WorleyParsons exceeded client expectations at identifying and developing opportunities for renewable power generation and providing support through project implementation.



Project: Technical Evaluation Consultancy of Renewable Investment Projects

Customer: Comision Nacional de Energia (CNE) - Chile

Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

Chile

ARA WorleyParsons is assisting the CNE in the technical and economical evaluation of 80 non-conventional renewable energy project proposals presented to Chile's state development agency for implementation funding. Evaluations include 45 wind parks, 18 mini hydraulic units, 6 biomass cogeneration facilities, 6 biogas digester units and 5 geothermal facilities.





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Advanced Coal

WorleyParsons is a forerunner in all aspects of advanced coal technologies including integrated gasification combined cycle (IGCC), oxyfuel combustion, ultrasupercritical steam, supercritical CFB, carbon capture and deep geological storage, as well as a range of gasification-based facilities for natural gas and chemical production.

Gasification can economically and environmentally fuel new generation requirements for load growth or repower older coal plants that require environmental enhancements. It can also refuel existing combined cycle plants that suffer from low dispatch due to high natural gas prices. With the addition of CO₂ capture and deep geological storage, this clean coal technology can provide a solution for future power generation demands.

WorleyParsons has extensive experience in the design and construction of gasification process units, CO₂ capture, compression and pipeline transport, and the range of issues for deep geological storage or enhanced oil recovery. We have provided coal gasification plant design, carbon capture plant design, and support contractor services for over 27 years to our utility customers and national research organizations including the U.S. Department of Energy and the Electric Power Research Institute. WorleyParsons also has substantial qualifications and experience in process design and cost estimating for greenfield and repowering applications, and the full range of CO₂ pipelines and storage.

WorleyParsons has the capability to work with all major gasification technologies such as Siemens, GE Energy, Shell, E-Gas, and British Gas/Lurgi. Our *Select* group utilizes an in-house proprietary process and economic models to conduct feasibility studies and front-end engineering and design packages.

WorleyParsons provided engineering, procurement, and construction services for major gasification projects, including Valero (formerly STAR) at Delaware City, Delaware and ExxonMobil at Baytown, Texas. WorleyParsons also conducted multiple process design packages, feasibility studies, and front-end design for global power and chemical gasification applications, engineering over 100 million cubic meters per day (nominal) of Syngas production.

Our current engineering and design support for ZeroGen IGCC project with carbon capture and storage maintains WorleyParsons' leadership role as a provider of innovated solutions in the global power markets.

4

Large-scale Gasifiers Installed

60

Gasification System Studies

235

MW of IGCC Installed Capacity



Project: Delaware City Repowering Project**Customer: Valero (originally STAR, a joint venture between subsidiaries of Texaco and Saudi Aramco)****Phases:** IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE**United States of America****WorleyParsons provided EPC services for this IGCC repowering project.**

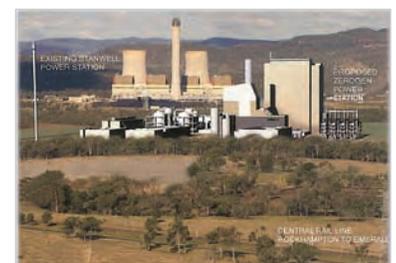
The Valero refinery produces approximately 2,000 tons per day of petroleum coke as a by-product. This coke is gasified using twin train 900 cubic-foot GE Energy (formerly ChevronTexaco) gasifiers to fuel two 90 MW combustion turbines and HRSGs that in turn supply 530,000 pounds per hour of 1250 psi steam to 55 MW of existing steam turbines. The plant supplies both electric and steam energy to the refinery, with excess electric power being sold into the power grid.

**Project: Baytown Syngas Project****Customer: ExxonMobil Chemical****Phases:** IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE**United States of America**

WorleyParsons provided front-end engineering and design and detailed engineering services, procurement, and construction management for this critical ExxonMobil project. The deasphalter rock (DAR) gasification facilities consist of two gasification trains with a common gas cooling section. The facility will have a nominal combined train capacity of raw syngas (H₂ + CO) equal to 95 MMscfd. This is consistent with a 200 gpm feed rate of hot DAR rock. Each train is designed to produce 75 MMscfd of raw syngas when one train is down. This is consistent with a 160 gpm feed rate of hot DAR.

**Project: ZeroGen Feasibility Study****Customer: Queensland Government****Phases:** IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE**Australia**

WorleyParsons is completing the FEED phase for the first Australian-based clean coal power demonstration project. We are assisting the ZeroGen project to meet its goals to create cleaner power and demonstrate the viability of integrating coal-based gasification, carbon capture and storage to achieve deep cuts in carbon dioxide (CO₂) emissions. The ZeroGen gasification plant is planned to be located near the existing Stanwell Power Station in Queensland, Australia. WorleyParsons' design includes the potential to reduce emissions in excess of 75 percent, which can be scaled up to 90 percent in full-scale commercial plants.

**Project: EPRI CoalFleet for Tomorrow****Customer: Electric Power Research Institute (EPRI)****Phases:** IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE**United States of America**

EPRI's CoalFleet for Tomorrow ("CoalFleet") is an industry-led, broad-based collaborative research program founded with the goal of making a portfolio of advanced coal technologies more accessible and affordable for power producers and society. WorleyParsons is assisting EPRI in providing guidance on technologies covered by CoalFleet include integrated gasification combined cycle (IGCC), ultra-supercritical pulverized coal (USC PC), and supercritical circulating fluidized-bed combustion (SC CFBC).





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Transmission Networks

WorleyParsons brings you the confidence that comes from more than 100 years of experience in transmission networks. Our staff has the superior technical expertise to deliver a full range of high-quality transmission networks services.

This very broad background covers above and below ground power lines and substations for hundreds of utilities around the globe. We work in every type of terrain, climate, and location from inner city to neighborhood, rural, desert, and mountain. We not only understand project types; we know the technology and how to apply it. Our projects cover more than 50,000 MVA of new, "greenfield," upgraded, and retrofit substations including many with gas-insulated switchgear (GIS). Our expertise is based on more than 12,800 circuit km of overhead high voltage transmission; 8,800 km of extra high voltage (EHV) transmission to 765 kV; 6,400 circuit km of distribution; and 941 circuit km of underground lines.

As part of our **Select** services we also provide advanced power system analysis to underpin the planning, design, and optimization of networks and the connection of new generation or complex electrical loads, these services cover a wide range of transmission, distribution, industrial, and resource applications.

Program Management expertise allows us to deliver complete services for a range of projects from stand alone mega projects to managing portfolios of small projects.

With this background, we know how to get the job done, whatever the requirement. Our staff has both consulting engineering and manufacturing experience. Altogether, we are especially adept at providing optimized, cost-effective, life-cycle solutions.

50,000

MVA of New
Substations to 765 kV

21,700

Km of HV and EHV

941

Km of EHV Underground
Transmission to 400 kV



Project: Trans Bay Cable Project

Customer: Siemens Power Transmission and Distribution Inc.

Phases: IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

United States of America

WorleyParsons was awarded the contract to provide engineering services for the high voltage direct current (HVDC) terminals for the Trans Bay Cable Project.

The Trans Bay Cable Project is a 85 kilometer submarine transmission line that stretches under the San Francisco Bay from Pittsburg, California to San Francisco. The project scope relating to the terminals includes site engineering, electrical and structural engineering, and permit management. The HVDC link is rated at 400MW.



Project: Valley Power 300MW Gas Turbine Station

Customer: Valley Power

Phases: IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

Australia

Valley Power developed a 300 MW gas turbine peaking station in Australia's Latrobe Valley including a 220 kV transmission line to 220/500 kV transformation for connection to the grid. WorleyParsons was responsible for all electrical aspects of the project based on the relocation of six 50 MW gas turbines from New Zealand. This involved assessment of the existing electrical plant for re-use, preparation of detailed designs and specifications for the 220kV switchyard and transmission line, 220/500kV transformer connection and auxiliary power systems, protection, SCADA and OPGW communications. WorleyParsons also prepared applications and provided technical support in the negotiation of the connection agreements as well as site support during construction and commissioning.



Project: Singapore Underground 400 KV System

Customer: SP Power Assets Ltd. (formerly SP PowerGrid Ltd. and PowerGrid Ltd.)

Phases: IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

Asia

In 2001, WorleyParsons completed the 400kV cross-country transmission corridor for Tuas-Ayer Rajah-Labrador interconnection, the first ever undertaken in Singapore. It enhances the transmission capacity through better fault handling and ensures continued reliability and more economical quality power transmission in Singapore. The projects involving 330 kilometers of underground 400 kV 1000 MVA cables have enabled the network to transmit the electricity from the west to the central part of Singapore. More than 600 kilometers of optical fiber and auxiliary cables were laid underground.



Project: Continuing Engineering Services for Multiple Substations

Customer: National Grid

Phases: IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

United States of America

As part of a continuous engineering service contract, WorleyParsons upgraded substations in all voltage classes from 13.8 kV to 345 kV. The substations were both of the conventional open-air and GIS design. The engineering and design work included site preparation and grading, foundations, power transformer additions or replacements, bus extensions, circuit breaker additions, shunt capacitor bank installations, and shunt reactor additions. New control buildings were added or existing control buildings modified to include adding or upgrading metering, protective relay systems, telecommunication systems, and automation. New battery systems, powerline carrier, SCADA remote terminal units, and transient fault recorders are also a part of this work.





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Operations and Maintenance

WorleyParsons unique total capability enables us to deliver sustainable and competitive production solutions for the power generation asset owner/investor.

WorleyParsons' unique Operations and Maintenance value is based on our ability to access our global sources of knowledge and experience on power plant technologies including:

- Diverse plant technology experience in simple and combined cycle, cogeneration, coal fired, waste to energy, biomass, nuclear, hydro, and renewable energy
- Significant experience in developing and existing emissions mitigation technologies
- Extensive experience in providing project and engineering support to plant operations
- Comprehensive power plant management plans & systems and a fleet management approach that are globally transferable and enable continuous improvement
- Access to experienced power station management staff to develop plant technical and organization strategies to address performance objectives
- Strong relationships and experience dealing with OEMs
- A diverse range of plant which WorleyParsons operates

WorleyParsons Operations & Maintenance Service ranges through all project phases and includes operator's design reviews for operability, performance and sustainability, owner's engineer support, plant start-up commissioning, and mobilization services for seamless turn over to commercial operation. WorleyParsons manages all day to day and long-term aspects of the whole facility during commercial operations and includes warranty management, safety & environment management and asset management necessary to meet owner's dispatch and performance requirements.

Asset Management includes access to WorleyParsons global engineering capability to deliver plant improvements and includes projects like plant up-rates, emissions mitigation and life extension. We also provide operations due diligence, asset management plan development & audit, reliability assessment, and failure analysis.

WorleyParsons, supported by its EcoNomics™ resources, also works collaboratively with the owner's corporate group to develop business strategies involving leveraging from the existing assets to meet market opportunities and address business challenges like emissions trade, environment compliance, and water supply availability. Our Operations and Maintenance capability combines our other power capabilities enabling customers to access a complete single source delivery capability from feasibility studies through start-up and commissioning.

10,500

MW of Coal Start-up/
Commissioning and Initial
Operational Services

6,000

MW of Natural Gas
Start-up/ Commissioning
& Initial Operational
Services

9,500

MW of Operations
& Maintenance
and Construction
Maintenance Services

Part of our **Improve** services



Project: G•UB•MK Fossil/Hydro Plant Modifications

Customer: Tennessee Valley Authority (TVA)

Phases: IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

United States of America

Under a partnering agreement with TVA, G•UB•MK Constructors (a joint venture sponsored by WorleyParsons, which includes Williams Plant Services and Washington Group International) provides construction modifications and supplemental maintenance at six of TVA's 11 coal-fired facilities, all 29 hydroelectric facilities (46 total dams), 1 pumped storage facility, and the Power Service Shop II metal fabrication facility.

G•UB•MK plans, estimates, schedules, and executes the work through direct hire of union craft labor. G•UB•MK Constructors has performed over \$1.3 billion of work on approximately 2,000 "projects" since 1992 (through December 2005).



Project: UCLA Chilled Water and Cogeneration Facility

Customer: University of California at Los Angeles

Phases: IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

United States of America

Following successful engineering design, procurement, and construction services for the 20,900-ton chilled water and 44 MW cogeneration facility in 1993, WorleyParsons assumed complete responsibility through an on-site staff for O&M services of the facility under a five-year contract that was renewed in 1999 under a five-year extension agreement, and again in 2004.



Project: Ontelaunee Energy Center

Customer: LS Power and Dynegy

Phases: IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

United States of America

WorleyParsons assumed an existing O&M Agreement of the Ontelaunee Energy Center located in Reading, PA from Calpine Corporation on August 23, 2006 (Bankruptcy Court ratified). Ontelaunee is a 580MW merchant combined cycle power facility selling electricity into the PJM market and consists of Two (2) Siemens 501F Gas Turbine Generators, Two (2) Nooter Eriksen Heat Recovery Steam Generators, One (1) Siemens KN Steam Turbine Generator, a 12 cell cooling tower, and all supporting balance of plant equipment. O&M of the facility included personnel transition into the WorleyParsons' benefit plans as well as assumption of the complete outage and project management of the facility. LS Power sold the facility to Dynegy Inc. in April 2007. Dynegy performs all plant operations as part of its core business, making the renegotiation of an outside operational arrangement unnecessary.



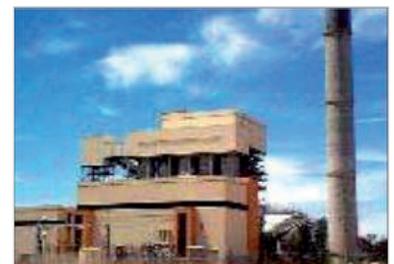
Project: Collie Power Station

Customer: Western Power

Phases: IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

Australia

WorleyParsons, with its joint venture partner, Transfield Services, won a six-year contract for the operations and maintenance of Western Power's Collie Power Station. With 330 MW capacity, this is the biggest single generating unit in Western Power's portfolio and one of the most modern and efficient coal-fired power stations in Australia. The project involves a joint commitment to continuous improvement with the project owner. WorleyParsons subsequently designed and managed implementation of boiler modifications that enabled the unit to operate continuously in excess of 340 MW, continuing our commitment to find improvements that give a competitive edge to the customer.





WorleyParsons

resources & energy

Air Quality Control

Over the past century, WorleyParsons has emerged as a world leader in air quality with 15,000 MW of new flue gas desulfurization (FGD) design and installation.

As air quality control (AQC) technology came to the forefront in the mid 1970s, we designed some of the first FGD systems, and since that time, we have effectively advised customers through 80 FGD unit studies and many successful regulatory compliance plans. We have placed 16,500 MW of selective catalytic reduction (SCR) into service and are currently implementing SCRs at five units totaling more than 1,600 MW, with 15,000 MW of FGD systems either completed or currently in progress, and 400 MW of mercury control projects.

We continue to analyze all available AQC technology, which includes solving the specialty issues of mercury and carbon capture. Our *Select* services group has conducted more than 100 technology option studies and introduces technically innovative thinking to help customers identify, evaluate, screen, and pursue strategic opportunities. We support our AQC customers' needs from strategic development through implementation of mandated compliance.

Our experience has led to Southern Company selecting us to study, define, and execute retrofitting SCR and FGD for all fossil units at Plant Scherer, totaling 3,272 MW. In addition, we have air quality programs for other customers to install 15 units of wet and dry FGD systems on existing coal-fired plants.

We know precisely what it takes to develop and implement comprehensive, technologically sound, and environmentally compliant strategies. This ensures the shortest project schedules, with the most beneficial life cycle results. We use our "best-in-class" automated systems to engineer, design, construction manage, and commission air quality systems.

15,000

MW of FGD Systems

80

FGD Unit Studies

16,500

MW of Selective Catalytic Reduction Systems

Part of our *Improve* services



Project: Clean Smokestacks Program**Customer: Progress Energy****Phases:** IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

United States of America

WorleyParsons was the engineer for Progress Energy's FGD program in North Carolina. The project extended through 2008 and consisted of installing FGD systems on 6 of the company's coal-fired units, and owner's engineer on an additional 3 units.

Our alliance-based team for these projects is comprised of WorleyParsons, Progress Energy, the OEM, and the constructor. Key challenges faced within the initial phases of the project included determining the optimal arrangements of the new facilities and the selection of the right technologies. WorleyParsons' scope of work includes program/project management, engineering and design, and procurement.

**Project: Mitchell Station - FGD and SCR Projects****Customer: American Electric Power****Phases:** IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

United States of America

American Electric Power selected WorleyParsons as the Architect Engineer for the design of the installation of the FGD and SCR system at the Mitchell Power Station. The Mitchell Power Station consists of two 800 MW coal-fired units that became operational in the early 1970's. Available existing space at Mitchell Station was very limited requiring a thorough assessment of several plant site layout options for optimal operation. WorleyParsons assisted American Electric Power in the preparation of the FGD and SCR equipment specification, the formulation of its design basis, and in the detailed design of the facilities.

**Project: Plant Scherer Units 1-4 Phase I and II****Customer: Southern Company Services Inc.****Phases:** IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

United States of America

Southern Company is one of the largest generators of electricity in the nation, serving both regulated and competitive markets across the southeastern United States. Plant Scherer is a four-unit 3,272 MW coal-fired facility (4 x 818 MW) located in Juliette, Georgia. As a result of WorleyParsons work on a wet vs dry FGD study, Southern Company awarded the Phase 1 Conceptual Engineering project. This consisted of developing preliminary designs, material takeoffs, detailed scope books, and cost estimates to retrofit SCR and FGD technology. Subsequently, Phase II project was also awarded to retrofit the FGD and SCR equipment on each of the 4 units at the plant.

**Project: Pulau Seraya Stage I Orimulsion Project****Customer: PowerSeraya Ltd, Singapore****Phases:** IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

ASIA

WorleyParsons was the owner's engineer of the \$140 million project at Pulau Seraya Power Station in Singapore. The project required the modification of the existing boilers of three 250 MW conventional oil-fired steam to fire Orimulsion. The work includes installation of FGD system, material handling system, wastewater treatment plant, replacement of existing electrostatic precipitators, including ash handling system and upgrading the distributed control system (DCS) and existing jetty.





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Environmental

WorleyParsons delivers environmental expertise to power clients around the world, backed by 192,800+ MW of WorleyParsons power plant engineering experience.

WorleyParsons provides expertise in environmental management related to the production, transmission, and use of electricity. The environmental challenges related to power generation have been receiving increased media, government, and regulatory attention. We deliver solutions to these challenges throughout the entire project life cycle—from project planning and permitting through operations and eventual decommissioning.

WorleyParsons performs environmental and social impact assessments at the planning stage of a new power facility to expedite strategic environmental planning and decision-making. We offer viable solutions and alternatives for important considerations such as facility siting, transmission corridor selection, environmental economics, sustainability, water supply, and waste and wastewater management. During operations, we also provide atmospheric, soil, surface water, and groundwater monitoring and remediation for due diligence, as well as radiological and nuclear services. We assist at every stage of the project life cycle to attain requisite environmental permits that support facility operation and facilitate stakeholder management.

WorleyParsons also provides carbon management consulting services, including analysis for carbon emissions trading and use of the Clean Development Mechanism (CDM) that was created as part of the Kyoto protocol. We also offer technological options for carbon sequestration and strategic planning for carbon management and emissions reduction.

Our professionals assist throughout the decommissioning process for power facilities, including coal, nuclear, and oil-fired stations. WorleyParsons specializes in environmental assessment, remediation, reclamation, and brownfield redevelopment. We expedite the process for obtaining regulatory closure, meeting the needs of our customers and associated stakeholders. WorleyParsons has developed a reputation of technical excellence, successful project delivery, reliability with customers, and credibility with regulators and associated stakeholders.

7,000+

Environmental Projects

500+

Environmental Specialists



Project: Puente Nuevo 400 MW Power Plant EIA**Customer: ENEL VIESGO****Phases:** IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

Spain

The Puente Nuevo Combined Cycle Power Plant will be located near the world heritage city of Córdoba, Spain, next to a water reservoir in an area surrounded by forest and heavily used for recreational purposes.

WorleyParsons was retained to complete an environmental impact assessment utilizing models comparing impacts of using a water versus an air cooling system, determine required stack heights, and identify potential noise effects on tourism. The generated visual impact model determined the visibility areas and set the necessary measures to mitigate visual impacts. Coal power plant emissions, contamination measuring stations, and both European Union and Spanish regulations were considered. WorleyParsons provided analytical information which assisted the client in environmental planning and decision making, and enhanced corporate environmental sustainability.

**Project: Water Quality Studies for Power Plant Re-licensing****Customer: California Energy Commission****Phases:** IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

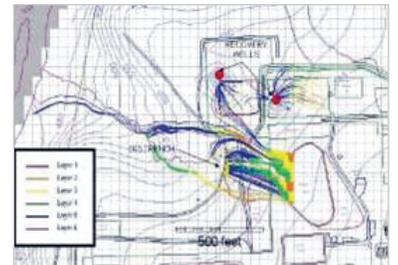
United States of America

Bacterial contamination resulted in repeated public beach closures near the AES Huntington Beach Generating Station. WorleyParsons performed an extensive water quality investigation including analysis of 1,700 water samples and collection of 2.2 million data measurements. The investigation included surface and process water sampling, outfall plume dispersion modeling, in-plant and outfall tracer dye studies, and salinity/temperature profile monitoring. The study found that the generating station was not the source of the bacterial contamination, but the interaction of the outfall plume and the along-shore currents forced ocean water containing bacteria from other sources across the surf zone and into the shore.

**Project: Uranium Conversion Facility Reclamation****Customer: Sequoyah Fuels****Phases:** IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

United States of America

The challenges presented by nuclear facility closures demand an experienced team of groundwater specialists. Sequoyah Fuels retained WorleyParsons for our superior knowledge of groundwater flow and transport modeling of radioactive materials. WorleyParsons used a flow and transport model to estimate current and potential migration of site-derived constituents, potential point-of-exposure pathways, and future loading of site-derived constituents to the adjacent Arkansas and Illinois river systems. This investigation was an important component of environmental and human health risk management.

**Project: Power Line Corridor****Customer: ISA - ETESA****Phases:** IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

South America

WorleyParsons and Consultaría Colombia conducted a corridor assessment for a planned power line connecting Panama and Colombia. Alternative alignments encompassing 1,300 km of tropical forest and marine habitat were evaluated, using satellite imagery and field work to prepare fragility maps. Based on these maps, the environmental sustainability of each alternative was assessed and environmental management plans and contingency plans were prepared. Features of interest included coral reefs, sea grass areas, mangroves, and other geological and biological features.





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Program Management

WorleyParsons is one of the world's largest providers of Program Management Consultancy (PMC) services.

Driven by today's concerns of cost effectiveness, reduction of corporate staff functions, and a general trend toward the adoption of a "doing more with less" philosophy, WorleyParsons offers a variety of program management and technical support services to its customers.

These diverse services range from specific task order/on-call assignments to open-ended requirements based on an anticipated level of effort and overall management for an entire program. WorleyParsons has an outstanding track record as a PMC contractor integrated with the customer's team. As Program Manager, we form a working partnership to ensure that customer interests and business objectives are met in the most cost-effective manner. This operational methodology produces a quality program that is safe, cost effective, technically sound, environmentally compliant, and deliverable in a minimum time frame.

WorleyParsons monitors and controls cost, schedule, and quality, using proven, in-place procedures, systems, and the experienced judgment of WorleyParsons' people to anticipate and avoid problems and to provide accurate and relevant data to the customer for timely decision making. Our systems are routinely configured to interface with existing customer systems and that of other consultants – allowing complete interaction and communication. Our methods of managing the performance of all the participants encourages accountability, especially our own.

WorleyParsons' experience with complex programs gives us a clear understanding of the importance of managing all the component parts of a complex program equally; we manage the whole by managing the pieces. We pay close attention to the small tasks that, if overlooked, can create a chain reaction affecting major schedule milestones or costs. This is a cornerstone of our approach to program management.

100

Years of Experience

11

Major PMC Projects in the Last 15 Years

21,200

MW in PMC Contracts



Project: STARS - License Renewal and Plant Aging Management
Customer: Strategic Teaming and Resource Sharing (STARS)

Phases: IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

United States of America

WorleyParsons is providing full license renewal and plant aging management services for STARS nuclear power stations, including Comanche Peak Steam Electric Station, Diablo Canyon Nuclear Power Plant, Palo Verde Nuclear Generating Station, South Texas Project Electric Generating Station, and Wolf Creek Generating Station.

WorleyParsons will support STARS during the preparation and submittal of the License Renewal Application (LRA); the U.S. Nuclear Regulatory Commission review of the License Renewal Application; and the creation and life cycle enhancements of aging management programs credited in the LRA.



Project: Power Sector Support Program II Consulting and Construction Management
Customer: Egyptian Electricity Holding Company (EEHC)

Phases: IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

Egypt

In response to rapid economic growth, expanding population, and market pressures, Egyptian Electricity Holding Company (EEHC) embarked on an ambitious electricity generation development plan. USAID funded EEHC's Power Sector Support Program II includes eleven stand-alone projects including controls upgrade for five power plants, three 220 kV Substations, three 220 kV reactive power compensation installations, short circuit test lab, and transmission tower testing facility; the upgrade of long-range planning software; and a large operations management program containing four major areas of study composing 22 subtasks. EEHC achieved operational benefits from the program with improved start-up times, 1.5% increased efficiency and 1.0% delivered fuel savings.



Project: Electrical Services Sector Program Management
Customer: U.S. Department of Defense

Phases: IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

IRAQ

The U.S. Department of Defense awarded a contract to the Iraq Power Alliance, a joint venture of WorleyParsons and Parsons Brinckerhoff Ltd, to direct the work to rebuild, expand, and modernize Iraq's war-torn and neglected electric power system. The Iraq Power Alliance is the Electrical Services Sector Program Management Office (SPMO) contractor under the Coalition Provisional Authority (CPA) Program Management Office (PMO). The work includes rapid rehabilitation of the existing power generating plant and transmission networks systems, together with development of new power generating plants and transmission networks systems.



Project: National Energy Technology Laboratory
Customer: U.S. Department of Energy

Phases: IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

United States of America

WorleyParsons provided management, supervision, personnel, materials, supplies, equipment, training, technical expertise, and services for operation and maintenance of existing government-owned test facilities including detail design and construction of additional test facilities; modification to existing test facilities; start-up, shakedown, and operating adjustment of test facilities; and process investigation, operation, and maintenance of test facilities.



Photo courtesy of NETL



WorleyParsons

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Long-Term Service Contracts

WorleyParsons values long-term service contracts as a mechanism for delivering new developments or supporting ongoing operations on developed assets for our clients.

Long-term service contracts are a major strategic platform for WorleyParsons. It is an approach that has been forged within the Company as an inherent part of our culture and the foundation of our *Improve* services. *Improve* teams are long-term, embedded and integrated with the customers' teams and act as a single point of access WorleyParsons global experience and tailored solutions.

Long-term *Improve* service contracts allow WorleyParsons' customers to:

- Focus on core competencies
- Establish a close working relationship with us, resulting in more efficient project delivery
- Align their interests with WorleyParsons' by sharing in risks and rewards

Our success is dependent on our customers being successful. Some of the benefits resulting from long-term *Improve* services contracts are:

- Continuous improvements in safety performance
- An environment where specialist skills are developed and effectively utilized
- Ability to develop sound working relationships and to invest in continuous improvement
- Visibility and the assurance that the investment is focused on the best business return

\$25B

Asset Supported by Long-Term Service Contracts

28,000

MW Served by Long-Term Service Contracts Globally

\$250M+

Sustaining Capital Projects Per Annum



Project: Engineering Support Services
Customer: Tennessee Valley Authority (TVA)

Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

United States of America

WorleyParsons is providing full engineering services, including design, construction support, and operations and maintenance support for projects that encompass 11 fossil plants, 29 hydro plants, and three nuclear plants - all TVA generating sites.

This is a long-term task order contract first awarded to WorleyParsons in 1987 – a span of 19 years. Services provided vary from site to site. At a typical plant, WorleyParsons addresses low NOx modifications, water treatment upgrades, control room consolidations, control upgrades, unit modernization, unit performance improvement, environmental compliance, plant technical support, facility renovations and improvements, small-unit generation, cogeneration, safety improvements, inspection and testing services, field engineering, outage support, fuel handling, and general engineering support.



Project: Support Implementation of Environmental Compliance Strategy
Customer: Reliant Energy

Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

United States of America

WorleyParsons has supported Reliant Energy since 1991 in developing the NOx reduction strategy for their coal-fired units in Pennsylvania and Ohio. In addition to performing preliminary engineering for implementation of SCRs on Portland, Shawville, Avon Lake, Cheswick, Conemaugh, and Keystone units, we also performed detailed engineering to implement low NOx burners at Portland, Titus, Conemaugh, Keystone, Shawville, and Seward stations. WorleyParsons provided preliminary engineering and cost estimates to install FGD systems at Cheswick and Avon Lake and provided controls upgrade services to enhance the scrubber controls at the Niles Station. More recently, we completed engineering and design for a new 350-foot chimney at the Titus station including new ductwork design tying in three boilers helping plume dispersion in a non-attainment area.



Project: Continuing Engineering Services
Customer: PPL Corporation

Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

United States of America

WorleyParsons places great value on the long-term continuing services contract that we have with PPL Corporation providing engineering and programmatic services and support for the two 1180 MW nuclear units at the Susquehanna Steam Electric Station, located in Berwick, Pennsylvania. In place continuously since the late 1980s, this long-term service contract has provided the opportunity to develop an in-depth understanding of the plant and engineering procedures and processes, allowing us to provide significant and efficient contribution relative to design engineering modification packages, as well general engineering support services. This long-term contract created a relationship that fostered an atmosphere of teamwork and continuous improvement built on a foundation of trust and commitment to the success of the entire customer team.



Project: Transmission Networks Projects
Customer: National Grid

Phases: IDENTIFY > EVALUATE > DEFINE > EXECUTE > OPERATE

United States of America

WorleyParsons provides engineering and design (civil/structural, electrical, protection and control, and transmission), material procurement, and engineering management for National Grid at various sites in the U.S.A. WorleyParsons performed engineering, design, and procurement management for the 115/15 kV Burt Road substation retrofit project; design of the 115/15 kV South Randolph substation retrofit project; and the expansion of the existing 115/69/23/13 kV Palmer substation including new control building, new relays, and SCADA addition.





WorleyParsons

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Select - Power

The Specialist Front-end Division of WorleyParsons

Decisions made during the early stages of an investment have the greatest impact on the ultimate business outcome.

Select is an integral part of the WorleyParsons' global Power delivery capability. *Select* provides consulting services to asset owners, operators, investors, financial institutions, and governments by utilizing WorleyParsons' extensive 'real world' experience in total project delivery and plant operation.

Drawing from this experience base enables our customers to be confident that the critical decisions made during the strategic planning stages of the project will support their ultimate business objectives.

Select offers its customers ready access to:

- Intellectual capital held by experienced industry leaders
- Strong planning, financial, and technical competencies throughout the business value chain
- Innovative and creative thinkers to help our customers identify, evaluate, screen, and pursue strategic opportunities
- A regionally relevant focus matching our customer's business model and the economic framework of the market and region
- Tailored customer workshops and training programs

Specific areas of expertise cover:

- Strategic Planning and Financial Analysis
- Meeting Future Demand for Electricity
- Existing Plant Optimization

30+

Global Power
offices

100+

Technology Option
Studies



Project: Advanced Coal Site Evaluation and Selection**Customer: New York Power Authority****Phases:** IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

United States of America

WorleyParsons completed an evaluation for the New York Power Authority to identify suitable sites for hosting an advanced clean coal power plant.

Using high-level screening criteria, numerous sites were evaluated. WorleyParsons specifically concentrated on the potential for utilizing existing power plant and brownfield sites based on site parameters and reasonable access to transmission, fuel supply, environmental attainment and CO₂ sequestration geology. WorleyParsons further analyzed the sites to determine if any fatal flaws were present. A profile document for each short-listed site was developed describing the feasibility and applicability for the proposed advanced clean coal power plant.

**Project: Belene Nuclear Power Plant Project Feasibility Study****Customer: Natsionalna Elektricheska Kompania (NEK)****Phases:** IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

Bulgaria

As part of an effort to restart construction, WorleyParsons was contracted to develop the Environmental Impact Assessment (EIA) for the Belene site and a technical and economic feasibility study for the completion of Belene Units 1 and 2. The feasibility study considered the technical and economic impacts of the entire life cycle for the facility, from initial construction through plant operation, nuclear radwaste disposal, and ultimate disposal or storage of the used nuclear fuel. In developing the EIA and feasibility study, WorleyParsons gained detailed and specific knowledge of the Belene site and plant and is now serving as A/E and project manager for project execution.

**Project: Power Purchase Assistance****Customer: MIM Holdings****Phases:** IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

Australia

With the setting up of the Queensland electricity market and the granting of contestability for consumers with an electrical energy usage over 40 GWh per annum, MIM faced both opportunity and risk. To better understand the possible impacts to their current and future business plans, MIM engaged WorleyParsons to conduct a survey of their operations to determine their electrical load characteristics and costs. This review determined the load magnitudes and daily patterns and possibilities for load shedding thus providing MIM with the required platform from which strategic investment options could be considered.

**Project: Kharkiv Heat Supply Improvement and Institutional Restructuring Study****Customer: Kharkiv Oblast State Administration****Phases:** IDENTIFY >> EVALUATE >> DEFINE >> EXECUTE >> OPERATE

Ukraine

Serving the City of Kharkiv, this project involved a comprehensive city-wide feasibility study addressing economic improvements in capacity, configuration, performance, and reliability; hydraulic analysis of the entire city district heating network, as well as institutional aspects of the business of energy supply and institutional restructuring to support development of combined heat and power facilities in Kharkiv, Ukraine.





WorleyParsons

resources & energy

WorleyParsons has added a new differentiator to emphasize the importance we place on profitable sustainability – for our customers and in our own business. EcoNomics™ brings together and extends our range of services in environmental, social and financial sustainability. It is our plan that these services will be embedded into all aspects of project delivery, across the asset lifecycle. In this we are focused on the green and the black and we see enormous potential for optimizing existing assets, solving customer problems and developing new solutions.

WorleyParsons has been built on long-term relationships, anticipating customer needs and delivering solutions. Today we are committed to working with our customers to create solutions to meet the green challenge while staying in the black. EcoNomics™ is our range of tailored, expert services and proprietary technologies that profitably embed environmental, social and financial sustainability into all aspects of the asset lifecycle.

To meet the challenge, some of the ways we are helping customers are to:

- Build in business resilience
- Modify facilities
- Increase efficiency
- Reduce energy consumption
- Reduce emissions and create cleaner operations
- Engage stakeholders

WorleyParsons is uniquely positioned to work globally and locally with our customers to deliver on the value of EcoNomics™. Our leadership role in resources & energy, together with our global network of experts, allow us to tailor solutions for projects and operations – large and small. We have a range of technologies, processes and systems built for application to even the most complex of these problems and a team of experts in all of our regions with practical in-market experience. We also bring our culture of results and innovation to help customers meet the challenge of sustainability with our resources & energy.



EcoNomics™

Delivering profitable sustainability



"EcoNomics™ is about delivering projects that are responsive to changing business drivers that our customers face as a result of climate change and resource limitations."

*Peter Meurs
Managing Director and leader of the global EcoNomics™ initiative*

EcoNomics™ capability includes, but not limited to:

Assessment

- Strategic environmental & economics analysis
- Social & community impact modeling
- Risk & sensitivity assessment
- Complex marine systems analysis

Efficiency

- Energy efficiency
- Water efficiency
- Sustainable building design
- Rail efficiency
- Advanced systems modeling
- Logistics modeling

Treatment

- Gas cleaning
- Clean coal
- Recycling
- Mining tailings management
- Water treatment

Mitigation

- Carbon credits and trading
- Desalination
- Renewable energy
- Carbon capture and storage

OneWay
to Zero Harm



WorleyParsons

resources & energy

Our Vision

WorleyParsons will be the preferred global provider of technical, project and operational support services to our customers, using the distinctive WorleyParsons' culture to create value for them and prosperity for our people.

