Infrastructure Services

HW&Co. Whitepaper

December 2015

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Industrial Services for Energy and Power Infrastructure

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Our mission with this paper is to provide an overview of the U.S. industrial service market for energy and power infrastructure. Outsourced industrial service providers support critical operations across upstream, midstream, downstream, power generation, and a wide range of additional process industries.

While the upstream market continues to face headwinds, North America is in the early stages of a prolonged investment cycle to expand the installed base of processing equipment, and upgrade and repair aging infrastructure. Sector investment is supported by a number of long-term, structural tailwinds. Providers of outsourced industrial services are poised to benefit from this substantial market opportunity.

CONTENTS

Abstract

HW&Co. Infrastructure Services Experience

Industrial Services Overview

Industrial Services in Today's Commodity Environment

Positive Domestic Refinery Market Outlook

Sustained Petrochemical and Chemical Growth

Rise of Domestic LNG Export Facilities

Strong Domestic Power Generation Fundamentals

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Harris Williams & Co. Infrastructure Services Experience

With more than 35 closed transactions across the sector, Harris Williams & Co. has provided sell-side advisory services to some of the infrastructure service market's premier service providers.

Harris Williams & Co. Select Transactions
Infrastructure Services

PSC *a portfolio company of* LINDSAY GOLDBERG has been acquired by LITTLEJOHN & CO. LLC	FOCUS *a portfolio company of* KRG CAPITAL PARTNERS, L.L.C. has been acquired by WSP	NESCO Sales & Rentals *a portfolio company of* Platinum Equity has been acquired by EnergyCapital Partners	REPCONSTRICKLAND *a portfolio company of* ARCLIGHT has been acquired by EMCOR	PSSI *a portfolio company of* HARVEST PARTNERS has been acquired by I&P	GTS *a portfolio company of* HUNTSMAN GAY has been acquired by NANA
POWER TEAM SERVICES *a portfolio company of* CIVC PARTNERS has been acquired by KELSO & COMPANY	JV Industrial Companies *a portfolio company of* THE STEPHENS GROUP has been acquired by ZACHRY	DISTRIBUTION INTERNATIONAL *a portfolio company of* Audax Group / CapStreet has been acquired by Advent International	aquilex *a portfolio company of* FIRST RESERVE CORPORATION has been acquired by HARVEST PARTNERS	Brock has been acquired by LINDSAY GOLDBERG & BESSEMER	ROBERTS & SCHAEFER *a portfolio company of* GFI Energy Ventures has been acquired by KBR
Osmose *a portfolio company of* OAKTREE has been acquired by KOHLBERG & COMPANY	RECON *a portfolio company of* LINDSAY GOLDBERG has been acquired by GFI Energy Ventures	IPS *a portfolio company of* Riverside has been acquired by ODYSSEY INVESTMENT PARTNERS, LLC	aquilex *a portfolio company of* HARVEST PARTNERS has been acquired by TEACHERS' PENSION PLAN	MMT *a portfolio company of* NASSAU POINT INVESTORS has been acquired by BerkshirePartners	MMM GROUP *a portfolio company of* OMERS Private Equity has been acquired by WSP
HydroChem *a portfolio company of* OAKTREE CAPITAL MANAGEMENT, LLC has been acquired by aquilex *a portfolio company of* HARVEST PARTNERS	Ohmstede *a portfolio company of* FIRST RESERVE CORPORATION has been acquired by EMCOR	Quala *a portfolio company of* KLH CAPITAL has been acquired by ROARK CAPITAL GROUP	HydroChem *a portfolio company of* The Sterling Group has been acquired by OAKTREE CAPITAL MANAGEMENT, LLC	HAKE has been acquired by MATRIX SERVICE COMPANY	NESCO Sales & Rentals *a portfolio company of* HKW has been acquired by Platinum Equity
PSSI *a portfolio company of* BLUE POINT has been acquired by HARVEST PARTNERS	AMES AMERICAN MAINTENANCE & ENGINEERING SERVICES has been acquired by CAPITAL PARTNERS®	ATLANTIC INDUSTRIAL *A Company on the Rise* *a portfolio company of* Sterling Partners has been acquired by Brock	Ohmstede *a portfolio company of* Tanglewood Investments, Inc. has been acquired by FIRST RESERVE CORPORATION	IISI *a portfolio company of* FIRST RESERVE CORPORATION has been acquired by HARVEST PARTNERS	PHILADELPHIA GEAR *a portfolio company of* WIND RIVER holdings has been acquired by TIMKEN

Industrial Services Overview

Over the last two decades, process industries have shifted to outsourcing non-core activities that make up today's industrial services market. Outsourced industrial services have served as a means to reduce costs for process industry operators by eliminating unnecessary equipment previously owned by the facility and associated maintenance expenditures, increase safety through specialization at service providers, and create efficiencies within plant operations and helped to mitigate skilled labor shortages in most U.S. industries.

Exhibit 1
Industrial Services Overview

MECHANICAL SERVICES

- Services include maintenance, turnarounds, and construction.

Key Players:

EMCOR, TURNER INDUSTRIES, JACOBS, BRAND ENERGY & INFRASTRUCTURE SERVICES, AEGION, CARBER, ZACHRY, NOOTER CONSTRUCTION, WYATT, BOLT TECH MANNINGS, CIANBRO, STARCON, TEAM FURMANITE


Zachry/JVIC conducts a turnaround at the Phillips 66 refinery in Borger, TX


EMCOR/RepconStrickland conducts first FCCU turnaround with cones in place


EMCOR/Ohmstede repairs and tests a heat exchanger

ELECTRICAL SERVICES

- Services include installation, maintenance, and testing of electrical equipment and instruments.

Key Players:

ardent SERVICES, EMCOR, IPS INTEGRATED POWER SERVICES, MMR GROUP, QUANTA SERVICES


IPS repairs a large electric motor for a petrochemical facility


Ardent completes new substation tie-in and coker turnarounds


Quanta installs sample tubing and instrumentation for turbines in Colorado

INDUSTRIAL CLEANING

- Services include hydroblasting, vacuum services, chemical cleaning, tank cleaning, remediation, and disposal & recycling services.

Key Players:

HydroChem, PSC, VEOLIA, CleanHarbors, USES


PSC uses an automated hydroblaster to clean a heat exchanger


HydroChem uses a specialized vacuum setup for coating removal


Veolia uses a specialized system to clean fin fans

MULTI-CRAFT AND OTHER

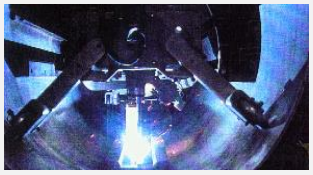
- Services include scaffolding, insulation, coatings, painting, refractory work, NDT, inspection and other related crafts.

Key Players:

Brock, SAFWAY, BRAND ENERGY & INFRASTRUCTURE SERVICES, HARSCO, TEAM, AZZ, MISTRAS


Brock erects scaffolding for a cracker turnaround


Brand uses scaffolding for refinery tank maintenance


AZZ/Aquilex uses automated weld heads for precision, in-pipe operations

Services Categories

Outsourced services performed by industrial services providers can be sub-divided into three categories that vary in scope and frequency.

Exhibit 2
Service Categories

	Routine Maintenance	Project Maintenance	Capital Projects
Description	▪ Daily / weekly maintenance operations performed by embedded outsourced service providers	▪ Medium and large scale maintenance operations that often require equipment to be temporarily taken offline every 1 – 3 years	▪ Upgrades, expansions, new construction, and capital projects scheduled on an as-needed basis
Typical Structure	▪ Time & Materials ("T&M")	▪ T&M / Lump Sum	▪ Lump Sum
Margins & Perceived Risk	▪ Low	▪ Medium	▪ High

Mechanical Services

Mechanical services include engineering, constructability, and planning services for routine maintenance, plant turnarounds, expansions, and new construction. Routine maintenance services consist of field machining, bolting/torqueing, and duct work, among others, and are performed by employees of mechanical services companies that reside in or are embedded in a customer's facility. These services serve as a stable base of work on a daily and weekly basis, are typically performed on time and materials agreements, and often carry a lower margin than turnaround maintenance and expansion work.

Planned turnarounds (in refineries and petrochemical facilities) or outages (in power plants) consist of scheduled, large-scale maintenance activities wherein an entire process unit is taken off-line for comprehensive maintenance, revamp, and renewal. While industry-specific terminology varies, the fall and spring seasons are the traditional turnaround seasons when lower demand justifies equipment being taken off-line temporarily as opposed to summer and winter seasons where facilities run 24 hours a day, seven days a week. These regularly scheduled plant turnarounds are necessary to minimize unexpected repairs and downtime of critical process equipment that can occur with equipment failure. While the frequency of turnarounds can vary by facility type, equipment age, and operator, a typical plant schedules turnarounds every two to five years. However, it is not unusual for a plant operator to stage turnaround activities by processing unit or type of equipment, so as to avoid having the entire facility shutdown at one time, which results in a consistent flow of work for mechanical service providers.

During a turnaround, mechanical service firms flex their employee base at the site, which can exceed 500 people for a large turnaround. Similar to routine maintenance, these services are often performed on a time and materials basis, but command higher margins due to added complexity and the timeliness in which work must be performed to limit plant downtime.

In addition to turnarounds, mechanical service providers specialize in facility construction and expansion, which occurs when a facility needs to upgrade a unit or expand its capacity. This work is often contracted in a lump sum structure that can introduce execution risk for the service provider, but experienced firms often mitigate these risks through effective planning and estimating, and can reap higher margins as a result. The mechanical services market is dominated by large, national providers and is in the midst of an ongoing consolidation trend as privately-held businesses begin to explore transition opportunities.

