

## High voltage: Rising electricity prices and electric power consumption will benefit the industry

This report was provided to

University of California - Berkeley (2127291013)

by IBISWorld on 04 October 2017 in accordance with their license agreement with IBISWorld

## IBISWorld Industry Report 22111b Nuclear Power in the US

April 2017

Viraj D'Costa

### 2 About this Industry

2 Industry Definition	.....
2 Main Activities	.....
2 Similar Industries	.....
2 Additional Resources	.....

### 3 Industry at a Glance

### 4 Industry Performance

4 Executive Summary	.....
4 Key External Drivers	.....
6 Current Performance	.....
8 Industry Outlook	.....
10 Industry Life Cycle	.....

### 12 Products & Markets

12 Supply Chain	.....
12 Products & Services	.....
13 Demand Determinants	.....
14 Major Markets	.....

### 15 International Trade

16 Business Locations	.....
-----------------------	-------

### 18 Competitive Landscape

18 Market Share Concentration	.....
18 Key Success Factors	.....
18 Cost Structure Benchmarks	.....
20 Basis of Competition	.....
20 Barriers to Entry	.....
21 Industry Globalization	.....

### 22 Major Companies

22 Exelon Corporation	.....
23 Entergy Corporation	.....
24 Dominion Resources Inc.	.....

### 27 Operating Conditions

27 Capital Intensity	.....
28 Technology & Systems	.....
29 Revenue Volatility	.....

### 30 Regulation & Policy

31 Industry Assistance	.....
------------------------	-------

### 32 Key Statistics

32 Industry Data	.....
32 Annual Change	.....
32 Key Ratios	.....
33 Industry Financial Ratios	.....

### 34 Jargon & Glossary

# About this Industry

## Industry Definition

This industry consists of companies that operate nuclear-powered, electricity generation plants. The power plants use nuclear fuel to generate steam, which in turn is used to power

turbines that generate electric power. The electricity reaches end users via transmission or distribution systems. This industry excludes government-owned nuclear facilities.

## Main Activities

### The primary activities of this industry are

Generating nuclear electric power

### The major products and services in this industry are

Nuclear generation from independent power producers

Nuclear generation from utilities

## Similar Industries

### **22112 Electric Power Transmission in the US**

Operators in this industry transmit high-voltage electricity and distribute to end users on the low-voltage network.

### **2211a Coal & Natural Gas Power in the US**

Operators in this industry generate electricity by burning fossil fuels.

### **2211c Hydroelectric Power in the US**

Operators in this industry generate electricity by using renewable power sources such as hydroelectricity, wind power, geothermal power and solar power.

### **2211d Wind Power in the US**

Wind power plants use wind turbines to generate electricity for distribution to the power grid.

### **2211e Solar Power in the US**

Solar power plants use solar panels to generate electricity for distribution to the power grid.

## Additional Resources

### For additional information on this industry

[www.ans.org](http://www.ans.org)

American Nuclear Society

[www.nei.org](http://www.nei.org)

Nuclear Energy Institute

[www.eia.gov](http://www.eia.gov)

US Energy Information Administration

[www.nrc.gov](http://www.nrc.gov)

US Nuclear Regulatory Commission

[www.world-nuclear.org](http://www.world-nuclear.org)

World Nuclear Association

# Industry at a Glance

Nuclear Power in 2017

## Key Statistics Snapshot

Revenue	\$36.3bn	Annual Growth 12-17	Annual Growth 17-22
Profit	\$3.2bn	-0.8%	0.6%

## Market Share

Exelon Corporation  
32.7%

Entergy Corporation  
6.2%

Dominion Resources Inc.  
6.1%

p. 22

## Revenue vs. employment growth



## Industrial production index



SOURCE: WWW.IBISWORLD.COM

## Products and services segmentation (2017)

## Key External Drivers

Regulation for the Nuclear Power industry

World price of uranium

Industrial

production index

Price of electric power

Electric power

consumption

p. 4

48.4%  
Nuclear generation from independent power producers

51.6%  
Nuclear generation from utilities

SOURCE: WWW.IBISWORLD.COM

## Industry Structure

Life Cycle Stage	Mature	Regulation Level	Heavy
Revenue Volatility	Medium	Technology Change	Medium
Capital Intensity	High	Barriers to Entry	High
Industry Assistance	Medium	Industry Globalization	Low
Concentration Level	Medium	Competition Level	Medium