Leadership

- Committed, empowered and rewarded people
- EcoNomics™ – Delivering profitable sustainability
- Integrity in all aspects of business
- Energy and excitement
- Minimum bureaucracy

Agility

- Smallest assignment to world-scale developments
- Local capability with global leverage
- Responsive to customer preferences
- Optimum solutions customized to needs

Relationships

- Rapport with all stakeholders
- Open and respectful
- Collaborative approach to business

Performance

- Zero harm
- Results for our customers and other stakeholders
- World-class resources, capability and experience



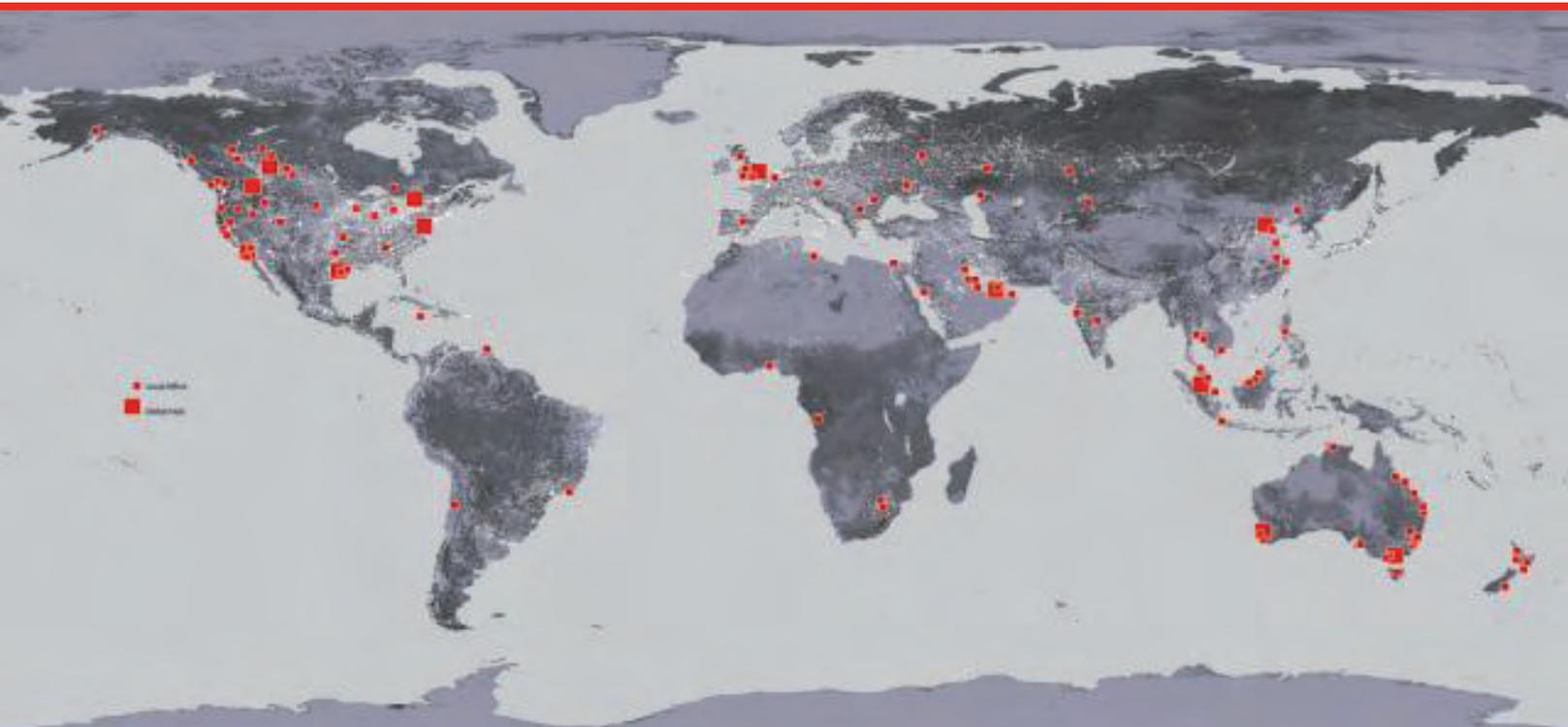
WorleyParsons

resources & energy

**For further information about
our global capability email:**

Power@worleyparsons.com

www.worleyparsons.com



**KBMD
Qualifications**

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Company Overview

Firm Profile

Founded in 1898, Burns & McDonnell Engineering Company, Inc. is an internationally recognized architectural/engineering and construction firm with our headquarters in Kansas City, Missouri. The firm maintains branch offices throughout the United States and serves international clients through its wholly-owned subsidiary, Burns & McDonnell International, Inc. With annual revenues that exceed \$850 million, Burns & McDonnell plans, design, permits, constructs, and manages facilities all over the world with one mission in mind – to make our clients successful.

Safety

Burns & McDonnell is focused on safety for our employee-owners and the Clients and Partners that we work next to every day. We have consistently beat the Construction Industry Institute safety statistic averages, putting B&M in the upper 10% of the industry on safety ... and we recognize that still is not good enough. Our words are backed with action and results.

Metric	2006	2007	2008
Experience Modifier Ratio	0.59	0.57	0.57
Recordable Cases / Rate	3 ea / 0.17	4 ea / 0.14	0 ea / 0
Restricted Work Activity Cases / Rate	0 ea / 0	0 ea / 0	0 ea / 0
Lost Workday Cases / Rate	0 ea / 0	0ea / 0	0 ea / 0
Fatalities / Rate	0 ea / 0	0 ea / 0	0 ea / 0
Recordable Incident Rate	0.17	0.14	0.00
Total Workhours	3,559,983	5,342,508	5,863,618

Firm Ownership

Since 1986, Burns & McDonnell has been a 100% employee-owned firm, whose operations are directed by an officer group practicing a participative management philosophy. This combination produces an active interest and involvement on the part of each employee-owner in the performance of our firm. These same employee-owners form the Burns & McDonnell teams that serve our clients.

Operating Global Practices

Our more than 3,000 employee-owners include professional engineers, architects, construction managers, geologists, planners, estimators, economists, computer, and environmental scientists, representing virtually all design disciplines. Burns & McDonnell is comprised of ten functional groups that offer professional services: Energy, Process & Industrial, Environmental Services, Environmental Studies & Permitting, Transmission & Distribution, Aviation & Facilities, Infrastructure, Business & Technology Services, Healthcare & Research Facilities, and Construction Design-Build Services. Our services and expertise directly related to Gasification projects reside in our Energy Group and Process and Industrial Groups. In addition to our World Headquarters in

Kansas City, MO, Burns & McDonnell has a number of regional offices, including nearly 120 employee-owners in Houston, TX (including process engineering capabilities).

Energy

Our Energy group serves electric utility, commercial, institutional, industrial, and government clients, conducting various power-related economic, cost, and design studies. This global practice provides facility design services for steam and electric generation including assisting clients in the start-up and performance testing of new and reconditioned plants, in performing plant performance and operations assessments, in providing facility operations and maintenance (O&M) services, and in training clients' O&M personnel. This group has several specialists available to our clients to address critical issues and aspects of electric system and power plant planning, design, operations, and upgrades.

Process & Industrial

The Process & Industrial Group serves manufacturers that convert the physical or chemical form of a raw or intermediate material into more valuable products. Included are consumer food products, chemicals, petrochemicals, petroleum refinery products, pharmaceuticals, intermediates, and biofuels.

Our engineers (chemical, equipment, piping, electrical, instrument, controls, and civil/structural/architectural), designers and managers provide complete engineering and construction services. The Process & Industrial Group's fundamental expertise in process design is the basis for each successful engineering and construction project. Because we understand the science behind the engineering and the management behind the construction, our designs meet your expectations for efficiency, safety, and cost effectiveness.

Environmental Services

Since the first environmental laws were passed more than 30 years ago, Burns & McDonnell has helped clients achieve cost-effective compliance. Our experts provide risk assessment, soil and groundwater testing, and remediation; and design facilities and systems to handle solid and hazardous waste.

Environmental Studies & Permitting

Environmental studies and permitting are a critical first stage for many projects. Focused studies, comprehensive knowledge of environmental guidelines and longtime relationships with regulatory agencies are the keys to steering your project through the permitting process. Burns & McDonnell's Environmental Studies & Permitting group understands the complex regulatory requirements that affect your projects. A multidisciplinary staff of environmental scientists, engineers, and planners collaborates to find practical and cost-efficient solutions for your project's present and future permitting needs

Transmission & Distribution

Transmission & Distribution (T&D) services include T&D system studies and analyses, transmission engineering, distribution engineering, substation engineering, and relay and control engineering for both industrial and large utility clients.

Aviation & Facilities

The Aviation & Facilities group specializes in serving government, commercial, retail, educational, health care, institutional, military, and industrial clients, other than in power projects. Their services include the design of airport and aviation facilities, central utility plants, hospitals and laboratories, academic and other institutional facilities, public and commercial office buildings, and industrial manufacturing, administrative and warehouse facilities. This global practice is especially noted, both domestically and internationally, for its more than 60-year history of providing specialty services for airport and aviation projects.

Infrastructure

Our Infrastructure group is involved in the design of water and wastewater projects. This global practice provides engineering services from early water supply to final wastewater facilities studies and design projects. Burns &

McDonnell can help clients complete treatment process evaluations, compliance audits, waste minimization/reuse, flow monitoring, sludge management, toxicity reduction evaluations, feasibility studies, and water/wastewater system design.

Business & Technology Services

Business & Technology Services provides comprehensive financial and management services. Organizations rely on the group's expertise in forecasts, resource evaluations, rate studies, operations analysis and system planning studies. Burns & McDonnell can also help organizations prepare for future industry changes through competitiveness evaluations, strategic planning, and decision analyses.

Healthcare & Research Facilities

Burns & McDonnell's Healthcare & Research Facilities Global Practice offers integrated full service architecture and engineering for three types of facilities – healthcare (hospitals, clinics and surgery centers), research (laboratories, biopharmaceutical, biomedical and pharmaceutical manufacturing facilities) and design for aging (long term care, Alzheimer, assisted living).

Services include: Master Planning and Programming, Architecture, Interior Design and Space Planning, Mechanical, Electrical, Structural and Civil Engineering, Landscape Architecture, Laboratory Planning and Design, Program Management, Security (physical, structural, operational and cyber), Communications and tele-medicine, Environmental, and Construction.

Construction Design-Build Services

Construction Design-Build Services provides the construction management resources for Burns & McDonnell construction projects including on-site representatives for our construction jobsites.

Construction safety, scheduling, progress tracking, and cost control services are provided. Construction Services perform design-build and turnkey projects through a multiple subcontract approach. Ongoing relationships with specialty firms across the country and around the world extend our capability to address special problems and to provide local liaison where needed or desired.

Burns & McDonnell Services

Safe, on-time, and on-budget projects are the expected results when an owner hires Burns & McDonnell. We combine technical expertise in process design with effective project management to achieve predictable project results. Safety, cost, schedule, and quality are managed with proven procedures and experienced leadership. Our philosophy is to operate as an extension of the client's staff. We seek to provide our clients a single source responsibility for their projects. We provide services which may begin with front-end engineering design packages or consulting services through detailed engineering, procurement and construction (EPC) services. Startup services, process hazard analysis (PHA) reviews, value management process (VMP) execution, financial and economic consulting, consent decree, site vulnerability assessment, security planning, and design services are also available.

After our involvement is defined on a project, we have an established framework for execution of a project of which the key components are planning, organization, execution and control. Finally, we seek to provide "No Surprises" in execution of projects.

Front-End Project Planning (FEP)

Front End Project Planning (FEP) is an important part of determining the economic viability of a project. A majority of our projects begin as FEP projects. The project definition is developed through the three step FEP process.

The FEP 1 or Feasibility phase of the Front End Project Planning process typically consists of a series of studies that aid the owner in determining if they have a viable project. Those studies are important tools that allow owners to gain management and project team alignment on the business objectives and project assumptions to be used. This is accomplished by generating block flow diagrams and project parameters that allow the project team to develop an order of magnitude cost estimate.

The FEP 2 or Conceptual phase of the Front End Project Planning process has a typical set of deliverables. This phase of the project typically takes the most promising options from FEP 1 and further develops them.

During the execution of FEP 2, the project team will be able to validate the project assumptions that have been made in FEP 1 and develop key project documents. The key project documents that will be developed include, but are not limited to process flow diagrams, individual discipline design bases, a project schedule, and a budgetary cost estimate. During this phase, it is important for the project team to continue to review the business objectives and the economic viability of the project.

During the FEP 3 or Detailed Scope phase of the Front End Project Planning process, it is important for the project team to freeze the project scope, schedule, and execution plan. The project team will establish the specific equipment, piping, electrical, instrumentation, civil, and structural requirements for the project. This will include key documents such as piping and instrumentation diagrams, equipment datasheets, equipment arrangements, and preliminary design quantities. The project team will assemble a complete resource loaded project schedule that discusses detail engineering, equipment procurement, and construction scheduling. The project team will, once again, consider the economic viability of the project as they revalidate the project assumptions and ensure that the project is set-up to successfully meet the business objectives. The project team will establish the execution plan for detailed engineering, procurement and construction and the documents required to release the project team to begin detailed design. In addition, a definitive cost estimate will be prepared.

The fact that Burns & McDonnell later executes many of these projects as EPC projects has helped us refine our approach to design development and definitive estimating.

Design Engineering

Burns & McDonnell offers experience in providing the required integration of layout, equipment selection, detail design and construction for quality processing facilities in many industries. We work very closely with our clients to meet the requirements and restraints of designing expansion, retrofit projects, new battery limits and grass roots facilities.

Our strong background in a wide variety of power generation applications, combined with our strong process industry background gives us a broad knowledge to meet our clients' needs. We are skilled in the considerations of quality, constructability, value engineering, maintenance, safety, operations, and aesthetics. Our staff understands the intricacies inherent with layout of piping, electrical and structural project features, and as such, our initial layouts typically require minimal modification into detailed design. Burns & McDonnell was one of the Beta testers in the 1980s for Integraph's version of 3-D modeling ... we still fully believe in this concept and are leading the industry as we have recently rolled out SmartPlant on our latest large power generation projects ... allowing our clients to "see" the plant take shape during the design phase of the project and allowing the engineering staff significant intelligence and interaction within the plant model.

Our design efforts often culminate with a complete construction contract package, including design drawings and specifications. We offer the flexibility and the resources to utilize client specifications or to develop all construction documents required for a specific project. We also have experience in providing, prior to design completion, bid packages sufficient for accurate bidding by construction contractors on fast track projects. We have provided our clients with on-site shutdown assistance for retrofit projects, start-up assistance for new systems and long-term on-site design/construction coordination engineers.

Site Vulnerability Assessment, Security Planning and Design

In early 2007, the United States Department of Homeland Security issued new rules for security in Chemical Facilities. Burns & McDonnell is a company that brings many years of experience in chemical facilities together with experts who have up-to-date knowledge on government security regulations and the methods that industries have been using to meet the regulations. Burns & McDonnell engineers and security experts can provide expertise in site vulnerability assessments, critical asset protection, site security planning, cyber security and physical security that meet the guidelines of the new government chemical facility anti-terrorism standards.

Procurement

Burns & McDonnell's purchasing staff has worked on a wide variety of projects in the power generation, chemical, food processing, grain-processing, refining, and petrochemical industries. Equipment purchased on these projects include process equipment ranging from reactors, fractionation towers, vessels, pumps, compressors, exchangers to crystallizers, dryers, furnaces, electrical hardware, gas and steam turbines, power generation equipment, control systems, and instrumentation.

Our purchasing procedures are specifically designed to effectively obtain pricing and place orders for engineered equipment on capital expansion projects. For the Taylorville Project, we will form a procurement organization based on "best athlete" approach within the Burns & McDonnell and Kiewit organizations.

Estimating

Our in-house staff has the experience and capabilities to develop several different levels of estimates. Burns & McDonnell utilizes commercially available software along with extensive in-house cost databases, which are used for cost estimates.

We work with subcontractors where detailed labor and productivity estimates are required.

Our estimating experience includes:

- Conceptual estimates (factored or scale-up).
- Definitive cost prior to construction document issue.

- Construction check estimates.
- Contractor change order review.

Scheduling

We have in-house schedulers who are responsible for working with the project team to develop schedules of increasing details as required by the project. We use computer based project scheduling software, primarily Primavera. Our scheduling capabilities include:

- Major project milestone schedules.
- Resource Loaded Detailed Schedules
- Critical path definition
- Bar chart reports
- Labor and resource reporting and allocation

Construction / Design-Build

Burns & McDonnell has a centralized construction group that provides construction services to all the Burns & McDonnell engineering global practices. This centralized group allows for a uniform approach to our construction and construction management. For this particular project, our internal Construction/Design/Build organization will provide only support as required for our construction partner, Kiewit.

Technical Capabilities

The Energy Practice and the Process & Industrial Global Practice has been providing our clients with design solutions for more than 100 years. Burns & McDonnell has built a reputation by providing outstanding engineering design and predictable project results in the electric utility and refining industry. The benefits of our experience are highlighted in the following items.

Strong Process Capabilities

Many of our assignments deal with unusual, unique processes and challenges. Our process staff is skilled in applying engineering and unit operations principles to solve problems.

We have considerable experience in the following areas:

- Hydrotreating
- Hydrocracking
- Crude/vacuum distillation
- Isomerization
- Reforming
- Gas Processing / Treating
- Coking
- Sulfur Recovery
- Amine Systems
- Sour Water Stripping
- Gasification
- Tailgas Treating
- Flare Systems
- Flare Gas Recovery
- Steam Generation
- Electrical Distribution
- Water Treatment
- Nitrogen Oxide Reduction
- DCS Control Systems
- Utilities

We understand the importance of proper equipment design and selection to meet the design process conditions.

Strong Power Generation Capabilities

We have served the utility industry with new generation and retrofit

We have considerable experience in the following areas:

- Project Development
- New Generation – Coal Fired
- New Generation – Gas Fired
- Gasification/IGCC
- Cycle Optimization
- Wet/dry scrubbers
- Mercury/Particulate removal
- Selective Catalytic Reduction
- Water Treatment
- Combustion Improvements
- Controls Systems
- Electrical Systems
- CO₂ Mitigation
- Permitting
- Electrical Distribution
- Water Treatment
- Nitrogen Oxide Reduction
- Project Management
- Scheduling

We understand the importance of proper equipment design and selection to meet the design process conditions.

Detailed Design Capabilities

Burns & McDonnell is a full-service multi-discipline Engineering, Procurement and Construction (EPC) firm, which executes all facets of plant design. Our discipline capabilities include:

- Process Design
- Equipment Specifications
- Plant Layout
- Piping Design
- Civil/Structural/Architectural Design
- HVAC Design
- Mechanical Systems Design
- Plumbing Design
- Fire Protection and Fire Proofing Design Basis

- Electrical Design
- Controls/Instruments System Design
- Project Coordination
- Project Execution Planning

Our detailed design capabilities are further enhanced by our use of various tools and software packages which (amongst others) include:

- SmartPlant
- PDS 3-D design software
- Laser Scanning for Revamp Projects
- Microstation
- AutoCAD
- SmartPlant P&ID
- InTools
- PIP Standards and Specifications
- CF Design (Computational Fluid Dynamic Modeling Software)
- Autodesk Inventor

In-Plant Experience

Our engineers travel to the jobsite. Having spent a significant amount of time in various processing facilities, our engineers can efficiently gathered equipment data and develop as-built drawings as the first step in debottlenecking projects for many plants. Interviewing plant operations and maintenance personnel and studying plant operating data allow us to more effectively complete the projects we undertake.

Team Concept

We prefer to work as an extension of your staff—to work with your staff toward a common goal. Burns & McDonnell engineers get personally involved with and take pride in every project we do. Your goals and objectives are our goals and objectives because we work together as a team. The team concept is an integral part of the Burns & McDonnell project approach.

Leveraging Past Work

For this project, Burns & McDonnell has some distinct advantages ... we've already been working on your project. B&M completed the original Front End Planning document for Taylorville Energy Center. In addition, we have discussed our recent work with Cash Creek Generation, LLC and how, with agreements in place, we could utilize the work that we have completed for that project to advantage all parties involved in Cash Creek and Taylorville. To the extent that Burns & McDonnell can help facilitate discussions between Tenaska, Green Rock, and Cash Creek Generation, LLC we would volunteer our services to that end.

In addition to the above two projects, B&M has outlined below past gasification and related projects that have formed the backbone of our gasification experience and thus our qualifications to proceed with this project.

Gasification Technologies Council

Burns & McDonnell is a very active member in a number of organizations supporting the process and power generation industries, including the Gasification Technologies Council.



Gasification Experience

Over the last several years, Burns & McDonnell has been a leader in the United States in the development, design, and technical evaluations for gasification and IGCC facilities. During this period, interest in IGCC technology has increased dramatically. Burns & McDonnell has remained on the forefront of IGCC development and design, as demonstrated by our IGCC and gasification experience described below.

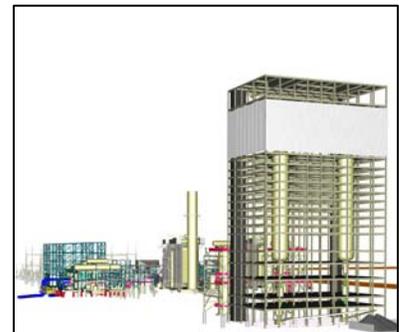
Cash Creek Energy Center, Coal to SNG Facility, The ERORA Group and Cash Creek Generation, LLC; Current and Ongoing

Burns & McDonnell has been selected as the Project Engineer for the development and implementation of a Coal to Substitute Natural Gas (SNG) facility located in the State of Kentucky. Burns & McDonnell is currently responsible for the overall engineering effort to support the project development including the Front End Planning (FEP) Level 3 (or FEED) study. Burns & McDonnell has also subcontracted the construction related portions of the study to Kiewit. Kiewit will be performing the construction for the project. Burns & McDonnell's scope includes the preparation of all engineering deliverables to support an EPC level project estimate to be utilized by the Client to obtain all permits, and financing. Burns & McDonnell is also assisting the Client in the acquisition and execution of the project technology license agreements. Burns & McDonnell will serve as the Project Engineer throughout the implementation of the project up to commercial operation.



Taylorville Energy Center, Tenaska/The ERORA Group, Current and Ongoing

In 2005/2006, Burns & McDonnell served as the Project Engineer on The ERORA Group's nominal 600 MW IGCC / chemicals co-production facility located in southern Illinois. Burns & McDonnell was responsible for the overall engineering effort to support the project development and FEED design. The facility is based on the GE gasification technology. Burns & McDonnell responsibilities have included technical assistance, cost estimating, and systems design, including the preparation of Piping & Instrument Diagrams, one-line diagrams, overall plant layout drawings, process flow diagrams, and technical and commercial specifications. The FEED package was completed in late 2006. Since completion of the FEED package, Burns & McDonnell has provided technical and consulting support to The ERORA Group and Tenaska (current managing partner) reviewing path forward for the project.



Confidential Client, 150 MW IGCC, Current and Ongoing

Burns & McDonnell is currently performing Front End Planning (FEP) Level 2 study (Pre-FEED) for a nominal 150MW IGCC facility to be located in the State of Pennsylvania. The project is a mine mouth facility, and will utilize an air-blown fixed bed gasification process, including all gas cleanup technologies, and a 1x1 syngas fired combined cycle. Burns & McDonnell's responsibilities include the development of Process Flow Diagrams, Heat and Material Balances, site permitting data, site plan, and capital and operations and maintenance cost estimates. For this project, Burns & McDonnell is reviewing a confidential alternative gasification technology for project feasibility.

Confidential Client, Coal to Gasoline, Current and Ongoing

Burns & McDonnell is currently finalizing an FEP Level 1 study for a nominal 10,000 barrel per day Coal-to-Gasoline facility. The project is a mine mouth facility located in the State of Kentucky. The project will utilize local coal to create methanol, which is then converted to an ultra-low sulfur gasoline product. Burns & McDonnell has performed the conceptual engineering including, site plan, process design, and cost estimating.

Homeland Energy Solutions, Current and Ongoing

Homeland Energy Solutions plans to construct a 100 million gallon per year ethanol plant in New Hampton, Iowa, USA. Burns and McDonnell is currently performing an FEP-2 level feasibility study for utilizing the EPIC coal gasification technology to provide the fuel for the ethanol process. Burns and McDonnell has performed a FEP Level 2 feasibility study for facility utilizing coal gasification technology to provide the fuel for the ethanol process. Burns & McDonnell is currently negotiating with HES to perform the engineering, procurement, and construction of the facility. Construction is expected to begin upon financial closure of the facility, anticipated by 3Q 2010.

Process Energy Solutions, 2006

BMcD conducted a FEL1+ Study for PES to evaluate the cost to restart the El Dorado Gasifier and modify the unit to produce hydrogen for use in the refinery. The existing configuration was to power a co-generation unit with the syngas. The new configuration included the following modifications:

- Addition of a new Air Compressor to replace the original Air Separation Unit (ASU) feed from the co-generation unit combustion turbine.
- Addition of a new ASU to supply additional oxygen for sale to the refinery.
- Modifications to the coke grinding system to improve operation
- Addition of a new sour Shift Unit
- Addition of a new Acid Gas Removal Unit (AGRU)
- Restart of an existing PSA unit

BMcD performed the process design for the sour Shift Unit. We evaluated several AGRU technologies including Selexol, MDEA, Shell Paques, and others. The effort included the evaluation of process and utility requirements for each system. Tie-in reviews, equipment layouts and rack studies were done to provide a +/- 35% estimate.

Synthetic Natural Gas (SNG) Facility Conceptual Engineering, Confidential Client, 2006

Burns & McDonnell provided conceptual engineering services for a Coal-to-SNG facility. Burns & McDonnell was responsible for development of the SNG process and process simulation. Burns & McDonnell was also responsible for preparation of the process flow diagrams, heat and mass balances, preliminary one-line diagrams, utility summaries, and technical performance specifications.

Gasifier Expansion, Coffeyville Gasification Plant, Coffeyville Resources Nitrogen Fertilizers, LLC, Current and Ongoing

The Coffeyville Coke Gasification to Ammonia Plant gasifies 1,100 tons per day (TPD) of petroleum coke. The gasifier produces 75 million cubic feet of hydrogen, which is then converted to 1,100 TPD of ammonia. Burns & McDonnell is currently designing an expansion of the gasification process to increase production capacity at the plant, which is located in Coffeyville, Kansas. Construction has been completed. Burns & McDonnell continues to consult for Coffeyville on various plant improvement projects.



IGCC Feasibility Study, 600MW IGCC, EPRI / CPS Energy, 2006

Burns & McDonnell is currently performing a technical feasibility study of a 600MW IGCC facility utilizing Powder River Basin coal as a feedstock. The project is based on the Shell gasification technology. Burns & McDonnell is responsible for the conceptual engineering, process modeling, cost estimating, and report preparation.

IGCC and Solid Fuel-Fired Siting Study, Wisconsin Public Service and Wisconsin Power & Light, 2005

Burns & McDonnell provided development services to perform a siting assessment to identify feasible sites for installation of a base load generation facility. Potential sites were identified that could support a solid fuel-fired PC unit or an IGCC facility. Development services included site selection, fuel delivery analysis, environmental assessment, preliminary water supply analysis, and transmission load flow analysis and interconnection assistance.

550 MW IGCC Assessment, Minnesota Power, 2004-2005

Burns & McDonnell was retained by Minnesota Power to provide a conceptual design and screening level cost estimate for a 2x1 550 MW GE 7FA IGCC plant to be located in Minnesota. In addition to a capital cost estimate, Burns & McDonnell prepared a site plan, electric one-line diagram, water mass balance, and emissions estimates for the facility.

On-Time Reliability Upgrades, H2 and CO Production Facility, Singapore Syngas, 2001

Singapore Syngas' H₂ and CO production facility utilizes Visbreaker Tar as a feedstock with a GE 600TPD gasifier to produce chemicals. Burns & McDonnell provided mechanical and process design engineering services to the chemical production facility to improve overall on-time reliability.



IGCC Project Development, Confidential Client, Ongoing

Burns & McDonnell is completing IGCC project development activities for a confidential client that is developing two alternative IGCC facilities. Development services include site assessments, conceptual engineering, initial feasibility studies, capital and performance estimates, transmission interconnection analyses, and environmental reviews.

Technology Assessments

Burns & McDonnell has completed technology assessments for gasification facilities for over twenty other clients.

Refining Project Summaries

ConocoPhillips, Low Sulfur Gasoline *Ponca City, OK*



Burns & McDonnell was contracted by ConocoPhillips to provide engineering, procurement, and construction (EPC) services for the OSBL part of the Clean Fuels project at the Ponca City Refinery. The OSBL side of the project consisted of an Isom unit, utility upgrades, all process piping tie-ins to the existing refinery, pipe rack modifications, process unit revamps, electrical, controls and instrumentation that will occur outside the main process unit. In addition, Burns & McDonnell was also contracted to construct the ISBL for this project. The ISBL portion of the project consisted of a 45,000 BPSD Axens' Prime G+ technology and a 20MM SCFD Hydrogen Plant.

Burns & McDonnell was responsible for the FEP-3 and definitive cost estimate of the OSBL for AFE approval. Burns & McDonnell worked with operations personnel to collect field data for pipe routing and pipe rack modifications. Burns & McDonnell personnel were assigned to the field for this effort. The data collected was used to put better define the offsites work and to develop a definitive cost estimate for the OSBL work. Burns & McDonnell completed the construction for both the OSBL and ISBL portions of the project using a multiple subcontract approach. Burns & McDonnell developed defined bid packages.

ConocoPhillips, OSBL Low Sulfur Gasoline *Lake Charles, LA*



Burns & McDonnell was contracted to provide FEP engineering and EPC services for the OSBL and ISBL portion of the LSG project at ConocoPhillips' Lake Charles Refinery. Burns & McDonnell's refinery experienced project team was sent to the site to help develop Front-End Loading definition for the offsites and tie-in locations to the existing refinery. The project consisted of interconnecting piping, a new storage sphere, new piperacks, tie-ins and a new air compressor. A definitive cost estimate was provided at the end of FEP-3 for use in the AFE approval process and as the basis for the EPC contract.

Burns & McDonnell was also contracted to construct the ISBL portion of the project. The ISBL consisted of ConocoPhillips' SZorb technology and is the largest SZorb unit in the refining industry. All construction was completed utilizing a multiple subcontract approach.

ConocoPhillips, Ultra Low Sulfur Diesel *Ponca City, OK*

Burns & McDonnell was awarded the FEP engineering and EPC services for the OSBL portion of the ULSD project at ConocoPhillips' Ponca City refinery. Burns & McDonnell placed process engineers on-site to help develop the OSBL portion of the



project. The OSBL included two hydrotreater revamps (33,000 BPD Diesel Hydrotreater and a 15,000 BPD Kerosene Hydrotreater), modifications to the tank farm, interconnecting piping and upgrades to utility systems. At the end of the FEP phase of the project, Burns & McDonnell completed a definitive cost estimate for use in the AFE approval process. The construction of the hydrotreater revamps are being completed during planned turnarounds. Burns & McDonnell is responsible for planning and execution of the capital project portion of the turnaround.

Burns & McDonnell was also contracted to construct the ISBL portion of the project. The ISBL consisted of a new diesel hydrotreater and related equipment. All construction will be utilizing a multiple lump-sum subcontract approach.

ConocoPhillips, Coker/VDU Project

Borger, TX



Burns & McDonnell was contracted to provide FEP and EPC services for the Balance of Plant portion of the Coker/Vacuum Distillation Unit project at the Borger Refinery. The installation of a new coker/VDU at the refinery requires extensive reconfiguration of the refinery for the new coker.

Burns & McDonnell was contracted to provide process engineering services related to development of the reconfiguration process designs during front-end project planning. This reconfiguration will include revamps of an atmospheric resid desulfurization (ARDS) unit, gas plants on two FCC units, interconnecting piping, extensive electrical infrastructure work, installation of a Hydrogen plant, site preparation work, installation of new make-up compressors, HF alkylation revamp and other work. Burns & McDonnell process engineers were onsite for over six months during the FEP stage of this project.

Cost estimates and scope documents were developed for the AFE approval process and were the basis for the EPC contract. Burns & McDonnell completed the Balance of Plant project with an excellent safety record. The project started-up on-time and within budget. A multiple lump-sum subcontract approach will be utilized for the construction of the project.

Sinclair Oil, Sulfur Block

Tulsa, OK

Burns & McDonnell was hired to provide FEP and EPC services for the installation of a new SRU, TGTU, and revamps of related units including the Sour Water Stripper unit, Amine Regenerator Unit, and a FCC Gas Absorber at the Tulsa Refinery. The work included FEP activities such as definition development, analysis of sulfur technologies, and estimate development. The SRU will be modularized and installed at the site. Burns & McDonnell process engineers helped develop the specification for the technology providers' and the modular bids.

ConocoPhillips, ULSD

Borger, TX

Burns & McDonnell has been contracted to provide FEP engineering services for the OSBL portion of the ULSD project at ConocoPhillips' Borger Refinery. We have provided a project team on-site to provide definition and scope of work services. The offsites include interconnecting piping, water treatment, tank farm upgrades, and utility modifications. Cost estimates and scope documents will be prepared as deliverables for this project.



Suncor, Sour Water Stripper

Denver, CO

Burns & McDonnell provided engineering services for the ULSD project at the Denver refinery for Suncor. As part of this project, Burns & McDonnell process engineers studied and reviewed the existing sour water stripper. This evaluation included review of existing equipment and gas flows and composition. Burns & McDonnell has completed the FEP3 portion of the project.

Texas Petrochemicals, LP, Boiler Replacement



Burns & McDonnell was retained by Texas Petrochemicals (TPC) to perform FEP-3 and EPC services for a Powerhouse NO_x Reduction project. The project was required to meet 2004 Houston area emission limits. The scope included the preliminary engineering and development of a definitive cost estimate for the demolition of an existing boiler and the installation of two new package boilers (250,000 pph each, 750 psig/SH), new feedwater equipment, a Continuous Emission Monitoring systems (CEMs), provisions for the addition of a future SCR, as well as an extensive upgrade of the existing Honeywell DCS. The boilers are to utilize the latest Ultra Low NO_x technology firing a varying refinery fuel gas stream resulting in emission rates of less than 0.02 lb NO_x/MMBtu.

The boilers will be controlled from a Honeywell HPM system, including a Fail Safe Controller (FSC) burner management system.

Flint Hills Resources, Boiler Replacement

Corpus Christi, TX

Burns & McDonnell was retained by Texas Petrochemicals (TPC) to perform FEP-3 for a Powerhouse NO_x Reduction project. The project was required to meet 2004 Houston area emission limits. The scope included the preliminary engineering and development of a definitive cost estimate for the demolition of an existing boiler and the installation of two new package boilers (250,000 pph each, 750 psig/SH), new feedwater equipment, a Continuous Emission Monitoring systems (CEMs), provisions for the addition of a future SCR, as well as an extensive upgrade of the existing Honeywell DCS. The boilers utilize the latest Ultra Low NO_x technology firing a varying refinery fuel gas stream resulting in emission rates of less than 0.02 lb NO_x/MMBtu. The boilers will be controlled from a Honeywell HPM system, including a Fail Safe Controller (FSC) burner management system.

Sunoco, Hydrocracker Conversion

Philadelphia, PA

Sunoco contracted Burns & McDonnell to provide front-end project planning, field inspection, procurement, and construction management services for a hydrocracker conversion project. Burns & McDonnell process engineers analyzed and developed the flow sheets for the conversion of the hydrocracker to an Ultra Low Sulfur Diesel unit. Burns & McDonnell field personnel hired and managed subcontractors to inspect the hydrocracker unit equipment to determine its viability in a new service. After inspection and process design, Burns & McDonnell providing FEP cost estimates to allow Sunoco to perform economic evaluations for the project. Burns & McDonnell helped procure long lead equipment and materials to support the overall schedule. Burns & McDonnell will provided detail engineering and construction services to complete the project.

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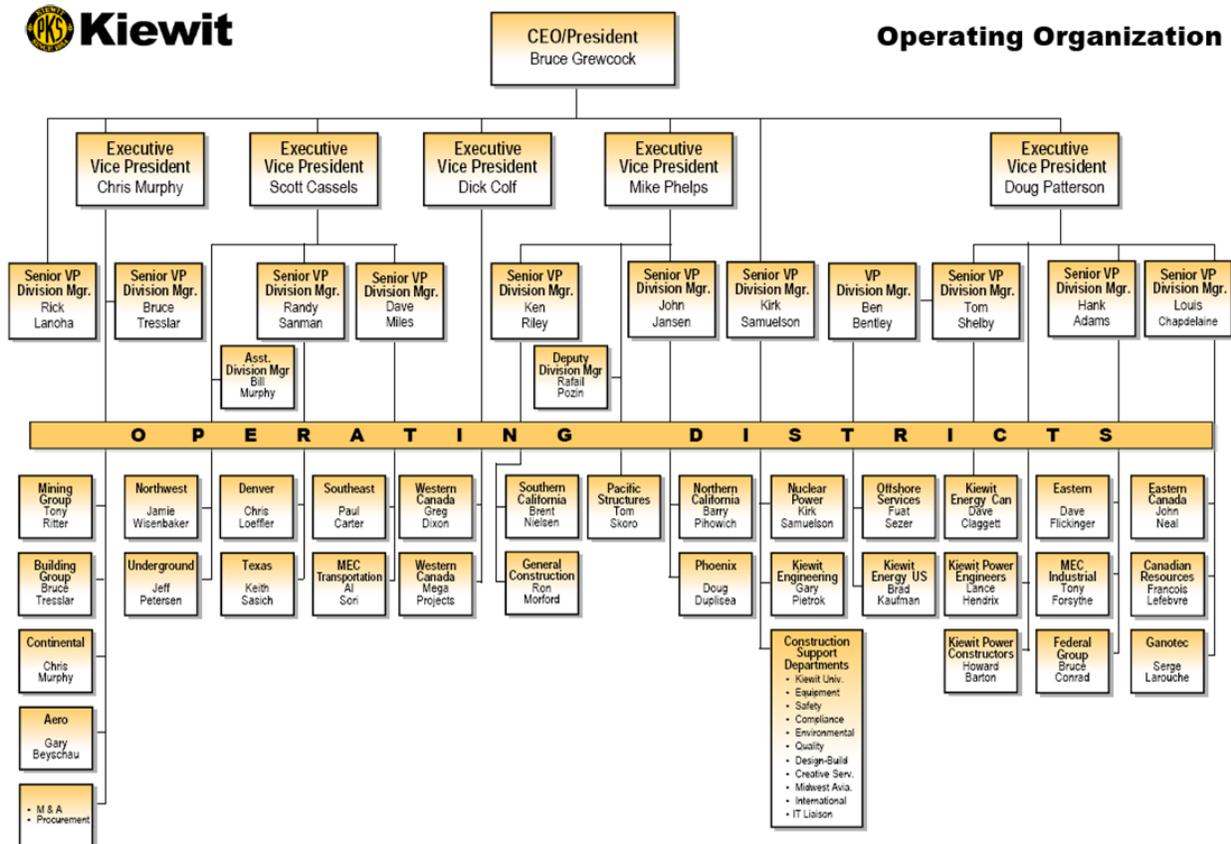
Company Overview

Energy Group Capabilities and Experience

- Energy
- Module Fabrication
- Power

Company Overview

Clients have been counting on Kiewit since 1884 and we've always delivered. While other contractors have come and gone, we've evolved into one of the largest and most respected construction organizations in North America. With no long-term debt, our strong balance sheet offers clients the assurance their projects will get done.