Exhibit 3
Mechanical Services

Key Services Description		Key Players
Routine Maintenance	▪ Smaller scale, regularly scheduled maintenance performed by resident outsourced service providers energy infrastructure equipment throughout a continuous process facility.	EMCOR, JACOBS, TURNER INDUSTRIES, BRAND ENERGY & INFRASTRUCTURE SERVICES, ZACHRY, AEGION, CIANBRO, STARCON, NOOTER CONSTRUCTION, Wyatt, CARBER, BOLTTECH MANNINGS, TEAM FURMANITE
Turnarounds & Revamps	▪ Planned, periodic shut down (total or partial) of a process unit or plant to perform maintenance, overhaul and repair operations, and to inspect, test, and replace process materials and equipment.	
Facility Design & Construction	▪ Services focus on constructability and maintainability of facilities and operations across process industries and other industrial and commercial applications.	
Piping and Plumbing	▪ Provide piping and plumbing system installation and integration in addition to welding services associated with construction and maintenance.	
HVAC	▪ Full service design, construction, and ongoing maintenance of heating, ventilation, and air conditioning systems.	
Other Services	▪ Include cold cutting, isolation of lines and pipes for hot-work, hydrotesting services on welding and bolts, and hot tapping and line stop services.	

Electrical Services

Electrical contractors within the industrial services sector provide engineering and construction, fabrication, installation, and maintenance services to electrical systems and equipment. These services typically encompass a wide array of maintenance services and capital projects to numerous end markets, including electrical systems for refinery capacity expansions, new petrochemical plants and expansions, LNG export facilities, oilfield electrification, offshore oil and gas rigs and platforms, power generation facilities, renewable energy resources, and many other process facilities in related markets. Electrical systems in these facilities require significant ongoing maintenance to control, lighting, and power systems and must be performed by specialized contractors to ensure the safe and efficient operation of facilities.

Exhibit 4
Sample Electrical Instrumentation Process Flow
Typical Electric Systems Flow in an Industrial Process Facility

- Unit substation act as as an electrical control center in an industrial facility.
- Substation connected to electrical control systems.
- Cable trays take cable from the substation to process unit.

- Conduit duct banks connect to process unit.
- Conduit and cable connect to control stations, lighting, electric motors, etc.

The electrical services market is highly-fragmented with several large contractors gaining scale and market share through the acquisition of smaller regional or "mom and pop" operations across the country. Large industry participants include Quanta Services, Ardent Services, EMCOR Group, and MMR Group, and several smaller providers with a nationwide presence, diverse end market exposure, wide service offerings, and skilled labor pools.

Exhibit 5
Electrical Services

Key Services Description		Key Players
Electrical and Instrumentation ("E&I") Systems Installation and Repair	▪ Typically ongoing, daily maintenance services including repair, upgrades, and installation services for electrical infrastructure within process facilities, including conduit trays, other associated cable trays, switchgear repair, calibration services, among others.	Ardent Services, EMCOR, MMR Group, IPS Integrated Power Services, Quanta Services
Electrical Systems Design	▪ Computer modeling and engineering planning to design the proper locations of electrical systems and components around a facility.	
Electrical Systems Inspection and Testing Services	▪ Inspection and testing services that ensure equipment and systems function properly at anticipated capacities without risk to other systems.	
Substation Repair and Construction	▪ Repair and construction services for electrical substations, which transform voltage along T&D systems from high to low, or vice versa, to control the transportation of electricity.	

Industrial Cleaning

The industrial cleaning market's core services include hydroblasting, industrial vacuuming, chemical cleaning, and tank cleaning, among other specialty services, which are necessary to improve or sustain the operating efficiencies and extend the useful lives of process equipment and facilities through routine daily maintenance and turnaround programs. Hydroblasting and industrial vacuum services represent the two largest segments of the cleaning market and have seen substantial technological development over the last five years, including increased automation and engineered safety systems. For example, in an effort to create a safer environment and capitalize on increased efficiency, speed, and quality, many service providers are moving to automate hydroblasting services, which minimizes risk to employees and helps shorten cleaning projects.

Industrial cleaning companies typically provide services to a wide range of process industries, including hydrocarbon processing (petrochemical and refining), the electric utility industry, and upstream oil and gas industry, among others. The industrial cleaning market is highly fragmented with a few large, national providers comprising a large portion of the market, while smaller regional and local companies make up the broadest segment of the landscape. Industrial cleaning providers typically perform ongoing daily maintenance within a facility, utility territory, or oil and gas field, as well as large-scale projects such as turnarounds. Given the larger role these outsourced service providers have taken, maintenance is no longer simply a necessary expense, but rather a strategic contributor to the plant's productivity. This has driven greater use of outsourced maintenance and cleaning services to handle the more significant environmental, safety, and reliability requirements of complex plants and infrastructure. Further, cost-cutting at large process facilities has focused on supply chain management as a tool to consolidate vendors, which will continue to favor the larger providers that have the requisite ability to offer bundled services, a nationwide footprint, and leading safety and training programs.

Exhibit 6
Industrial Cleaning

Key Services Description		Key Players
Hydroblasting	▪ High-pressure, sometimes automated, water washing of interior and exterior surfaces, process configurations, heat exchangers, and other vessels.	HydroChem
Industrial Vacuuming	▪ Liquid vacuum services consist of the removal and transportation of various liquids, while air moving vacuum services include a wide range of materials from fine powder to concrete.	PSC USES United States Environmental Services
Chemical Cleaning	▪ The cleaning of equipment using chemical mixtures to loosen, dissolve, and remove materials from equipment.	VEOLIA
Tank Cleaning	▪ Cleaning of storage tanks to allow inspection and maintenance activities and the removal of hazardous materials from inside the structure.	CleanHarbors

Multi-Craft and Other Trades

Multi-craft services address a wide range of service specialties for energy infrastructure. These services are involved in the majority of maintenance and capital projects on-site and are traditionally contracted to both large national players and a vast network of regional firms with smaller service offerings. Multi-craft services include scaffolding, refractory, crane / heavy haul, specialty welding, testing & inspection, painting, blasting, insulation, and fireproofing, among others.

Exhibit 7
Other Trades

Representative Other Trades		Key Players
Scaffolding	▪ Industrial facilities use scaffolding systems that provide closer access to repair equipment and perform routine maintenance activities, unplanned repairs, and major pre-planned turnaround projects. ▪ Larger scaffolding projects involve engineering designs to comply with OSHA standards and require qualified personnel with expertise in scaffolding assembly in harsh and dangerous environments and facilities. ▪ Erecting and dismantling industrial scaffolding typically requires considerably more technical expertise than commercial scaffolding.	Brock, BRAND Energy & Infrastructure Services, SAFWAY
Refractory	▪ Refractory contractors provide installation and maintenance services across a wide variety of processing industries and traditional materials include castables, brick, mortar, refractory anchors and plastics, grouting, and other, usually nonmetallic, natural and synthetic materials. ▪ Refractory products are exposed to temperatures of up to 2,000 degrees Celsius and require regular maintenance in today's high utilization environment across process industries.	BRAND Energy & Infrastructure Services, HARSCO, EMICOR, Diamond, Construction Wyatt, NOOTER, API Group, Inc., Thorpe, JTT J.T. THORPE & SON, Inc.
Crane / Heavy Haul	▪ Industrial crane / heavy haul services providers serve the refining, petrochemical, power, and oil & gas markets, among many other industrial and commercial markets. ▪ Crane services are typically billed for on-site time on daily or hourly rates and are used for large capital projects (turnarounds) and on a recurring basis with ongoing maintenance and repair operations. ▪ Equipment types include gantry lifts, boom truck cranes, rough terrain cranes, all terrain cranes, and crawler cranes, among others.	MAXIM Crane Works, LP, TNT Crane & Rigging, ALL Erection & Crane Rental, ALLEGIANCE Crane & Equipment, NCSG Crane & Heavy Haul Services, AmQuip The Crane People, STERLING CRANE
Specialty Welding	▪ Welding services are an integral part of turnaround and maintenance services at refineries, petrochemical plants, and power plants. ▪ These services require highly-skilled labor forces to perform quality welding services on everything from revamps and upgrades of piping systems to heavy wall pressure vessels, exchangers, and tower services.	AZZ Incorporated, JACOBS, TRANSFIELD Services
Testing & Inspection	▪ Testing services encompass a wide variety of solutions to ensure process industry code and specification compliance. ▪ Services include visual inspection liquid penetrant, magnetic particle, radiographic, ultrasonic, and acoustic emissions tests. ▪ Advances in testing technologies have allowed for more advanced techniques such as eddy current inspections for crack detection and conductivity measurements, digital radiography for live inspections of piping systems, and automated ultrasonic systems for scanning during turnarounds and maintenance.	TEAM FURMANITE, MISTRAS
Other Services	▪ Specialty painting and blasting. ▪ Insulation and fireproofing.	Mobley Safway Group Company, BRAND Energy & Infrastructure Services, apache Industrial Services

Industrial Services in Today's Commodity Environment

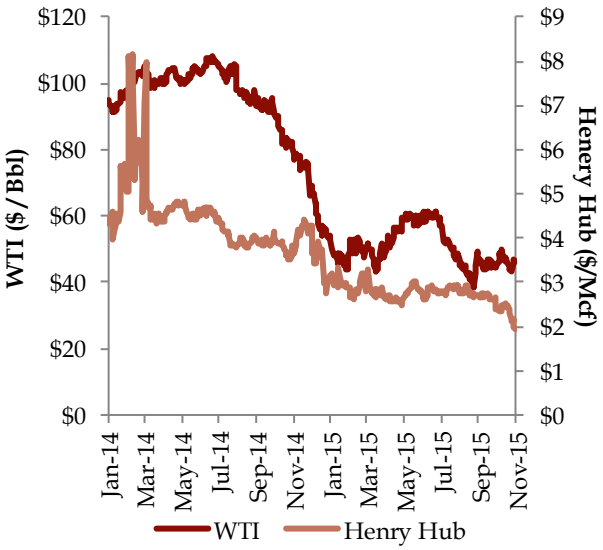
While the oil price turmoil has severely impacted the North American upstream market, midstream and downstream markets have fared better though not without greater near-term uncertainty. However, with billions of planned, announced, and committed capital for energy infrastructure projects in the coming years, North America remains in the early stages of a significant downstream energy infrastructure build out. Much of this infrastructure is supported by the significant increase in North American natural gas production (and concurrent price declines), which has increased North American global cost competitiveness in petrochemical markets.