FOR ADDITIONAL STATISTICS AND TIME SERIES SEE THE APPENDIX ON PAGE 32

# Industry Performance

Executive Summary | Key External Drivers | Current Performance  
Industry Outlook | Life Cycle Stage

## Executive Summary

Over the five years to 2017, the Nuclear Power industry has contracted due to stagnant nuclear power generation and slow electricity price growth. Electricity is a necessity for consumers and businesses, resulting in stable demand for industry operators; however, nuclear power generation has stagnated due to growing public concerns regarding nuclear safety. According to the Energy Information Administration (EIA), nuclear power generation is expected to remain stagnant over the five years to 2017. Additionally, just 48.4% of nuclear power

Fukushima Daiichi disaster in Japan. Therefore, nuclear capacity additions slowed and facilities steadily closed. For example, major player Dominion Resources closed its Keweenaw power plant in early 2013. Facility closures and downsizing are anticipated to result in lower nuclear power generation in 2017, causing revenue to fall 2.1%. However, while revenue contracted, profit experienced moderate gains over the past five years due to falling uranium prices. A rise in mining output over the past five years drove down uranium prices, which benefited industry operators.

Over the five years to 2022, the Nuclear Power industry is anticipated to grow slowly as electric power consumption rises alongside electricity prices. Industrial production is projected to increase at an annualized rate of 1.4% during the five-year period. Nevertheless, nuclear power generation is expected to fall, as the Electric Power Transmission industry (IBISWorld report 22112) increasingly looks to different fuels to generate energy. According to the EIA, nuclear power generation will fall an annualized 0.4% over the next five years. Overall, IBISWorld forecasts industry revenue to increase at an annualized rate of 0.6% to \$37.4 billion over the next five years.

## Facility closures and downsizing are anticipated to result in lower nuclear power generation

generation comes from independent power generators, compared with 51.6% of the electric power sector. Independent power producers are more likely to participate in wholesale electricity markets, where prices are considerably more volatile. Wholesale prices contracted following the recession, cutting into industry revenue. IBISWorld expects industry revenue to fall at an annualized rate of 0.8% to \$36.3 billion over the five years to 2017.

Public concerns regarding nuclear safety have grown over the past several years, mostly due to the 2011

## Key External Drivers

### Regulation for the Nuclear Power industry

Regulations limit industry growth and make it difficult for players to build new plants. Industry operators face strict oversight of current operations and must undergo an extensive review process to make upgrades to existing facilities. Regulators grant power uprates to companies looking to increase capacity, but these uprates depend on past

performance and safety reviews. Increased regulation of uprates limits revenue growth. Regulation for the Nuclear Power industry is expected to decline slowly in 2017.

### World price of uranium

Enriched uranium is the fuel used to generate nuclear power and, as a result, the price of uranium has a substantial effect on industry costs. When the price

# Industry Performance

## Key External Drivers continued

of uranium goes up, industry costs increase accordingly. Operators can either pass on some of these increased costs in wholesale markets or rely on government regulatory agencies to raise retail rates. The world price of uranium is expected to decrease in 2017.

### Industrial production index

Industrial use of electricity by manufacturing industries accounts for about 30.0% of industry demand. Therefore, an increase in industrial production benefits the industry, especially energy-intensive metal production. The industrial production index is expected to increase in 2017.