10/01/08

Kiewit Corporate Information

- More than \$6.2 billion 2007 revenue
 - 92% construction
 - 8% mining
- Over \$12 billion in backlog
- 6,500 staff employees August, 2008
- 38 million direct construction man-hours performed in 2007
- Over 1,000,000 engineering man-hours managed on EPC projects in 2007
- Largest, most modern equipment fleet in North America
- Employee-owned, Kiewit has on the most highly motivated staffs in the industry
- Headquarters in Omaha, Nebraska; 77 district and area offices throughout the US and Canada, including Illinois.

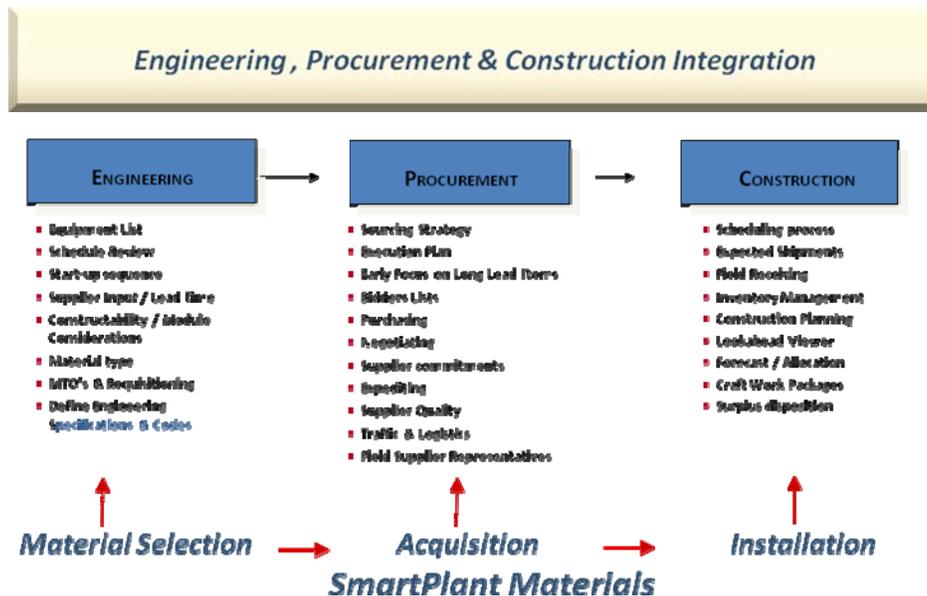
Kiewit Safety Statistics

Kiewit has a robust safety program with proactive participation by all levels of management, staff, and craft to identify potential issues and avoid accidents. The company’s mantra is that all accidents are preventable and everyone goes home safe every night. The following statistics reflect the company’s devotion to the safe planning and execution of work.

Metric	2006	2007	2008
Experience Modifier Ratio	0.57	0.57	0.57
Recordable Cases / Rate	7 ea / 0.91	14 ea / 1.06	3 ea / 0.99
Restricted Work Activity Cases / Rate	6 ea / 0.78	6 ea / 0.45	0 ea / 0
Lost Workday Cases / Rate	2 ea / 0.26	2 ea / 0.15	0 ea / 0
Fatalities / Rate	0 ea / 0	0 ea / 0	0 ea / 0
Recordable Incident Rate	0.91	1.06	0.99
Total Workhours	1,541,007	2,548,548	604,578

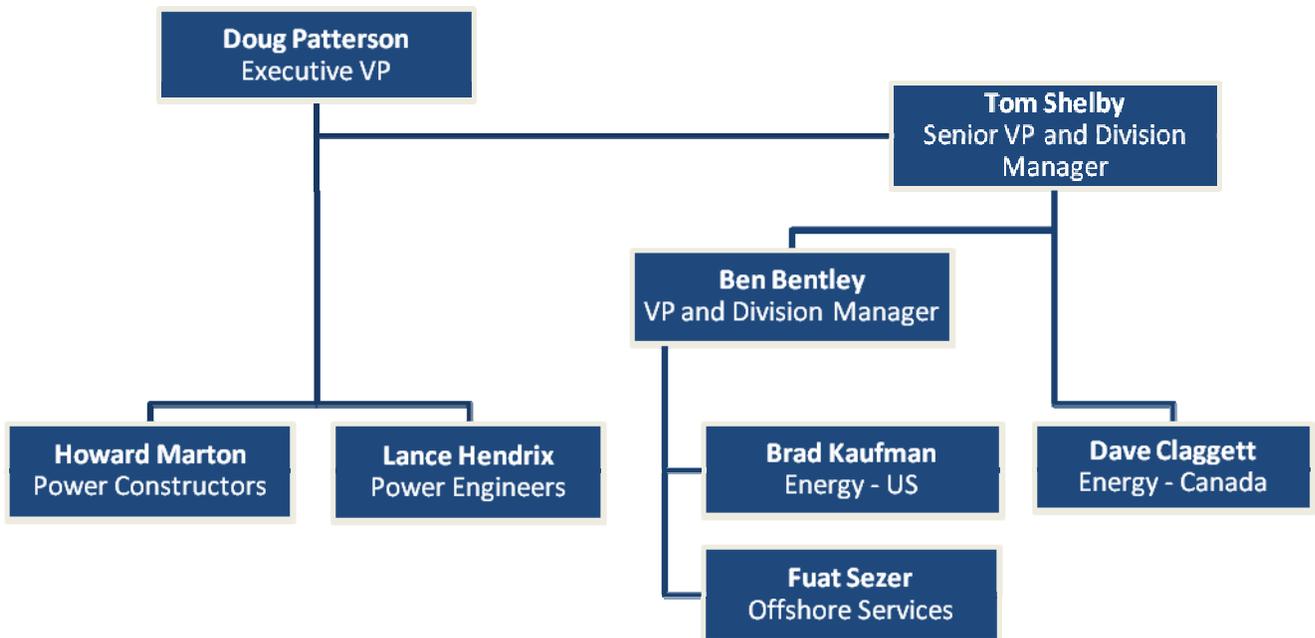
Supply Chain Management

Kiewit has a highly experience group of supply chain management professionals skilled at international and North American sourcing and procurement. They manage all engineered equipment and bulk materials acquisition from the point they are identified as requirements until they are issued to the construction supervisors.



Energy Group Capabilities

Kiewit Energy Group, Inc., a Kiewit Corporation subsidiary, is comprised of Kiewit Energy, Kiewit Power Constructors, Kiewit Offshore Services, and Kiewit Power Engineers. With a “right the first time” quality objective, Kiewit Energy Group, Inc. has become an industry leader in EPC and has gained extensive experience in the oil, gas, industrial and power industries. Our office and facility locations span the United States and Canada, making us well-equipped to handle jobs of any size at nearly any North American location. Our world-class fabrication facility in Ingleside, Texas includes a 400-acre yard with 2,800 linear feet of continuous pile-founded bulkhead. Our water depth of 45 feet and a 77-foot hole allows for successful offloading of large floating structures. We are proud owners of a significant fleet of heavy lift cranes and equipment, including the heavy lift device, which is unmatched in lifting capability.



Energy

Kiewit Energy is located in Houston, Texas to serve the process industries. With boots on the ground in Illinois and throughout North America, Kiewit is focused on building quality projects safely, on time and on budget; no matter how challenging or unique the project, no matter how large or small. Kiewit has three decades of EPC and design-build project experience in capital projects markets including oil sands, refining, bio-fuels, industrial gases, oil & gas processing, gasification, and LNG. Kiewit has a proven track record of success with an execution model based on:

- An integrated, EPC team co-located at the engineer’s offices
- Direct perform construction
- Risk sharing commercial model

Horizon Sulfur Recover Project

Location: Ft. McMurray, Alberta, Canada
Contractor: KAPEC (a Kiewit-APEC partnership)
Engineering/Construction Manager: KAPEC (a Kiewit-APEC partnership)
Client: Canadian Natural Resources, Ltd.
Contract Approach: EPC Fixed Price
Approximate Contract Value: \$ 500 million
Date of Award: December 2004
Contract Completion Date: 2008
Project Description: 800 TPD gas treating and sulfur plant sour water stripper, amine, sulfur recovery and degassing, SCOT tail gas, incinerator, stack and common utilities. This project requires the fabrication of 117 modules: 43 piperack modules, 15 electrical modules, and 59 equipment and skid modules.



Pine Bend Refinery Phase II

Location: Eagan, Minnesota
Contractor: Kiewit Energy District
Engineering/Construction Manager: Jacobs Engineering
Client: Flint Hills Resources, Inc.
Contract Approach: Construct Only
Approximate Contract Value: \$57 million
Date of Award: March 2005
Contract Completion Date: April 2006
Project Description: Major mechanical work for new diesel hydrocracker unit that included setting and installation of 128 pieces of equipment, 86,000 linear feet of pipe, and 900 tons of structural steel. At peak, the project employed approximately 500 personnel.



Mount Vernon Ethanol

Location: Mount Vernon, Indiana
Contractor: Kiewit
Client: Aventine Renewable Energy, Inc.
Contract Approach: EPC Fixed Price
Approximate Contract Value: \$230 million
Date of Award: September 2007
Contract Completion Date: Under Construction
Project Description: Engineering, procurement, and construction of a 113-million-gallon-per-year denatured fuel grade ethanol facility utilizing Delta-T proprietary process technology.



Christina Lake SAGD Phase II

Location: Christina Lake, Alberta, Canada
Owner: MEG Energy Corp.
Contract Value: \$600,000,000
Contract Approach: EPC Reimbursable
Completion Date: Under Construction
Project Description: Design and construction of a 22,000 BPD oil sands extraction facility. Second phase of a multi-phase project.



Pekin Ethanol

Location: Pekin, Illinois
Engineer/Construction Manager/Contractor: Fagen Inc.
Client: Confidential
Contract Approach: Reimbursable/Lump Sum
Approximate Contract Value: Confidential
Completion Date: December 2006
Project Description: Construction and equipment procurement of a 50 million gallon per year ethanol distillation facility utilizing proprietary process technology



Rochelle Ethanol

Location: Rochelle, Illinois
Engineer/Construction Manager/Contractor: Fagen Inc.
Client: Confidential
Contract Approach: Reimbursable/Lump Sum
Approximate Contract Value: Confidential
Completion Date: December 2006
Project Description: Construction and equipment procurement of a 50 million gallon per year ethanol distillation facility utilizing proprietary process technology



Gasification Experience

- Cash Creek Generation – A coal to substitute natural gas plant co-located with a 2 on 1 combined cycle power plant in Henderson County, Kentucky. Privately financed project developed by the ERORA Group, a subsidiary of Green Rock Energy. Pre-NTP scope of work involves planning, constructability reviews, logistics survey, pre-project labor negotiations, procurement planning, detailed construction schedule and detailed estimate. Planned Kiewit scope of work and responsibilities for the detail engineering, procurement and construction phase of the program includes Kiewit providing program management, engineering, procurement, and construction services.
- Rentech REMC Feedstock Conversion Project—Project Development, Licensor Selection, FEED and Estimate, Constructability, Power Island and Coal Handling planning, development of Project Execution Plan. This project entailed the Conversion of Ammonia Facility to Coal Gasification in East Dubuque, Illinois.
- Great Plains Coal Gasification Project (now Dakota Gasification Company) Beulah, ND; Kiewit constructed the main pipe rack; approximately 2,000 feet long (see image)
- Jim Bridger Integrated Gasification Combined Cycle (IGCC) Project, a PacifiCorp “Mouth of Mine” coal gasification project development in Wyoming---Conceptual Planning, Constructability and Feasibility Estimate. The work included determination of costs for remote jobsite and high altitude coal gasification facility.
- Kiewit serves on the Gasification Technology Council board and has been a member of GTC since 2006.



Module Fabrication

Ingleside, Texas

- FEED support
- Constructability studies
- Fabrication services
 - Process, oil & gas, and gasification industry modules
 - Offshore platforms and jackets
 - Hook-up and commissioning
 - Subsea templates, piles, and assemblies
 - Drill rig and maintenance
 - Bridge and marine facility components
- Kiewit wholly owns the fabrication facility in Ingleside, TX
- Over 400 acres of property, 350 acres developed
- Versatility in services offered (plant modules, offshore platforms, bridgework)
- Heavy Lifting Device with 13,000 ton lifting capability
- Large-capacity plate-bending (rolling) machine
- Heavy lift crane fleet
- Modular trailers at 1,400 tons
- Strong manufacturing and heavy lift engineering expertise
- Heavy haul and barge transport logistics specialists



Modules



Bullwinkle



Independence Hub



Marco Polo



Thunder Horse



XBR

Power

Kiewit Power Constructors Co. specializes in large integrated industrial, mechanical and electrical projects. Our experience began in 1951 with the award of several U.S. Army Corps of Engineers contracts to construct facilities in the harsh climate of Northern Greenland. From our early exposure to mechanical and electrical work, we expanded to build major power and mechanical process facilities. We have built nuclear and fossil fueled, simple and combined-cycle gas turbine, waste-to-energy and geothermal power projects; natural gas compressor stations; oil and process facilities; nuclear fuel process facilities; water and waste water treatment plants; and many other power and heavy industrial facilities throughout the United States, Canada and the Philippines.

Power Experience – Total Installed Capacity

3,300 MW Coal Projects
 12,000 MW Gas Projects
 2,300 MW AQCS Projects

Award-winning Power Projects



High Desert Power Project – PCU/ER Magazine Plant of the Year



**Palomar Energy Project – Combined Cycle Journal Pacesetter Plant Award
 Environmental Protection Magazine Facility of the Year
 Honorable Mention
 Adobe Success Story**



Los Medanos Energy Center – PCU/ER Magazine Top Plants



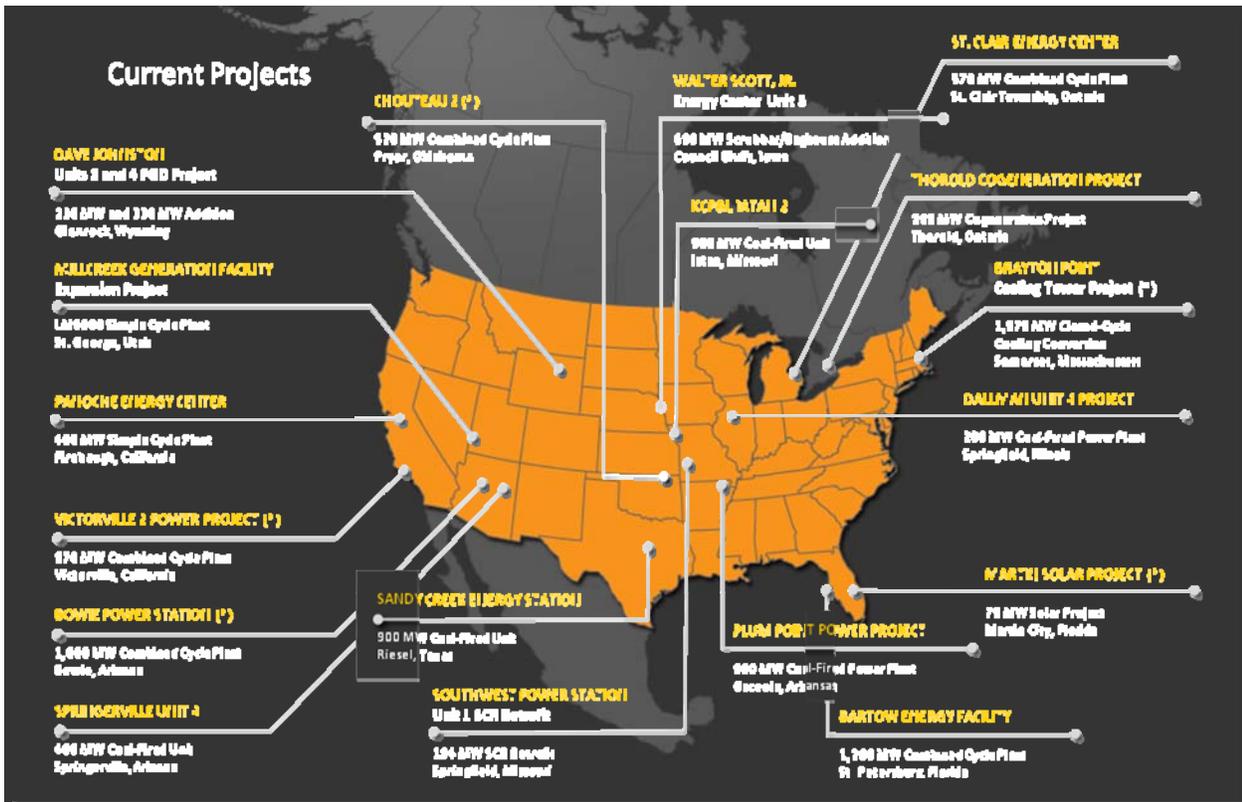
LADWP Haynes Repowering Project – Los Angeles Council of Engineers & Scientists Project Achievement Award



Tenaska Virginia Power Project – DBIA-MAAC 2005 Best Project Industrial/Process Sector Over \$25 Million, PCU/ER Magazine Top Plants



Magnolia Power Project – PCU/ER Magazine Plant of the Year



Full scope of services

- Conceptual space studies
- Detailed scope and cost estimating
- Detailed design
- Procurement
- Construction
- Startup / commissioning
- All market segments
 - Gas-fired, coal-fired, air quality control systems, nuclear, renewables, transmission/substations

With extensive resources that include talented people, in-depth market knowledge, state-of-the-art equipment and unparalleled experience, Kiewit Power Constructors is uniquely qualified to handle any size project.

Engineering Capabilities

Our team works closely with energy industry clients to provide them with complete engineering services unique to each project's specifications. These award-winning services range in magnitude from small scale owner's engineer studies to full scope EPC joint venture project developments and projects. As a wholly owned subsidiary of the Kiewit Corporation, Kiewit Power Engineers Co. can handle any project, regardless of size, with the same personal touch on which our company was founded years ago. We remain committed to quality and excellence as we continue to satisfy the energy needs of clients throughout the U.S. and Canada.

Looking ahead, the future of the energy market is constantly changing. The unstable price of natural gas and the focus on global warming are moving the market toward new technologies. Our commitment to innovation means we're staying on top of those technologies, continuing to be big enough to work on a variety of projects but small enough to give our clients and their projects the attention they deserve.

- Excellent “production design engineering” capabilities
- Integration with Kiewit
 - Constructability
 - Focus on project execution (schedule and cost performance)
- Excellent power resume
- Engineering for “minimal project Total Installed Cost (TIC)”
- Quality program
 - Lessons learned database
 - Quality incident rate/quality incident cost tracking
- Estimating
- Schedule certainty achieved through rigorous to detail
- Track record of successes working collaboratively with customers to achieve price certainty.



Project Schedule Development

- Key milestones and logic from Planning Sessions used to develop initial detailed Level 3 Project Schedule
- Project schedule resource loaded using production rates included in the estimate
- Schedule leveled to eliminate manpower peaks without affecting critical path activities
- Area superintendents use Project Schedule to develop their 90-day schedules for crew and equipment planning
- 90-day schedules used to develop a more detailed 3-week look ahead
- 3-week look ahead feeds the Plan of the Day
- Everything is tied back to the master Project Schedule

Schedule Certainty

This table illustrates Kiewit's track record completing power projects on schedule.

Project	EPC Scope	Guaranteed COD	Actual COD	Days early (late)	% complete
CWLP	200 MW PC	May, 2010	Dec., 2009*	150	58%
NC2	660 MW PC	May, 2009	Jan., 2009*	90	80%
Plum Point	660 MW PC	April, 2010	Jan., 2010*	90	20%
Louisa	700 MW AQS	Dec., 2007	Dec., 2007*	0	95%
CB3	700 MW AQS	April, 2009	Feb., 2009*	60	16%
Lindsay Hill	840 MW CC	June, 2002	June, 2002	0	100%
Fredrickson	248 MW CC	Aug., 2002	Aug., 2002	0	100%
Palomar	500 MW CC	April, 2006	March, 2006	30	100%
Greater Des Moines	540 MW CC	March, 2005	Dec., 2004	74	100%
Fluvanna	890 MW CC	July, 2004	April, 2004	68	100%
Valley	500 MW CC	March, 2004	March, 2004	15	100%
High Desert	840 MW CC	July, 2003	April, 2003	70	100%

* Expected Completion Dates

Cost Control

- Kiewit is and has been historically a “hard money” contractor, so we are razor-focused in managing costs within budget which is critical for the customer’s and our success
- Success in controlling cost starts with a solid, quantity-based estimate, using real past costs and verified with an independent second estimate
- Knowing their daily costs is a condition of employment for our foreman and superintendents

Price Certainty

The following table illustrates Kiewit’s track record of completing power projects on budget.

Project	EPC Scope	Bid amount	Change Orders	% of Change Order	Final Price	% complete
CWLP	200 MW PC	\$436MM	\$26.6MM	6.1%	\$463MM*	58%
NC2	660 MW PC	\$604MM	\$10.7MM	1.8%	\$615MM*	80%
Plum Point	660 MW PC	\$875MM	\$7.6MM	0.9%	\$883MM*	20%
Louisa	700 MW AQCS	\$136MM	\$2.1MM	1.5%	\$138MM*	95%
CB3	700 MW AQCS	\$180MM	\$1.7MM	0.9%	\$182MM*	16%
Lindsay Hill	840 MW CC	\$150MM	\$3.1MM	2.1%	\$153.1MM	100%
Fredrickson	248 MW CC	\$46MM	\$4.1MM	8.9%	\$50.1MM	100%
Palomar	500 MW CC	\$186MM	\$10.1MM	5.4%	\$196.1MM	100%
Greater Des Moines	540 MW CC	\$164MM	\$2.3MM	1.4%	\$166.3MM	100%
Fluvanna	890 MW CC	\$165MM	\$3.9MM	2.4%	\$168.9MM	100%
Valley	500 MW CC	\$208MM	\$13.2MM	6.3%	\$222MM	100%
High Desert	840 MW CC	\$255MM	\$13.5MM	5.3%	\$268.5MM	100%

*Estimated

Joint Work

Over the last five (5) years, Burns & McDonnell and Kiewit have worked together on projects in over ten (10) cases. This working relationship has been fostered in many different relationship arrangements:

- Kiewit EPC Contractor, B&M Owner's Engineer
- Kiewit Subcontractor role on EPC Team, B&M Owner's Engineer
- B&M Engineer, Kiewit General Contractor
- Kiewit Subcontractor to B&M
- B&M Subcontractor to Kiewit
- Joint Venture Relationship on EPC Projects

These projects have been focused on power generation, air quality control, and gasification business units. Most notably, Burns & McDonnell is currently heavy into the Pre-Finance Engineering package development as the Project Engineer for the development and implementation of a Coal to Substitute Natural Gas (SNG) facility located in the State of Kentucky. This project is owned by Cash Creek Generation, LLC Burns & McDonnell is currently responsible for the overall engineering effort to support the project development including the Front End Planning (FEP) Level 3 (or FEED)



study. Burns & McDonnell has also subcontracted the construction related portions of the study to Kiewit. Kiewit has been supporting B&M on the constructability of the facility, and will be rolling heavy into the cost estimate rollup for the project in the upcoming months. Burns & McDonnell's scope includes the preparation of all engineering deliverables to support an EPC level project estimate to be utilized by the Client to obtain all permits, and financing. Burns & McDonnell is also assisting the Client in the acquisition and execution of the project technology license agreements. It is anticipated that the Client will move forward with the project in 3Q 2009 with Burns & McDonnell and Kiewit as Joint Venture partners to complete the Engineering, Procurement, and Construction of the facility.

In addition to Cash Creek, Burns & McDonnell is the Engineer and Kiewit is the General Contractor for the 900 MW Iatan II and AQCS upgrade for Iatan I; both entities contracted directly to Kansas City Power & Light. Kiewit and Burns & McDonnell have a Joint Venture agreement in place, jointly marketing EPC air quality control projects, of which MidAmerican Energy's Louisa scrubber/baghouse project is complete, and MidAmerican Energy's Walter Scott Energy Center Unit 3 scrubber/baghouse project is under construction. In addition, Burns & McDonnell has been Owner's Engineer on a number of Kiewit EPC projects, including a combined cycle project for Sempra Generation and various coal-fired generation projects.

Pace Qualifications

REPRESENTATIVE POWER MARKET EXPERIENCE

Prepared for:

Tenaska, Inc.

September 17, 2009

INTRODUCTION

Since its founding almost 30 years ago, Pace Global Energy Services, LLC (“Pace”) has specialized in energy sector strategy and transactional support. Based in Fairfax, VA, Pace employs approximately 200 full-time professional energy consultants, including professional staff located in our platform offices in New York, Houston, Columbia, Sacramento, San Diego, London, and Moscow who provide local insight and a broadened perspective on the challenges and opportunities facing our clients. Pace clientele consist broadly of energy sector companies, financial institutions, other passive investors in the sector, energy intensive industries, regulatory bodies and other government institutions charged with energy sector oversight.

We offer strategic, market, tactical implementation, and transactional support across the fuels, electric power, energy management, finance, and risk management sectors. As an independent source of energy expertise, Pace serves as an objective outsourcing partner, executing transactions on behalf of our clients and protecting their energy interests.

In addition to the power market experience specifically referenced in this document, Pace has supported or is supporting power financing transactions valued at over \$5 billion. Pace isn’t able to disclose the descriptions of these transactions due to the confidentiality restrictions.

POWER MARKET ADVISORY QUALIFICATIONS

SMELTER ASSESSMENT

Pace performed a nodal market analysis of the ERCOT power market to assist client to understand the impacts to the Rockdale smelter of the ERCOT market moving from a zonal to a nodal market. Pace evaluated the implication of these developments on the value of client's power position at Rockdale and on the economic implication to smelting operation at Rockdale.

SOLAR ASSESSMENT

Pace prepared an independent power market assessment of the PJM East power market covering the period from 2009 through 2028. Pace developed reference case assumptions about future market pricing that did not include the impacts of environmental compliance costs. This was done to value the energy and capacity from a solar facility which has no compliance costs associated with its generation.

POWER MARKET ASSESSMENT - NY AND CA

Pace developed NYISO and CAISO power market assessment report. The Report provided an analysis of the main market drivers and risk factors in the California and New York power markets as well as the results of market dispatch simulations for the market. Pace provided projections of the likely range of Short Run Avoided Cost and Market Index Formula energy prices applicable to qualifying facilities in California consistent with these long-term fundamental forecasts.

CUSTOM FORECASTING SERVICE

Pace supported the client's budgeting and planning processes through customized forecasts of specific coal commodities, emission rates for 500 eastern coal plants, delivered coal prices by U.S. census region, reagent prices, and emission allowance prices in addition to Pace's quarterly Outlook service. Pace presented the forecasts and supporting assumptions to the client's staff through several on-site presentations. The forecasts took into consideration the client's views on future, environmental regulatory conditions and other concerns. Pace conducted an analysis of the Alexander-Lieberman multi-pollutant legislation that included carbon caps and stricter regulation of SO₂, NO_x, and mercury on the price of power and coal.

RISK INTEGRATED RESOURCE PLAN FOR MUNICIPAL UTILITY

Pace supported a municipal electric utility in the development of a long term Risk-Integrated Resource Plan and facilitated a stakeholder process to solicit public opinion and achieve consensus around a preferred resource planning strategy. Pace performed a complete risk analysis for fourteen distinct portfolio options, evaluating the choices through a wide range of uncertainties, including statistically derived distributions for fuel prices, power market prices, electricity demand, and capital costs; uncertainties around regulatory regimes for CO₂ compliance and emissions accounting; uncertainty around the availability of certain renewable

technologies; uncertainty around the price at which divested coal power could be sold; and analysis of the reliability of the utility's system.

COLORADO FINANCING SUPPORT

Pace provided a power market assessment for a gas-fired combined cycle power plant in Colorado. Pace's power market assessment was suitable for financing support for an existing power plant and the content of the report was referenced in a Confidential Information Memorandum.

MULTI-REGION POWER MARKET ASSESSMENT

Pace performed a power market assessment for an energy asset developer across three power markets: ERCOT, California ISO, and NYISO. As part of the assessment, Pace provided key market driver inputs and produced long term plant operational projections and pricing estimates for wholesale market values and regulated tariff rates.

PJM POWER MARKET ASSESSMENT AND DISPATCH ANALYSIS

Pace provided a market assessment and plant dispatch analysis for a waste coal developer in the western PJM market area. As part of the analysis, Pace documented key market drivers, including fuel price projections, carbon compliance cost expectations, transmission constraints, and expansion expectations. Pace developed long term energy and capacity price forecasts, as well as projected operating margins for the coal facility.

FRCC POWER MARKET ASSESSMENT

Pace was engaged by the client to advise them in developing a binding bid for the potential acquisition of a gas-fired generator in Florida. Pace provided an independent review of power market conditions and expected power prices for a 25-year horizon.

REGIONAL POWER PLANT DEVELOPMENT REVIEW

Pace reviewed the status of existing and proposed natural gas power plants in a six state region in order to support a natural gas provider. Pace prepared a review of plant capacities operating characteristics and regional locations.

SIX-REGION NORTH AMERICAN POWER MARKET ANALYSIS

Pace provided a market overview and analysis of North American power markets, including specific assessments in six geographically diverse regions. As part of the analysis, Pace provided historical data on market conditions, including historical pricing, reserve margins, demand growth, and supply mix, as well as projections for market pricing and generating technology performance.

NEW YORK AND PJM POWER MARKET AND TRANSMISSION PROJECT ANALYSIS

Pace provided an updated power market and financial analysis for a transmission developer assessing the NYISO Zone J and PJM East market areas. Pace developed and documented

key market driver assumptions for both regions, including fuel price projections, expansion unit costs, demand projections, and expectations for carbon compliance costs. Based on long term market price projections, Pace performed a discounted cash flow analysis to provide a fair market valuation of the project. Pace supported the inclusion of its analysis and market price projections into a Confidential Information Memorandum for project equity offering.

ISO NEW ENGLAND MAINE POWER MARKET ASSESSMENT

Pace provided a power market assessment of the ISONE Maine market region to support a power generation owner. As part of the assessment, Pace delivered documentation of key market drivers and risk factors and provided 20-year projections for market energy and capacity prices.

ERCOT POWER MARKET ASSESSMENT

Pace provided a summary of key ERCOT market drivers for an independent power producer looking to refinance a natural gas-fired combined cycle asset. Key drivers included load growth expectations, capacity expansion costs, transmission expansion, fuel prices, and environmental compliance costs.

MULTI-REGION POWER MARKET ASSESSMENT

Pace provided a power market assessment for a hydro asset developer across six North American power regions in order to evaluate comparative market attractiveness. As part of this assessment, Pace developed analysis on market drivers including fuel prices, load growth, capacity expansion, and environmental compliance costs. Pace provided long term energy and capacity market projections for each of the six regions.

NEW YORK AND PJM POWER MARKET AND TRANSMISSION ASSESSMENT

Pace provided power market and financial analysis and advisory support for a transmission developer assessing the NYISO Zone J and PJM East market areas. Pace developed and documented key market driver assumptions for both regions, including fuel price projections, expansion unit costs, demand projections, and expectations for carbon compliance costs. Long term power market price projections were provided for both regions. Based on the market price projections, Pace performed a discounted cash flow analysis to provide a fair market valuation of the project. Pace also conducted an analysis of the probability of an emergency curtailment event in the PJM ISO in order to assess risks to the project.

PJM CAPACITY MARKET ANALYSIS

Pace provided a long run capacity market forecast for the PJM East area within the Reliability Pricing Model structure. In addition to capacity price projections, Pace developed a report documenting market structure, market rules, key market drivers, and assumptions on the cost of new entry and reserve margin expectations.



CALIFORNIA MUNICIPAL ELECTRIC COMPANY SALES AND LOAD FORECAST

For a municipality, Pace developed long-term electric energy sales and peak demand forecasts in support of integrated resource planning analyses. Forecasts were based on econometric forecasting model developed by Pace and customized for the clients service area, as well as in-depth review of major construction and economic expansion projects in the municipality.

MID-WEST IGCC MARKET ASSESSMENT

Pace has assisted the developer of a high-profile IGCC project since its inception by providing market assessments for power, coal, and gas sectors, including estimates of project revenue and impacts of the project on retail power prices and consumer bills. These assessments have explored a wide range of potential states of the market, providing important insights to the effects of varying fuel costs, wholesale market conditions, and power plant specifications.

NATIONAL FUEL AND POWER MARKET ADVISORY SERVICES

Pace performed long term energy and capacity price projections for ten power regions throughout the United States, including markets in four NERC regions and four ISO territories. As part of its advisory support, Pace provided regional fuel market projections and national CO₂ compliance cost estimates.

CALIFORNIA POWER MARKET ASSESSMENT

Pace provided power market analysis and energy and capacity price projections for two market areas in the Western United States. These long term market projections included specific analyses of local ISO pricing tariffs, based on market indicators and expectations.

PJM POWER MARKET ASSESSMENT

Pace was hired to support the financing by providing an independent power market assessment report for a major power asset manager considering acquiring a hydroelectric facility located in the PJM market. . Pace provided energy and capacity market forecasts for two power regions - the PJM-West Hub and AEP. Downside sensitivity was performed to analyze the effect of low demand and low gas prices.

Wood Mackenzie Qualifications

Credentials Pack

Wood Mackenzie

Wood Mackenzie's reputation as one of the leading providers of high quality research to the Energy industry dates back to May 1973 when its very first North Sea Report was published. Its energy coverage now extends across 93 countries covering upstream oil and gas, oil refining and marketing, downstream gas and power generation.

With regional centres around the world, we cover all aspects of the global industry including Upstream, Downstream, LNG, Coal, Gas and Power as well as coal. We have partnered with more than 800 diverse clients around the world, in both public and private sectors, ranging from global super majors to regional service specialists.



Our competitive advantage comes from over 30 years of hands-on experience and teams of professionals drawn from a variety of backgrounds who bring with them a wealth of industry and client knowledge.

Wood Mackenzie has grown significantly in recent years and currently employs around 600 staff making it one of the largest energy research and consulting companies in the world. Whilst most staff are located at the head office in Edinburgh, Scotland, Wood Mackenzie also has offices in London, New York, Houston, Boston, Johannesburg, Moscow, Brisbane, Perth, Sydney, Tokyo, Singapore, Kuala Lumpur, Beijing and Dubai.

Coal Consulting Credentials

Wood Mackenzie has been a respected adviser to the energy industry for more than 30 years and has developed a reputation associated with quality and trust. We combine experience with knowledge of the industry to provide energy companies and financial institutions with analysis which is commercial, forward looking and value based.

Wood Mackenzie has been providing its unique range of consulting services and research products to the Energy, Metals, & Mining industries.

With our foundation in quality analysis, our detailed industry understanding and our wealth of experience, Wood Mackenzie is able to offer clients a unique skill combination that sets us apart from other solution providers.

Our market proposition is based on our ability to provide forward-looking commercial insight that enables our clients to make better business decisions.

Blending analysis with advice

Wood Mackenzie's research and consulting businesses are highly integrated and provide a full range of services to the world's leading energy companies ranging from content and analytics through to action orientated advice. By combining rigorous analysis with creative thinking we have helped the major stakeholders in the Energy business make better informed decisions.

Expert Analysis

Wood Mackenzie has more than 190 dedicated Energy professionals including a range of recognised industry leaders. The importance of maintaining quality is ingrained in the culture of the company and knowledge is valued throughout the business.

Sectors and Clients

Wood Mackenzie applies its integrated research and consulting services to the upstream oil & gas, LNG, gas & power, and downstream oil sectors. Our clients include all of the major Energy companies and leading financial services organisations.

Wood Mackenzie provides invaluable commercial analysis and strategic advice to the world's leading Energy companies. Wood Mackenzie has developed a unique and unrivalled formulation of knowledge, experience and understanding of a broad range of markets and companies. Firmly established as the market leader in its field, Wood Mackenzie's reputation has been built on the provision of high quality and innovative consultancy services and research products.

Clients throughout the world subscribe to Wood Mackenzie's research retainer services on an annual basis and can choose to have analysis delivered to their desktops via a number of media, including the Internet and CD-ROM. This 'Packaged Insight' enables our clients to reduce the risk associated with decision making and increases the productivity of key functions supporting operational and corporate decision making.

Wood Mackenzie's solutions have gained a worldwide reputation for being informed, perceptive, thorough, independent and confidential. Our commitment to quality and our detailed industry understanding makes us uniquely placed to help our clients meet the challenges which lie ahead with absolute confidence.

Wood Mackenzie's knowledge-based consulting expertise includes strategy development, market analysis, corporate and competitor analysis, public policy and regulation, valuations, benchmarking and project analysis.