While the market has changed dramatically over the last 12 months, we continue to watch it closely. In conjunction with the precipitous decline in oil prices, natural gas prices have remained stable, albeit at a low historical level. Many analysts expect natural gas prices to benefit from the current oil environment if production falls and the associated gas supply weakens from the loss of production. As a result, there are a number of trends we are watching closely as 2015 concludes.

Exhibit 8

Current Commodity Price Environment and Near-Term Impact to Industrial Service Providers

West Texas Intermediate and Henry Hub Gas Prices



Source: EIA

Key Near-Term Indicators

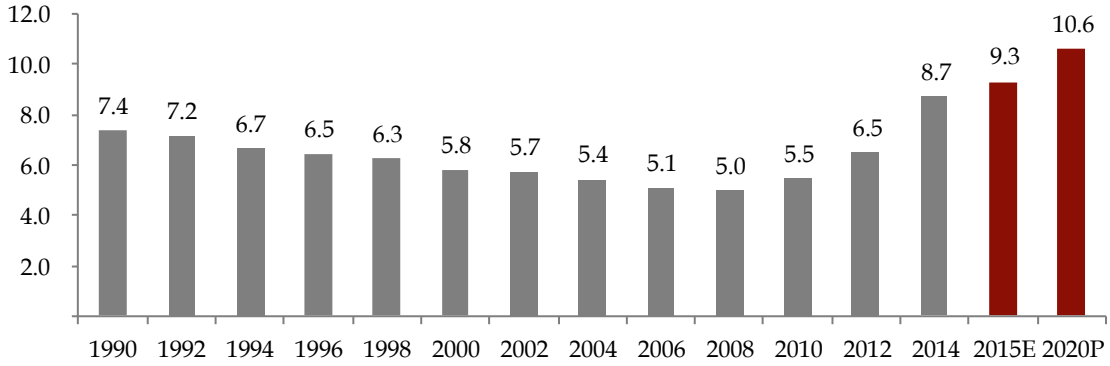
Refinery	▪ Refinery capacity utilization ▪ Crack spreads and refiner margins ▪ Petroleum products imports / exports ▪ Workforce dynamics (e.g. United Steelworkers strike)
Petrochemical	▪ Natural gas prices ▪ Global ethylene demand and cost curve dynamics
Midstream	▪ Ongoing projects (large and small diameter) ▪ Political climate ▪ Throughput rates ▪ MLP activity, guidance, and dividend health
Upstream	▪ Global hydrocarbon demand and consumption ▪ Capital markets liquidity and availability ▪ E&P capex guidance ▪ Commodity environment ▪ Regulatory requirements and changes to oil export ban ▪ Geo-political climate ▪ U.S. land purchases / leases / well permits

Resurgence of Domestic Crude Production

In recent years, technological advancements have enabled producers to successfully develop previously uneconomic hydrocarbon resources throughout the U.S. Oil producing regions such as the Bakken Shale in North Dakota and the Eagle Ford Shale and Permian Basin in Texas have greatly contributed to a revival of U.S. oil production, which has spurred a renaissance in the domestic upstream, midstream, and downstream markets. Due to the rapid development of shale oil resources, U.S. oil production rose in each of the last five years after more than 20 years of decline. While oil from unconventional resources represented approximately 15% of U.S. production in 2010, the EIA estimates that currently identified unconventional oil plays could add output of nearly three million barrels per day, boosting U.S. production beyond Saudi Arabia by 2020.

The resurgence in domestic production has resulted in a revival of the energy infrastructure industry and spurred increased budgets to upgrade existing infrastructure for lighter crude that comes from unconventional resources. In the refinery market, domestic production increases have enabled many refiners to purchase crude at large discounts to international benchmark prices providing a sharp cost advantage. Based on this cost advantage, the U.S. is a net exporter of refined petroleum products for the first time since the 1940s.

Exhibit 9
Domestic Crude Production
U.S. Historical and Projected Crude Production
(Mbpd)



Source: EIA 2015 Annual Energy Outlook.

Positive Domestic Refinery Market Outlook

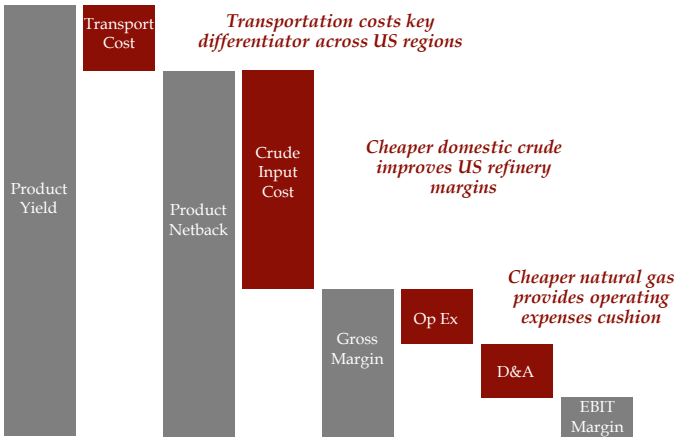
The U.S. refining market maintains structural price advantages relative to the rest of the world. Domestic refiners are operating much more profitably, which has strengthened utilization, particularly along the U.S. Gulf Coast corridor due to the close proximity to the Eagle Ford Shale and Permian Basin. One of the major competitive advantages for U.S. refiners is the short distance that oil must be transported before being refined, as transportation costs can deteriorate much of the profit spread. Additionally, the low cost of WTI crude relative to Brent provides domestics refiners with some of the lowest input costs worldwide. Lastly, sustained low natural gas prices continue to keep domestic operating costs low, further benefitting domestic refiners relative their international peers.

As refiners' profits are directly tied to the crack spread, or the difference between the price of crude oil and the price of refined products, strong spreads can translate into stronger financial performance for refiners whereas falling crack spreads will spur retrofits and lead to catch-up spending by operators to maintain facilities after extended periods of operations at high utilizations. In environments with strong crack spreads, many refineries will delay turnaround maintenance programs to maximize cash flow, which can sometimes impact the backlog and pipeline of industrial service providers. On the positive side for outsourced service providers, delays often result in expanded repair and maintenance work in the near-term as equipment is strained by the deferral of maintenance.

Exhibit 10

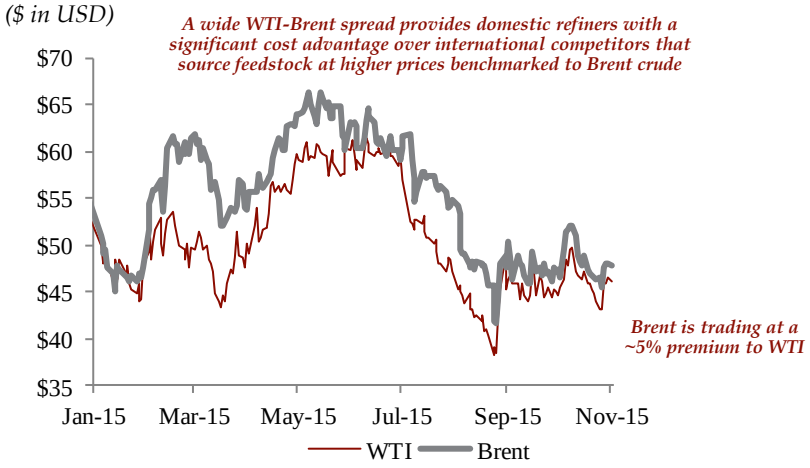
Significant Advantage for Domestic Refiners

U.S. Refinery Margin Advantage in 2015 - 2016



WTI – Brent Spread

($ in USD)

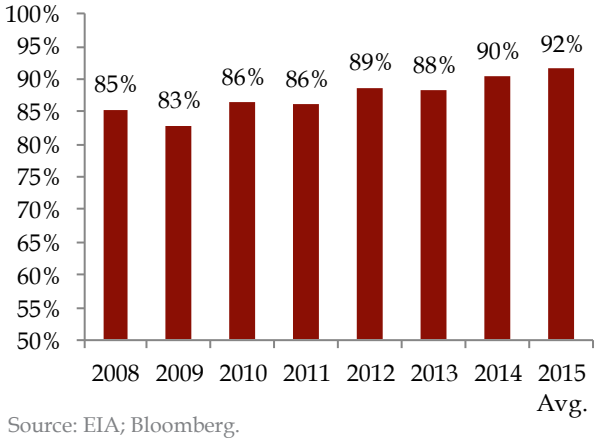


Source: Equity Research; Bloomberg.