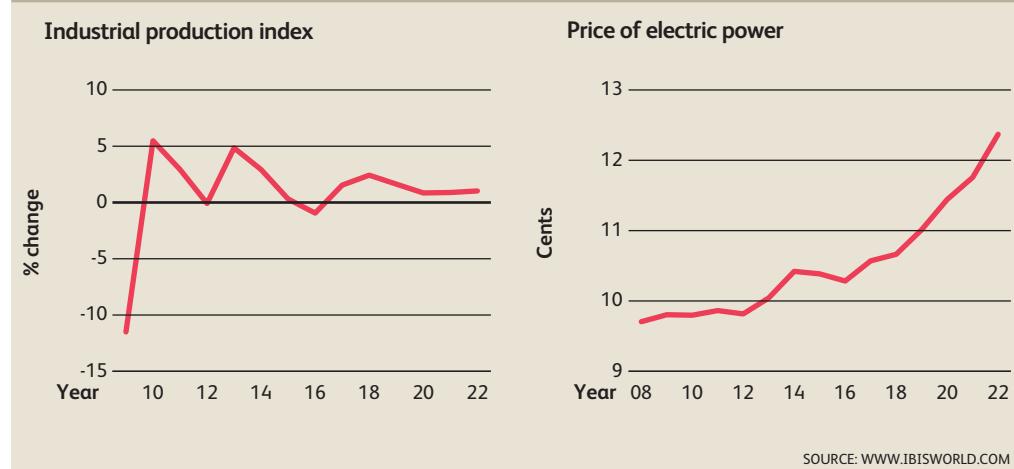
### Price of electric power

Demand for electric is relatively inelastic. As a result, in addition to higher

generation levels, industry operators benefit from higher electricity prices. Rising demand for electricity generally corresponds to increasing electricity prices, leading to higher revenue for industry operators. In 2017, the price of electric power is expected to rise, representing a potential opportunity for the industry.

### Electric power consumption

Many nuclear power generators sell electricity to the wholesale market rather than directly to end users. The level of energy sold is an indication of demand from electric power transmission. Higher transmission demand results in heightened industry revenue. Electric power consumption is expected to increase slowly in 2017; however, such slow increases could represent a threat to the industry.



# Industry Performance

## Current Performance

The Nuclear Power industry has experienced moderate contraction over the five years to 2017. No new nuclear power stations have come on line since 1996; instead, power generators have increasingly used uprates (i.e. improvements in nuclear electricity-generating capacity) to maximize the quantity of nuclear power available for sale to downstream customers. Uprates proved insufficient, with nuclear power generation anticipated to stagnate (0.0% annualized growth) over the five years to 2017. Electric power consumption also slowed, putting additional downward pressure on revenue. As a result, IBISWorld expects industry revenue to fall an annualized 0.8% to \$36.3 billion over the five years to 2017.

The Nuclear Power industry is heavily regulated by the government; for instance, companies that operate in regulated utility areas may not be able to raise rates because governmental approval can be difficult to obtain. Failing to obtain rate increases will limit revenue and profit growth. In addition, if a nuclear reactor does not pass inspections or the US Nuclear Regulatory Commission (NRC) determines that a nuclear generator is not



SOURCE: WWW.IBISWORLD.COM

safe, it can be shut down immediately, which is a prominent risk for the industry. Broader electricity regulations affect the industry as well because the regulatory environment shapes developments in the industry. For example, deregulation in the late 1990s and early 2000s produced an expansion in the wholesale electricity market. At the same time, access to transmission facilities made state boundaries less important than they once were. As a result, nuclear facilities have been able to sell energy across state boundaries, boosting industry revenue.

## Output trends

Heavy regulatory scrutiny has prevented the construction of new nuclear reactors over the past five years; in response, operators have increasingly used uprates to boost capacity instead of building new plants. The use of power uprates involves using more highly enriched fuel to produce more thermal energy and steam, thereby generating more electricity. Components of the nuclear reactor, including pipes, valves, pumps, heat exchangers, electrical transformers and generators, must be able to accommodate the conditions that exist at a higher power level, so uprates must be approved by regulators.

Power uprates are submitted to the NRC, which licenses nuclear power stations and reviews amendment requests. In evaluating a power uprate request, the NRC reviews data and accidental analyses submitted by a licensee to confirm that the plant can operate safely at the higher power level. Reviews of power uprate requests are a high priority and are conducted on accelerated schedules. The NRC usually has several power uprates under review at any given time.

Over the past five years, nuclear power generation has stagnated, despite uprate efforts by power plants. For example, the

# Industry Performance

## Output trends continued

closure of the San Onofre Nuclear Generating Station significantly cut into generation capacity. According to data from the Energy Information Administration, nuclear power generation is expected to stagnate (0.0% annualized growth) over the five years to 2017 to 792.1 million kilowatt-hours, with the majority of the decline coming in 2012 and 2017. As a result, industry revenue is expected to fall 2.1% in 2017 alone.

Over the five years to 2017, the industry was rocked by several plant closures, the first of its kind in more than

15 years. The closures were due to several reasons, ranging from stiff competition to safety concerns. As a result, over the period, the number of establishments declined at an annualized rate of 1.6% to 96 locations. Overall, these closures had a negative impact on total net generation for the industry. However, despite plant closures, industry employment declined only marginally due to the need to ensure power plant safety, falling at an annualized rate of 0.1% to 49,783 people. A sufficient number of maintenance personnel is required even when revenue and power generation is contracting.