The company is privileged to count amongst its clients virtually every major company in the global Energy industry, as well as Governments and Government agencies across the globe.

Woodmac Consulting

To compete effectively in a complex and dynamic industry, energy companies need strategies forged from deep knowledge, proven analytic capability and thought leadership.

Over the past 30 years, Wood Mackenzie has helped more than 800 companies grow and become more profitable. We have more than 400 analysts around the world, including specialists in all aspects of the industry.

Coal Consulting Credentials

They draw on our extensive databases, a huge resource of authoritative analysis at asset, company, country and regional level.

Our proprietary data and unique analytical tools allow our consultants to provide local insight with a global perspective. In short, it's what's behind us that keep you in front.

Our clients rely on us to anticipate how the industry is changing and guide them to remain successful.

Whether you want to evaluate investment options, mitigate risk, build partnerships or maintain investor confidence, you can trust us to help you make better decisions.



To cover the Energy market in more detail, Wood Mackenzie has joined forces with Hill & Associates and Barlow Jonker, two internationally renowned coal consultancies.

Now, our global team of experts draws on all three companies' extensive research, proprietary data and analytical tools to provide informed advice to our clients. Whether you want to evaluate investment options, mitigate risk, build partnerships or maintain investor confidence, you can trust us to help you make better decisions.

Our wide ranging consulting expertise covers four key areas.

Business Environment

We provide insight and advise clients on:

- Trends, risks and opportunities in coal markets
- Developing their existing coal portfolio
- Competing successfully in the future

Resource Monetisation

Through detailed analysis we assist clients:

- Find and value coal reserves
- Understand the market and all the commercial aspects
- Consider the transportation options and other constraints
- Bring coal to market profitably

Strategy and Process

We help clients play to their strengths and make the right decisions when:

- Entering a new market
- Evaluating investment opportunities for existing coal interests
- Introducing coal into their portfolio
- Considering corporate scenarios

Transactions Support

Clients seek our advice throughout the transaction process, for:

- Independent and thorough fair market valuations
- Commercial and technical due-diligence
- Support at all stages of negotiation
- Data-room analysis
- Independent market reports for project financing

In an increasingly competitive coal market we have helped clients gain a sustainable advantage.

Woodmac's Coal Experts

Both organisations (Barlow Jonker and Hill and Associates) are founded on proprietary supply data and high quality independent analysis. The combined expertise enhances the support we provide to our clients' commercial decision making.

The most notable characteristic of our staff is that every consultant has had considerable experience working in the coal and/or utility industries.

The educational background of the consulting staff includes a wide variety of disciplines including: business administration, geology, mining engineering, industrial engineering, chemistry, and chemical engineering. Most of the consulting staff has advanced degrees.

Like most consulting firms, we occasionally utilize other consultants for their expertise in particular areas. For example, we recently received assistance from a financial expert in the evaluation of the creditworthiness of a coal supplier bidding on a long-term coal supply contract. We also draw upon outside resources for support in the detailed programming of some models; steam and coking coal market research in Latin America, Western Europe and Eastern Europe; coal supply data for Australia, South Africa, and Indonesia; and some work on the outlook for ocean freights.

We provide research and consulting services to hundreds of clients worldwide, including from the following countries and industry sectors:

5.1. Client Countries

Australia
Bangladesh
Botswana
Brazil
Canada
Chile
Colombia
Cyprus
France
Germany
Hong Kong
India
Indonesia
Ireland
Israel
Japan
Netherlands

New Zealand
Norway
Philippines
Russia
Singapore
South Africa
South Korea
Switzerland
Thailand
The People's Republic of
China
The Republic of China
UAE
United Kingdom
United States
Vietnam

5.2. Client Sectors

Accounting Companies
Cement Companies
Coal Producers
Coal Traders
Financing Organisations
Government Bodies
Investment Banks
Port Operators
Power Companies
Rail Providers
Shipping Companies
Steel Companies

Summary

Wood Mackenzie (Woodmac) is a global energy company supplying research and consulting services to its customers. The integration of coal into the existing oil and gas services makes Woodmac a global energy advisor on the most important energy sectors.

The coal division is globally spread and offers research and consulting services. Woodmac's coal research products are used by many leading company's in their decision making processes. The utilisation of coal experts in the coal industry to conduct consulting services, make Woodmac the ideal company to evaluate potential investments and to advise on existing and potential projects.

Siemens Qualifications

The background of the advertisement is a photograph of an industrial gasification plant. In the foreground, two workers are seen from behind, looking towards the facility. The worker on the left wears a yellow hard hat and a high-visibility vest, while the worker on the right wears a white hard hat and safety glasses. The plant itself is a complex of metal structures, pipes, and walkways, with a prominent vertical stack on the right side. The sky is clear and blue.

Siemens Fuel Gasification Technology

Fuel gasification technology for Integrated Gasification Combined Cycle
and industrial applications

Answers for energy.

SIEMENS



High oil and gas prices have led to a resurgence of coal as an affordable energy source. Especially coal-rich regions have increasingly been tapping their local resources. This allows them to reduce their reliance on foreign imports of natural resources and at the same time achieving stable prices to meet ever growing energy demands.

Gasification offers one of the cleanest and most flexible ways of converting coal and low-grade fuels into high-value products – electricity, chemicals or synthetic fuels. Combining gasification with advanced gas turbines in Integrated Gasification Combined Cycle (IGCC) power plants results in a highly efficient technology for coal-based power generation.

Environmental requirements are becoming more and more stringent all over the world. Gasification

projects are attractive solutions as they can offer environmentally friendly plants with lower emissions and the combination with readily available technology for CO₂ Capture and Storage (CCS).

The Siemens Fuel Gasification (SFG™) technology continues a long-held Siemens tradition of satisfying the needs of our customers worldwide. High availability, low life-cycle costs and multi-fuel capability are among the most important factors for being competitive. The Siemens Fuel Gasification technology addresses all of these key competitive drivers. The technology is flexible with regard to feedstock and products, and can utilize all types of coal, ranging from anthracite to lignite, as well as refinery residues (petcoke and liquids), and biomass.



Siemens Fuel Gasifier

The entrained-flow Siemens Fuel Gasifier (SFG™) is able to convert a large range of fuels and is ideally suited for lower-rank fuels like lignite with high ash and moisture content. The syngas leaving the gasifier island mainly consists of CO, hydrogen and small amounts of CO₂ and is free of any higher hydrocarbons.

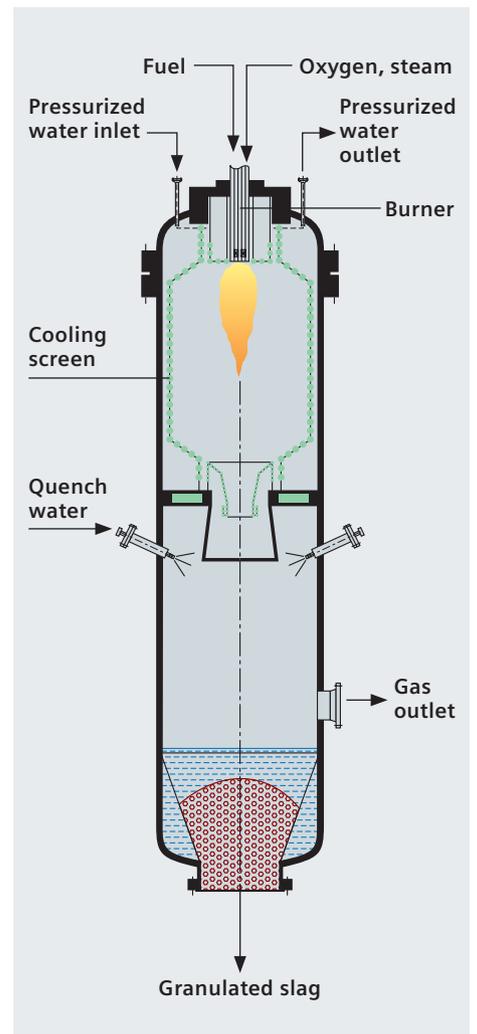
Noxious components such as particulates, sulfur and nitrogen compounds which are typical of gasification are removed by conventional gas treatment and conditioning processes downstream the gasification process.

Main features of Siemens Fuel Gasification technology:

- Dry solids feeding for high efficiency and low O₂ consumption
- Top-mounted dust burner with extended burner lifetime
- Cooling screen for high availability and low maintenance
- Full water quench for simple and reliable design

Benefits of Siemens Fuel Gasifier:

- Feedstock flexibility: Suitable for all kind of coal types, especially lignite, biomass, petcoke and liquid refinery residues
- High carbon conversion: > 98 %
- Operating pressures: 40 bar and above
- Shorter start-up times
- Smaller dimensions for reduced equipment costs
- High availability and low maintenance
- Proven experience: More than 20 years of successful operating experience





Design of Siemens Fuel Gasifier

The gasifier is equipped with a cooling screen, consisting of spiral-wound tubes filled with cooling water. Molten slag builds up a protection layer against the high reaction temperatures. Liquid slag from the reaction phase only comes in contact with the solidified slag layer, and hence no corrosion of the reactor wall can take place.

The cooling screen design ensures long gasifier availability periods before requiring repair or relining. This design has been in successful operation for over 12 years. Compared with a conventional refractory lining the cooling screen is insensitive to high ash content or fluctuating ash composition.

The gasifier can startup or shut down within few minutes. Cold startup can be done in less than two hours vs. refractory lined gasifiers which can take days to startup.

The reactor design with cooling screen is ideally suited for fuels with ash contents of more than 1-2 % by weight. For fuels with lower ash content like refinery residues, an alternative design with refractory wall is also available.

Gasification Process

The feedstock together with oxygen and steam is supplied via top-mounted burners. Conversion takes place at temperatures of around 1,300°C to 1,800°C (2,350°F to 3,250°F). These high temperatures, in combination with the dry feed system, allow for the almost complete conversion of the feedstock.

After the reaction chamber, raw gas and slag discharge into a quench section arranged beneath the reaction chamber. By injection of water the gas is cooled to temperatures of around 220°C (430°F) and the molten slag solidifies.

The vitrified slag granulates, accumulates in the water-filled quench bottom and discharges via a lock hopper. The slag is non-leachable and can be sold for use as building or road construction material.

Dry Feeding System

For solid fuels, a dry feeding is used, based on a pneumatic dense-phase feeding system. This makes the process more efficient and applicable to low-rank coals. Particle size distribution and moisture level depend on the type of feedstock used; typical ranges are below 0.5 mm and 2-12 % moisture.

Pulverized solid fuel is first supplied into lock hoppers and pressurized with a feeding gas like nitrogen or CO₂ to gasifier operating pressure. From there, it passes into a feeder vessel and further on into the gasifier. Dry feeding allows use of robust dust burners with lifetimes well above one year.



Siemens Fuel Gasifier Island

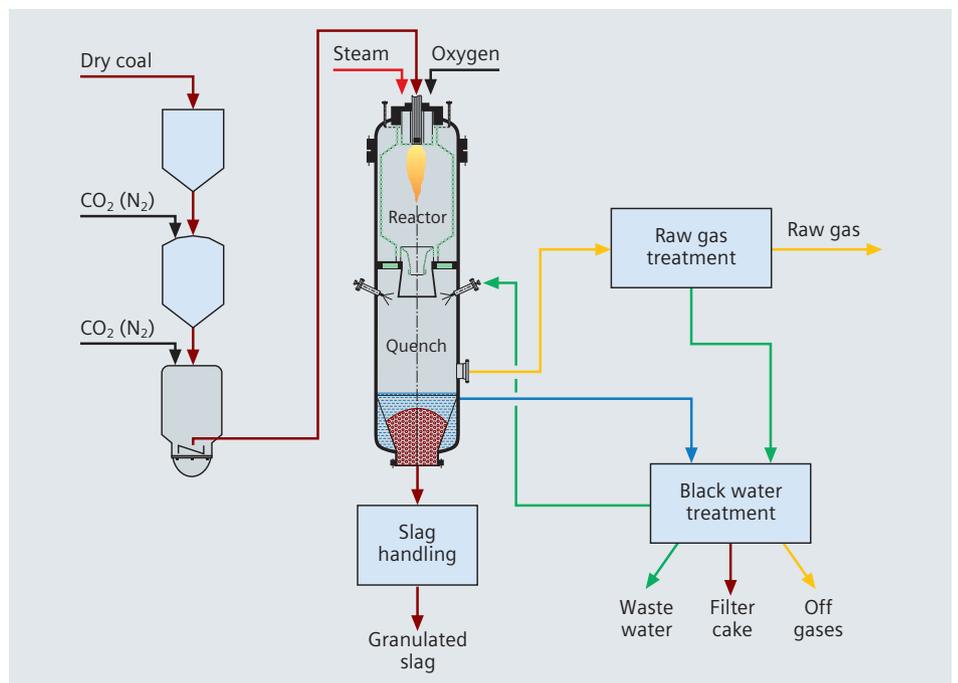
The Siemens Fuel Gasifier is the heart of the Gasifier Island. Process steps like the dry feed system, slag handling system, the raw gas treatment and the black water treatment complement the gasifier island. Siemens offers design and basic engineering of the complete gasifier island process. The process layout ensures efficient design, optimized handling of by-streams and water usage and minimum interfaces to downstream processes and utilities.

Raw Gas Treatment

Downstream of the quench section, the syngas passes to a raw gas treatment section with venturi scrubbers and a partial condenser. The system removes fine particles, halogens and alkalines from the raw gas flow. The raw syngas leaving the gasifier island is essentially free of particulates.

Black Water Treatment

The liquid effluents of the quench zone, water from the slag discharge units and scrubbing water from the raw gas treatment contain fine particulate matter, soot, salts and volatile heavy metal sulfides. Water from the black water treatment system is recycled back to the quench section.





Solution for many applications

Siemens gasifiers are equally well suited for power generation in Integrated Gasification Combined Cycle (IGCC) as well as production of chemicals, and synthetic fuels. Resulting products may be used in refineries, for iron or fertilizer production, transportation and in many other applications.

Most of the downstream processes require a fixed H_2/CO ratio which is adjusted in a CO shift reactor downstream of the gasifier. In the reactor, the equilibrium of the CO shift reaction $CO + H_2O \rightleftharpoons CO_2 + H_2$ is influenced by adding water to increase the hydrogen content of the syngas. The raw gas from the quench is already saturated with water and little or no additional steam injection is needed for the shift reaction.

Gas conditioning complexity depends on the requirements of the downstream process. For desulfurization and CO_2 removal, standard chemical or physical absorption processes can be applied. Elemental sulfur can be removed and sold as a marketable by-product. For sequestration, CO_2 is compressed and transported to underground storage sites or used for Enhanced Oil Recovery.

IGCC

Integrated Gasification Combined Cycle (IGCC) combines modern gasification with advanced gas turbine and steam turbine power generation technology. The concept of an IGCC power plant incorporates a gasifier producing raw gas which is cleaned of pollutants and burned in the combustion chamber of the gas turbine-generator for power generation. Matching mass and heat flow in an IGCC system offers further potential to optimize overall plant efficiency and economics.

IGCC emission levels can be in compliance with the most stringent emission regulations. It offers performance which is comparable to state-of-the-art supercritical steam plants. Application of CO_2 removal in IGCC's is straightforward with commercially available technology and offers flexible CO_2 emission reduction to very low levels.



Besides gasification, Siemens can provide entire power islands, air compressor technology, water treatment solutions and plant instrumentation and controls. Siemens is able to offer customized IGCC solutions – everything from an equipment-only solution to providing the complete IGCC Power Island on a turnkey basis.

References

SVZ, Waste Recycle Center “Schwarze Pumpe”	
Location:	Schwarze Pumpe, Germany
Commercial operation:	1984
Technical data	
Capacity:	200 MW _{th} (25 bar)
Type of reactor:	Entrained-flow, cooling screen
Type of quench system:	Full quench
Feedstock:	Lignite (1984-89) Natural gas (1989, 1990) Liquid waste, tars & oils (1990 – present)
Products / by-products:	Syngas for methanol and power production / sulfur, slag

SOKOLOVSKÁ UHELNÁ, A.S., Autothermal Oil Conversion Plant	
Location:	Vřesová, Czech Republic
Commissioning:	2008
Technical data	
Capacity:	175 MW _{th} (28 bar)
Type of reactor:	Entrained-flow, refractory-lined
Type of quench system:	Full quench
Feedstock:	Tar and liquid by-products of 26 fixed-bed gasifiers
Products / by-products:	Syngas for power production / slag, soot cake

Shenhua Ningxia Coal Industry Group	
Location:	Ningxia, China
Commissioning:	2009
Technical data	
Capacity:	5x 500 MW _{th} (40 bar)
Type of reactor:	Entrained-flow, cooling screen
Type of quench system:	Full quench
Feedstock:	Hard coal
Product:	Syngas for chemical production

Shanxi Lanhua Coal Chemical Corporation	
Location:	Jincheng, China
Commissioning:	2010
Technical data	
Capacity:	2x 500 MW _{th} (40 bar)
Type of reactor:	Entrained-flow, cooling screen
Type of quench system:	Full quench
Feedstock:	Anthracite
Product:	Syngas for ammonia and urea production

Secure Energy	
Location:	Decatur, Illinois, USA
Commissioning:	2010
Technical data	
Capacity:	2x 500 MW _{th} (40 bar)
Type of reactor:	Entrained-flow, cooling screen
Type of quench system:	Full quench
Feedstock:	Bituminous coal
Product:	Syngas for synthetic natural gas production

Siemens Gasification Test Center

With the Gasification Test Center in Freiberg, Germany, Siemens owns one of the most comprehensive gasification test facilities in the world. More than 60 different fuels have been tested so far, which gives Siemens a rich body of experience.

The centerpiece of the Siemens Gasification Test Center is a 5 MW_{th} gasification reactor with operating pressures up to 26 bar. The test gasifier is complemented by a range of feedstock preparation systems and related gas cleaning process units. Further equipment for coal and slag analysis (e.g. fluidization behavior and viscosity) is available.

With this equipment, a broad range of test conditions can be simulated. For gasification-based projects, for instance, it can be used to test how to:

- Determine detailed analytical data of feedstock and gasification products
- Optimize feedstock preparation to maximize efficiency and carbon conversion rate
- Determine the optimum gasification process conditions
- Gain valuable information about the expected products and environmental performance.

Dry feeding test rig

The Siemens Gasification Test Center furthermore provides a test rig for high-pressure coal feeding. This test rig consists of a fully equipped dry feeding system and can be used to find optimized feeding solutions. In particular, it allows the following aspects to be explored:

- Investigation of fluidization behavior under elevated pressure conditions
- Comparison of different coal density and velocity measurement systems
- Investigation of different feeding gases for solid feeding
- Test of alternative dry feeding systems

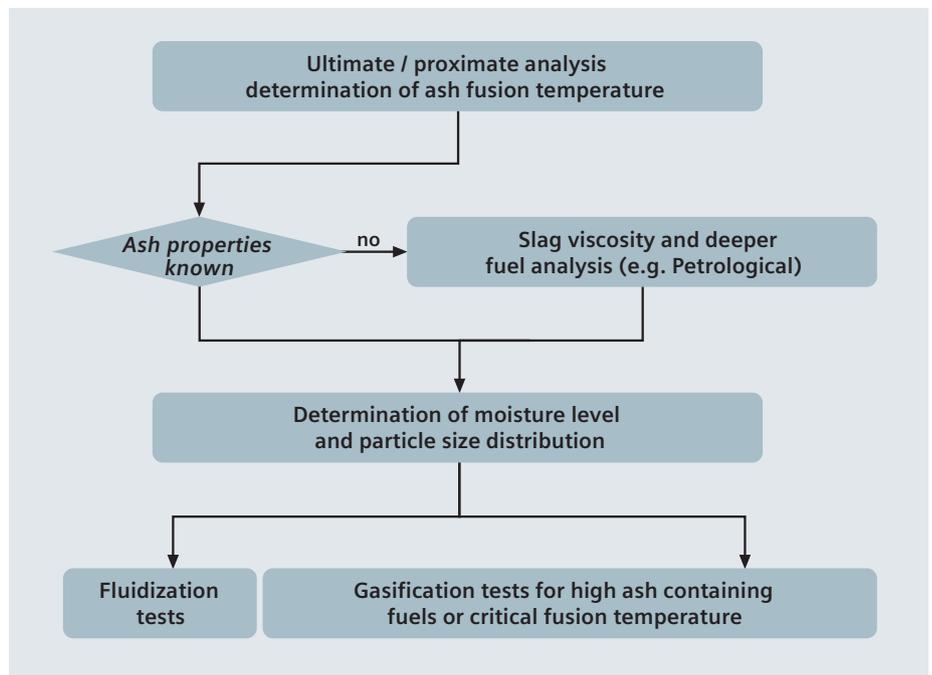


Figure: Testing procedure

Siemens Fuel Gasification Technology GmbH	
Location:	Freiberg, Germany
Commercial operation:	1996
Technical data	
Capacity:	3-5 MW _{th}
Type of reactor:	Entrained-flow, cooling screen, retrofittable with refractories, dry or liquid feeding possible
Feedstock:	More than 60 different fuels tested so far

With our test center and extensive knowledge and experience in gasification technology, Siemens offers an unparalleled level of solutions that help the customers achieve compatibility and profitability faster and easier.



Scope of supply and services

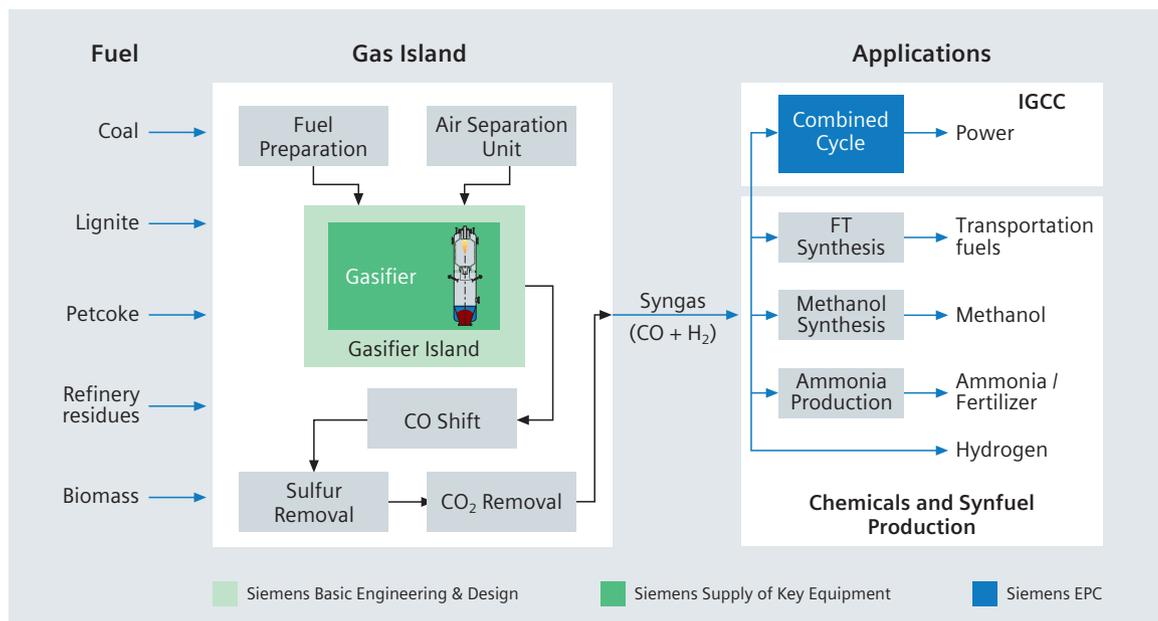
Siemens is entirely committed to delivering tailored technology that is more reliable, more efficient, more competitive, and easier to maintain. The solutions we offer push the highest limits of efficiency and reliability. According to the customer's needs, Siemens provides all services from engineering the Gasifier Island to key equipment and project execution.

Siemens scope of supply includes:

- Licensing of the Siemens Fuel Gasification technology
- Process Design Package (PDP) and Basic Engineering Design Package (BEDP) for the Gasifier Island
- Supply of key equipment like reactor, cooling screen, burner, and more
- Feasibility and FEED studies for the Gasifier Island

- Gasification tests
- Engineering services and Technical Field Assistance

As part of our commitment to being customer focused, we provide an established powerful and responsive service network. We are available for you worldwide when and where you need us – for technical field assistance, parts, or operations and maintenance services.



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descriptions of the technical options available, which
may not apply in all cases. The required technical
options should therefore be specified in the contract.

Siemens Gas Turbines over 100 MW

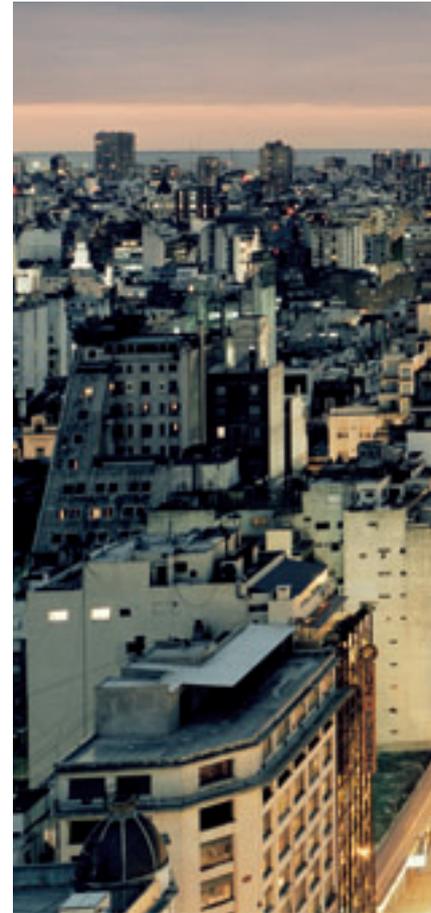


Proven and reliable

Answers for energy.

SIEMENS

State-of-the-art and innovative gas turbines to meet today's energy needs



Changes in today's energy markets are presenting power producers worldwide with new challenges and opportunities. In a competitive, market-driven economy, the ability to reduce the cost of power generation is becoming an increasingly important factor for success. Today, it is more important than ever to find solutions that provide a fast return on investment without sacrificing long-term reliability and flexibility.

To help you meet the challenges of a dynamic market, we have developed our Siemens Gas Turbines (SGT™) that have been proven in operation for many years in a global fleet of 1,010 machines over 50 MW with a combined power generation capacity of 135 GW and more than 18 million cumulative operating hours. Using the most advanced technologies, our engines have ratings

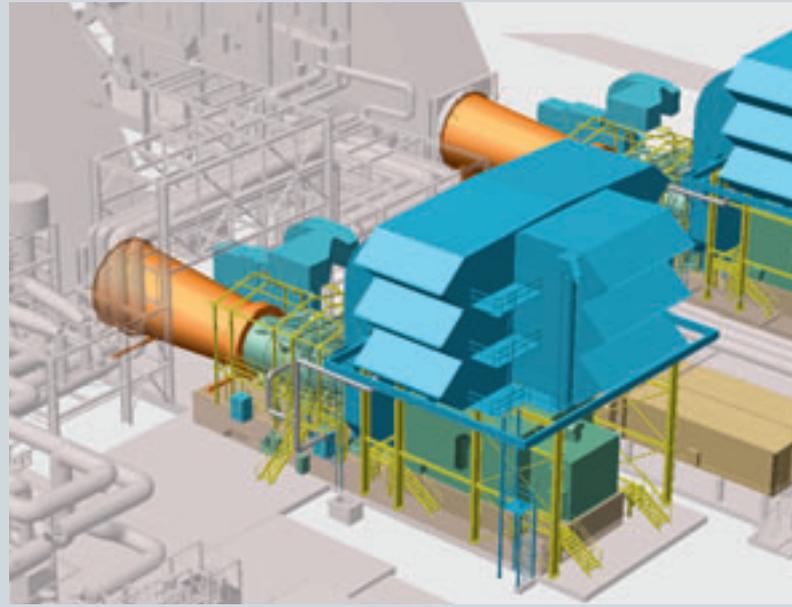


from 113 MW to 340 MW and cover both 50 Hz and 60 Hz applications with efficiencies approaching 40% in simple cycle and over 58% in combined cycle configurations. Siemens' latest development, the new 340 MW SGT5-8000H gas turbine, is designed to achieve more than 60% efficiency in combined cycle operation. Our proven modular design approach provides a flexible range of gas turbine packages in various scopes of supply, ranging from Siemens Gas Turbine Packages (SGT-PACs) to Siemens Combined Cycle Power Islands (SCC™ Power Islands) and Siemens Combined Cycle Turnkey (SCC™ Turnkey) plants, in order to meet individual customer needs.



All of the Siemens Gas Turbines share these proven common technical features:

- Four-stage turbine for moderate stage loading
- Low NO_x combustion system for reduced environmental impacts
- Cold end generator drive for increased efficiency
- Two-bearing rotor for simplified rotor alignment
- Variable inlet guide vanes for improved efficiency
- All blades removable with rotor in place for easy maintenance and shorter outages
- Unique design features for field serviceability across the fleet



Our Siemens Gas Turbine Packages have power outputs up to 340 MW.

High-performance gas turbines

Covering a wide spectrum of applications

Today, our materials engineering, blade cooling, thermodynamics and combustion technology know-how, together with our production engineering expertise, provide a sound basis for successful developments designed for the widest range of applications:

- Combined cycle power plants for base-load or flexible intermediate-load duty
- Cogeneration plants, where heat extraction and steam can increase fuel utilization
- Peak-load stations, where our gas turbines put their exemplary fast start capability to the test with fast start-up times
- Repowering of older coal-fired power plants to increase profitability; depending on the concept employed, this results in efficiency improvements of approximately 20 percentage points with a simultaneous increase in power output
- Integrated Gasification Combined Cycle (IGCC) power plants are a clean and efficient solution that makes coal and refinery residual products viable fuel options



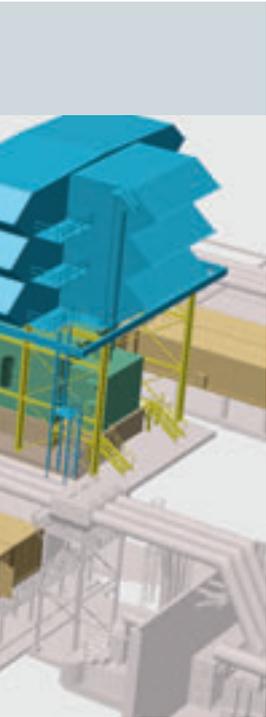
Shuweihat S1, United Arab Emirates: 1,500 MW combined cycle power plant with desalination using five V94.3A (new: SGT5-4000F) gas turbines in a multi-shaft configuration



Paka, Malaysia: 404 MW combined cycle power plant consisting of two blocks with two V94.2 (new: SGT5-2000E) gas turbines each



Uruguaiana, Brazil: 600 MW combined cycle power plant with two W501F (new: SGT6-5000F) gas turbines in 2x1 multi-shaft configuration



Proven and reliable Siemens Gas Turbines for power generation ranging from 113 MW to 340 MW:

SGT5-8000H	340 MW
SGT5-4000F	292 MW
SGT6-5000F	208 MW
SGT6-4000F	187 MW
SGT5-2000E	168 MW
SGT6-2000E	113 MW

■ We also offer a complete line of industrial gas turbines with ratings from 4 MW to 47 MW.

■ The SGT6-4000F (187 MW) gas turbine is available for custom applications.

A global network of service and support for the entire life cycle of your plant

At Siemens, we want to develop an ongoing partnership to ensure your project's long-term success. We are committed to serving our customers well after plant commissioning. As part of our commitment to being customer-focused, we have established a powerful and responsive service network with more than 3,000 field engineers and technicians in regional service offices around the globe. So wherever you are, wherever your plant is located, we speak the language, we know the market and we are available to provide customer service and support 24 hours a day, 7 days a week.

That is why we offer comprehensive service options including Corrective Maintenance, Preventive Maintenance, Performance Enhancement Programs, Service Agreements, as well as Training & Consulting.

With our extensive knowledge in supplying and servicing the power market, we offer an unparalleled level of comprehensive solutions that help our customers achieve competitiveness and profitability faster and easier. Furthermore, our global diversity and financial strength mean that we will be there when and where you need us.



*Payne Creek, Florida, USA:
515 MW combined cycle power plant with two W501F (new: SGT6-5000F) gas turbines in 2x1 multi-shaft configuration*

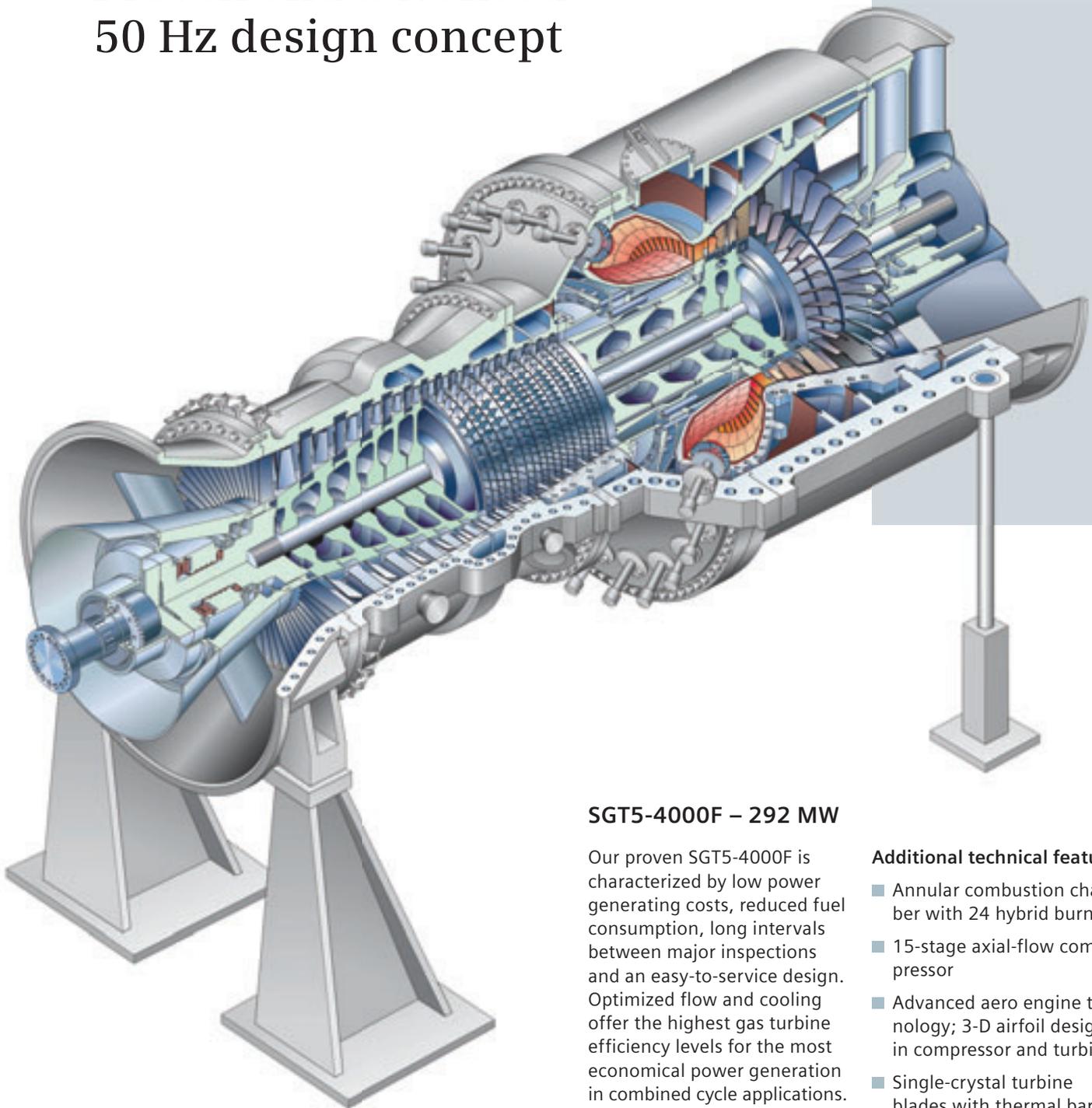


*Mainz-Wiesbaden, Germany:
400 MW combined cycle cogeneration power plant using one V94.3A (new: SGT5-4000F) gas turbine*



*Buggenum, Netherlands:
290 MW IGCC power plant with one V94.2 (new: SGT5-2000E) gas turbine for both syngas and natural gas application*

Proven and advanced 50 Hz design concept



SGT5-4000F – 292 MW

Our proven SGT5-4000F is characterized by low power generating costs, reduced fuel consumption, long intervals between major inspections and an easy-to-service design. Optimized flow and cooling offer the highest gas turbine efficiency levels for the most economical power generation in combined cycle applications. Its advanced technology is based on proven design features, resulting in a fleet reliability of over 99% and a combined experience of nearly 4,500,000 operating hours for all family members.