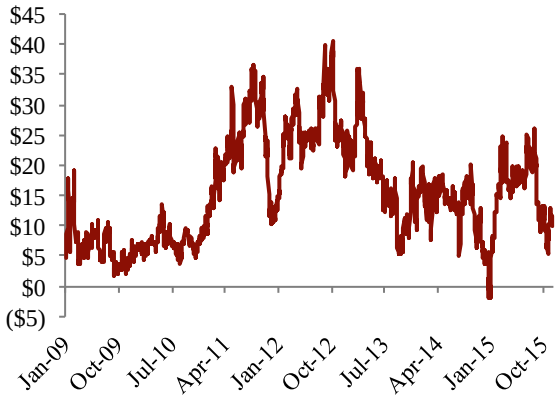
Strong crack spreads have supported attractive margins for domestic refiners and driven U.S. refinery utilization rates to increase from a decade-low of 83% in 2009 to an average of 92% in 2015 as independent refiners capitalize on profits and integrated refiners aim to offset losses in upstream operations. For example, Tesoro reported their plants were running at 101% of their official capacity in Q3 2015. While in the short-term refiners often delay routinely scheduled maintenance to take advantage of high margins, they increase the risk of shutdowns and equipment malfunctions due to over-utilization of equipment as already seen in several instances in North America. In fact, BP Whiting was forced to shut down due to over-utilization, which further underlines the importance of routine maintenance work and provides a positive outlook for industrial services providers.

Exhibit 11
Refinery Utilization Rates and Crack Spreads

Average Annual Refinery Utilization Rates



Cushing Crack Spreads
($ per Bbl)



Source: EIA; Bloomberg.

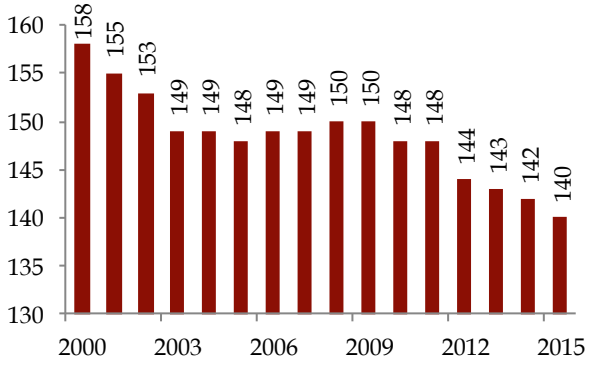
The relative lack of domestic investment in recent years is expected to drive material capital spending in the U.S. refining industry with nearly $50 billion in capital projects slated for 2015 and 2016, according to IIR. Additionally, a new 20,000 bbl/d refinery to serve the Bakken Formation began operations in July 2015 and is the first greenfield refinery in the U.S. since 1976. Given the boom in domestic oil production and favorable cost environment, industry analysts anticipate additional refinery construction and expansion project announcements.

Increasing Refinery Capacity

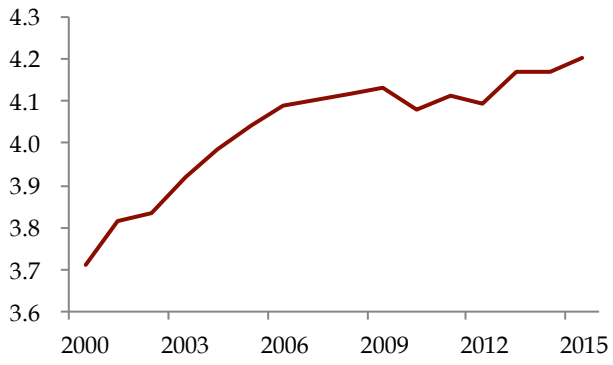
Since 2000, the number of domestic refineries has decreased from 158 to 142. According to IHS, weak refining margins caused by overcapacity, along with costly environmental requirements, were a major burden on refiners and resulted in numerous closures over the last 15 years. Now, given attractive pricing and crack spreads, existing facilities have chosen to expand capacity rather than greenfielding new plants. Despite the declining installed base, capacity has increased by over 458 mbpd over that same period due to facility expansions and increased capacity within current facilities. Continued facility expansions and utilization increases are expected to drive additional service intensity, including maintenance, cleaning, electrical, and craft services within the fence as throughput and capacity expand.

Exhibit 12
Domestic Refineries

Refinery Count from 2000 to 2015
(As of January 1, 2000 – 2015)



Net U.S. Capacity Additions
(MMbpd)



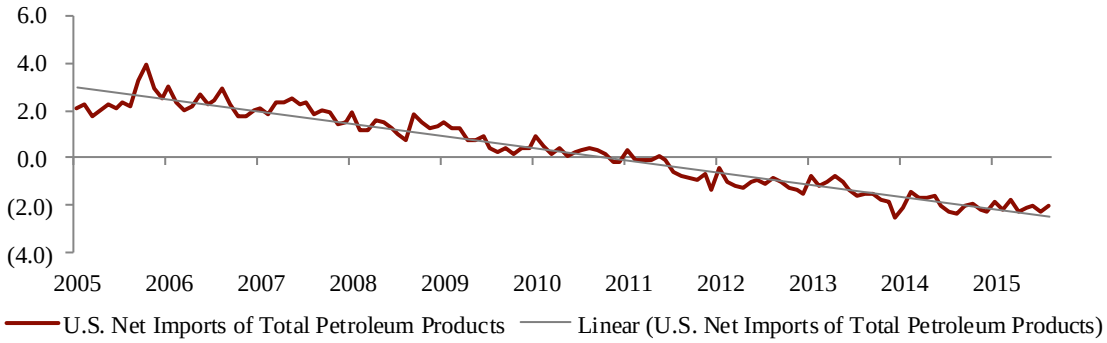
Source: EIA.

Refineries Operating at Record Levels to Export Refined Petroleum Products

Due in large part to increasing domestic production and the relative strength of U.S. refiners, U.S. exports of finished petroleum products have increased dramatically over the past ten years and shifted the country from a net importer to a net exporter of petroleum products. This trend is expected to continue in the future.

Exhibit 13
Refinery Inputs and Petroleum Products

U.S. Net Imports of Total Petroleum Products
(Mbpd)



Source: EIA.

Changing Mix of Crude Slates

According to Turner Mason, a leading refinery consultancy, the quality of growing domestic crude supply is significantly different than the waterborne imports it displaces, requiring refiners to spend new capital to maintain capacity and maximize yields. The domestic shale crudes are lighter, and will require refinery-specific modifications (e.g., distillation towers, debutanizers, and light ends recovery). Distillation yields from the new shale crude are skewed more toward light ends and naphtha, and there are fewer middle distillate and gas oil barrels. Since this runs counter to expected demand patterns, capital expenditures for hydrocrackers, distillation towers, and other facilities to "reshape" yields will be necessary. In addition, shale crudes serve as an ideal feed for resident fluid catalytic cracking units ("FCCU"), and this will encourage conversion of existing units to add this capability.

Increased heavy, sour crude production, particularly from oil sands regions, has also led to a fundamental shift in U.S. refinery capabilities. Canadian heavy crudes have increased TAN ("total acid number") levels, requiring investment in metallurgical upgrades and other corrosion prevention and remediation projects. As heavy crudes with higher impurities continue to grow as a component of oil supplies, refineries must continue to invest in additional capacity in order to process these inputs profitably.

Sustained Petrochemical and Chemical Growth

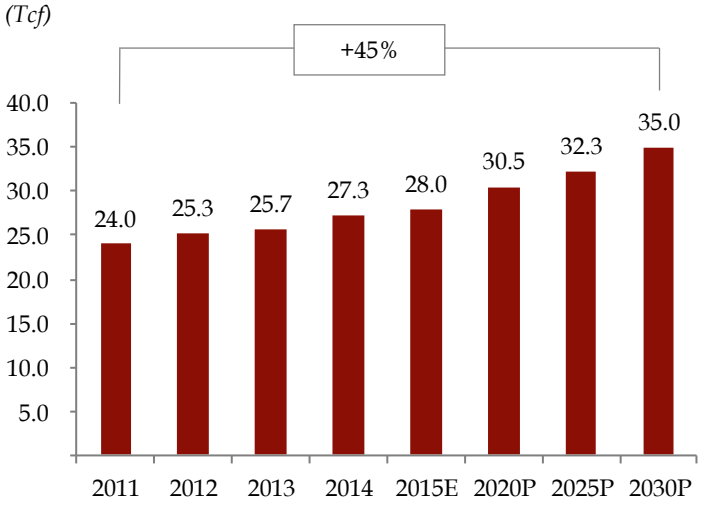
Unconventional resources have dramatically changed the landscape for domestic natural gas supply. Shale gas production, which accounted for 2% of natural gas production in 2000, represented approximately 20% of gas production in 2010 and is expected to increase to more than 45% by 2030, according to Wood Mackenzie. According to the EIA, U.S. natural gas production is estimated to increase over 45% from 24.0 Tcf in 2011 to 35.0 Tcf in 2030P due largely to continued shale gas development.

The abundance of natural gas resources and structural decline in natural gas prices has radically changed North America's global cost competitiveness for ethylene and derivative products. Currently, North America is second only to the Middle East on the ethylene cost curve, a remarkable shift from being the highest cost producer in 2003. This development is expected to result in higher utilization at current facilities, the construction of new facilities, and significant capital investments to expand capacity at existing petrochemical plants in the U.S.