## Volatile prices

Before the recession, uranium prices rose significantly. Strong consumer demand gave companies the ability to pass these increased costs on to customers, boosting industry profitability. The economic downturn caused demand from the wholesale electricity market and downstream industrial customers to sharply contract. Industry operators were forced to lower prices to remain competitive, decreasing industry profit as a result. As the overall economy recovered and demand for industry services has picked up, profit margins experienced a steady increase.

Falling generation capacity has spurred companies to push for new reactor construction over the past five years. Upgrades are typically easier to obtain because established reactors have already passed major safety tests. However, upgrades often do not provide industry operators with the capacity level they seek when prices are rising and demand is high. The economic recovery has led to steady increases in industrial production and electric power consumption; however, industry revenue has continued to fall because nuclear generation capacity has failed to keep pace with this rising demand.

Low natural gas prices have spurred intense competition for nuclear power

Reactor construction is lengthy and requires significant regulatory oversight. Despite rapidly increasing demand prior to the recession, no new nuclear reactors went online, primarily due to public health concerns and the government's concerns regarding possible terrorist attacks. The 2011 Fukushima Daiichi nuclear crisis in Japan also brought a renewed sense of caution toward nuclear power, making it harder for companies to propose the establishment of new plants. Additionally, low natural gas prices have spurred intense competition for nuclear power; electric generators have increasingly turned to natural gas power plants, often at the expense of new nuclear reactors. These persisting roadblocks have hindered this industry from expanding capacity over the past five years, which has constrained revenue growth.

# Industry Performance

## Industry Outlook

Companies in the Nuclear Power industry are poised to benefit from favorable market conditions over the five years to 2022. In the midst of a growing economy, electricity demand is expected to rise as industry operators and consumers use more energy. As a result, industry players will continue using power uprates to expand nuclear power generation volume, which will help nuclear energy producing companies to better meet downstream demand. Furthermore, nuclear power companies will continue to push for new reactor construction over the next five years. Despite the 2011 nuclear crisis in Japan, which heightened public concern regarding nuclear safety,

government regulation is projected to somewhat ease as the push for energy independence gains momentum. Due to this increased demand along with higher electricity prices, industry revenue is forecast to steadily increase at an annualized rate of 0.6% to \$37.4 billion over the five years to 2022.

Over the next five years, however, the wholesale electricity market is anticipated to expand, especially as more independent power producers enter the market. Consequently, companies must be able to expand their customer base and secure long-term power purchasing agreements. Failure to do so can result in sharp fluctuations in revenue and profitability.

### Uprates boost profit

Nuclear power generation, which stagnated over the past five years, is forecast to decline slightly, despite increasing demand for electricity. Power uprates, or the use of more highly enriched fuel to increase nuclear output at existing plants, will continue to boost nuclear generating capacity but not generation. The Nuclear Regulatory Commission (NRC) expects that an additional 35 uprate applications will be submitted over the next five years. More uprates will translate to more energy being generated more efficiently which will boost profit margins over the next five years, as more efficient power output is met with higher prices. As the global

**Power uprates will continue to boost nuclear generating capacity**

economy expands, industrial customers and utilities will require more power to use for production or to deliver to their downstream customers. Despite the decline in generation, government regulatory agencies will raise electricity rates in response to higher demand, spurring greater infrastructure investments. These price increases will be the main driver behind industry revenue during the period.

### New reactors

Despite a large number of applications for new plants, companies still face a lengthy regulatory process for construction approval. Georgia Power, a subsidiary of Southern Company, is constructing two new reactors for its Vogtle Electric Generating Plant. The reactors are projected to be running in 2017 and 2018, respectively. As a result,

the number of industry establishments is anticipated to grow slowly at an annualized rate of 0.6% to 99 plants over the five years to 2022. While the growth in establishments is marginal, new reactors that come online will be the first new plants in operation since 1996. Though concerns about safety persist, especially after the nuclear crisis in

# Industry Performance

## New reactors continued

Japan, the push for energy independence and rising awareness of climate change will likely mitigate these safety concerns in the long run. Additionally, domestic natural gas prices are projected to slowly rise over the next five years, which will

lower the competitiveness of natural gas power. As more plants are opened, the need for employees increases, to this end, industry employment is expected to grow an annualized 1.2% to total 52,912 people over the five years to 2022.