Additional technical features:

- Annular combustion chamber with 24 hybrid burners
- 15-stage axial-flow compressor
- Advanced aero engine technology; 3-D airfoil design in compressor and turbine
- Single-crystal turbine blades with thermal barrier coating and film cooling
- Advanced cooling technology
- Multiple fuels capability
- Hydraulic turbine blade tip clearance control

Siemens Gas Turbines and Siemens Combined Cycle Plants for 50 Hz Grids (Standard design, ISO ambient conditions)

	SGT5-4000F	SGT5-2000E
Siemens Gas Turbines		
Gross power output (MW)	292	168
Gross efficiency (%)	39.8	34.7
Gross heat rate (kJ/kWh)	9,038	10,366
Gross heat rate (Btu/kWh)	8,567	9,825
Pressure ratio	18.2	11.7
Siemens Gas Turbine Packages*		
	SGT5-PAC 4000F	SGT5-PAC 2000E
Net power output (MW)	288	165
Net efficiency (%)	39.5	34.5
Net heat rate (kJ/kWh)	9,114	10,471
Net heat rate (Btu/kWh)	8,638	9,925
Exhaust temperature (°C/°F)	580/1,075	539/1,002
Exhaust mass flow (kg/s)	688	526
Exhaust mass flow (lb/s)	1,516	1,161
Generator type	Air-cooled	Air-cooled
Siemens Combined Cycle Plants*		
Single-Shaft		
	SCC5-4000F 1S	SCC5-2000E 1x1
Net power output (MW)	423	251
Net efficiency (%)	58.4	52.2
Net heat rate (kJ/kWh)	6,164	6,895
Net heat rate (Btu/kWh)	5,842	6,535
Multi-Shaft		
	SCC5-4000F 2x1	SCC5-2000E 2x1
Net power output (MW)	848	505
Net efficiency (%)	58.5	52.5
Net heat rate (kJ/kWh)	6,158	6,860
Net heat rate (Btu/kWh)	5,836	6,502

* incl. pressure losses



SGT5-4000F



SGT5-2000E

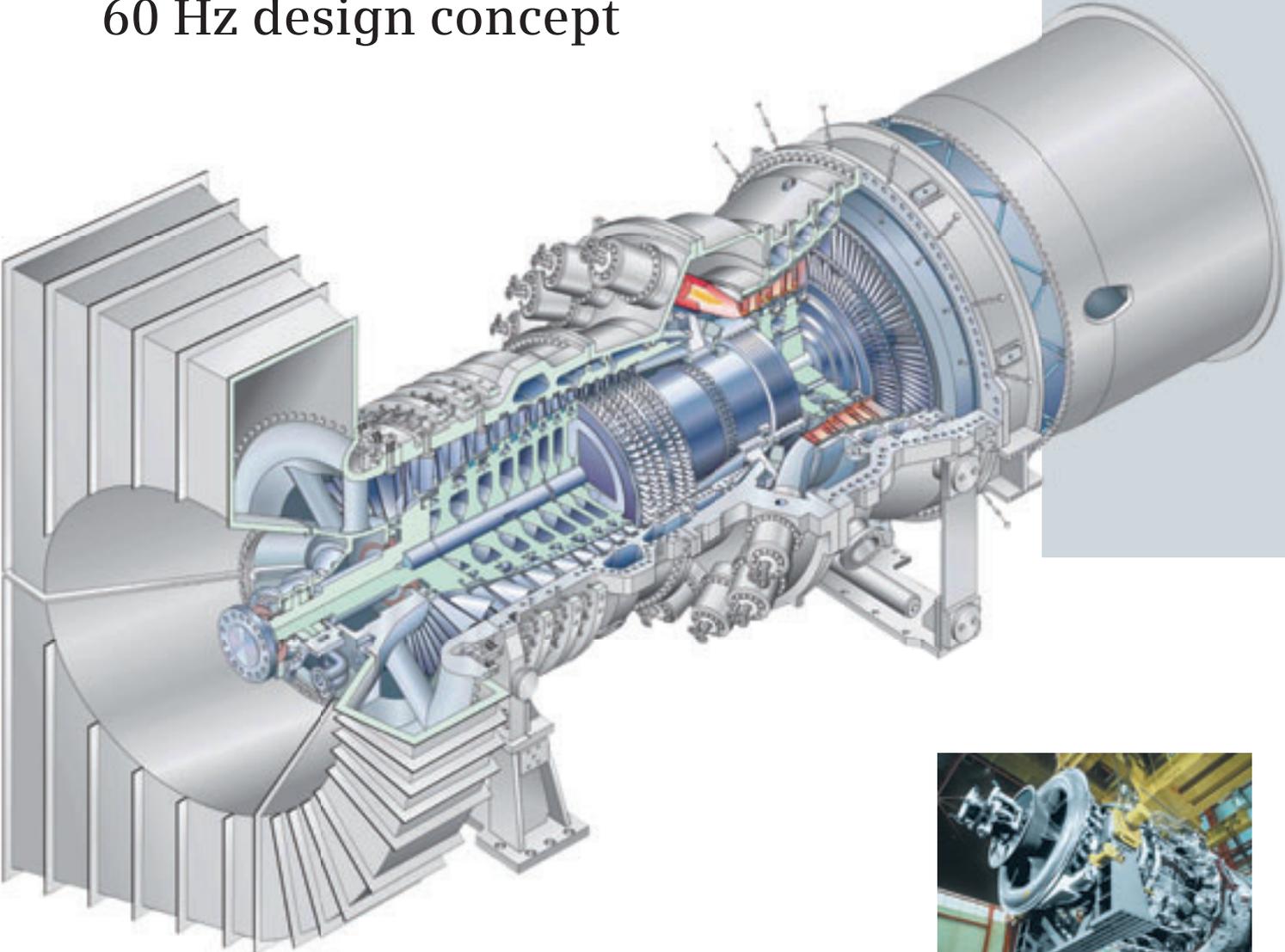
SGT5-2000E – 168 MW

The SGT5-2000E is a long-proven machine for simple or combined cycle applications, with or without combined heat and power, and for all load ranges – particularly peak-load operation. The machine is capable of burning a variety of fuels – from low to high caloric gaseous and/or liquid fuels to treated heavy oil at lowest emission levels. For IGCC applications, we offer the SGT5-2000E (LCG) machine with a modified compressor. The SGT5-2000E has a record of durability with more than 300 units accounting for over 6,400,000 operating hours. This gas turbine is also available for 60 Hz markets named SGT6-2000E.

Additional technical features:

- Two walk-in combustion chambers for hot-gas-path inspection without cover lift
- Combustion chambers lined with individually replaceable ceramic tiles
- 16-stage axial-flow compressor
- Hybrid burners for premix and diffusion mode operation with natural gas, fuel oil and special fuels, such as heavy oil and refinery residues
- Fast inlet guide vanes for peak-load operation and frequency stabilization (optional)
- Wet compression (optional)

Proven and advanced 60 Hz design concept



SGT6-5000F – 200 MW



SGT6-2000E

**Siemens Gas Turbines and
Siemens Combined Cycle Plants for 60 Hz Grids**
(Standard design, ISO ambient conditions)

	SGT6-5000F	SGT6-2000E
Siemens Gas Turbines		
Gross power output (MW)	208	113
Gross efficiency (%)	38.1	34.0
Gross heat rate (kJ/kWh)	9,446	10,606
Gross heat rate (Btu/kWh)	8,953	10,052
Pressure ratio	17.2	11.8
Siemens Gas Turbine Packages*		
	SGT6-PAC 5000F	SGT6-PAC 2000E
Net power output (MW)	206	111
Net efficiency (%)	37.6	34.0
Net heat rate (kJ/kWh)	9,580	10,717
Net heat rate (Btu/kWh)	9,081	10,158
Exhaust temperature (°C/°F)	600/1,113	545/1,014
Exhaust mass flow (kg/s)	504	365
Exhaust mass flow (lb/s)	1,110	805
Generator type	Air-cooled	Air-cooled
Siemens Combined Cycle Plants*		
	SCC6-5000F 1x1	SCC6-2000E 1x1
Net power output (MW)	314	171
Net efficiency (%)	57.0	51.3
Net heat rate (kJ/kWh)	6,320	7,007
Net heat rate (Btu/kWh)	5,990	6,642
	SCC6-5000F 2x1	SCC6-2000E 2x1
Net power output (MW)	623	342
Net efficiency (%)	57.2	51.6
Net heat rate (kJ/kWh)	6,290	6,971
Net heat rate (Btu/kWh)	5,960	6,608

* incl. pressure losses



SGT6-5000F – 208 MW

The SGT6-5000F gas turbine continues to break reliability and continuous operation records.

With more than 4,600,000 hours of fleet operation, the SGT6-5000F is ideally suited for either simple cycle or heat recovery applications including cogeneration, combined cycle and repowering.

Our SGT6-PAC 5000F provides economical, rapid on-line generation that is ideal for peaking duty, intermediate operation or continuous service.

Additional technical features:

- 16 can-type combustors in a circular array
- 13-stage axial-flow compressor with advanced 3-D design technology
- Multiple power augmentation options
- Best 60 Hz simple cycle efficiency in its class
- Fuel flexibility for diverse applications
- Low emissions technologies including 9 ppm NO_x combustion system
- Robust and proven rotor design

SGT6-2000E - 113 MW

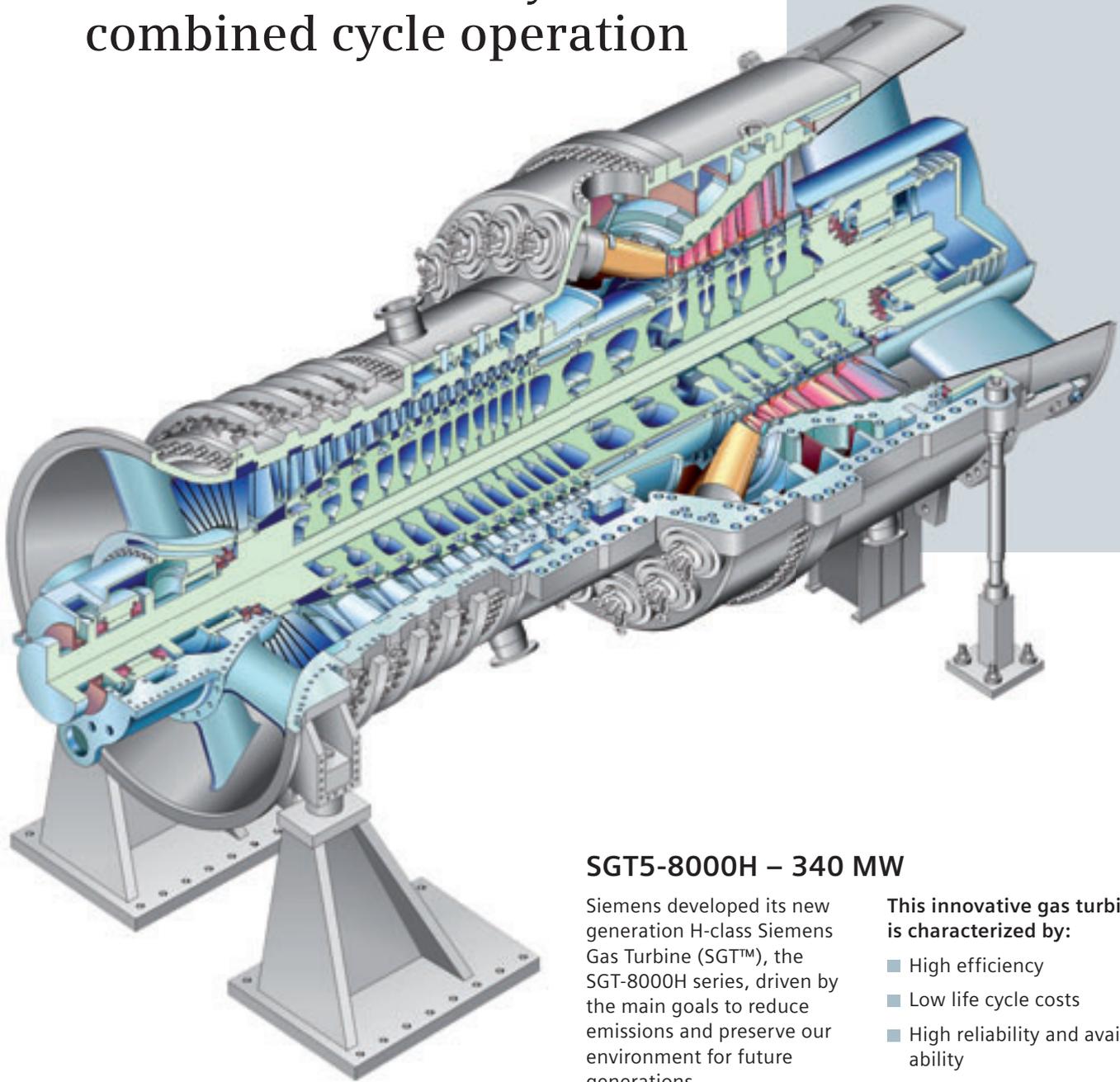
The SGT6-2000E gas turbine is designed for reliable, efficient and flexible power generation. With more than 3 million hours of fleet operation, the SGT6-2000E is a proven machine for simple cycle and combined cycle applications for all load ranges.

Additional technical features:

- Two walk-in combustion chamber for hot gas path inspection without cover lift
- Combustion chambers lined with individually replaceable ceramic tiles
- Multiple fuel capability



Designed to achieve more than 60% efficiency in combined cycle operation



SGT5-8000H – 340 MW

Siemens developed its new generation H-class Siemens Gas Turbine (SGT™), the SGT-8000H series, driven by the main goals to reduce emissions and preserve our environment for future generations.

The new, advanced SGT-8000H series gas turbines and the SCC-8000H series combined cycle power plants feature the best-in-class technology captured from our long line of large direct-drive Siemens 50 Hz and 60 Hz heavy-duty gas turbines and power plants.

This innovative gas turbine is characterized by:

- High efficiency
- Low life cycle costs
- High reliability and availability
- Operational flexibility
- Low emissions

Siemens Gas Turbine SGT5-8000H and Siemens Combined Cycle Plant SCC5-8000H

(Standard design, rated data at ISO ambient conditions)

Siemens Gas Turbine SGT5-8000H

Grid frequency (Hz)	50
Gross power output (MW)	340
Pressure ratio	19,2
Exhaust temperature (°C/°F)	625/1,157
Exhaust mass flow (kg/s)	820
Exhaust mass flow (lb/s)	1,808

Gas Turbine Emissions

NO _x (ppm)	25
CO (ppm)	10

Gas Turbine Physical Dimensions

Weight (t)	440
Length (m)	13.2
Height (m)	5.0
Width (m)	5.0

Siemens Combined Cycle Power Plant

Single-Shaft SCC5-8000H

Net power output (MW)	530
Net efficiency (%)	60
Net heat rate (kJ/kWh)	6,000
Net heat rate (Btu/kWh)	5,687



Features for high efficiency include:

- New compressor with advanced blade design
- Advanced materials to increase the firing and exhaust-gas temperature
- Advanced sealing system for low-leakage cooling air
- Advanced high-efficiency, high-pressure, high-temperature combined cycle process with BENSON® boiler, based on the high mass flow and exhaust-gas temperature of the new engine

Features for lowest life cycle cost include:

- H-class – designed for more than 60% efficiency in combined cycle mode and reduced emissions at part load
- Less complexity in engine and parts which can lead to lower maintenance and operating costs
- Straightforward operational concept



Features for advanced operating flexibility include:

- Air-cooled engine for a cooling method that is always present at speed
- Fast start-up and cycling capability to support intermediate load requirements
- Less complexity in engine and plant design leading to more flexibility in operation and reduced start-up time
- Improved turndown capability for high efficiency and low-emissions part-load operation

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Patrick Engineering Qualifications

PATRICK CAPABILITIES OVERVIEW

Patrick has over 30 years of proven leadership and expertise in project management, specializing in the fields of engineering, planning, technology consulting and construction management. The Engineering News Record (ENR) has included Patrick in its ENR Top 500 for 16 consecutive years; and we've earned numerous industry design awards for the consistent quality of our work. Our expanding client roster includes key government agencies, public utilities and major corporations in a broad range of industries throughout the United States and Canada.



Engineering Procurement

& Construction Management

- Planning & Project Controls
- Preconstruction Services
- Estimating & Scheduling
- Constructability Reviews
- Value Engineering
- Procurement
- Design/Build
- General Contracting
- Turnkey Project Management

Transportation

- Highway/Railroad/Bridge Design
- Traffic Studies & Signal Design
- Railroad Crossing Studies
- Intermodal Facility Design
- Roadway Improvements
- Resident Engineering

Civil/Structural Engineering

- Analysis & Design
- Stormwater Management
- Pump Stations
- Docks/Marine Structures
- Utilities/Water Supply/Wastewater
- Pipeline Design
- Grading & Drainage/Pavement
- Best Management Practices
- Permitting

Geographic Information Systems (GIS)

- Needs Assessments
- Web- and Field-Based Applications
- Database Design
- GIS Software Training
- Organizational Development
- Data Integration & Conversion

Mining

- Development Planning
- Infrastructure Design
- Permitting/NPDES
- Reclamation Planning & Design
- Post Mining Development

Environmental/Groundwater

- Hydrogeologic Investigations
- Brownfield Remediation/RI/FS
- UST/LUST Management
- Solid Waste Management
- Stormwater/Groundwater Management
- Landfill Services
- Spill Plans/SPCC
- Environmental Impact/Volume Statements

Geotechnical

- Soil Investigations
- Foundation/Pile/Caisson Design
- Retaining Structure Design
- Slope Stability/Stabilization
- Ground Improvement
- Sediment Investigation/Dredging
- Materials Management Planning

Surveying & Mapping

- GPS Control Surveys
- Geodetic Leveling Surveys
- Bathymetric Surveys
- Boundary/ALTA Surveys
- Wide-Area Monument Networks
- Easement Descriptions & Plats
- Topographic Mapping
- Height Modernization

Electrical Engineering

- Arc Flash Analyses
- Short-Circuit Analyses
- Power Distribution Design
- Motor Studies & Controls
- Electrical Generator Sizing & Design
- Substation Design
- SCADA/Controls
- Energy Efficiency Studies

PATRICK CAPABILITIES OVERVIEW

Patrick offers a complete range of performance-minded power system solutions for utilities, RUS Co-Ops, municipalities, merchant generation developers and industrial clients. No matter what your needs may be, Patrick's discipline, dedication and, diverse expertise can deliver. We back that commitment with the support and direct supervision of senior management. Our client-focused approach, technical competence and project management expertise are positioned to provide cost-effective, on-time solutions that result in success.



Project Management & Planning

- Turnkey Project Management
- Seamless Coordination of Multiple Services & Specialties
- Planning & Procurement
- Construction Management

Substation Engineering

- Site Development
- Station Physical Layout & Design
- Electrical Design

SCADA & Protection and Control Systems

- Technology Evaluation & System Analysis
- Equipment & Communication Specification
- RTU, PLC, & Meter Programming
- Coordination Studies

Electrical Distribution Systems

- Studies and Analysis
- Overhead Distribution Design
- Underground Distribution Design

Industrial Electrical

- Large Industrial Systems Design
- Power System Studies
- Power Distribution Systems
- Emergency/Backup Systems Design
- Industrial Lighting & Building Systems

Transmission Engineering

- Overhead Line Design
- Underground Line Design
- Transmission Foundations and structures
- Transmission Operation and Maintenance

Power Plant Engineering

- Transformer Replacements & Upgrades
- Switchgear Replacements & Upgrades
- Auxiliary Power System Studies & Modifications
- Plant Electrical & Structural Modifications
- Electrical Control Houses

Asset Management

- Facility Inspections
- Maintenance Planning
- Life Cycle Planning
- Cost Estimating/Cost Avoidance

Civil & Structural

- Design-Build
- Foundation/Underground Structures
- Building & Control House Design
- Governmental Site Permitting

OFFICE LOCATIONS

Patrick has locations nationwide to better serve our wide range of clients. **Below is a map indicating our office locations throughout the United States.**

**Illinois**

4970 Varsity Drive
Lisle, Illinois 60532-4101
Phone: 630-795-7200 Fax: 630-724-1681

55 East Monroe, Suite 3450
Chicago, Illinois 60603-5710
Phone: 312-201-7900 Fax: 312-220-0722

300 W. Edwards Street, Suite 200
Springfield, Illinois 62704-1907
Phone: 217-525-7050 Fax: 217-525-7053

Colorado

7905 West 120th
Broomfield, Colorado 80020
Phone: 1-800-799-7050

Florida

801 International Parkway, Suite 500
Lake Mary, Florida 32746
Phone: 407-573-0350 Fax: 407-573-0351

Kansas

7500 College Boulevard, Suite 500
Overland Park, Kansas 66210
Phone: 913-279-9185 Fax: 913-279-9186

Massachusetts

312 Stuart Street
Boston, Massachusetts 01226
Phone: 1-800-799-7050

Michigan

39500 Orchard Hill Place, Suite 200
Novi, Michigan 48375
Phone: 248-319-0690 Fax: 248-319-0691

Ohio

4200 Regent Street, Suite 200
Columbus, Ohio 43219
Phone: 614-470-9750 Fax: 614-470-9054

Pennsylvania

1285 Drummers Lane, Suite 200
Wayne, Pennsylvania 19087
Phone: 610-994-0865 Fax: 610-994-0866

Utah

1707 South 4490 West
Salt Lake City, UT 84104-4708
Phone: 1.800.799.7050

Wisconsin

10101 Innovation Drive, Suite 450
Milwaukee, Wisconsin 53226
Phone: 414-771-0264 Fax: 414-771-0418

480 Pilgrim Way, Suite 1250
Ashwaubenon, Wisconsin 54304
Phone: 920-321-2330 Fax: 920-321-2331

Pipeline Engineering

I-90 Randall Road Interchange, Badger Pipeline Company, *Elgin, Illinois*

As part of a multi-million-dollar project to upgrade I-90, the Illinois State Toll Highway Authority created a four-way interchange at the intersection of I-90 and Randall Road in Kane County, Illinois. The project required major reconstruction of the Randall Road bridge, in addition to creation of the interchanges and tollbooths. The project also required relocation of all underground utilities affected by construction in the area.

Badger Pipeline Company, managed by Citgo Petroleum and owned by a group of five petrochemical firms, asked Patrick to perform all civil engineering tasks related to the 1,680-foot, 12-inch pipeline relocation of the pipeline crossing at Randall Road, and all environmental and construction permitting. The design included both

horizontal and vertical relocation and required avoidance of other existing and proposed utilities. The pipeline relocation was designed in accordance with Title 49 CFR 195 and API RP1102. An uncased crossing was installed by pipe jacking using the auger boring method. Patrick also performed topographic surveying; plan and profile drawings; as-built drawings of the road crossing and pipeline relocation; and secured all required permitting from local government agencies.



Pipeline Relocation, West Shore Pipe Line Company, *West Dundee, Illinois*

Provided engineering design and surveying services to prepare construction plans, job specifications and survey work with West Shore Pipe Line's relocation of its 16-inch-diameter pipeline for the Altman Development Corporation. This relocation was necessary in order for the Altman Development Corporation to construct a large apartment complex.

Geotechnical Investigations, Willbros Engineers, Inc., *Joliet, Illinois to Ixonia, Wisconsin*

Patrick performed various geotechnical investigations along the 141 miles of new construction for the Guardian Pipeline. The Guardian Pipeline is a 36-inch natural gas transmission pipeline, which runs from the pipeline hub at Joliet, IL to Ixonia, WI.

Geotechnical investigations were performed to identify soil and groundwater conditions along the pipeline route to delineate areas where buoyancy compensation would be installed. By first researching soil types and groundwater levels along the pipeline route using publicly available literature, Patrick was able to expedite the field reconnaissance and only perform soil borings at select locations where the need for buoyancy compensation was suspected. Recommendations for buoyancy compensation were provided based on the site conditions and constructibility concerns. Options for buoyancy compensation included concrete set-on weights, concrete-coated pipe, and pipe anchors.





Elgin to Volo Pipeline, Northern Illinois Gas, *Elgin, Illinois*
 Patrick was selected to provide both design and construction phase services for this two part, \$65-million project. Hydrogeologic investigations during the design phase provided the client with engineering data to verify that the trenching operations during construction would not sever any pervious soil layers and consequently drain any of the project's 26 jurisdictional wetlands. This information was used to obtain the project's individual 404 Permit from the U.S. Army Corps of Engineers. The combined 44 miles of pipeline in the two projects required an Illinois Environmental Protection Agency NPDES Storm Water Permit for construction site

activities. Services included: prepared Storm Water Pollution Prevention Plans for each of the two sites; performed on site inspection services to assure Contractor adherence to the Plans; assisted the client in quality assurance, quantity measurements, Agency communication and on site civil engineering design services.

36-Inch-Diameter Gas Pipeline, Alliance Pipeline, Universal EnSCO, Inc., *Renville County, North Dakota to Joliet, Illinois*
 The Alliance Pipeline is a 36-inch-diameter steel pipeline extending from Fort St. Johns, British Columbia, Canada to Joliet, Illinois. Patrick was retained by Universal EnSCO, Inc., to perform geotechnical investigations at select pipeline crossing locations along the Illinois and Iowa spreads (U.S. Spread Four-Seven). Based on information obtained from the soil borings and rock corings, Patrick developed soil profiles at the crossings and provided recommendations for construction. Geotechnical investigations were also made at compressor station locations in Illinois, Iowa and Minnesota. Patrick also performed field surveillance along 80 miles of U.S. Spread One in North Dakota to assess buoyancy compensation requirements in wetlands and wet sandy soils.



Geotechnical Investigation, Vector Pipeline, Universal EnSCO, Inc., *Joliet, Illinois*
 Patrick was retained by Universal EnSCO Inc., to perform geotechnical investigations related to buoyancy compensation along the 268 miles of new construction for the Vector Pipeline. This pipeline is a 42-inch natural gas transmission pipeline, which interconnects the pipeline hubs at Joliet, Illinois, U.S.A. and Dawn, Ontario, Canada.

Pipeline Replacement, BP Amoco Pipeline Company, *Hammond, Indiana*

Assisted in the preparation of design plans to replace four pipelines across the Lake George Canal at the Whiting Refinery. The four pipelines, consisting of 8-inch-, 12-inch-, 14-inch- and 18-inch-diameter sizes, currently cross under the canal in a 300-foot-long, 60-foot-deep, concrete tunnel built in the 1930s. Both the tunnel and the pipelines were in need of repair. BP Amoco's decision was to replace the four pipelines using Horizontally Directionally Drilled (HDD) crossings. The project included preparing the four HDDs with close tolerances due to the proximity of these four pipelines to each other, and to other utilities. This design also had to provide sufficient depth to allow for future dredging of this canal. Four new above ground valve sites were installed on the south side of the canal.



Pipeline Repair Permitting, Coates Field Service, Inc., *Lockport, Illinois*

Patrick Engineering was retained by Coates Field Service to obtain the required permits and approvals for making repairs to a 12-inch products pipeline owned and operated by ExxonMobil Pipeline Company (EMPCO). The pipeline repair work needed to be performed on a portion of the pipeline that is located within the boundary of an Illinois Nature Preserve known to contain at least one federally endangered species, the Hine's Emerald Dragonfly. Patrick coordinated the approval process with various agencies, including the U.S. Fish & Wildlife Service (USFWS), the U.S. Army Corps of Engineers, and the Illinois Department of Natural Resources (IDNR).

Ashland Avenue Crossing Replacement, Premcor, Inc., *Riverdale, Illinois*

Premcor, Inc. retained Patrick to prepare design plans to relocate their eight-inch pipeline crossing over Ashland Avenue utilizing the Jackson Street Bridge. The pipeline was attached to the bridge that was slated to be removed. Patrick prepared the design plans to construct a new crossing under Ashland Avenue by using Horizontally Directionally Drilled (HDD) methods. Scope of services included: survey (design, construction staking, record survey); soil borings and geotechnical investigation and evaluation; preparation and design plans for pipeline crossings and new valve stations; preparation of construction specifications; assisted in material procurement; obtained necessary permit approvals; prepared record drawings. The plan was subsequently changed to replacing one of the gate valves to a below grade valve in a vault and the design of new pipe brackets for the bridge. This change was made due to the decision not to remove the bridge.



Permitting & Design, Pipeline River Crossing, West Shore Pipeline, *Winnebago County, Illinois*

Patrick was retained by the owner of a 12-inch products pipeline to obtain permit approval for emergency repairs to a river crossing after it was discovered that the 80-foot wide river had eroded the riverbanks and exposed the pipeline. Patrick obtained the required approval for completing the emergency repairs from the local district of the U.S. Army Corps of Engineers and Illinois Department of Natural Resources. After the emergency repairs were completed, Patrick prepared preliminary plans and construction cost estimates for two permanent solutions to the erosion problems at the crossing. The first option was to rebuild and stabilize the riverbank to protect the existing pipeline. The second option was to replace the river crossing with a new deeper, directionally drilled river crossing. It was determined that replacing the river crossing was the better long-term solution. Patrick was given notice to proceed with the design of the replacement crossing. Patrick's scope of work for the final design included: route surveying, geotechnical investigations, the development of full engineering plans, and obtaining permit approval for the 1,200-foot long directional drill.

Pipeline Relocation, West Shore Pipe Line, *Milwaukee, Wisconsin*

Provided the construction staking and as-built survey for their pipeline relocation along Rawson Road in Milwaukee . The relocation consists of approximately 5,700 feet of a 12-inch pipeline.



Water Systems – Supply and Treatment

Nordic Park Water System Improvements, DuPage County Department of Environmental Concerns, *Wheaton, Illinois*

Design of improvements to an existing water system to include water well rehabilitation, a new 150,000-gallon elevated storage tank, a new reverse osmosis treatment plant and structure, civil, mechanical piping and landscaping. Services included preparation of plans and specifications; permitting assistance; construction phase services to include bid, pay and shop drawing review; and construction observation.



Water System Evaluation, DuPage County Public Works Department, *DuPage County, Illinois*

Performed a comprehensive evaluation of the Greene Road water supply, treatment and storage systems. The evaluation included the equipment contained within the water treatment building, the building, a 250,000-gallon elevated water storage tank, a 285-foot-deep well, and an 800-gpm-capacity pump and motor. Services included completing a site visit to collect data, review the system components and observe system operations; photographing and documenting the system; reviewing existing data on the system; and preparing a summary report detailing the system and the approximate present-day worth of the system.



Jake Wolf Memorial Fish Hatchery, Illinois Capital Development Board, *Mason County, Illinois*

Design of new well field and associated pumps, piping, mechanical equipment and protective structures. Project consisted of 250 HP vertical turbine water well pumps, two (2) miles of 16-inch DIP water main, a SCADA system and primary/backup electrical power system. Services consisted of hydrogeological investigation and analysis; surveying; preparation of plans and specifications; and construction phase services to include bidding assistance, construction observation, pay estimate review, and shop drawing review.

Water System Study, Amoco Chemical, *Joliet, Illinois*

Conducted a study of an existing on-site water system which provided domestic, process and fire suppression water for a 700-acre petrochemical facility which had been experiencing difficulty with water quality and maintenance of the system. Services included review of record drawings to determine location, size and type of distribution piping; water distribution system analysis to determine existing capacity and identify undersized pipes; preparation of water analysis to determine best available technology for improving quality; preliminary design of water treatment plant to include ion-exchange softening, manganese green sand filtration, high service pumps and a hydropneumatic tank to pressurize system; preparation of project cost estimates.



Crystal Tree Development, Corley Real Estate Corporation, *Orland Park, Illinois*

Performed complete site engineering services for a planned unit development of 283 acres. The scope of work included initial project planning and final design of all building and site grading, drainage systems, storm water control facilities, roadways and sanitary sewers and water main systems. Site design features included six drainage systems with 12 storm detention facilities, 5,000 feet of off-site water main, a water system booster pump station, two sewage lift stations, 4.5 miles of roads, an intersection improvement of Illinois Route 7, a 700 GPM deep well for golf course irrigation and mutually suitable grading/drainage conditions along all residential property/golf course property lines.

Water Main Extension, Thompson Correctional Center, *Dane County, Wisconsin*

Designed a water main extension to serve the center's needs and eliminate the dependency on the on-site wells. Services included a survey of the potential route of a water main extension between the center and the future water tower site for the Village of Cambridge. Patrick also analyzed the various alternatives to provide municipal water for domestic use only, for domestic use plus fire flow for existing buildings at the site and for domestic use plus fire flow for existing and future buildings. Also designed the water main extension, prepared plans, specifications and cost estimates for bidding purposes and administered the bidding process. Provided construction management services and prepared record drawings.

Sanitary Sewers and Water Main Extension, City of Elgin, *Elgin, Illinois*

Patrick was responsible for preparing plans and specifications for sanitary sewers and water main extension for the new Highlands Golf Course including the clubhouse, comfort station, and maintenance facilities. The sanitary system included both gravity and force main sewers. The force mains and associated pump stations were designed to ensure proper velocity through the pipe. The alignment of the sewers and water mains was chosen to minimize the future impact to the proposed golf course features. An estimated construction cost estimate was prepared for the project. Contract documents were prepared and bidding assistance was provided. Oversaw the construction of the project to ensure

adherence to the project specifications. Coordinated and prepared the necessary permits required by the IEPA and the local sanitary district.

Water Treatment Microfiltration, Baxter International, *Round Lake, Illinois*

Designed a microfiltration water treatment upgrade for the well water supply system at the company's largest research-and-development center. The system was required because sand particles in the groundwater supply were increasing the amount of maintenance being performed on the facility's water mains, water tower, and reverse osmosis system. Water supply piping and facility modifications were designed to add high volume microfiltration strainer units with automatic backwash controllers. A grit chamber and wastewater piping modifications were made to settle out solids from the backwash water before it was discharged to the on-site wastewater treatment system. Engineering and design included civil, environmental, mechanical, electrical, and architectural services for the facility's upgrades.

**Prairie Court Water Main Extension Design/Build**, City of West Chicago, *West Chicago, Illinois*

Performed design-build of approximately 1000 linear feet of new water main to complete a properly looped water main system for the City of West Chicago. The new water main is 8-inch-diameter HDPE inside a 12-inch-diameter HDPE casing pipe, and will be installed using directional drilling construction techniques. Services included surveying, wetland delineation, design, permitting, and construction. Legal descriptions were provided, as well as assistance in obtaining new easements within the property of DuPage County Department of Transportation, Forest Preserve District of DuPage County, Commonwealth Edison, West Chicago Park District, and private property owners.

Danada Water Main Extension, Forest Preserve District of DuPage County, *Wheaton, Illinois*

Prepared plans, technical specifications, special provisions, and bid documents for a 4,497-foot water main extension, removal of an existing backflow prevention assembly, a new fire service supply line, five domestic service lines with meters and connections, plumbing modifications at two buildings, abandonment and sealing of three existing wells, and a water main loop around an administration building. Services included acquisition and review of record drawings, verification of field conditions, performing soil borings, preparing a geotechnical report, and surveying existing utilities and structures in the water main corridor. The drawings prepared included the location of the right-of-way along the west side of Naperville Road, topographic information, easement information, boring locations, underground utilities, wetlands, and other surface features that could impact construction. An archeology survey was performed and a written report submitted to the Illinois Historic Preservation Agency for approval. Permit applications prepared for the project included a City of Wheaton Permit, an IDOT permit, a DPCDEC Stormwater Management Permit, and an IEPA Construction Permit with Schedules A and B. Construction costs for the project are estimated at \$325,000.



ELECTRICAL ENGINEERING CAPABILITIES

Patrick Engineering and Patrick Energy Services have significant experience in the design of electrical systems from transmission to distribution. This experience is demonstrated in the following pages. Listed below is specific experience in power delivery, focusing on our ability to design and coordinate the interconnection to ComEd.

Credibility

We have extensive experience in power delivery and have consistently been ranked in the top ten for Transmission and Distribution Engineering work according to Engineering News Record (ENR) magazine. We are currently ranked 8th in the country for Power Deliver Work. We do work throughout the country and have extensive experience in Illinois.

Illinois Power Delivery Experience			Length		
Name	Client/Interconnection	Voltage	1 - 5 mi	5 - 10 mi	10+
Camp Grove Wind Farm (Peoria/Camp Grove, IL)	ComEd	138kV		X	
Pontiac 345/138kV	ComEd	138kV	X		
345kV Transmission Line Relocation	Ameren	345kV	X		
Big Sky Wind Farm (Dixon, IL)	ComEd	345kV	X		
Elmhurst – New Line	ComEd	138kV		X	
345kV Re-build	Fermilab	345kV	X		
Rutland (double circuit) (Rutland, IL)	ComEd	138kV		X	
ComEd Summer Critical Programs (hundreds of projects)	ComEd	34kv/12kv	X	X	X
Algonquin Road (double circuit) – New Line	ComEd	138kV		X	
Lockport Road – New Line	ComEd	138kV	X		
Huntley – New Line	ComEd	138kV	X		

We have been the company responsible for establishing the routing and obtaining permission on hundreds of power delivery projects in Illinois over the past 10 years. The bulk of our experience has been with ComEd and Ameren on 12kv, 34kv, 138kv and 345kv projects. We have obtained permits and interfaced directly with State, County and Local governments, railroads, transportation agencies and environmental agencies to obtain permits. We have also worked with the local communities and individual land owners to obtain easements. We have led numerous town hall meetings to obtain consensus from the home owners, associations and farmers. We have developed numerous displays to communicate proposed routing of lines to permitting agencies, railroads, local residents and public utility commissions. Through the FutureGen project, Patrick dealt with MISO during their Feasibility Study and System Impact Study. Patrick has patent pending software that has been developed for the purposes of organizing projects and depicting line routing for permit/easement purposes.

We have been involved in coordinating numerous impact studies including, species impact, wetlands impact, noise studies, EMF studies, stray voltage studies, geological studies and impacts to native species such as birds/bats etc. We have much of this expertise in house.

TRANSMISSION ENGINEERING

Patrick offers a wide range of transmission line services, from the planning and design of new facilities to the inspection and evaluation of existing lines. Our expertise includes the design of overhead lines including wood pole, steel pole and lattice towers as well as underground cable applications. Our broad range of capabilities includes horizontal bore designs and numerous specialty line applications.