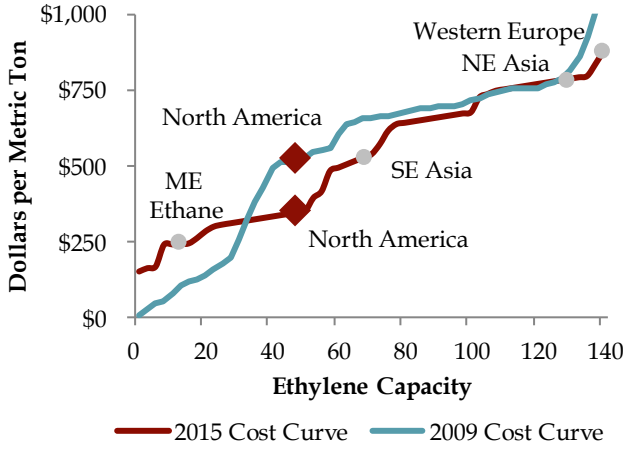
Exhibit 14

Abundant Supply of Natural Gas has Lowered Prices and Feedstocks

U.S. Natural Gas Production
(Tcf)



Ethylene Cost Curve[1]
(industry capacity in metric tons)

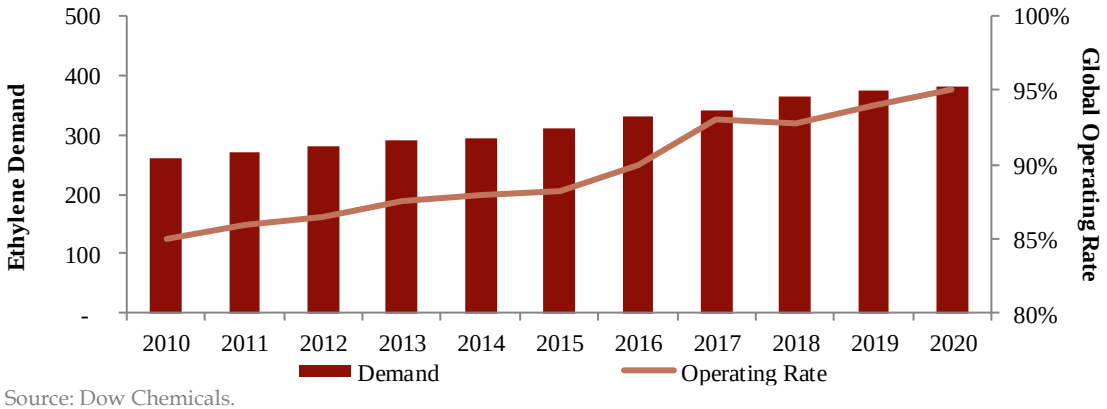


Source: EIA, Equity Research.
1) 2009 cost curve assume $50 WTI and $60 Brent Crude
2015 cost curve assume $50 WTI and $50 Brent Crude

Increasing Demand for Ethylene Driving High Operating Rates

Global product demand for ethylene-derived products (e.g., PVC, plastics) is expected to increase driven largely by demand from Asia and other emerging markets. Industry analysts expect demand growth to outpace supply growth in China for the foreseeable future, with much of the supply differential for ethylene derivatives coming from the U.S. As a result, global demand will continue to drive high utilization rates at U.S. petrochemical process plants leading to longer run-times and throughput with petrochemical operating rates, standard industry nomenclature for utilization, expected to climb above 90% in 2016 to accommodate the steadily growing demand for ethylene. Additionally, these trends will result in increasing turnaround slates, ongoing preventative and corrective maintenance, and a higher frequency of emergency repair work.

Exhibit 15
Worldwide Ethylene
Worldwide Ethylene Demand and Petrochemical Operating Rate
(ethylene demand in million mt/year)

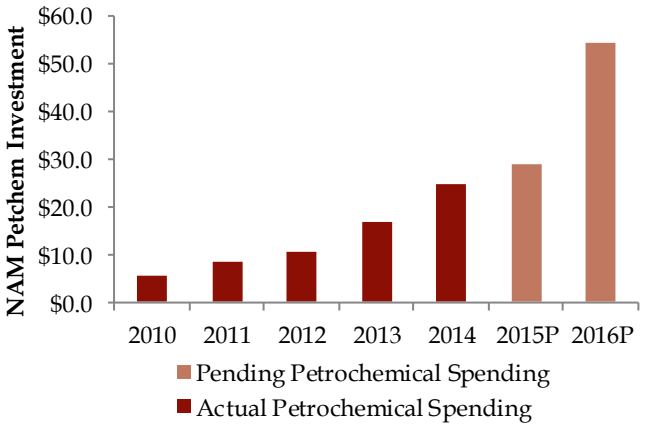


Source: Dow Chemicals.

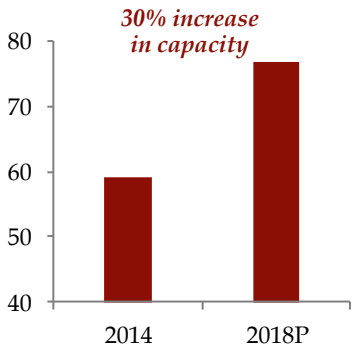
As a result of the high operating rates and favorable cost environment, the petrochemical industry is projected to attract over $85 billion of capital investment in 2015 and 2016 to augment ethylene capacity through (i) feedstock flexibility projects; (ii) expansion projects; and (iii) new crackers. Increased throughput at existing facilities and an expanding installed base provide a large maintenance opportunity for industrial services providers.

Exhibit 16
Near-Term North American Petrochemical Investment

North American Petrochemical Investment
($ in billions)



U.S. Ethylene Cracker New-build Projects Under Construction[3]
(lbs in billions)

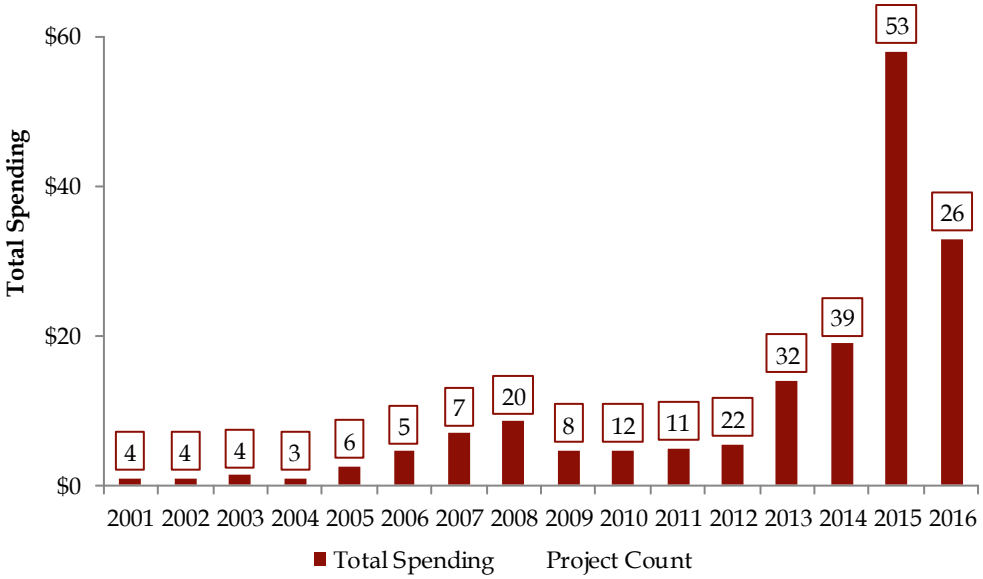


Facility	In Service
Freeport – Dow	2017
Baytown – Chevron Phillips	2017
Baytown – ExxonMobil Chemical	2017
Lake Charles – Sasol	2017
Monaca - Shell	TBD

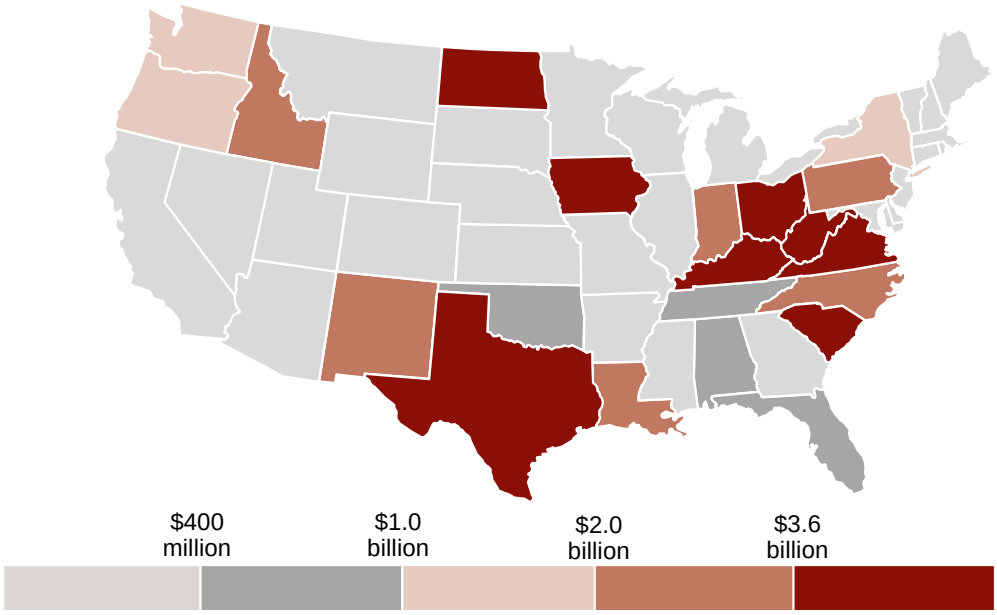
Source: IIR, Equity Research.