Overhead Line Design

- Route Selection and Tower Spotting
- Line Sag Calculations
- Plan and Profile Development
- Insulation Coordination
- Line Permitting
- Electromagnetic Field Analysis

Underground Line Design

- Cable Ampacity Calculations and Sizing
- Duct System Design
- Cable Pulling Calculations
- Thermal Backfill Evaluation
- Plan and Profile Development
- Horizontal and Boring Applications
- Earth Retaining Systems

Transmission Foundations and Structures

- Lattice Tower Design
- Steel Pole Design
- Wood Pole Design
- Foundation Design
- Guyed Structures Design

Transmission Operation and Maintenance

- Line Inspection and Evaluation
- Inspection Plan Development
- Life Extension Analysis
- Maintenance
- Planning Development

SUBSTATION ENGINEERING

Patrick delivers a range of substation engineering services to support electric utilities, transmission system operators, generating stations, and industrial clients. We can provide complete engineering and project management services on turnkey projects at both Greenfield and Brownfield sites. We can also assist with scope identification; specification and standards development; product evaluation; system studies and analysis; document management and control; and permitting.

Site Development

- Soil and Rock Exploration
- Phase I and II Environmental Studies
- Soil Resistivity Determination, Ground Penetrating Radar
- Remediation of Contaminated Soil and Groundwater
- BMPs for the Construction and/or Maintenance of Wetland and Waterbody Crossings
- Grading and Drainage
- SPCC and Oil Containment Systems
- Pavement Evaluation for Heavy Load Moves
- Permitting Support and Services

Station Physical Layout and Design

- Ground Grid Design and Analysis
- Foundations Design and Analysis
- Structural Design and Analysis
- General Yard Arrangements and Detailed Design
- Bus Design and Analysis
- Conduit and Troughing
- Underground Services
- Excavation and Directional Boring for Cable Installations, Survey and Characterization of Utility Vault Waters and Sediments
- Lightning Protection Design
- Control House Layout and Design

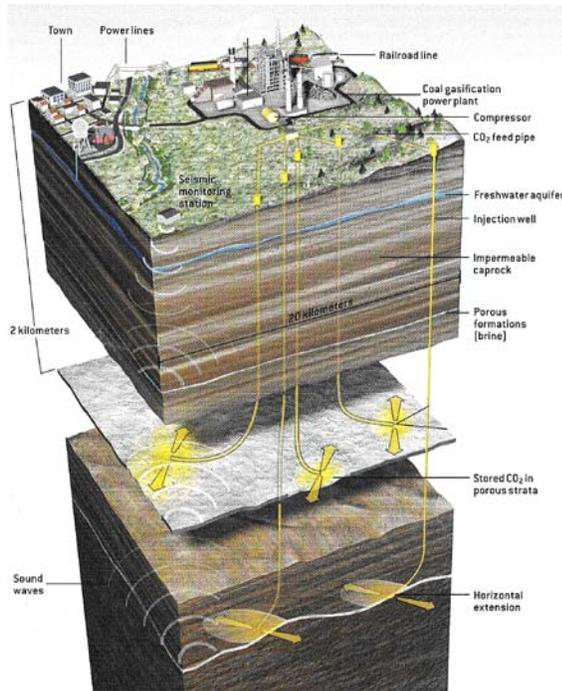
Electrical Design

- Station One-Line Development
- Battery Systems Analysis and Design
- Auxiliary Power Systems/ATOs
- Equipment Sizing and Specification
- Power Equipment Installation and Retrofit
- Interconnections and Wiring Design
- Lighting Design
- Bill of Material Development



Future Site Characterization for FutureGen

Illinois Department of Commerce and Economic Opportunity & Illinois Clean Coal Institute



Services Provided

- Coordinated ALL written submittals to the USDOE
- Analyzed FutureGen Industrial Alliance (Alliance) Request for Proposal
- Evaluated 33 sites in Illinois based on qualifying and scoring criteria
- Geographic Information Systems (GIS)
- Site Proposal Preparation (4 sites)
- Prepared Environmental Information Volume (EIV) for floodplain, seismic stability, cultural resources, threatened and endangered species, water, air, and land for two finalist sites.
- Railroad Economic Analyses
- Rail Loop Design
- Site Plans
- Cost Estimates

Patrick Engineering Inc. (Patrick) worked with the State of Illinois staff to evaluate potential sites for the \$1 billion FutureGen project, an initiative to build the world's first coal-based, zero-emissions electric power plant and hydrogen production facility, capable of generating 275 megawatt. FutureGen will capture carbon dioxide emissions and sequester it permanently deep underground.

Patrick compiled technical and geographic information into coherent site summaries that were submitted to the U.S. Department of Energy (USDOE) and the Alliance. Patrick coordinated the evaluation of numerous criteria including seismic activity, endangered species, highway access, rights-of-way, water resources, air pollution, attainment areas, electric transmission capability, and most importantly, each area's potential to sequester carbon dioxide 5,500 to 8,500 feet below ground in porous and saline-saturated sandstone formations. Services also included GIS screening of 33 Illinois sites for site selection. Then the number of contenders was narrowed to four sites.

Patrick coordinated rapid response teams to reply to questions from the Alliance. Patrick and State staff worked closely together preparing final reports for the four sites in east central Illinois under a very tight timeframe to meet Alliance RFP requirements.

Two Illinois sites were selected out of the four finalists countrywide: Mattoon and Tuscola. Patrick coordinated the preparation of the EIV, which was used by the USDOE to prepare an Environmental Impact Statement (EIS). For the EIV, Patrick staff conducted field studies and prepared reports on soils, air quality, climate and meteorology, ground and surface waters, wetlands, aquatic and terrestrial ecologies, cultural and visual resources, noise, non-potable water supplies, electrical transmission load capacity and waste management. Patrick also assisted the Illinois State Geological Survey in preparing the subsurface geology sections by developing a CO₂ Release Mitigation Program Plan and contracting for a seismic line analysis at each site. To complete the EIV, Patrick conducted an archeological field study and an analysis of the seismic line data.

In the “best value” phase, Patrick initiated an electric transmission network interconnection study through MISO (Midwest Independent Systems Operators) to determine the requirements and cost to connect FutureGen to the utility network at both sites. Patrick also prepared preliminary site designs, reservoir analyses, stormwater analyses, railroad analyses, and preliminary cost estimates for site development. Patrick managed site studies including aerial photography and topography, surveying, and geotechnical investigations. Prepared the appropriate studies for the power plants and the utility corridors, including gas, water, and Co2 pipelines, and electric transmission lines.

Black & Veatch Qualifications

BUILDING A WORLD OF DIFFERENCE®



FACT SHEET



BLACK & VEATCH
Building a world of difference.®

Energy



Black & Veatch offers engineering, technology, consulting and construction solutions that span the life cycle of projects in the power generation, power delivery and hydrocarbon process industries. Our services encompass planning, design, procurement, construction, startup, optimization and maintenance.

COAL

- Pulverized coal
- Subcritical
- Fluidized bed technologies
- Integrated gasification combined cycle (IGCC)

AIR QUALITY CONTROL (AQC)

- Multi-pollutant compliance planning studies
- Phase I engineering program for environmental retrofit planning
- NO_x control solutions — neural nets to SCRs
- SO₂ control solutions — wet and dry scrubbers including CT-121 WFGD
- Particulate control solutions
- Mercury control solutions

COMBUSTION TURBINE

- Simple cycle
- Combined cycle
- Combined cycle conversion
- Cogeneration
- Repowering
- Industrial

POWER DELIVERY

- Substations
- Overhead transmission lines
- Underground transmission lines
- HVDC stations and lines
- VAR compensation/voltage support
- Power system studies

GAS, OIL & CHEMICALS

- Base load/mid-scale/peak shaver natural gas liquefaction
- LNG regasification terminals
- Sour/rich gas processing
- Sulfur recovery
- Gasification

NUCLEAR

- Advanced nuclear plants – Generation III
- Future reactor designs – Generation IV
- Nuclear plant engineering services
- Operating nuclear plant modifications
- New plant initiatives

CONSULTING ENGINEERING SERVICES

- Water management
- Plant improvement
- New generation
- Environmental management
- Technical due diligence
- Technologies assessment
- Fuels services
- Renewable technologies
- Performance optimization
- Operations and maintenance

Water



Black & Veatch supplies best-value design, engineering and construction solutions for the full spectrum of water and wastewater endeavors. We serve public and private clients of every size with a strong focus on life cycle economy, efficiency and reliability.

In partnership and collaboration with all stakeholders, we work to deliver this valuable resource with affordability and innovation to clients, and responsibility to communities and the environment.

Our team of engineers, scientists, researchers, technicians and construction professionals offers unequalled experience and expertise across the broad, diverse fields of water and wastewater specialties, from small projects to large, complex ventures.

DRINKING WATER

- Water supply, treatment and distribution
- Membrane treatment
- Ozone systems
- UV
- DAF
- Desalination
- Pumping stations and conveyance

WASTEWATER

- Water reclamation and reuse
- Collection and pumping
- CSO/SSO conveyance and technology
- Residuals management
- Biological nutrient removal
- Industrial pre-treatment
- Emerging technologies (IFAS/MBBR)

WATER RESOURCE MANAGEMENT

- Aquifer storage and recovery
- Groundwater modeling
- Locks, dams and irrigation
- Storm drainage and flood control

ENVIRONMENTAL RESOURCE MANAGEMENT

- Hazardous waste and remediation
- Safety and health
- Solid waste

HYDROPOWER

- Dam and plant rehabilitation
- Hydropower plants
- Feasibility studies

UTILITY OPERATION SOLUTIONS

- Asset management
- Electronic operations and maintenance
- IT and management
- SCADA
- Utility systems security

Telecommunications



Our extensive, first-hand industry experience and independent stature enable us to offer value-focused information management solutions. Services range from consulting on strategy, market analysis, regulatory issues and risk management matters to delivering seamless broadband and wireless telecommunications solutions.

A true turnkey service provider, Black & Veatch offers more than 40 years of industry experience in the areas of telecommunications consulting, architecture and engineering, procurement, construction and technology deployments. Our solutions encompass:

- Integrated broadband networks
- Wireless and wireline networks
- Utility telecommunications networks

Enterprise Management Solutions



Utilizing our integrated strategy, technology and process capabilities, we consult with energy and water sector executives on a wide range of enterprise management matters. Our consultants include experienced executives as well as senior-level analysts with backgrounds in economics, finance and applied mathematics. This bridging of advanced analytics with practical business experience enables Black & Veatch to deliver unparalleled solutions in:

- Asset management
- Financial advisory services
- Independent engineering
- IT planning
- Operations technology
- Organization strengthening
- Performance management
- Program management
- Transmission services

Federal Services



Black & Veatch offers comprehensive engineering, procurement, construction management and program management services to meet the complex missions of our government client base. Our government work is focused on aerospace and defense facilities, civil works, environmental services, critical infrastructure, security and transportation. Primary clients include:

- Department of Defense
- Department of Energy
- Department of Homeland Security
- Environmental Protection Agency
- Federal Aviation Administration
- Transportation clients, including airport and port authorities

About Black & Veatch

VISION

Black & Veatch leads the industry in value creation for each of its stakeholders – clients, professionals, shareholders and business partners.

MISSION

Building a World of Difference®

Black & Veatch is a leading global engineering, consulting and construction company specializing in infrastructure development in energy, water, telecommunications, management consulting, federal and environmental markets. Founded in 1915, Black & Veatch develops tailored infrastructure solutions that meet clients' needs and provide sustainable benefits. Solutions are provided from the broad line of service expertise available within Black & Veatch, including conceptual and preliminary engineering services, engineering design, procurement, construction, financial management, asset management, program management, construction management, environmental, security design and consulting, management consulting and infrastructure planning. With \$3.2 billion in revenue, the employee-owned company has more than 100 offices worldwide and has completed projects in more than 100 countries on six continents.

Learn more about us at www.bv.com.

By advancing the frontiers of knowledge, Black & Veatch provides its clients with reliable solutions to their most complex challenges, thereby helping improve and sustain the quality of life around the world.

Engineering News – Record Rankings

TOP 500 DESIGN FIRMS SOURCEBOOK (2008)

- No. 15 Top 500 Design Firms

ENERGY (Power)

- No. 4 Top 25 Power
- No. 4 Top 25 in Fossil Fuel
- No. 4 Top 5 in Hydroplants
- No. 5 Top 15 in Transmission and Distribution
- No. 5 Top 5 in Cogeneration
- No. 7 Top 10 in Nuclear Plants

WATER (Environmental)

- No. 4 Top 20 in Wastewater Treatment
- No. 4 Top 25 in Water Supply
- No. 4 Top 15 in Treatment and Desalination
- No. 5 Top 25 in Sewerage and Solid Waste
- No. 7 Top 10 in Dams and Reservoirs
- No. 10 Top 15 in Transmission Lines and Aqueducts
- No. 12 Top 15 in Sanitary and Storm Sewers

ENERGY (Petroleum)

- No. 14 Top 25 in Refineries and Petrochemical Plants

TELECOMMUNICATIONS

- No. 6 Top 10 in Towers and Antennae
- No. 8 Top 25 in Telecommunications

GENERAL BUILDING

- No. 18 Top 25 in Government Offices

OTHER

- No. 18 Top Designers in International Markets

TOP 200 ENVIRONMENTAL FIRMS (2008)

- No. 5 Top 200 environmental Firms
- No. 1 Top 20 Environmental Firms Working Abroad
- No. 2 Top 20 Firms in Wastewater Treatment

Quick Facts

- Founded: 1915
- Chairman, President and CEO: Len C. Rodman
- Number of offices: 100+ worldwide
- Number of employees worldwide: 9,600+
- Global client base: Clients in 100+ countries on six continents
- 2007 revenues: \$3.2 billion
- Ownership: Black & Veatch Corporation is privately held through an Employee Stock Ownership Program (ESOP)

Industry Leadership

ENERGY

Black & Veatch is involved in more megawatts of power generation than any other company in the world.

WATER

An estimated 20 percent of the world's population who drink from community systems will drink potable water through systems designed, constructed or supported by Black & Veatch.

TELECOMMUNICATIONS

More than 5,000,000 hours of traffic are carried on Black & Veatch deployed cell sites each day.

FEDERAL SERVICES

Black & Veatch's work with the U.S. federal government, helping to ensure national security, dates to WW II.

Safety

Black & Veatch places the highest importance on the safety and health of our professionals, subcontractors, and clients. Black & Veatch is committed to providing a work environment where safety and health are preplanned into every task with a mindset that every injury is preventable. It is our goal to provide a place of employment where every professional is given the time, equipment and training necessary to perform their jobs without injury, and where supervisors and professionals alike view safety and health performance as the key element to a task being performed on-time and within budget.

- For our U.S. operations, Black & Veatch has earned the National Safety Council's Excellence Achievement Award as well as Liberty Mutual's Gold Award for Safety Excellence.
- For our U.K. operations, the company has earned three gold awards from ROSPA (the Royal Order of the Society for the Prevention of Accidents) and one ROSPA Commendation award.

corporateinfo@bv.com
www.bv.com



BLACK & VEATCH
Building a world of difference®.

BLACK & VEATCH BY THE NUMBERS

6,500+ Black & Veatch's Total Client Base

9,600 Professionals employed in 100+ global offices

80+ Languages spoken by Black & Veatch professionals in the U.S.

100+ Countries in which Black & Veatch has project experience

Ranked on *Forbes* magazine's "America's Largest Private Companies" listing for 2007

Ranked 12th largest employee-owned company in the U.S. in 2007 by the National Center for Employee Ownership

SUPERIOR SAFETY RECORD: FROM 2004-2006, BLACK & VEATCH ACHIEVED:

Incident Rate: 90% lower than U.S. national average

Days Away from Work Rate: 98% lower than U.S. national average

EMR: 59% lower than industry standard (U.S. Experience Modification Rate)

OSHA VPP Certified: Cooperates with OSHA in the development of VPP Star sites

Engineering News-Record, **TOP 500 DESIGN FIRMS SOURCEBOOK (2007)**
Ranked 14th overall

TOP 200 ENVIRONMENTAL FIRMS (2007)

Ranked 11th overall

3rd in Water

4th in Water Treatment/Desalination

6th in Wastewater

8th in Transmission Lines/Aqueducts

8th in Dams/Reservoirs

WHAT WE DO

Black & Veatch is an international leader in the design, development and construction of wastewater facilities, including systems for the collection, treatment, reuse and disposal of wastewater. More than 3,000 wastewater design projects have been completed for communities, government agencies and industries in the United States and around the world.

Master Planning

Siting Studies

Environmental Assessments

Wastewater Treatment

Nutrient Removal

Solids Processing and Handling

Odor Abatement and Control

Value Engineering

Wastewater System Engineering Reports

Infiltration/Inflow Analyses

Sewer System Evaluation Surveys

Design of Facilities for Collection, Treatment, Reuse and Disposal

Public Participation Programs

Utility Rate, Financial, Management and Operations Studies

Start-Up, Troubleshooting and O&M Manuals

Assistance in Preparing Federal and State Grant Applications

ABOUT BLACK & VEATCH

Black & Veatch is a leading global engineering, consulting and construction company specializing in infrastructure development in energy, water, telecommunications, management consulting, federal and environmental markets. Founded in 1915, Black & Veatch develops tailored infrastructure solutions that meet clients' needs and provide sustainable benefits. Solutions are provided from the broad line of service expertise available within Black & Veatch, including conceptual and preliminary engineering services, engineering design, procurement, construction, financial management, asset management, program management, construction management, environmental, security design and consulting, management consulting and infrastructure planning. With \$3.2 billion in revenue, the employee-owned company has more than 100 offices worldwide and has completed projects in more than 100 countries on six continents.

WASTEWATER

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Managing the waste, valuing the water.

weknowwater@bv.com
www.bv.com



BLACK & VEATCH WASTEWATER SOLUTIONS

RENOWNED WASTEWATER EXPERTS, EXTENSIVE EXPERIENCE, PROVEN PERFORMANCE—ALL AT YOUR DISPOSAL.



Appropriate best-fit solutions mean we help you balance your multiple objectives including economic practicality, environmental sensitivity and operational ease. To help you achieve a superior wastewater system, we avoid “cookie cutter” approaches. Black & Veatch considers your needs in relation to the whole system including the vast collection infrastructure that supports your treatment facilities, efficient process and system design, expert risk management and innovative construction strategies.

Wherever and however you deal with wastewater, Black & Veatch offers you the knowledge and experience to handle it successfully. From the initial collection of wastewater to safe conveyance of flows to comprehensive treatment processes, we help you harness the most efficient and appropriate approaches. Most importantly, we view water as a precious resource for your community. That’s why you can count on Black & Veatch to identify insightful reuse options or return treated water safely back to the environment at the best feasible quality.

We know what works and why, through extensive research, global project experience and an extensive international network. To provide you with the best technology-based solutions, we constantly monitor public expectations, environmental issues, emerging regulations, applicable laws and available technology.

Your success is directly tied to our people. From our renowned central process technology group to “on the ground” process professionals all over the world, we ensure you access to the full resources of our network of highly skilled specialists. Black & Veatch professionals lead the wastewater industry in research, new technologies and process enhancements, and that means realistic, reliable and affordable wastewater solutions for you.

BROOMFIELD WASTEWATER RECLAMATION FACILITY Broomfield, Colorado



Black & Veatch designed this innovative wastewater facility that is the first full-scale hybrid IFAS (Integrated Fixed Film Activated Sludge) of its kind in North America. It is an archetype for efficient storage and reuse of treated wastewater and the economical use of existing facilities. The expansion from 4 mgd to 8 mgd makes maximum use of the existing activated sludge aeration basins through the implementation of the IFAS process. The IFAS basins are able to handle twice their original design load while fully nitrifying the flow.

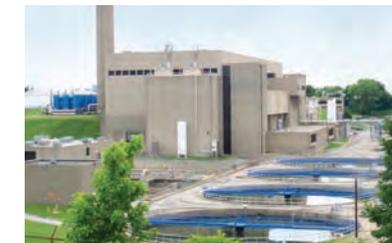
STICKNEY WATER RECLAMATION PLANT MASTER PLAN Chicago, Illinois



Black & Veatch developed a three-phase, prioritized Master Plan to guide capital improvements for this plant that serves central Chicago and 43 suburban communities. With a permitted capacity of 1,200 mgd, the Stickney Plant is among the largest wastewater treatment facilities in the world and serves an area that covers 260 square miles. The prioritized Master Plan encompassed plant simulation modeling, conceptual designs and alternative approaches. To achieve the most comprehensive, perceptive Master Plan,

the Black & Veatch project team included leading experts in the wastewater field, including specialists in biosolids processing, nutrient control and disinfection.

MORRIS FORMAN WASTEWATER TREATMENT PLANT Louisville, Kentucky



Fifteen years of community complaints about odors ended when this new sludge processing/handling facility opened. Black & Veatch, as design-builder, delivered an innovative, alternative approach that saved the client \$32 million and won the prestigious National DBIA Design-Build Award in 2004. The new process eliminates foul odors, produces a dried fertilizer product suitable for land application and saves the client an estimated \$4 million in annual O&M costs. The existing dewatering system was replaced with five new centrifuges and new material conveyance equipment that increased dewatering capacity by 10 times. New heat dryers that are powered by digester gas are just one of many energy efficient features.

EAGLES POINT WASTEWATER TREATMENT PLANT Minneapolis, Minnesota



Population growth was the major driver for an aggressive schedule

to enlarge and replace an aging wastewater treatment facility. Black & Veatch led a joint venture to design and build the project on an accelerated timetable. In addition to construction of the new facilities and complete demolition of the existing facilities, the project included a new site access road, pumping facility, large diameter interceptor sewer, river outfall structure and large diameter in-river outfall piping. A biological nutrient removal treatment system provides flexibility to operate either of two process trains in one of four different process configurations. The system is designed to meet current total nitrogen limits as well as anticipated future regulations.

HYPERION WASTEWATER TREATMENT PLANT FULL SECONDARY UPGRADE Los Angeles, California



Named one of the Ten Most Outstanding Public Works of the 20th Century by the American Public Works Association, Hyperion is one of the largest wastewater treatment facilities in the western hemisphere and treats about 80 percent of Los Angeles’ wastewater. Black & Veatch provided master planning and design assistance for the upgrade to full secondary treatment. A dense urban environment, limited space, community resistance and maintenance of utility service were major challenges. Improvements included advanced odor control provisions, new waste activated sludge thickening facilities and new digesters. Limited space was addressed with pure oxygen reactors and egg-shaped digesters. A phased construction approach kept the facility operational during construction on a very confined site.

DESCRIPTION OF SERVICES

CONDITION ASSESSMENT

Avoid catastrophic failures that force you to manage by crisis. Using a structured process, the Black & Veatch R³ approach helps you replace the right pipe, at the right time, with the right material—and make better decisions while maintaining customer service, controlling costs and managing risks.

WATER AND WASTEWATER

In systems of all sizes, Black & Veatch can handle the most complex pipeline design requirements and the most challenging construction scenarios. As a full-service provider, we can help you virtually every step of the way, from impact studies through construction and commissioning.

CONVEYANCE AND SEWERAGE

Compliance, tighter regulations and aging infrastructure are stretching resources to the limit. Black & Veatch draws on broad international experience to pinpoint appropriate, affordable solutions for managing stormwater, reducing overflows and making the most of your capital and system resources.

TRENCHLESS TECHNOLOGIES

To build or rehabilitate water infrastructure, you need dedicated water experts. Black & Veatch blends extensive water industry experience with trenchless technology capabilities to lower your risk, costs and environmental impact.

LARGE SEWER REHAB

Black & Veatch helps you work with the infrastructure you have, using the latest design and technology advancements to reclaim and renew failing sewer infrastructure. With approaches custom-tailored for you, we work to cost effectively extend your system's functional life while meeting regulatory targets.

INFRASTRUCTURE PLANNING

A sound system for the future requires smart planning today. Black & Veatch is a leader in water and wastewater planning for the long-term, with more than 300 successful planning projects in the past decade alone involving potable water, reclaimed water, wastewater, combined sewer overflow and GIS solutions.

CONSTRUCTION MANAGEMENT

In the inherently risky business of underground construction, Black & Veatch is a valuable partner for on-time, on-budget, on-the-mark performance. Broad experience, a deep understanding of design and technology, and meticulous attention to detail make B&V a leading construction manager for today's most ambitious underground projects.

BLACK & VEATCH BY THE NUMBERS

9,600+ Professionals employed in **100+** global offices; project experience in **100+** countries

6,500+ Black & Veatch's Total Client Base

Ranked on *Forbes* magazine's **America's Largest Private Companies** listing for 2008

Trenchless Technology TOP 50 DESIGN FIRMS 2007
1st: Engineering Design Firm, Overall

Engineering News-Record, BLACK & VEATCH RANKINGS:

TOP 500 DESIGN FIRMS SOURCEBOOK (2008)
Ranked 15th overall
4th in Water
4th in Treatment & Desalination
4th in Wastewater
5th in Sewerage and Solid Waste
7th in Dams and Reservoirs
10th in Transmission Lines & Aqueducts
12th in Sanitary and Storm Sewers

TOP 200 ENVIRONMENTAL FIRMS (2008)
Ranked 5th overall
2nd in Wastewater Treatment
3rd in Water Supply/Treatment

OTHER RANKINGS (2008)
29th in Top 400 Contractors
6th in Top 100 Design-Build Firms
15th in Top 100 Construction-Management-for-Fee Firms
14th in Top 40 Program Management Firms

BURIED INFRASTRUCTURE

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Underneath it all, the most important thing we build is confidence.

weknowwater@bv.com
www.bv.com



BLACK & VEATCH BURIED INFRASTRUCTURE

A LOT OF COMPANIES CAN MOVE YOUR PROJECT FORWARD. WE CAN TAKE IT FURTHER.



ARE WATER INFRASTRUCTURE PROBLEMS SURFACING IN YOUR COMMUNITY?

It's out of sight, but top of mind for public works leaders worldwide. Aging infrastructure, urbanization, climate change and public health issues are focusing urgent attention on the next generation of buried water infrastructure. Black & Veatch is ready to help you optimize the time, money, assets, processes and people it will take to prioritize and make the difficult decisions...with top efficiency and minimal risk.

We know you need to do more than move your underground projects forward. You need the vision to take it further. Black & Veatch can help you do that. For clients big and small, we are developing sustainable, comprehensive approaches that balance performance, costs and risks with clients' specialized needs and unique local and regional resources.

WATER PROJECTS NEED WATER EXPERTS

Black & Veatch is among the world's leaders in water and wastewater treatment, conveyance and storage. Extensive water experience ensures cost-efficient, sustainable life-cycle performance for buried water infrastructure. We know how to minimize system water loss, maximize rehabilitation economy, design and build sustainable systems for the future, and consider the complex, holistic nature of your community's water needs.

NOT JUST GLOBAL—GLOBALLY INTEGRATED

We're located all over the world, but that's just the start. More important is *how* we work: with a truly integrated global workforce. You get the most qualified team for your project, no matter where they might be based. It also means our "best practices" are global in scope. If the best solution for you is flourishing half a world away, we can bring it right to your doorstep.

FOCUSED SPECIALISTS FOR BROAD GOALS

From within Black & Veatch, we can deploy many focused specialists into one cohesive team to address your issues and challenges. Virtually every water-related specialty is available at Black & Veatch, including planners, hydrologists, geo-specialists, scientists, engineers, construction professionals and more. Your team is unique to *your* needs and the demands and the scope of each individual project.

REAL RESPONSIVENESS, REAL RESULTS

We are strategically structured for optimum client service and responsiveness. Black & Veatch easily works and communicates across geographical, financial and functional lines. Our fluid internal structure enables us to quickly and easily put the best, most qualified people on your project, unencumbered by restrictive traditional boundaries or hierarchical barriers.

MORE WATER SUPPLY NOW, MORE OPTIONS FOR TOMORROW



Nacimiento Water Project, San Luis Obispo County, California

After decades of stalled planning, new water supply will flow 45 miles from Lake Nacimiento to communities in San Luis Obispo County via a Black & Veatch-designed water intake system and pipeline. The ambitious project will immediately supplement the County's present groundwater supply

with surface water, but the new design's best feature is its foresight. The system will be capable of delivering the County's maximum entitlement to accommodate future needs and growth—up to 15,750 acre-ft. per year. Black & Veatch is helping the County anticipate different future scenarios to ensure the system is flexible and future-ready.

TURNING MULTIPLE ALTERNATIVES INTO ONE ACTIONABLE DESIGN



Rampart Parallel Pipeline City of Aurora, Colorado

Sound strategy is the foundation of successful projects, and in this integrated design project, Black & Veatch is translating strategy to action with the knowledge gained as consultants for the City of Aurora's 2004 Evaluation Study. Drawing on an in-depth understanding of the entire Rampart system, B&V is

designing an efficient, flexible Rampart Raw Water Delivery System that combines tunnel and reservoir improvements with a key new pipeline that will increase capacity from 72 mgd to a minimum of 90 mgd. In addition, the 72-in. pipeline will enhance reliability and operational efficiency within the system that the community depends on as its primary source of high quality water.

HAVING IT ALL: SPEED, COST-EFFICIENCY AND QUALITY PERFORMANCE



North Dakota Red River Valley Water Supply Project, Garrison Diversion Conservancy District

With a construction window of just three months a year, flawless planning and teamwork is essential. Black & Veatch is providing design and construction support for this 125-mile, 122 cfs-capacity large diameter steel pipeline to convey water east across

North Dakota from the Missouri River in the west. Poor soil conditions, lakes and severe weather conditions require the highest level expertise in project and construction management. Schedule challenges won't compromise cost efficiency, though; Black & Veatch is designing for cost saving opportunities from day one, including an innovative design method to minimize the necessary steel tonnage.

ASSESS, PRIORITIZE, STAGE, CONSTRUCT: A FORMULA FOR REALISTIC REHAB



Pickens Transmission Main, Greenville Water System, South Carolina

Pickens County's 1970s-era 27-mile large transmission main had begun to fail, with three ruptures in the late 1990s. A Black & Veatch study pinpointed the failure points and recommended 55,700 feet be paralleled and replaced. Capital budget restrictions limited how much could be installed under a single construction

contract. The project was organized into three stages, prioritizing design and construction according to highest risk of failure. Black & Veatch provided pipeline condition assessment, design and construction phase services for eleven miles of 72- and 64-inch transmission main. The complex \$22 million phased construction project crossed rivers, railroads, sound rock, high-voltage power lines, contaminated groundwater and numerous wetlands and streams.

Nexant Qualifications

CLEAN ENERGY CONSULTING SERVICES

Nexant's Capabilities and Experience

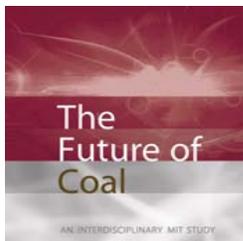


Providing services in the strategic design, development, and financing of onsite clean energy facilities through environmental attributes for corporations

About Nexant



"Red Herring---the global technology business magazine---has selected Nexant and 99 other companies as the 2008 Top 100 Companies in North America. The selection was made from over 800 candidate firms based in the U.S. and Canada on the basis of technology innovation, quality of management, breadth of partners and customers, and depth of financial backing. Nexant made the shortlist of 200 finalists at the end of April 2008 with the last round of winners announced in May 2008. Previous top 100 companies have included Google, Yahoo, Skype, and Salesforce.com."



Options for a Carbon-Constrained World, an MIT Study

Basem Sarandah, President and CEO of Nexant serves as an MIT Coal Energy Advisory Committee Member

Nexant is recognized globally by financial institutions for its advisory in the petrochemicals, refining and gas processing fields. Over the past 15 years, projects totaling over \$60 billion were successfully financed. Nexant acted as both Technical and Market Advisor in the majority of these transactions. Representative clients include:

ABN AMRO ANZ, Bank of America, Bankers Trust, BNP Paribas, Chase, Citigroup, HSBA, JP Morgan, RBS, Société Générale, and UBS.

Nexant has a record of being the independent adviser (Technical and/or Market) on several winning financial deals.

Middle East Awards

Oil & Gas Deal of the Year - Sohar Refinery Company (Oman)

Petrochemical Deal of the Year - Oryx GTL (Qatar)

Asia Pacific Awards

Best Syndicated Loan and Best Project Finance Loan – Reliance (India)

Oil & Gas Deal of the Year - Blue Sky Pertamina Refinery Upgrade (Indonesia)

Petrochemical Deal of the Year – CNOOC/Shell (Nanhai, China)

European Award

Petrochemical Deal of the Year – Basell Orlen Polyolefins (Poland)

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Introduction

Clean Energy

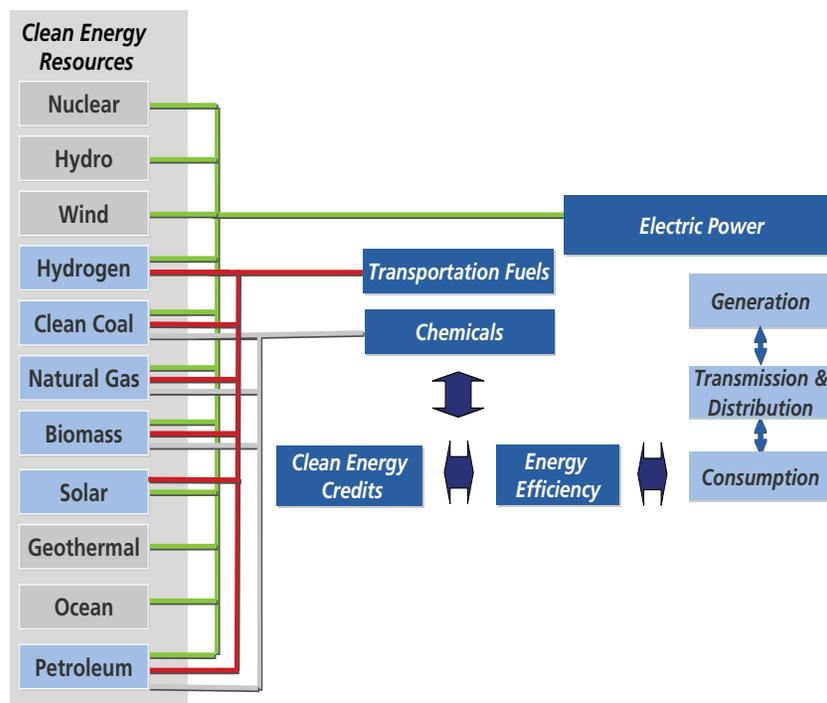
Clean Energy is the terminology used to characterize resources of energy that are more environmentally friendly, less polluting than standard practices and environmentally sustainable. Clean Energy is often used *interchangeably with the terms “Green Energy”, “Alternative Energy” and “Renewable Energy”*, each of which suggests lower pollution and non-fossil-fuel energy sources. However, the inherent pollution control available due to development of carbon dioxide (CO₂) capture and sequestration (CCS) has expanded this definition to include all major energy resources. Thus, while clean energy sources initially included biofuels, biomass, geothermal, solar, hydrogen, wind, hydroelectric and nuclear, CCS allows inclusion of petroleum, natural gas, and coal. Thus, CCS is essential to clean energy in that it can take an otherwise heavily emitting CO₂ energy source such as coal, and transform it into a Clean Energy resource. While all Clean Energy resources can be associated with the production of electric power, some can also be used as feedstocks to produce power, fuels and chemicals as shown in the Figure 1. Moreover, they all share issues of energy efficiency improvements and clean energy (carbon credits).

Heading into New Horizons

Clean Energy has become extremely important recently due to the rise of environmental concerns such as climate change, threats to air and water quality, and apprehension regarding overall energy availability and security of supply. Clean Energy is benefiting from a bounty of attention, and is expected to vastly grow over the next decade, with essentially all forms of energy becoming more “Clean” relative to current performance. Nexant believes that a critical mechanism for growth in Clean Energy will be the development of new technologies as well as improvement of existing technologies fostered by massive government support.

The successful development and sustainability of these emerging Clean Energy technologies is a multifaceted endeavor given its technical complexity, significant cost and complex supply and delivery infrastructure. Key areas of development are expected to be in the areas of equipment improvement, catalysis, and energy efficiency. In addition, Nexant expects that industrial facilities will adopt a comprehensive “life cycle” approach to minimize total emissions, energy use, and waste of all kinds.

Figure 1: Clean Energy Resources



About Nexant

Nexant is a leading provider of technical and management consulting services, not only in the gas, oil, and chemicals sectors, but also in the clean energy arena where we have extensive experience and capabilities in:

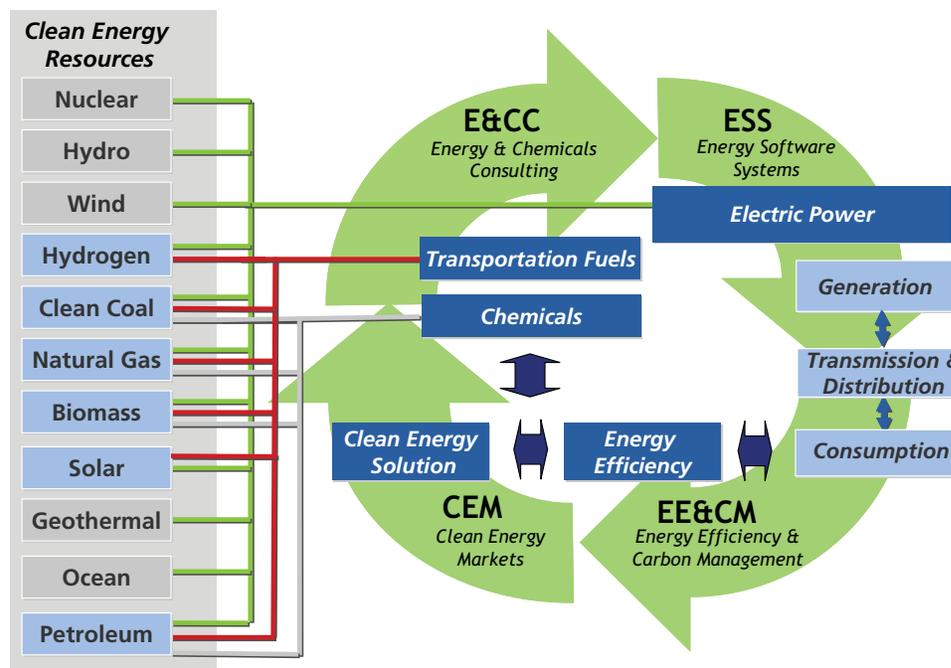
- Biomass
- Clean Coal
- CO₂ Capture and Sequestration
- Geothermal
- Hydrogen
- Natural Gas
- Solar and Wind Power

These capabilities are rooted in our global staff of industry experts who over the past five decades have gained direct and extensive experience in the advanced technological, commercial, and economic aspects of the Clean Energy industry. With offices across the globe, Nexant is an industry leader, entrenched in every facet of Clean Energy's development and commercialization by offering all functional services in Clean Energy consulting, including:

- Strategic Planning
- Transaction Support (M&A)
- Project Feasibility
- Operations & Portfolio Performance Enhancement
- Technology Management & Development
- Technology Evaluation & Owner's Engineer
- Energy & Utility Management Platform
- Market Analysis
- Greenhouse Gas (GHG) Management and Certification
- Marketer of Energy Certificates (RECS), and Energy Efficiency Certificates (EECs)s

Nexant consultants have hundreds of man-years of project experience touching every aspect of Clean Energy technology. These unique qualifications drive the comprehensive multi-disciplinary approach we apply to clients ranging from start-up/venture capital firms, Fortune 100 companies, licensors and EPC contractors to most National Governments around the world. Frequently we advise on "first-in-the-world" clean energy technology along the project development chain from concept to commercialization. While this brochure is largely focussed on Nexant's Energy Business Unit, other Business Units have additional, business core competencies that work synergistically, as shown in Figure 2.

Figure 2: Nexant's Focus



Nexant's Experience

U.S. Government Consulting Projects

Nexant's extensive experience in Clean Energy Technology is exemplified by the number and breath of project studies that we have completed for U.S. Government-related entities and its grantees as shown in the following tables.

On-Site Technical Support to NETL

	Example Task
Coal Gasification Demonstration Technology Owner's Support. A techno-economic viability of converting coal and its waste mixtures into premium transportation fuels, co-producing power.	NETL Gasification Web-Site Technical Content Development & Update Support (2008)
	Develop a Baseline Analysis of a Coal to Methanol-to-Gasoline System (2008)
	Review of Capital Cost Estimates of FutureGen Conceptual Design (2007)
	System Analysis Support for Liquid Fuels Program – Assessment of Finance, Tax and Subsidy Policies on the Economic Performance of a Large Fischer-Tropsch Facility (2007)
	Process Design Basis for a Commercial Scale Fischer-Tropsch (FT) Facility with Various Levels of Carbon Capture (2007)
	Technical, Economic and Environmental Assessment of Small Scale FT Facilities (2007)
	Review NETL technical report entitled "Carbon Sequestration for Existing Power Plants Feasibility Study" (2006)
	Financial Analysis of Advanced Fuel and Power Systems for NETL using the Nexant developed Power Systems Financial Model (2005-2008)
	Project Finance Structures for the Economic Analysis of Fossil-Based Energy Projects
	ASPEN process simulation modeling supports
Engineering cost estimating modeling supports	

Biomass and Solid Waste Gasification, and Biofuels

Principal Clients	Selected Projects
DOE National Renewable Energy laboratory (NREL)	Thermochemical Ethanol Production – Supplemental Design and Process Modeling Support (2008 -)
DOE/NREL	Equipment Design and Cost Estimation for Small Modular Biomass Systems, Synthesis Gas Cleanup and Oxygen Separation Equipment (2004-2005)
DOE & Boise Cascade	Boise Cascade Gasification Project (2003)
DOE & Calla Energy	Calla Biomass Co-Firing Project (2002)
DOE & West Kentucky Energy	West Kentucky Energy Biomass Co-Firing Project (2002)
State Govt/CR&R	Los Angeles MSW (Municipal Solid Waste) Gasification Project (2000)
Future Energy Resources Corporation	Vermont Biomass Gasification Project (2000)
DOE & Weyerhaeuser	Weyerhaeuser Black-Liquor Gasification Project (1999)



Coal Gasification - IGCC, Coal-To-Liquids, Chemicals and Fuels

Principal Clients	Selected Projects
DOE/NETL and WMPI	EECP (Early Entrance Co-Production Plant) Gasification Co-Production Project (2000-2008)
USAID and Govt. of India	Indian Integrated Gasification Combined Cycle Evaluation (2002-2006)
State Gvt./Hunnan International Technopolis Shenyang	Feasibility Study for Shenyang Polygeneration Project (2005-2007)
DOE/GreatPoint Energy, Inc.,	BlueGas™ Coal-to-Methane Gasification Economic and Engineering Analysis (2006-2008)
Korea Institute of Energy Research (KIER)	Coal Gasification-to-Liquids Feasibility Study (2006)
DOE/NETL and Arizona Public Service Company (APS)	Substitute Natural Gas from Coal Co-Production Project (2005-2006)
DOE/NETL and RTI	Preliminary Engineering Analysis of RTI Warm Gas Cleanup Technology (2006-2007)
DOE/NETL	Integrated Gasification Combined Cycle Economic and Financial Model Development (2004)
US EPA	Assessment and Comparison of Gasification Combined Cycle and Pulverized Coal Power Generation
DOE/NETL and Global Energy	Lima Energy IGCC Process Engineering Development (2006)
DOE/NETL and ITN Energy	Novel Composite Membranes for Hydrogen Separation in Gasification Processes for Vision 21 Energy Plants (2001-2004)
DOE/NETL	Gasification Plant Cost and Performance Optimization (2000-2005)
DOE/NETL and GTI	Gasification Alternatives for Industrial Applications (2004-2005)
DOE/NETL	Refining and End Use Study of Coal Liquids (1998-2001)
DOE/FETC	Baseline Design/Economics For Advanced Fischer-Tropsch Technology (1998-2000)

Gas to Liquids

Principal Clients	Selected Projects
DOE/NETL and Conoco Phillips	Ultra Clean Fuels Study
DOE/FETC	Slurry Reactor Design Studies
DOE/FETC	F-T Diesel Upgrade and Testing
DOE/FETC and Air Products and Chemicals, Inc.	Alternate Fuels and Chemicals from Synthesis Gas

Hydrogen and Fuel Cells

Principal Clients	Selected Projects
DOE/NETL and Fuel Cell Energy	Conceptual Design of a High Efficiency State-of-the-Art 400 MW Integrated Coal Gasification/Solid Oxide Fuel Cell Power Plant (2007-2008)
California Energy Commission (CEC) and GTI	System simulation, integration and cost estimation support of CEC/GTI's SOFC developmental program
EPRI	Direct Coal Fuel Cell (DCFC) System Assessment (2007)
EPRI	Technical Assessment Guide (TAG) - Hybride Gas Turbine and Fuel Cell Combined Cycle Power Plant (2005)
EPRI	Technical Assessment Guide (TAG) – Onsite Hydrogen Production (2003)
DOE/NREL	Fuel Cell Vehicle Infrastructure Demonstration Program (2004-2007)



Representative Private Sector Consulting

Corresponding to these government-funded projects, Nexant has significant Clean Energy consulting expertise with private sector clients as illustrated by our Process Evaluation and Research Planning (PERP) and related subscriptions services. See following selection.

Algae: Emerging Options for Sustainable Biofuels. (June 2009) - This study examines algae as an emerging option for non-agricultural, non-food, highly sustainable lipid, or hydrocarbon biofuel feedstocks; it describes the critical technical and economic challenges of simultaneously capturing CO₂ greenhouse gases, treating wastewater, and potentially making high value co-products.

Unconventional Natural Gas. (May 2009) - In key gas markets, unconventional natural gas has or is becoming a viable supplement to dwindling conventional gas reserves. The principal types of unconventional gas are: Tight Gas, Shale Gas, Coal Seam Gas, and Gas Hydrates. This report addresses technical and operational challenges, environmental concerns, breakeven economics, worldwide occurrences, and long-term production scenarios.

Liquid Biofuels: The Next Generation. (February 2009)-This study assesses the technical status and economic competitiveness of the second generation of liquid biofuels that is likely to supersede traditional ethanol and FAME biodiesel in supplementing or replacing petroleum motor fuels.

Floating LNG Production. (Dec 2008) - Floating LNG production technology is part of an ongoing effort to monetize "stranded" offshore natural gas resources. This report assesses the various technologies that are being developed around the world to enable cost effective floating LNG production. Technical, economic, and market drivers are discussed.

Brazil's Biofuels Industry: Outlook for a Global Leader. (Nov 2008) - This study assesses the technical, commercial and policy status of existing and anticipated biofuel and biofuels-related activities in Brazil. Related markets such as flexible-fuel and dedicated ethanol vehicles and distiller grains are examined.

Development in Biodiesel Production Technologies. (Sep 2008) - Latest process technologies for producing biodiesel are assessed. Axen's Esterfip-HTM process and Neste Oil's NExBTL® process are analyzed and production economics are compared to conventional base-catalyzed process.

Methanol Strategic Business Analysis. (Sep 2008) - SBA program identifies the strategic trends and issues that will shape the industry based upon a review of the fundamental business drivers and their dynamics with respect to markets, pricing, technology and delivered cost competitiveness.

Polygeneration from Coal: Integrated Power and Chemicals. (Jun 2008) - This study analyzes the economics of an integrated coal-based gasification complex coproducing electric power and chemicals via IGCC technology.

Polygeneration from Coal: Integrated Power and Fuels. (Jun 2008) - This study analyzes the economics of an integrated coal-based gasification complex coproducing electric power and liquid fuels via IGCC technology.

Biomass Gasification. (Apr 2008) - Various approaches for biomass gasification are assessed including pyrolysis, staged gasification, and indirect gasification. Associated issues such as biomass availability and downstream syngas-based technologies, such as fermentation, mixed alcohols synthesis, and FT syntheses are presented. A case study comparing the production economics of n-butanol via biomass gasification versus conventional propylene oxo synthesis is given.

Biobutanol: The Next Big Biofuel. (Feb 2008) - This study examines the manufacturing (by biological and thermochemical routes), economic, global commercial, regulatory, and practical feasibility of biobutanol, and considers whether/how it could fit into existing ethanol/petroleum gasoline infrastructure.

NGL Extraction Technologies. (Dec 2007) - The technologies and economics of natural gas liquids (NGL) extraction are presented. In addition, an overview of the tri-regional NGL market is provided.

Carbon Management: CO₂ Capture, Transport, and Sequestration. (Nov 2007) - This study details the major issues surrounding carbon capture and storage in the power and industrial sectors. Study includes: technology, costs, applications, transport and storage, and regulatory information based on current policy and the impacts of proposed future legislation.

Hydrogen Production in Refineries. (Oct 2007) - The technologies and economics for hydrogen production are presented in this report. Steam reforming, pressure swing adsorption (PSA), and membrane purification processes are assessed. Regional hydrogen capacities are also provided.

LNG: The Expanding Horizons of Liquefaction Technology and Project Execution Strategies. (Jun 2007) - This study analyzes the technologies and economics of base load LNG plants and reviews alternative project execution strategies.

Coal to Olefins. (Apr 2007) - The technology for converting coal all the way through to ethylene and propylene is developing rapidly and commercialization plans are developing rapidly as well, especially in China. This report demonstrates the favorable economics of coal to olefins (CTO) using both UOP and Chinese-based technology.



LNG Receiving Terminals. (Jan 2007) - This report identifies/comparates different types of technology that comprise an LNG receiving terminal; discusses important trends/challenges that players in this growing business face. Capital investment/operating costs for LNG regasification are included.

Biogasoline. (Dec 2006) - Assesses the various approaches for converting renewable feedstocks to liquids that can serve, as close as possible, to “drop-in” replacements for or blend-stocks with petroleum-based gasoline.

Liquid Biofuels: Substituting for Petroleum. (Dec 2006) - This study characterizes and assesses the status and economics of the technologies and markets for liquid biofuels as a replacement for conventional gasoline and diesel.

Adding Value to Methane – Strategic Opportunities for the Middle East. (Aug 2006) - The study provides a valuable aid for strategic planning at a time of opportunity and challenge for methane exploitation. Study includes: regional market dynamics, impact on global trade, technology, capex/opex, and cost competitiveness.

Gas Processing and NGL Extraction: Gas Conditioning. (Mar 2006) - The technologies and economics for conditioning natural gas are presented. In addition, regional supply and demand status, issues, and outlooks are also provided.

Synthetic Ethanol. (Jan 2006) - The process technology and production economics of both synthetic and fermentation ethanol are presented. Supply/demand issues in key ethanol producing countries are also provided.

Coal to Chemicals: Is It Coal's Time Again? (Dec 2005) - Study provides an in-depth quantitative/qualitative analysis of the production of commodity chemicals from coal. Study includes a wide-ranging cost of production analysis, comparisons to conventional technology and feedstocks, and regional comparisons.

Unconventional Heavy Oils. (Nov 2005) - The technology for recovering and using unconventional heavy oils is discussed. Emphasis is given to the Alberta Oil Sands in Canada and the Orinco Belt in Venezuela

Fuel Switching with NGLs/Small Scale LNG. (Aug 2005) - This report examines the technical feasibility and commercial status of LNG and SSL LNG technologies and other fuel switching options and their potential for application in the chemical industry.

Developments in Syngas Technology. (Feb 2005) - The chemistry, process technology, and production economics for syngas and key derivatives are presented. A syngas demand outlook is also included.

Coal Gasification Technologies. (Jan 2005) - The process technology and economics for coal gasification, syngas, and methanol production is assessed. In addition, a market forecast for methanol is provided.

Advances in LNG Technologies. (Oct 2004) - The latest technologies for natural gas liquefaction, shipping, and regasification are assessed. LNG economics and regional supply/demand forecasts are also presented. Biodiesel. (Dec 2003) - The chemistry, process technology, production economics, and performance characteristics of biodiesel are assessed. The oleochemicals, glycerine, and petroleum diesel markets are also presented.

Fuel Cells for Transportation. (Dec 2003) - Fuel cell technology, leading developers, fuel selection, and fuel distribution issues are assessed.

Stranded Gas Utilization: Steps to Commercialization. (Dec 2003) - This study provides an in-depth quantitative and qualitative analysis of the various end-uses and production processes for converting large, remote natural gas reserves to viable commodity products.

Fischer-Tropsch Liquids as Steam Cracker Feedstocks. (Dec 2002) - The processing and economic advantages of cracking F-T liquids at various severities are discussed in this report. In addition, a review of commercial and developing GTL technologies are also provided.

Biotech Route to Lactic Acid/Polyactic Acid. (May 2002) - The chemistry, process technology, and production economics are presented for both petrochemical and biotech routes to lactic acid and polyactic acid. Market applications and forecast demand for materials are also presented.

Methanol to Olefins. (Feb 2002) - The chemistry, process technology and production economics of UOP/Hydro MTO and Lurgi MTP processes are compared to conventional routes to ethylene and propylene. Regional market outlooks for ethylene and propylene are also presented.

Stranded Gas Utilization: Methane Refineries of the Future. (Jan 2001) - This study provides an in-depth analysis of the manufacturing processes and economics for converting large, remote natural gas reserves to viable products.

Additional illustrative client-specific consulting engagements are enumerated later in this booklet.

Nexant's Services and Approach

Nexant's functional services and capabilities developed over the course of five decades are critical for carrying out our Clean Energy Consulting. Our various multidisciplinary and integrated approaches are described below.

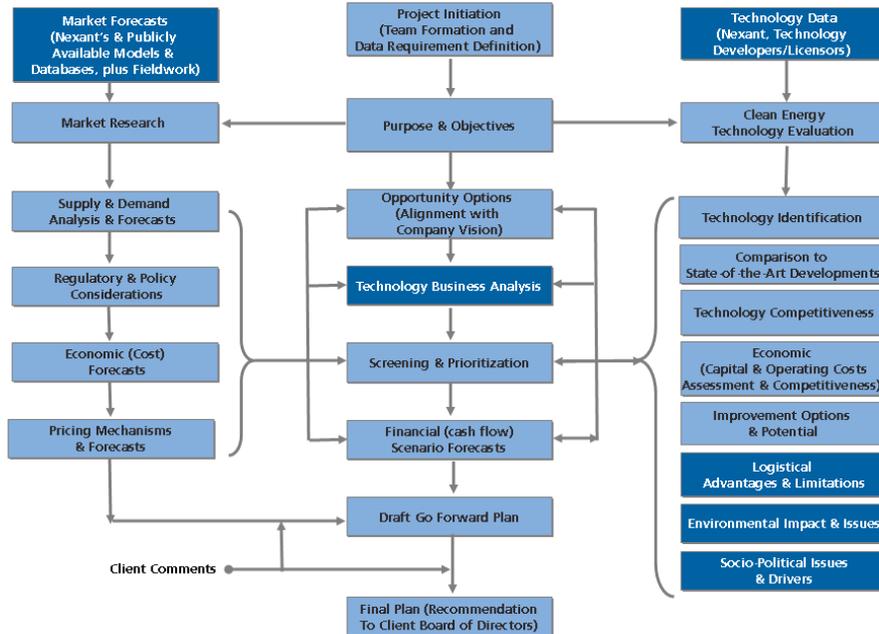
Strategic Planning

Nexant offers real-life, hands-on services to help our clients develop actionable plans to achieve sustainable and profitable businesses through organic growth,

repositioning, technology development and transfer, diversification, acquisition, and/or divestiture. Nexant commercial, technical, economic, and socio-political analysis is informed by state-of-the-art industry-specific knowledge and a real-time understanding of world markets.

Nexant's typical multidisciplinary and comprehensive approach for a Clean Energy Strategy Project is illustrated in the following Figure.

Figure 3: An Example of Nexant's Clean Energy Strategy Project

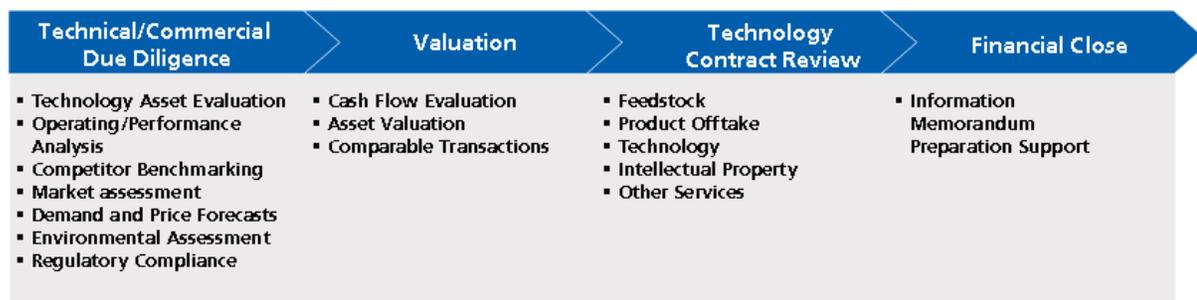


Transaction Support

Nexant lends its expert independent commercial and technical analysis to firms and financial sponsors contemplating financial transactions from concept to financing. Nexant also provides post merger support

including Operations and Portfolio Performance Enhancement in order to assist our customer in optimizing its profitability and long-term sustainability as described below.

Figure 4: Operations and Portfolio Performance Enhancement

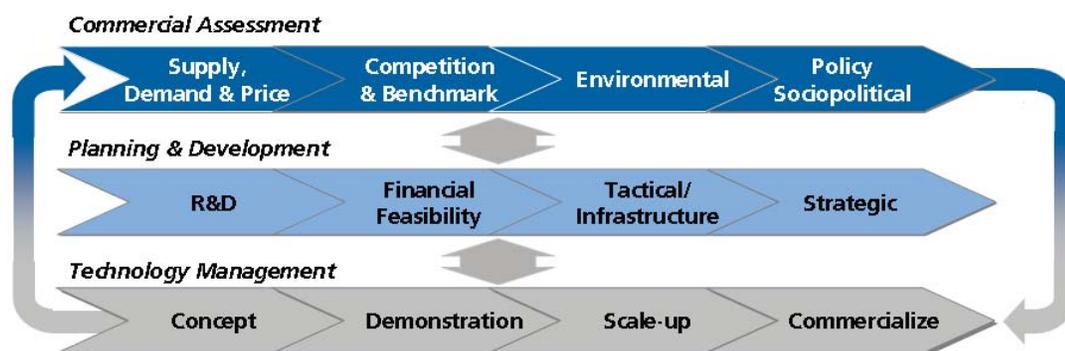


Project Feasibility

Nexant's experts have extensive experience in developing conceptual designs, material flow balances, investment and operating cost estimates, product demand and pricing forecasts, project cash flows, financial assessments, and implementation plans for commercial development. We have conducted numerous project feasibility studies including but not limited to carbon capture technologies, clean coal units, gasification of waste streams, gas-to-liquids and fuels, coal-to-liquids and fuels, solar, wind, and biofuel technologies as well as other clean energy technologies.

A proper feasibility study requires multiple inputs and careful evaluation of detailed commercial, technical/ economic and financial factors; all need to be executed simultaneously, seamlessly and consistently. Nexant offers complete end-to-end and side-to-side analysis. This is a typical feasibility study workflow methodology: Nexant is proud of its record of working on a very extensive set of some of many of the world's major energy projects, many of which ultimately have been built and are in operation.

Figure 5: Feasibility Study Breakdown



Portfolio Analysis and Enhancement

This area of Nexant's expertise generally relates to improvement of a customer's assets on the ground. The end result is a program to drive improvements in performance of operating assets and technology, product offerings (portfolio), and/or business processes. Very often, the program identifies improvements based on industry and technology benchmarking of best practices, or closing the gaps identified in a strategic analysis phase.

For Clean Energy Portfolio Enhancement engagements, Nexant compares the best technology/practices in the world with a client's technology, operation, product offering, or business process, and recommends:

- Production process design or redesign
- Identification and development of strategic partnerships with appropriate services companies
- Development of new technology testing and implementation programs
- Technology/vendor analysis and selection

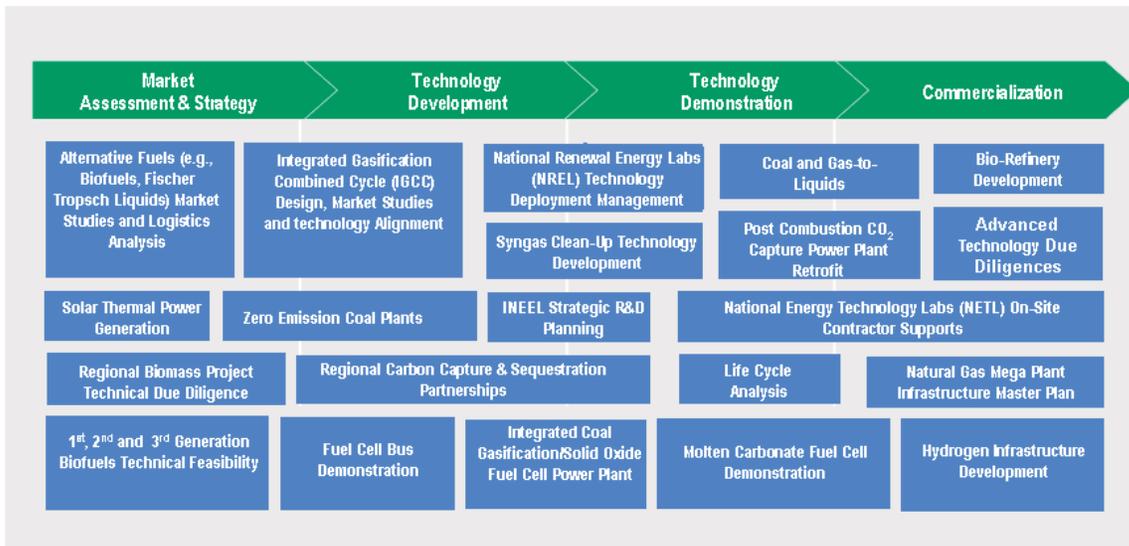
- Change management to ensure the performance improvement objectives are met
- Sustained organizational restructuring, at both the corporate and plant level.

The objective of this is to combine people, process, and technology to fundamentally transform a business for significant and sustainable performance improvement.

Technology Management and Development

Nexant experts are at the forefront of developments in Clean Energy technologies. We have worked on new carbon capture technologies using both hydrates and chilled ammonia as a separation tool. We have developed design templates for coal gasification and gas-to-liquids plants. We have pioneered work in the areas of renewable energy and fuel cell technology. Illustrative Clean Energy Technology Projects are shown below.

Figure 6: Illustrative Clean Energy Projects



Technology Evaluation and Owner's Engineer

Another significant aspect of Nexant's core technology management and evaluation offering is in Project Development Support, that is, all aspects of technology evaluation and Owner's Engineer including construction monitoring, support to the lenders from basic engineering through plant start-up, and project completion certification.

The following figure exemplifies the stages of Project Development at which Nexant offers technical consulting support and independent assessment.

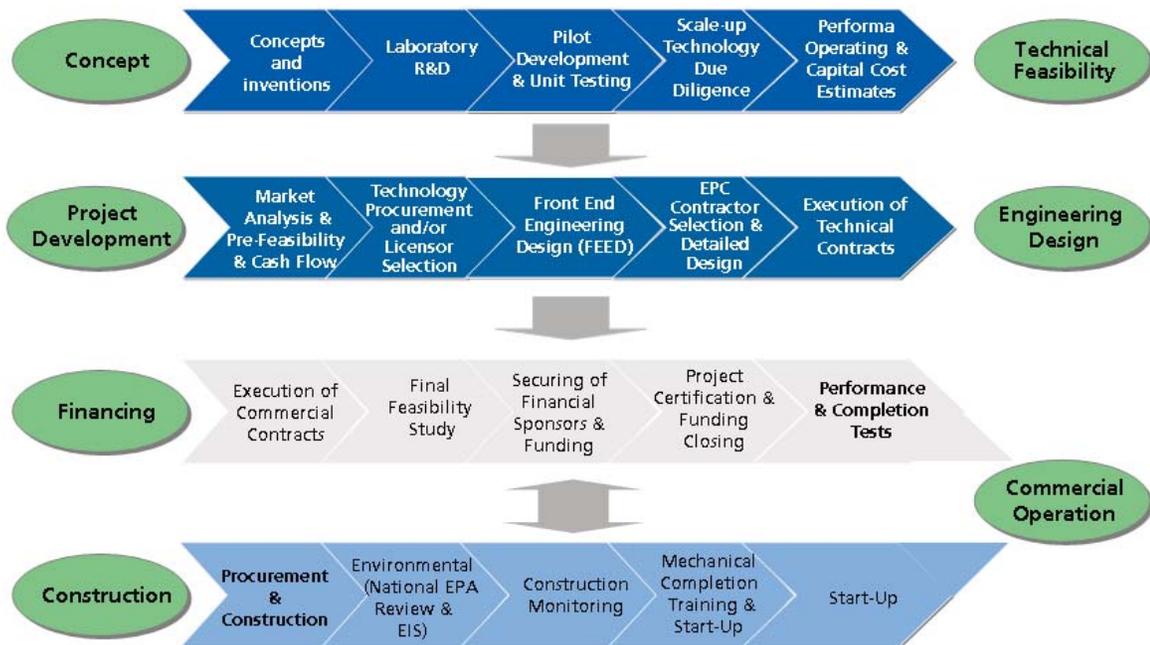
The area of Technical Evaluation includes the feasibility of the technical process. Here, Nexant has served as Independent Technical Consultant to advise technology developers on a go-forward strategy, by reviewing and auditing new technology in all phases of the development (including all steps along a typical development chain: lab to pilot work, pilot to semi-commercial, semi-commercial to commercial). Our technology due diligence and risk analysis provide technical perspective necessary for deciding whether to proceed on the development track.

Supporting these efforts, Nexant engineers have extensive real-world process design and engineering experience with:

- Conventional and advanced fossil power generation systems
- Clean coal technologies including gasification
- Syngas cleanup and processing
- Carbon dioxide capture and sequestration
- Gas turbine and fuel cell power cycles
- Renewable energy power generation including solar thermal, and biomass power generation by gasification and direct fire.

Nexant engineers also have extensive experience in process simulation using AspenPlus, Hysis, Promax, GateCycle, and proprietary in-house design simulation tools. Nexant has extensive cost estimation experience using ICARUS, supported by an extensive in-house database derived from decades of real project experience.

Figure 7: Stages of Project Development



Energy and Utility Management Platform

Our Energy and Utilities Management Platform is focused on a clients improved visibility, performance and productivity in order to reduce facilities costs and emissions.

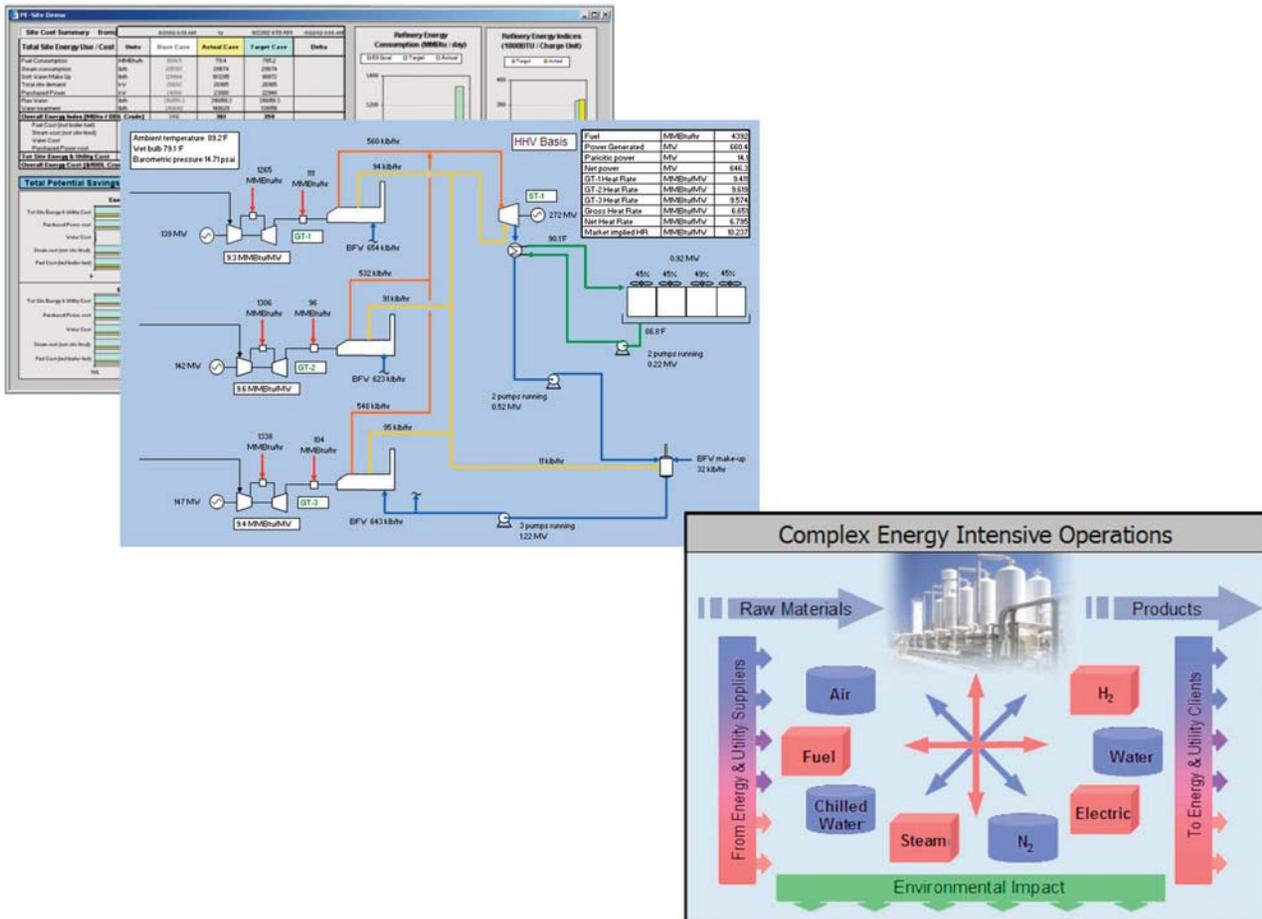
Nexant with LightRidge Resources, LLC, can implement a software platform, PE-Advisor™ that empowers operators of complex energy and utility plants to make informed decisions based on a more complete understanding of their facilities. It presents a site-wide, bottom-line view of all the integrated energy and utility systems and provides instant visibility of operating performance and the impacts of decisions. This is key because the optimal operating point for the site changes frequently.

Due to complex, integrated and distributed nature of energy and utility systems in the process industry, it is a challenge to comprehend what is dynamically happening in the systems to identify and act on opportunities for cost and emissions saving in a real-time manner.

The PE-Advisor system uses fundamental models and actual plant data to describe the facility's utility assets and their operation. It includes the site's energy and utility demands, the greenhouse gases produced, energy contracts and the economic impacts of operating the site – all in one platform. The unique on-line, what-if capability enables quick analysis of possible changes in the plant's conditions, operations, or design.

Nexant works closely with the personnel of a company to complete all phases of a project, from initiation to installation and verification.

Figure 8: Energy and Utilities Management Platform - Illustrative



Market Analysis

Market analysis includes a dynamic understanding of three fundamental characteristics along any product value chains: end use demand/supply volume, technology structure, and inter product competition/ replacement potential. Nexant analyzes these fundamentals with numerous sophisticated tools:

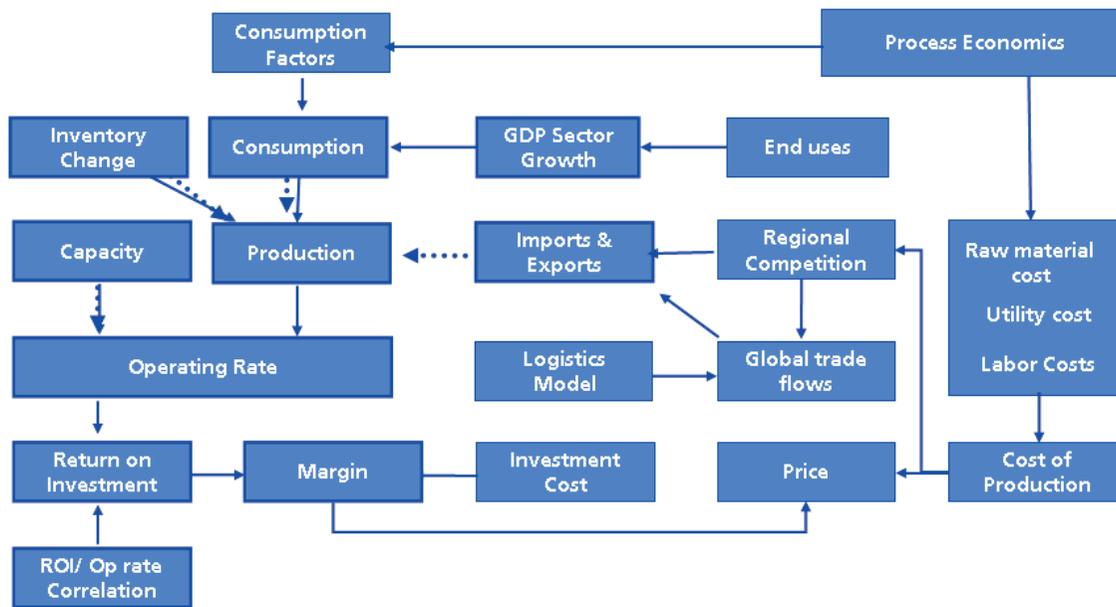
- Real-time and comprehensive forecasting models of supply, demand, trade, end use, and capacity
- Soundly based and widely accepted price forecasts
- Extensive in-house technology databases
- Broad and deep industry contacts in all facets of the energy industry
- Advanced knowledge of the cutting edge emerging technologies

- In-depth country specific and global market analyses of clean energy and related conventional energy resources and chemicals products.

Overall, Nexant's approach for market analysis is to follow commodity theory to link "tons" or volume of product supplied and sold in the market with "money." Optimizing that driver is equally key to mature (such as oil and chemicals) and evolving business (such as clean energy) models. Nexant evaluates complex linkages illustrated below.

Nexant provides market analysis on a standalone basis or as input to our other offerings like planning and feasibility studies.

Figure 9: Market Analysis - Illustrative



Greenhouse Gas (GHG) Management and Certification

The GHG experts at Nexant have over 50 years combined experience with climate change and clean energy, and have delivered credible services for over 100 GHG assignments since 2001. Nexant team members continue to offer innovative GHG management services to numerous large and multi-site clients:

- GHG program design and methodology development
- Corporate management plans and strategies
- Regulatory compliance strategic plans and management systems
- Inventory development, reporting and verification
- Needs analysis and implementation of GHG Information Management Systems
- Clean technology assessments
- Carbon neutral product evaluation
- Offset project advisory services, validation and verification
- GHG Training

Nexant helps companies achieve double dividend results on their GHG investments by capitalizing on carbon market opportunities, managing GHG inventories more efficiently, and investing in clean technologies with the right standards and strategies.