Chemical projects across North America have significantly increased in recent years representing a significant opportunity for infrastructure service providers with the largest planned expenditures through 2016 expected across the South and Midwest United States.

Exhibit 17
North American Chemical Projects
As of January 2015 *($ in billions)*



Domestic Capacity Expansion Heat Map by State and Expected Investment by 2016
As of January 2015



Source: Equity Research.

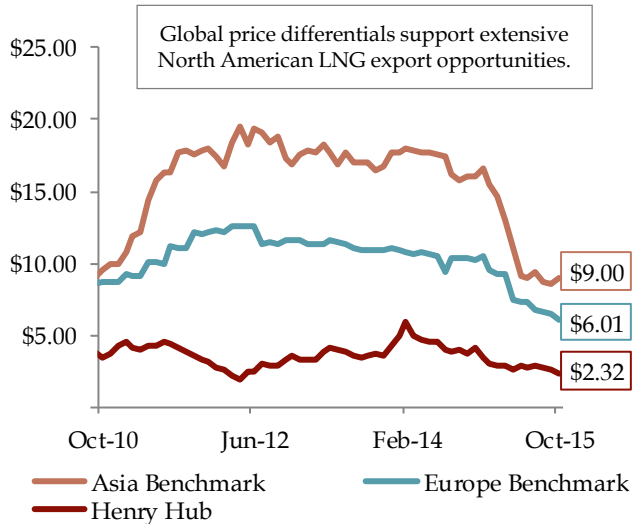
The Rise of Domestic LNG Export Facilities

U.S. natural gas prices have remained substantially below global market prices due to increasing supply from domestic unconventional resources. With U.S. natural gas prices expected to remain below the major European and Asian markets, five U.S. LNG export facilities are currently under construction or in advanced planning stages in Sabine, LA, Hackberry, LA, Freeport, TX, Cove Point, MD, and Corpus Christi, TX.

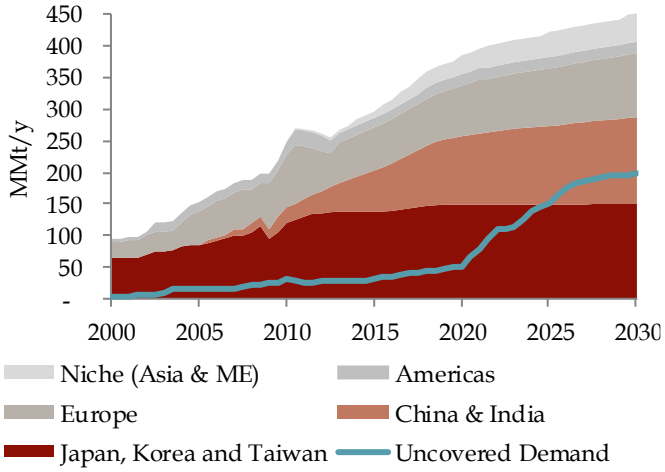
Exhibit 18

Global Price Differentials and Rising Demand Support Additional Investment

Global Price Differentials[1]
(USD in actual dollars per MMBtu)



Global LNG Demand



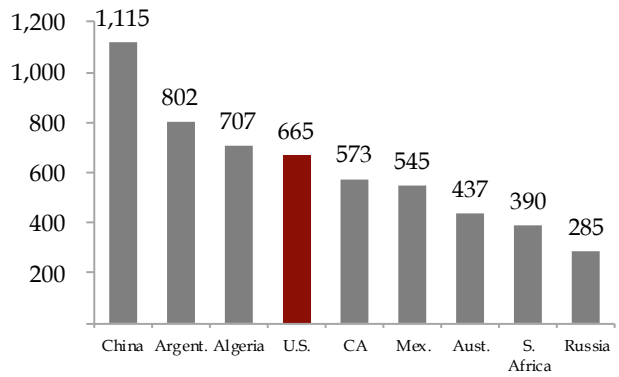
(1) As of October 2015.
Source: IMF. Poten & Partners, Cowen and Company.

Growing global LNG demand is spurring a race by major oil and gas producers to expand the already-constrained approximately 300MM mtpb global LNG capacity currently in place. With the fourth largest shale gas resource in the world and the most attractive cost profile for supplying East Asia, the U.S. remains the most attractive opportunity for LNG expansion projects.

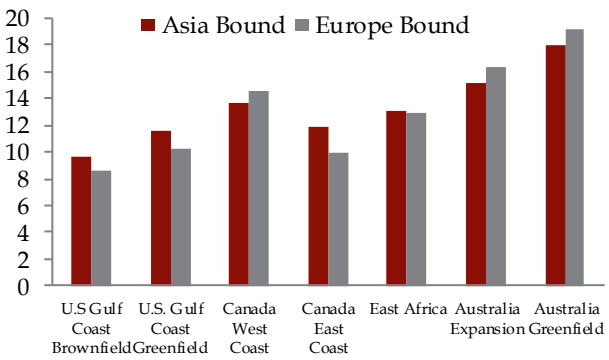
Exhibit 19

Resource Abundance Coupled With Attractive Cost Profile

Abundant Shale Gas Resource
(Tcf)



LNG Breakeven Price (15% IRR)
($/MMBtu)



Source: EIA; Poten & Partners, Cowen and Company.

LNG Export Projects Advancing in North America Due to Attractive Pricing Dynamics

The construction and engineering of new LNG export facilities will require billions in capital expenditures and represent an attractive opportunity for industrial service providers on capital, turnaround, and long-term maintenance contracts. While there are presently 5 U.S. facilities under construction, there are an additional 27 applications currently under review by the DOE and FERC, which represents a significant growth opportunity for contractors in the coming years. Sabine Pass, for example, has expected total project costs of approximately $11.5 billion for the first two LNG trains that are currently under construction.

DOE and FERC approvals, which are required for non-FTA destinations, span approximately 2-3 years and provide an attractive outlook on U.S. LNG opportunities even if only a few facilities ultimately receive approval or move forward as global demand for LNG is assessed. Asian demand is expected to be the main factor, where, in addition to a more challenging economic model, Asian buyers typically desire to price long-term contracts on an index derived from oil prices so any faltering in demand there could potentially lead to project delays or cancellations.

Exhibit 20

North American LNG Export Terminal Proposals

As of September 2015

U.S. LNG Export Terminal Proposals

(Capacity in Bcfd)

Project	Capacity	Owner
Pending Applications		
Coos Bay	0.9	Jordan Cove Energy Project
Lake Charles	2.2	Southern Union - Lake Charles
Astoria	1.3	Oregon LNG
Elba Island	0.4	Southern LNG Company
Lake Charles	1.1	Magnolia LNG
Sabine Pass	2.1	ExxonMobil-Golden Pass
Pascagoula	1.5	Gulf LNG Liquefaction
Freeport	0.3	Freeport LNG Dev
Cameron Parish	1.4	Venture Global Calcasieu Pass
Projects in Pre-Filling		
Plaquemines Parish	1.1	CE FLNG
Plaquemines Parish	0.3	Louisiana LNG
Robbinston	0.5	Kestrel Energy - Downeast LNG
Jacksonville	0.1	Eagle LNG Partners
Hackberry	1.4	Sempra-Cameron LNG
Brownsville	0.5	Texas LONG Brownsville
Brownsville	0.9	Annova LNG Brownsville
Port Arthur	1.4	Port Arthur LNG
Brownsville	3.6	Rio Grande LNG - NextDecade
Freeport	0.7	Freeport LNG Dev
Corpus Christi	1.4	Cheniere-Corpus Christi LNG
Plaquemines Parish	2.8	Venture Global LNG
Nikiski	2.6	Exxon, Conoco, BP, TransCanada

Project	Capacity	Owner
Proposed to US-Marad/Coast Guard		
Gulf of Mexico	1.8	Delfin LNG
Proposed Canadian Sites		
Kitimat	1.3	Apache Canada Ltd.
Douglas Island	0.2	BC LNG Export Cooperative
Prince Rupert Island	2.7	Pacific Northwest LNG
Squamish	0.3	Woodfibre LNG Ltd.

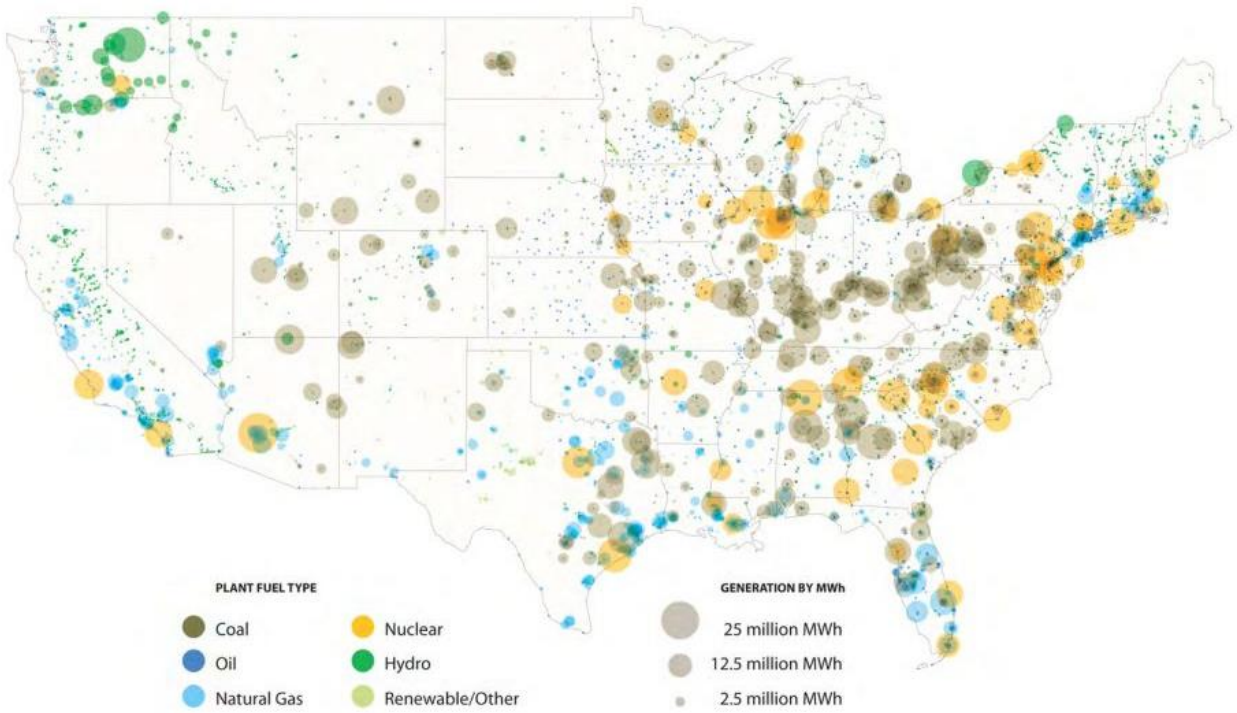
Source: Equity Research.