Where others see costly risk mitigation processes, we see business opportunities for generating non-conventional revenue streams. Our team can help do much more than document and manage a company's GHG emissions. Whether a company is invested in clean technologies, carbon neutral products, or offset projects, Nexant assists in optimizing the return on investment.

Marketer of RECS and EECs

Nexant is the largest and oldest independent retail marketer of environmental credit products including:

- Renewable Energy Certificates (RECS)
- Energy Efficiency Certificates (EECs)
- Carbon Dioxide (CO₂) Offsets

Principals in Nexant's Clean Energy Solutions practice have:

- Created and transacted the very first EEC in the U.S.
- Developed one of the first corporate Greenhouse Gas (GHG) programs
- Created the first renewable energy credits from Combined Heat & Power (CHP) in Pennsylvania
- Transacted over 1 billion kWh of EECs in the state of Connecticut

Nexant has extensive experience in providing REC and EEC products and services to utilities, businesses, and universities. In just the last 6 months, Nexant has sold almost 2 billion kWh of renewable energy nationally and transacted over 1 billion kWh of energy efficiency. Three of the top EPA Green Power Partners recently purchased RECs from us. We have developed EECs certificates for projects of Fortune 500 companies, including the world's largest package delivery company and the world's leading producer of glass fiber materials.

Case Studies in Clean Energy

Nexant's consulting staff has carried out literally hundreds of projects in the Clean Energy industry. Selected Government-related projects are listed in Section 2; here is a selection of Nexant's private sector projects in Clean Energy.

Biofuels

Project: Multiple Projects Involving First Generation Ethanol

Client: Multiple

Nexant has performed technical, economic and/or market financial due diligence on several European first generation bioethanol projects, and re-financing due diligence of an existing bioethanol plants in the United States.

The sponsors of these projects have included groups already present in the industry, producing and selling biofuels; traditional motor fuel retailers preparing for an imminent biofuels sales obligation; agricultural groups with feedstock resources; local government; and entrepreneurs. Nexant has worked on the side of both Lenders and Equity providers to carry out commercial and technical due diligence; we have also conducted feasibility studies for potential sponsors.

These studies have covered: review of target markets, review of overall European markets, biofuels policy status and impact of trade and import issues, supply and demand projections, market entry strategy, financial model analysis, product price forecasts, byproduct market assessments, feedstock developments (supply, demand, prices, alternatives), distribution channels, development of 2nd generation technologies and likely impact on first generation plants, technology assessments, project planning and implementation, project management, contracts review, etc., and environmental review.

Project: Multiple 2nd Generation Ethanol Projects

Client: Multiple

Nexant is currently working with Government agencies in Europe (informally) on assessing the potential for cellulosic bioethanol given its interaction with the agricultural community and its implications for future farming practices. Nexant has also worked formally with the U.S. DOE on evaluating R&D progress in fermentation bioethanol (pre-treatment and other aspects), as well as on the thermo-chemical (gasification) biofuels platform. The analysis of the potential for and competitiveness of second generation processes features strongly in major technical due diligence work. In addition Nexant is currently assessing the opportunity for developing hybrid first and second-generation bioethanol facilities building on existing assets.

With respect to biofuels projects, Nexant has worked for Lenders and equity providers supporting over US\$3 billion of investment in Europe alone during the 2007/2008 months. These investments also included

significant projects in the biodiesel and biodiesel feedstock areas, covering new investment strategies, second generation processes and developments, and new business outlets for glycerin.

Project: Biodiesel Commercial and Technical Review

Client: Multiple in the U.S. and Europe

For a global petrochemicals producer with access to its own biodiesel technology, a detailed commercial review of European biodiesel business by country and a comparison of major biodiesel processes.

Project: Cellulosic Ethanol Process Evaluation

Client: Confidential

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

Project: Energy Utilization of Switchgrass Residue

Client: Confidential

For a leading multinational energy company, Nexant studied and compared options for using this finely-divided biomass process residue at a typical mid-western U.S. location for fermentation/residue IGCC, co-firing in existing coal boilers, or biomass gasification integrated combined cycle power generation. Biomass supply and logistics costs were modeled along with the conversion processes and the energy pricing scenarios in the context of "green electricity" pricing and GHG emissions reductions trading.

Project: Alcohol Drying Technology

Client: Confidential

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

Project: Business Development Strategy

Client: Confidential

For the world leader in the soybean industry, a business development strategy for entering the biodiesel business covering market opportunity by region, feedstock supply analysis, price and profitability analysis, market entry strategy, technology, cost competitiveness and project financials.

Project: Global Biofuels Strategy

Client: Confidential

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



Project: Financing Support**Client:** Consortium of banks led by Citicorp

Nexant assisted the consortium of banks that provided the \$1.7 billion project financing for the natural gas to gasoline (GTG) project in New Zealand. The initial assignment was a technology audit of Mobil's Methanol-to-Gasoline (MTG) process, as this was to be its first commercial application. Nexant reviewed the status of the technology, and the specific design and engineering for the New Zealand project and prepared a detailed report for inclusion in the Information Memorandum. After financing was completed, Nexant assumed the role of Independent Consultants as defined in the Credit Agreement. This involved periodic visits to the contractor's offices, the job site and the preassembly site, and status reports to the agent. As Independent Consultants, Nexant also had the responsibility to certify Plant Completion and Plant Performance in accordance with terms in the Credit Agreement. Nexant's work on this project was performed over a period of five years.

Project: Biofuels and Chemicals from Corn**Client:** National Corn Growers Association

Nexant was engaged by the National Corn Growers Association, under US DOE sponsorship, to study potentials for production of chemicals and biofuels ("biogasoline", *n*-butanol, etc.) from corn in the near term. The study focused on fuel ethanol derivatives, the available and emerging technologies to implement these routes, and the economic feasibility of these industrial models.

Project: Renewable Energy Feasibility Study**Client:** Detroit Energy

Nexant evaluated various promising biomass technologies for a renewable energy portfolio for Detroit Energy, a unit of Detroit Edison.

Project: Lenders Independent Technical and Commercial Advisor Biodiesel Project**Client:** Confidential (European Bank)

Technical and commercial due diligence services for Lenders to a leading European-based biodiesel producer. Producer planned to retrofit and expand an existing industrial plant to establish a new world scale biodiesel facility in the United Kingdom with a total capacity of 420 thousand tons (530 million liters) per year. The new facilities were to be back integrated into feedstock production, natural oils trading, and biodiesel trading activities.

Project: Biodiesel Technology Development and Business Due Diligence**Client:** Biodiesel Industries, DFJ Element, and 3i Investments

For the project sponsor and a finance syndicate, Nexant assessed on a fast-track basis the quality and uniqueness of the patents, experience, staff, and other intellectual and business assets of the sponsor company, and of its business plan. The business plan is based on a modular plant design, local systematic

acquisition of waste oil and crude oils and fats resources, a unique market positioning, and roll-out of a large new fleet of plants in specific strategic locations.

Project: Biodiesel Commercial Opportunity Analysis**Client:** Nordheim Westphalian Government

A detailed assessment of the European biodiesel opportunity to attract inward investment into the Port complex. The analysis included European supply/demand balance by country, cost competitiveness, technology selection, infrastructure requirements, and price and profitability analysis together with strategy development for new producers.

Project: Ethanol Market and Cost Competitiveness Evaluation**Client:** Confidential

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

Project: European Ethanol Market Analysis**Client:** Confidential

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

Project: Ethanol vs. MTBE – Litigation Support**Client:** State Department

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

Project: Potential Impact on U.S. Farmers of New Industrial Soybean Varieties**Client:** USSEC

This study focused on several major new industrial soybean varieties under development that are generating concerns for IP and disruptive effects on U.S. farming, including varieties that express oil with high oleic, high linolenic, acetylenic or vernolic acids, and others containing PHA/PHBs or guar gum.

Ultra Clean Fuels, Natural Gas Vehicles (NGV) and Gas

Project: Ultra Clean Fuels Comparison

Client: Confidential

For a private U.S. petroleum/energy company, Nexant investigated the potential for utilization of fuel ethanol in comparison with petroleum-based ultra clean fuels, CNG/LNG, and biodiesel in applications including diesel, spark-ignited internal combustion engine (ICE), ICE-electric hybrids, and fuel cell technologies.

Project: Development of Energy Sector Master Plan, Macau SAR

Client: Grupo de Trabalho para a Política Energética

A multidisciplinary Nexant team assisted the government of the Macau SAR to develop an energy plan and a comprehensive set of policy recommendations for the energy sector. Nexant's scope included identifying the possible reform options, conducting an analysis of these options, and then making recommendations based on that set of options which results in the best overall improvement in terms of quality, security, cost, and economic efficiency. Tasks included: preparing generation expansion plans, including recommendations regarding policy and regulations for electric power; evaluating options for developing a natural gas sector; revising liquids import policy; developing a renewable and DSM policy; and organizational development and capacity building.

This project also involved examination of appropriate financing and implementation mechanisms and preparation of a detailed execution plan associated with the recommended policies; organizational development of the distribution companies as operating entities in a changing environment; and the utility-side implementation of the regulatory framework.

Project: Natural Gas Vehicle Development

Client: PTT Public Company, Limited, Thailand/USTDA

Study to recommend the best vehicle technology and refueling options for NGV implementation in Thailand. Nexant defined the scope of likely bus, truck, and taxi fleet conversions to CNG or LNG and assessed conversion and OEM technologies for NGV engines, refueling systems, and infrastructure elements. Study quantified effects of natural gas quality on vehicle performance; effects of NGV development on petroleum fuels supply and demand; economic and environmental benefits of NGV conversions.

Project: Zinc-Air Battery Development Technical Audit

Client: New York Power Authority

Nexant audited and critiqued the economic, technical, and practical viability in mass transit bus applications of a developing consumable "battery" technology (zinc-air) that had been demonstrated on a commercial scale in Europe. This included reviewing and critiquing a third party's detailed engineering evaluation. Nexant

evaluated a proposed demonstration in one large metropolitan bus agency; this involved benchmarking AFVs against diesel buses, and comparisons with broad experience in refueling and maintaining AFVs (especially NGV and diesel buses) in various venues in the United States.

Project: Egyptian Environmental Policy Program (EEPP)

Client: Egyptian Natural Gas Holding Company (EGAS)

In an ongoing program under the sponsorship of USAID, Nexant has been providing technical and economic assessment to the Ministry of Petroleum (MoP) of the Arab Republic of Egypt and EGAS to help implement policies to reduce emissions of greenhouse gases and develop a strategic plan to accelerate domestic use of natural gas and a master plan to expand the use of natural gas vehicles in Egypt.

Project: Ultra Clean Fuels

Client: U.S. petroleum/energy company

Nexant investigated the potential for utilization of two natural gas-derived fuels, Fischer-Tropsch (diesel and naphtha fractions), and methanol, primarily in transportation applications. The scope includes diesel, spark-ignited internal combustion engine (ICE), ICE-electric hybrids, and fuel cell technologies, for comparison with petroleum ultra clean fuels, CNG/LNG, biodiesel, and ethanol. Issues include fuel manufacturing and vehicle efficiencies, emerging fuel standards, air emissions and other environmental performance measures, logistics, infrastructure development, testing and demonstration history, manufacturing economics, and the R&D and commercialization status of fuel cells, engine technologies, and tailpipe controls.

Project: Compressed Natural Gas (CNG) Refueling Station Feasibility Station Study

Client: Confidential (Asian Investment Bank)

Nexant prepared a pre-feasibility study concerning CNG refueling stations in China. The scope of work included:

- Provision of information on the market for CNG, particularly for buses. The rate of conversion of vehicles to CNG was estimated and used to derive the market forecast
- Outline of the technical requirements of operating a CNG Filling Station in China and at a broad level identify any major differences in practice from "western" standards. This included some comments on hazards
- Examination of the economics of CNG versus gasoline and diesel in China and the sustainability of any cost advantage
- Evaluation of the economics of the two filling stations and extension of this analysis to consider the economics of a CNG program for a western company
- Identification of actions and/or commitments that the Chongqing government should undertake in order to ensure the economic viability of the project



Project: Alternative Fuel/Natural Gas Vehicles (AFV/NGV) Implementation Technical and Commercial Assessment

Client: Latin American national energy company

In a multi-phase program, Nexant assessed the technical and economic feasibility of implementing AFVs among buses and taxis in the largest municipality in the nation. LPG, CNG and LNG-based vehicle and refueling alternatives were screened, with the result that CNG and LNG were short-listed, and LNG was selected for implementation. Among the many aspects analyzed in this complex study program were: the quality and costs of vehicles, engine, tank and refueling technologies; qualifications of suppliers of goods and services; comparative economics for CNG and LNG systems and the diesel systems they would replace; and private sector financing options.

Project: Gas Development Strategy

Client: Chilean energy agency

Nexant advised on the development of a natural gas-based fuel strategy in Santiago. Following an earlier Nexant study that determined that LNG was the optimal substitute for diesel fuel in large vehicles in Chile, Nexant was engaged to address the following: incremental cost of CNG versus LNG; LNG production, storage, transportation system costs; availability of OEM LNG vehicles; availability of LNG tanks; cost of converting CNG to LNG.

Project: Gas-to-Liquids (GTL) vs. Liquefied Natural Gas (LNG) Project, Middle East

Client: Confidential

Nexant is currently undertaking a strategic study for a major Middle Eastern gas producer to compare the economics of GTL vs. LNG. Nexant was asked to analyze the investment costs of GTL and LNG facilities and the potential revenues for the related products from each plant, and to prepare an economic model to allow future analysis in light of changing cost and market conditions. Additional study items included: full market reviews for GTL products and for LNG, a technology appraisal and risk assessment, and a logistics and infrastructure review.

Project: Master Plan for the Utilization of Natural Gas

Client: Multiple

Nexant developed a Master Plan for the utilization of natural gas in Malaysia which emphasized the maximum use of gas and natural gas liquids as a potential replacement for crude oil derived products. The principal focus was diesel and gasoline displacement by natural gas and natural gas liquids. The study also evaluated the local, regional and global petrochemical markets to identify natural gas and natural gas liquids based petrochemical products which should be produced in Malaysia; recommended alternative technology; formulated an investment program by region within Malaysia, in accordance with the identified alternative natural gas utilization options; provided an overall project implementation plan as well as detailed plans/schedule for each project, and training staff on

methodology and special software developed for the project.

Carbon Dioxide Capture and Sequestration

Project: Regional Sequestration Partnerships

Client: West Coast Regional Carbon Sequestration Partnership and the Plains CO₂ Reduction Partnership

Nexant is a member of both the West Coast Regional Carbon Sequestration Partnership and the Plains CO₂ Reduction Partnership, two programs that are part of the DOE's Carbon Sequestration Regional Partnerships. Nexant has engaged in work identifying and quantifying major carbon dioxide emissions sources for each partnership, as well as providing additional technical expertise.

Project: Survey of Carbon Capture Options

Client: Confidential, Japanese client

In March 2007, Nexant completed a "Survey of Carbon Dioxide and Associated Gas Treatment Technologies" for a Japanese client. The technology survey broadly examined natural gas treatment to remove CO₂ and acid gases, along with the technologies, capabilities, and issues of CO₂ sequestration in geological formations. Commercial technologies were reviewed to define benchmarks for design and cost. New technologies and research activities were reported for gas treatment at the pre-commercial and laboratory stages of development. CO₂ storage and transport operations were covered, including types of potential storage, monitoring of sequestered CO₂, transport, injection, and storage costs, and global storage potential. The study includes three case studies of major CO₂ capture and sequestration operations.

Project: Review and Assessment of Enzymatic CO₂ Capture Technology.

Client: Confidential European

Reviewed enzymatic CO₂ capture technology fundamentals, and identified technical hurdles for commercial economic development.

Project: Zero Emission Coal Alliance Technical and Business Plan

Client: Zero Emission Coal Alliance

From 2000 to 2004, Nexant prepared conceptual process designs, cost estimates, and business planning documents for the Zero Emission Coal Alliance, a group formed by about 20 international industrial firms and government organizations. ZECA sponsored process designs, economic/financial assessments, and a business plan for a zero emission carbon technology that includes hydrogasification, the production of hydrogen, and the carbonation of CO₂ with lime to form limestone as a means of CO₂ separation. In the base case, the hydrogen produces electric power in fuel cells and the limestone is calcined to produce a pure stream of CO₂ for sequestration. The near-term ZECA objective is to design and install a pilot plant. Nexant also coordinated ZECA sponsored work at the Gas Technology Institute and Natural Resources Canada.

The most recently completed work examined use of the process with biomass and petroleum coke generated at oil sand refining plants.

Project: Engineering Cost Reduction Study Project for Carbon Dioxide Capture

Client: BP/ChevronTexaco/EnCana/ENI, Norsk Hydro, Shell, Statoil, and Suncor

Nexant completed a Phase I \$500K engineering cost reduction study of CO₂ capture from natural gas fired combined cycle flue gas for the CO₂ Capture Project (CCP). The CCP organization was sponsored by eight major energy companies: BP, ChevronTexaco, EnCana, Eni, Norsk Hydro, Shell, Statoil and Suncor. Nexant designed system improvements that reduce by more than 50 percent efficiency penalty, additional capital expenditure, and avoided cost related to the use of an amine process to capture CO₂ from the flue gas. Part of the design innovation involves integration of the CO₂ capture plant into the power train. The CCP calls this new Nexant design the Best Integrated Technology (BIT).

Coal and Biomass Gasification, and Waste-to-Energy

Project: Boise Cascade Gasification Project

Client: Boise Cascade

In 2003, Nexant evaluated the Gas Technology Institute's (GTI) biomass gasifier for producing fuel gas from 150 tons per day of wood chips and bark at Boise Cascade's paper and pulp mill in DeRidder, LA. The assessment included plant design, cost and schedule estimates, financial analysis, and plant layouts.

Project: Vermont Biomass Gasification Project

Client: Future Energy Resources Corporation

In 2000, Nexant provided design review and startup assistance to FERCO for their 10 MW biomass gasification demonstration unit at the McNeil power station in Burlington, VT, a 50 MW wood-fired boiler plant. The FERCO demonstration unit consumes a portion of the wood feed, producing fuel gas for the boiler. Future plans include addition of a biomass gas turbine combined cycle. The demonstration unit had been constructed by a local engineering firm but when it did not start up successfully, Nexant was engaged by FERCO to review the plant design and make necessary modifications. The unit was successfully started and operated.

Project: Biomass Gasification for Gallo California Winery

Client: Gallo California Winery

Nexant conducted an engineering study to utilize pomace (grape waste after fermentation) as a boiler fuel, including storage, feed preparation, burner modification, and environmental impact.

Project: Calla Biomass Co-Firing Project

Client: Calla Energy

In 2002, Nexant completed a feasibility study of gasifying 300 tons per day of wood biomass to produce fuel gas for co-firing with coal in an existing 100 MW

circulating fluidized bed combustor. The power plant is owned by Calla Energy (an independent power producer) in eastern Kentucky. The fuel gas is generated by a Gas Technology Institute (GTI) gasifier and has a fuel value equivalent to 20 MW of power generation. Nexant provided the overall system integration engineering and cost estimates.

Project: West Kentucky Energy Biomass Co-Firing Project

Client: West Kentucky Energy

Nexant prepared the preliminary design and cost estimate for the feasibility analysis of this project in 2002. The project uses 80 tons per day of chicken litter from farms in western Kentucky to feed a Prime Energy gasifier to produce fuel gas. The biogas is co-firing with natural gas in an existing West Kentucky Energy (an independent power producer) boiler to produce power and steam.

Project: Los Angeles MSW (Municipal Solid Waste) Gasification Project

Client: CR&R

Nexant conducted a feasibility study for CR&R (a municipal waste disposal company in the LA area) to use 300 tons per day of municipal solid waste (MSW) to fuel a 15 MW integrated gasification combined cycle unit for power generation. The gasification process consumes much of the MSW material, leaving smaller volumes of ash for disposal. The gasifier is a proprietary process developed in Japan. In 2003, CR&R chose to substitute either a Prime Energy moving bed gasifier or an Energy Products of Idaho's (EPI) fluidized bed gasifier for their bids to build MSW to power projects in the Alameda and Santa Barbara Counties of California, respectively. Nexant arranged for MSW feed tests in Prime Energy's pilot plant near Tulsa, Oklahoma.

Project: Indian Integrated Gasification Combined Cycle Evaluation

Client: U.S. Agency for International Development and Indian Government

Nexant conducted a \$2 million IGCC study in India sponsored by the USAID program for climate change. The study included a detailed design and cost estimate for a 100 MW IGCC demonstration plant at the National Thermal Power Corporation (NTPC) Dadri Power Station near Delhi.

Project: Rural Electrification Project in Zambia

Client: The United Nations

In 2003, Nexant completed a preliminary design and cost estimate for a 1 MW biomass gasification plant for rural electrification in Zambia. The plant gasifies locally gathered wood chips and agricultural wastes in an open-top down-draft moving bed gasifier licensed by the Indian Institute of Science (IISc). The biogas is cleaned and electric power generated by gas-fired engines. In 2005, the project received the approval to proceed with implementation and operation.



Thermal Solar

Project: Project Development of A Solar Power Plant

Client: eSolar, Inc.

Nexant is currently providing project development services. For start-up of the 7 MWe Sierra demonstration solar power plant and eSolar's first commercial solar utility scale power plant, the 245 MWe Longview Sun-Tower facility in southern California. Nexant's services have included site selection; permitting support for local, state and federal approvals; interconnection studies; engineering review for plant design, plant operation and equipment selection and specifications. We have also provided procurement support which included bidding documents, bid evaluation, negotiations and award for the purchase of 6 each x 49 MWe steam turbines for the Longview Project. Nexant will be involved in the engineering and financial due diligence required to support eSolar's future international projects.

Project: Engineering and Procurement Services for a Demonstration Project for a Solar Plant in California

Client: Solar Millennium, LLC

Nexant is providing engineering and procurement services to Solar Millennium for the supply of their third generation solar parabolic trough collectors at the Kramer Junction solar plant. To date Nexant has facilitated the design, purchase, and fabrication of 40 parabolic collectors from the P.R. of China to Solar Millennium's very strict specifications. Nexant has continued its support of this project with permitting and interconnection approvals and the development of the site construction contracts.

Project: Solar Collectors for Low Temperature Process Heat

Client: Sociedad Contractual Minera El Abra

The El Abra copper mine in Chile uses approximately 19 MWt of low temperature energy for extracting copper metal from copper ore. This energy is supplied by water heaters fired with distillate fuel oil. The study examined the potential for various combinations of flat plate, parabolic trough, and evacuated tube solar collectors to reduce its fuel use by 30 to 70 percent. Nexant evaluated the annual performance of the solar collectors, and is developing system capital cost estimates to estimate the net present values of the various solar options.

Project: Rankine Cycle, Steam Generator, and Thermal Storage Analyses

Client: Pratt & Whitney Rocketdyne

Nexant provided technical and economic information to Pratt & Whitney Rocketdyne on the steam generator and thermal storage systems for use in its commercial nitrate salt 85 MWe central receiver power plant with 4 hours of thermal storage. Study increased plant capacity to 100 MWe with 6 hours of thermal storage, and generated as many as 4 proposals to various public utilities in the Southwest.

Project: Parabolic Trough and Central Receiver Technology and Economic Comparison

Client: Electric Power Research Institute

Nexant is conducting a technical and economic assessment for EPRI on parabolic trough and central receiver power plants in New Mexico. A range of design options was considered including plant size (50 MWe and 125 MWe), plant location (Albuquerque and Lordsburg), thermal storage (3, 6, and 9 hours), heat rejection (dry, wet, and hybrid), natural gas hybridization (10, 15, and 20 percent of annual solar thermal input), and annual solar radiation (+ and - 5 percent from long term average).



Photovoltaic

Project: Photovoltaic

Client: Multiple (since 2006)

Nexant has conducted a wide variety of technical and commercial consulting activities in photovoltaics and its precursor materials:

- Independent commercial due diligence evaluation of a thin film PV solar business
- Global market analysis of photovoltaic grade polysilicon
- Commercial and technical competitiveness for a 7.5 KT Siemens polysilicon plant located in the Middle East
- Presentation of Sustainable Policy Structures for the European Union, given to the World Future Council
- Contributor to Strategic Summit on Feed-in Tariffs versus Renewable Portfolio Standards, hosted by the Solar Industry Energy Association
- Established the path forward business plan for Europe's largest installer of PV polysilicon panels
- Strategic assessment of renewable portfolio standards in the United States
- Impact study on feed-in tariffs for stimulating industry for a Florida municipality
- Material Replacement Study for Aluminum versus Plastic – jointly co-sponsored by a major NA producer of PV panels and a major specialty polymer company
- Competitive analysis between polysilicon and thin-film PV for a producer of thin film photovoltaics
- Market Assessment of photo-reactive polymers and photovoltaics for an advanced polymer company in France.

Fuel Cells

Project: Stationary Power Generation

Clients: Multiple

Nexant engineers have design, construction, and operating experience in all three major types of fuel cells for stationary power generation:

- Phosphoric Acid Fuel Cell (PAFC)
- Molten Carbonate Fuel Cell (MCFC)
- Solid Oxide Fuel Cell (SOFC)

In addition to that, Nexant also is currently involved in Proton Exchange Membrane Fuel Cell (PEM) for transportation applications.

Project: Economic Analysis of Diesel Based Auxiliary Power Unit/Remote Power Generation Using Solid Oxide Fuel Cells

Client: Confidential (Overseas oil company)

Preliminary conceptual design, cost estimation, and economic analysis of the solid oxide fuel cells-based power units including developing APSEN PLUS based simulation model development for process review.

Project: India Fuel Cell Bus Project

Client: United Nations Development Program, United Nations Global Environment Facility, and the India Government.

Nexant provided consulting services to a fuel cell bus demonstration project in India.

Energy and Utilities Management Platform: PE Advisor

Project: Standard PE Advisor Implementation on a 110 MW power production capacity

Client: Director, Energy Management, University of Texas at Austin

From Mr. Kevin Kuretich, Director, Energy Management. "I could not live without this integrated software platform. We've always prided ourselves on understanding our environment; however, when we implemented PE-Advisor™, we discovered significant energy situations we were not aware of. Not only have we reduced our energy spend by an additional 7%, we now have an integrated energy software platform that can help us optimize our processes and assets into the future."

Project: PE-Advisor™ Energy and Utilities Management Software indicates significant savings available in typical refinery operation

Client: Midwest refinery of 140,000 BPD (This case study is based on a crude oil refinery but similar results can be expected for chemical, petrochemical, pulp-and-paper and other process manufacturing plants.)

This project yield excellent savings as the refinery is comprised of energy and utility systems that are highly dependent on complex fuel, power and utility supply contracts and off-take agreements. These contracts, which are typically handled at the site level, are difficult to incorporate into day-to-day operating decisions as energy prices tend to fluctuate and there are typically many options for how energy may be utilized throughout the plant.

Although significant process data is generally available, the energy and utilities side was sparsely metered. Moreover, existing data and measurements were inaccurate or unavailable due to maintenance issues. This impreciseness typically created internal conflicts in data expectation and interpretation, limits proper identification of problem areas and results in significant losses in productivity.

Furthermore, the plant units as well as individual utility systems were generally information-isolated or managed independently and thus optimized in a stand-alone fashion. For example, the steam system, fuel system and power system were the responsibility of different departments. Operator interfaces used a mix of vendor-provided solutions focused on controlling specific pieces of equipment or subsets of the overall plant.

controlling specific pieces of equipment or subsets of the overall plant. As a result, plant operators lacked an integrated perspective of the total site's utility operations. The plant has no tools to integrate these systems and to run timely "what-if" scenarios to examine potential cost savings opportunities that exist inside and across systems, it is a daunting task to effectively manage the total site's energy and utilities situation.

The PE-Advisor platform reduces energy costs by helping identify the most efficient way to operate complex energy and utility assets in conjunction with process demands. It empowers management, engineers and operators to make better decisions by providing a trusted, bottom-line view of energy and utilities and the ability to see and evaluate the impacts of decisions before and after they happen. Its predictive scenarios and optimizers can be used to discover and evaluate optimum operating alternatives and capital investment strategies by applying real plant data and market conditions through fundamental models of utility systems and energy contracts and off-take agreements. Furthermore, the PE-Advisor system provides on-line emissions information and the impact of decisions in this area.

The PE-Advisor system has multiple operating modes. The system status mode is focused on presenting a more complete, consolidated and integrated view of the status of streams, conditions and financials in the plant, ensuring that decisions are made based on valid information.

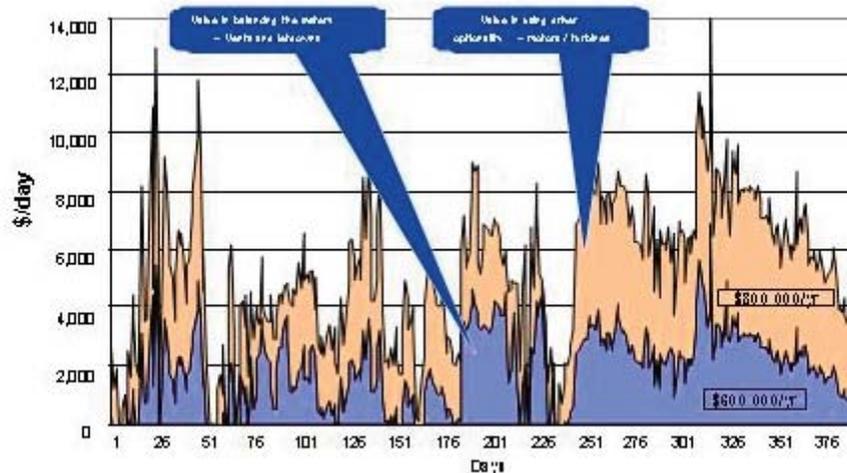
As one energy manager put it, "By using PE-Advisor, we now spend less time arguing about the correctness of the information and spend our time focused on analyzing the information and doing real work." The scenarios mode provides the user the ability to compare alternative scenarios to the real world or each other. These scenarios are either manually driven or pre-defined in the optimizer level.

The existing PE-Advisor model for the particular refinery was applied to one year of plant data extracted from the plant data historian. The System Status models were applied to these data sets to create a reference of how the plant personnel operated the plant over time using best efforts and all the normal information and tools at their disposal.

The PE-Advisor system was then applied to find the optimal point for each data set. This problem is a mixed integer non-linear optimization problem. The resulting optimal points were then compared with the actual operating points. The difference constitutes the value that could have been added through application of the PE-Advisor™ software. This comparison is powerful as there is no ambiguity about the actual best energy situation that the plant personnel could achieve without such a tool.

The graph below, which spans one year of operation, gives the value of savings for steam system balancing (the blue area) and for using appropriate choices between motors and turbines (the tan area) provided by the PE-Advisor system.

Figure 10: Potential Savings Assessment



The following observations are useful and important to note:

- Over the course of a year's operation, the plant personnel only occasionally achieved close to optimal conditions – most of the time there was ample scope for improvement.
- The volatility of the optimal point is also visible – today's best solution will frequently be tomorrow's money waster.
- In the first half of the period, the high frequency of change in the system makes it difficult to use any manual analysis techniques to try to optimize the operation.
- In the second half of the period, there is more stability in the plant, which means that there is a better chance to achieve optimal conditions; however, it was in this period that the larger lost opportunity value (area under the curve) occurred. Thus the stability in the system did not guarantee more optimal operation.
- During periods of plant stability, some "learning" can occur over time (continuous improvement). The second half of the period depicts two distinct periods in which there was relatively steady plant operational conditions and the lost value steadily declined over time. During these periods operators continuously improved operation; however, this took significant time, sometimes as long as two months, in which a lot of value was lost.

The application of the PE-Advisor system to balance the steam system and to optimally manage the steam/power motor tradeoff resulted in the cumulative annual savings of \$1,400,000 or 4.1 percent of purchased energy or 1.7 percent of total energy for this typical refinery. Significant additional economic value can be expected from efficiency improvements in fuel, power, water and cooling systems and through improved management of the interaction across these integrated systems. With further value to be gained by using PE-Advisor to better manage energy and utilities demands and energy supply contracts and off-take agreements, total operational savings (excluding savings from changes in plant design) could well exceed 8 percent on purchased energy or 3.5 percent on total energy consumption, which results in a typical payback time of just a few months.

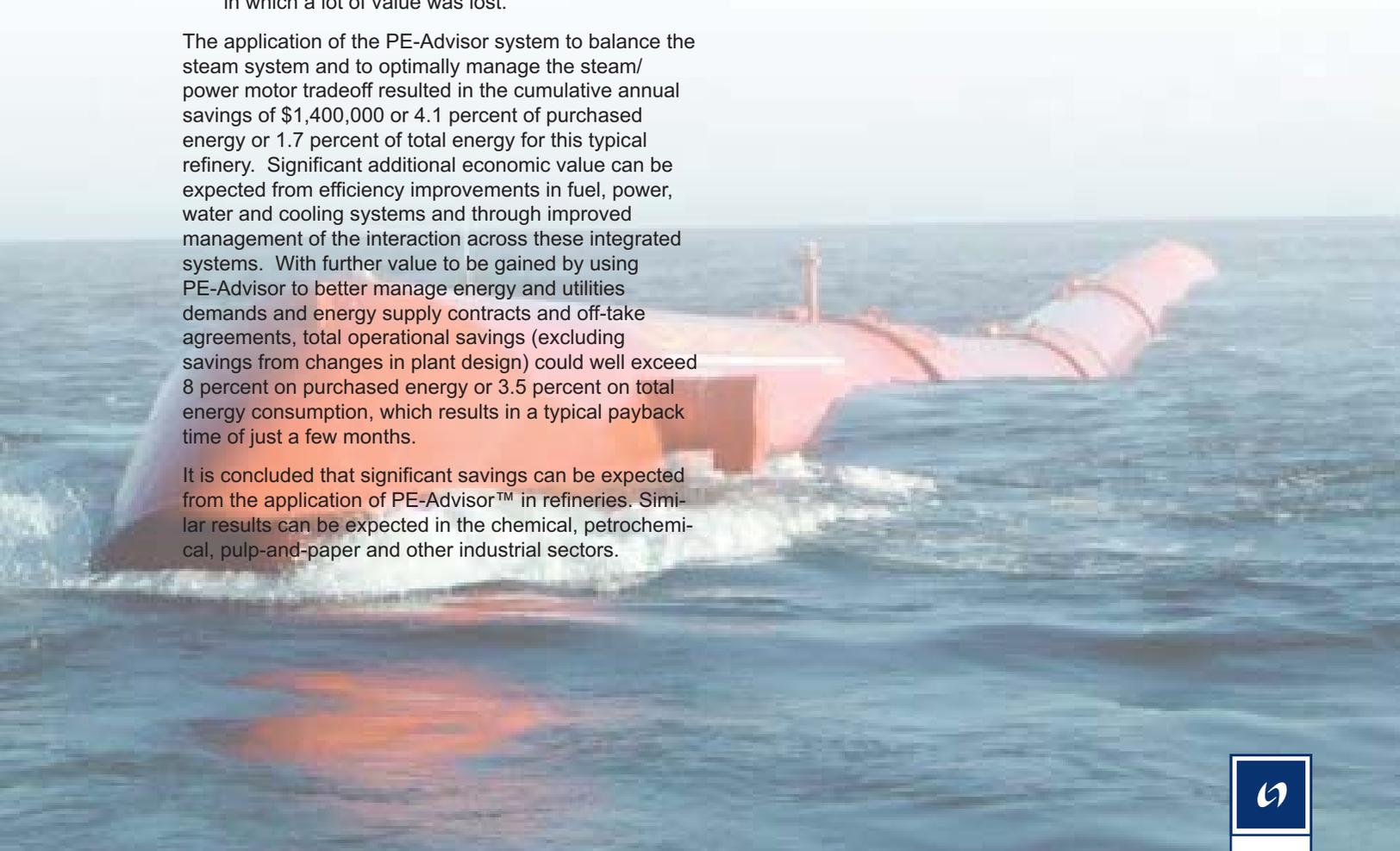
It is concluded that significant savings can be expected from the application of PE-Advisor™ in refineries. Similar results can be expected in the chemical, petrochemical, pulp-and-paper and other industrial sectors.

Nuclear

Project: Multiple Nuclear Projects

Client: Multiple

Nexant (with Bechtel) experience with nuclear power generation technologies spans more than 35 years. At the time of formation of Nexant in January 2000, several personnel with nuclear experience became a part of Nexant. These personnel brought with them unique experience covering feasibility evaluations, conceptual design, preliminary engineering, cost estimate, safety evaluation, and startup/operation -- primarily with conventional nuclear power plants, but also with advanced nuclear plants. Thus, Nexant's experience spans pressurized water reactor plants, boiling water reactor plants, gas cooled reactor plants, gas cooled breeder reactor plants, and sodium cooled breeder reactor plants. All together, Nexant personnel have conducted more than 130 nuclear feasibility studies, conceptual designs, safety analyses, and startup/operations. Specifically, Nexant experience covers nuclear plant operation and refueling outages, design, permitting, equipment specification, bid evaluations, construction support, startup, plant acceptance testing, operator training, and plant operation through the warranty period for various projects, including large nuclear plants in United States and abroad.





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