Strong Domestic Power Generation Fundamentals

The U.S. power generation grid is a vast network of over 3,000 operating power plant units that provide critical energy to residential and commercial customers and is dominated by three fuel sources – coal, natural gas, and nuclear power. These primary sources represent approximately 87% of U.S. electricity generation and are expected to maintain their share for the foreseeable future with mix changes occurring due to input costs and government and environmental regulations. Currently, coal accounts for approximately 37% of power generation largely due to its abundant supply, low cost, and existing plant infrastructure. While coal is forecast to remain the largest source of power generation in the U.S. through 2035, it has declined from 51% of to 37% since 2003. Conversely, natural gas has grown significantly as a percent of total generation (from 17% in 2003 to 27% in 2014) due to coal retirements and new-build gas capacity. While there is expected to be a slow shift from coal to gas power, nuclear power's share of the domestic power supply has remained relatively steady since 2003 at approximately 19%.

Exhibit 21

U.S. Power Generation Infrastructure



Source: Ceres.

Utility industry capital expenditures are expected to exceed $95 billion in 2015, with the majority of spending related to upgrading and retrofitting existing power infrastructure and environmental compliance, according to the Edison Electric Institute ("EEI"). Utilities are highly incentivized to spend their entire capital budgets or risk reduced funding or rate reductions in the future, making these spending forecasts a reliable predictor of pending investment.

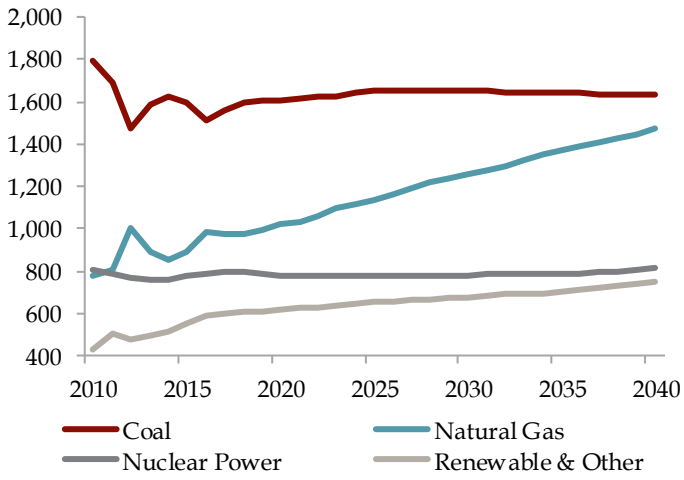
Furthermore, utility revenue streams tend to be very steady, thus allowing them to spend more consistently on repair, maintenance, and construction. This creates a stable and growing base of demand that further supports the long-term industry trends.

In addition to growing demand and aging infrastructure, state and federal regulations and initiatives are pressuring the energy infrastructure industry to meet more stringent requirements for quality, reliability, and emissions controls. This culmination of events highlights significant investment that is needed across the entire power generation market.

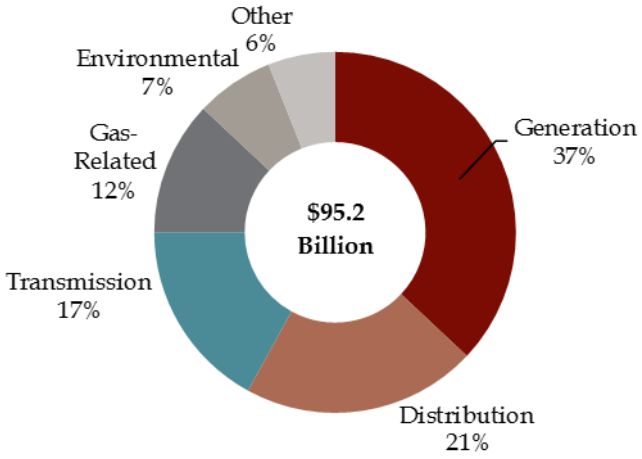
Exhibit 22

Domestic Power Generation

U.S. Power Generation by Fuel Source
(in billion kilowatthours)



2014 U.S. Power Generation Industry Capital Expenditures
($ in millions)



Source: EIA, EEI.

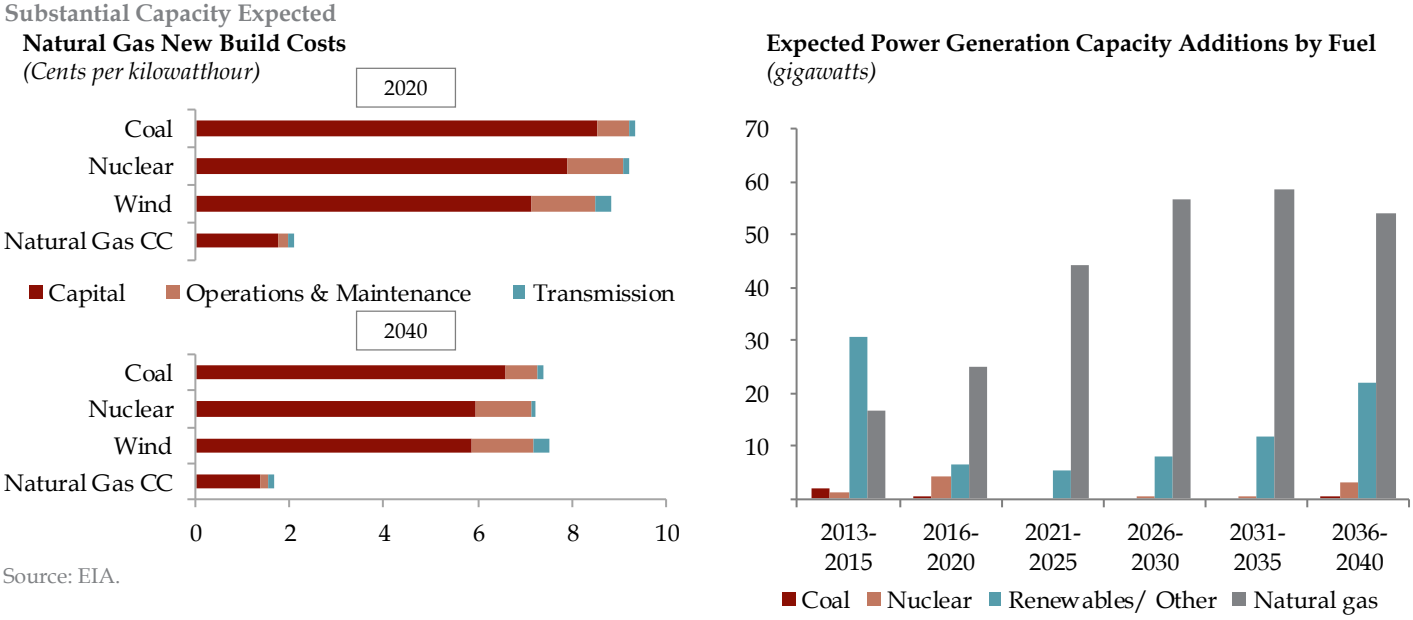
Natural Gas Driven Power Generation

An abundance of natural gas supply from shale production and persistent low prices are driving the construction of new natural gas combined-cycle units to act as baseload generators. Traditionally, due to the volatility of natural gas commodity prices, natural gas units were used as peak generators ("peakers") and only activated during periods of peak electricity loads, such as summer demand for air conditioning. This dynamic is shifting as natural gas' share of capacity additions rises through 2040, according to the EIA. Nearly 44% of all expected capacity additions will ultimately be natural gas by 2018.

With increased production, gas prices declined and normalized to levels low enough to attract investment in new build capacity for power generation in lieu new coal-fired generation. As a result, the long-term outlook for natural gas is extremely favorable as older, smaller coal plants are retired due to increasingly stringent environmental standards and the threat of additional EPA action for potential CO2 regulation down the road.

Electric power plants are utilized based on their variable cost of operation, which is dictated by both the price of the fuel used and the efficiency of the plant. Therefore, natural gas combined cycle power plants represent a significant opportunity for utilities to shift to a lower variable cost structure, as gas power generation is more efficient and flexible than traditional coal-fired steam turbines in today's low natural gas price environment. By 2040, the EIA expects fixed capital costs of new build gas plants to be roughly 20% of those of coal, nuclear, and wind per kilowatthour, which supports the ~250 gigawatts of expected natural gas power generation capacity additions projected by the EIA.

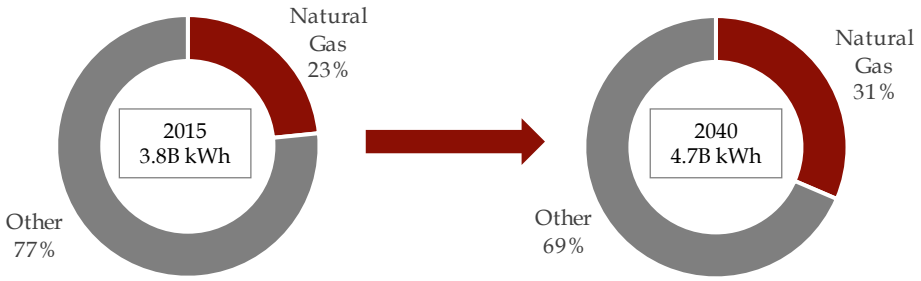
Exhibit 23
Substantial Capacity Expected



Source: EIA.

Natural gas is expected to grow its share of total generation over the next 25 years as a result of its favorable cost advantage (lower fixed costs), an accommodative political and regulatory environment, and shorter construction times than traditional power generation plants such as coal and nuclear. This expanded installed base represents a significant opportunity for growth for industrial service providers.

Exhibit 24
Natural Gas as a Percentage of Total Power Generation



Source: EIA.

Coal-Fired Power Generation

While coal's share of the total power generation market is slowly declining due to regulatory initiatives and the resurgence of gas generation, it represents a significant maintenance and retrofitting opportunity for service providers given the aging infrastructure and the need for large plants to be retrofitted with environmental compliance systems such as air quality control systems ("AQCS"), flue-gas desulfurization ("FgD") systems, baghouses, and selective catalytic reduction ("SCR") systems.

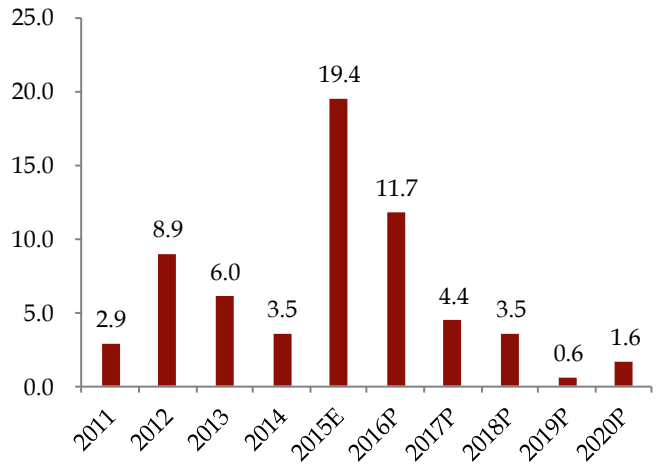
Coal Retirements Planned

With existing large, coal-fired power plants serving as a primary baseload, smaller and less-efficient coal plants have been selected for retirement over the next five years. Larger plants, which serve critical roles in the U.S. power system, will be retrofitted or converted rather than retired. These retrofits are much less costly than new build gas or coal plants, and adequately address the stringent emissions standards that are currently set. As a result, new EPA standards to reduce emissions are primarily driving the retirement of aging and smaller coal-fired power plants. Of the 3,084 operating power units in the U.S., 1,260 are coal-fired units with a total generating capacity of 320 GW, with 218 of those units currently scheduled for retirement, which make up only 14% of total coal-fired capacity. Nearly 80% of the units currently scheduled to be retired have generating capacity of less than 250 MW.

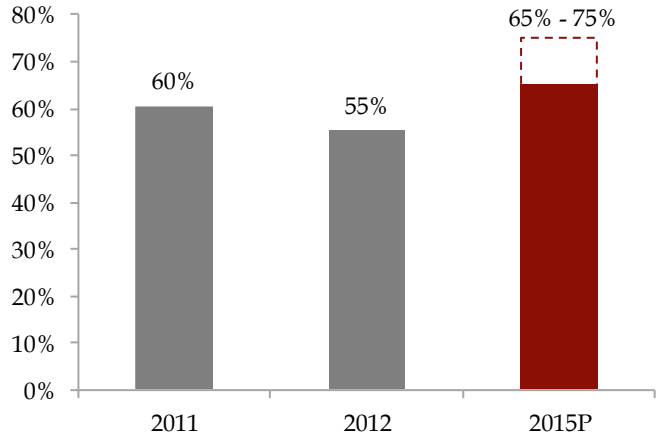
The reduction in generating capacity due to announced plant retirements is expected to increase utilization of the remaining units, which will require additional maintenance to ensure proper operation. According to the EIA, coal will account for over 35% of electric power generation in 2040 with utilization rates expected to increase through 2016 to offset the effect of coal-fired unit retirements. The newer, larger coal-fired units will be retrofitted with SCRs to reduce nitrogen oxides emissions, FgDs to reduce sulfur dioxide emissions, and baghouses to reduce particle emissions. Additionally, the corresponding reduction in capacity due to plant retirements will therefore be offset by increased utilization of the remaining units, which will require additional maintenance to ensure proper operation of each unit. This increase in utilization will drive higher maintenance expenditures.

Exhibit 25
Coal Retirements Impact Capacity Utilization

Estimated Coal Retirements
(Thousands of Megawatts)



Increase Remaining Fleet Utilizations
(Utilization Factor)



Source: EPA, Equity Research.

Regulatory Impact on Coal-Fired Fleet

The regulatory environment surrounding coal-fired power plants has all but eliminated opportunities for future new build capital spending, however, there remain substantial opportunities related to decommissioning and environmental compliance. Two recent EPA rulings – Clean Air Interstate ("CAIR") and Mercury and Air Toxics Standards ("MATS") – have been enacted to regulate emissions levels for existing and new power plants. Upon implementation in 2005, the EPA projected CAIR compliance costs of nearly $4 billion annually by 2015. Further, the EPA estimated the annual cost of MATS compliance to be $9.6 billion by 2015. NERA's estimated that compliance costs associated with MATS would approach $100 billion over the life of the law for the remaining fleet. These costs underscore the potential capital costs for retrofits to meet increasingly stringent standards.

Nuclear and Renewables

The World Nuclear Association estimates that existing operating nuclear facilities spend nearly $8 billion annually on recurring repairs and maintenance which is expected to increase as the existing fleet continues to age. Low natural gas prices and increased public scrutiny following the Fukushima melt down have dimmed the prospects of the U.S. nuclear industry. While new build opportunities are limited, there are a number of current reactors under construction in the southeastern U.S. that provide opportunities for EPC providers to win large projects. Long-term, new build opportunities seem available with several planned and proposed projects throughout the U.S., many of which remain in limbo given the current uncertainty behind the nuclear political environment. While new build opportunities are limited, there remains a sizeable maintenance, testing, and inspection opportunity.

Exhibit 26

Under Construction, Planned, and Proposed Nuclear Facilities

Under Construction

Site	Technology	MWe gross	Proponent/utility	Construction start	Operational Date
Watts Bar 2f, TN	Westinghouse PWR	1218 (1177 net)	Tennessee Valley Authority	2007 re-start	2015
Vogtle 3, GA	Westinghouse API 1000	1200 (1117 net)	Southern Nuclear Operating	March 2013	2017
Vogtle 4, GA	Westinghouse API 1000	1200 (1117 net)	Southern Nuclear Operating	November 2013	2017
V.C.Summer 2, SC	Westinghouse API 1000	1200 (1117 net)	South Carolina Electric & Gas	March 2013	2017
V. C. Summer 3, SC	Westinghouse API 1000	1200	South Carolina Electric & Gas	November 2013	2019

Planned and Proposed

Site	Technology	MWe gross	Proponent/utility	COL Status	Operational Date
Bellefonte 1, AL	B&W PWR	1263	Tennessee Valley Authority	COL review suspended	2018 - 2020
William States Lee, SC	AP1000 x 2	2400	Duke Energy	COL target late 2016	2024 - 2026
Turkey Point, FL	AP1000 x 2	2400	Florida Power & Light	COL target 2014	2022 - 2023
Levy County, FL	AP1000 x 2	2400	Duke Energy	COL target late 2015	2024
Shearon Harris, NC	AP1000 x 2	2400	Duke Energy	COL review suspended	2026
North Anna, VA	ESBWRi	1600	Dominion	COL review delayed	2022
Comanche Peak, TX	US-APWR x2	3400	Luminant	COL review suspended	2020
South Texas Project*, TX	ABWR x 2	2712	Toshiba, NINA, STP Nuclear	COL review delayed	Unknown
Clinch River, TN	mPower x 2	360	TVA	Permit deferred	2022
Callawayj, MO	Westinghouse SMR x 5	1125	Ameren Missouri	Proposal suspended	Unknown
Grand Gulf, MS	ESBWRi	1600	Entergy	COL review suspended	Unknown
Fermi, MI	ESBWR	1600	Detroit Edison	COL target late 2015	Unknown
River Bend, LA	ESBWRi	1600	Entergy	COL review suspended	Unknown
Nine Mile Point, NY	US EPR	1710	UniStar Nuclear	COL application	Unknown
Bell Bend (near Susquehanna),	US EPR	1710	PPL	COL review delayed	Unknown
Blue Castle, UT	unspecified	1200	Transition Power Development	ESP application expected	Unknown
Salem/Hope Creek, NJ	unspecified	1200	PSEG	ESP application 2014	On line 2021

Source: The World Nuclear Organization.

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