# Industry Performance

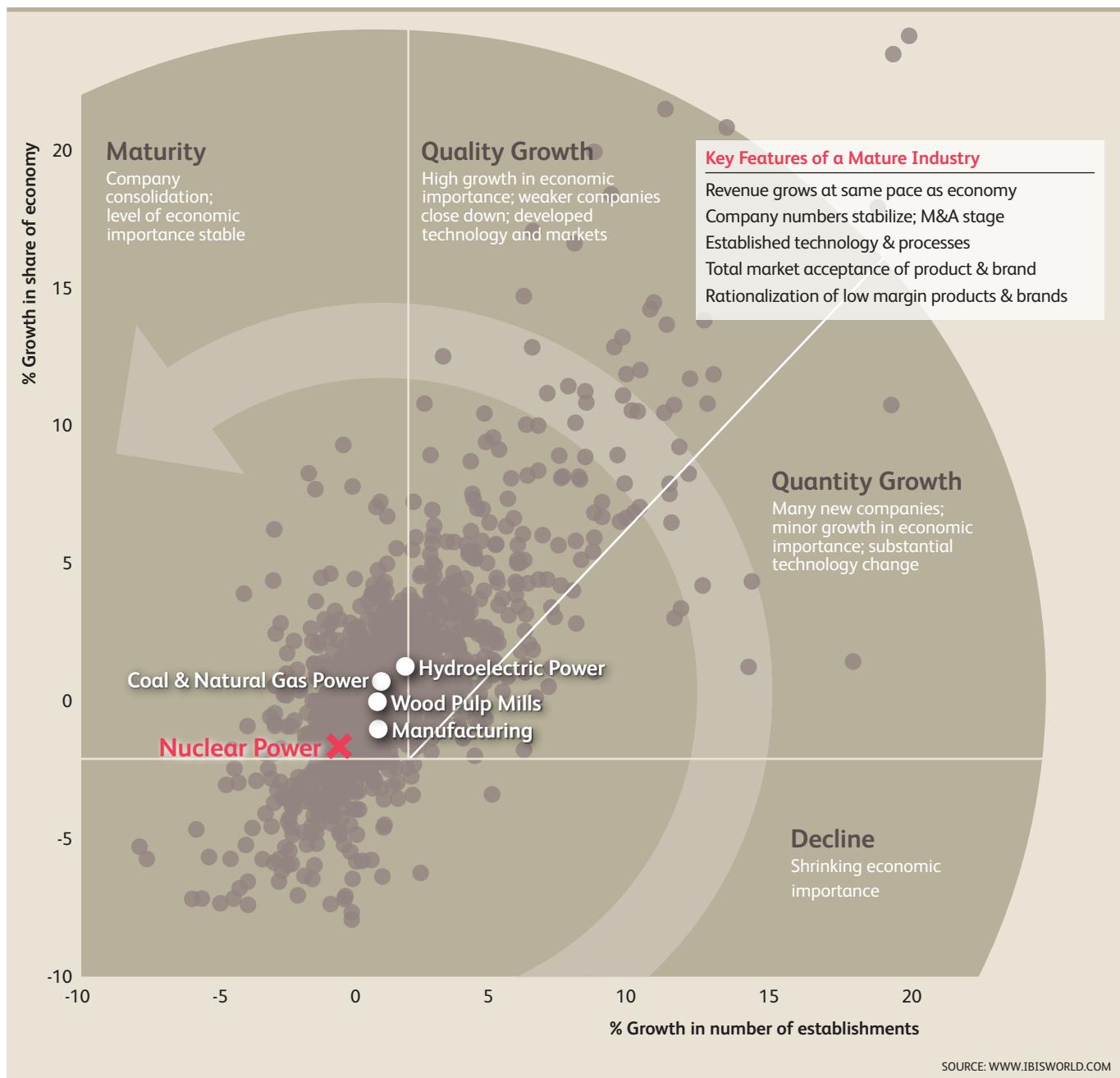
## Life Cycle Stage

This industry has a well-established product

Output follows trends in overall economic growth

The changing industry structure is increasing competition between generators

Concern over greenhouse gas emissions may improve prospects for nuclear power plants



# Industry Performance

## Industry Life Cycle

This industry  
is **Mature**

The Nuclear Power industry's product is well established and, as a result, production and revenue both tend to follow trends in overall economic growth. However, industry value added (IVA), a measure of the industry's contribution to the overall economy, is anticipated to fall an annualized 0.3% over the 10 years to 2022; US GDP is forecast to increase at an annualized rate of 2.0% over the same period. IVA decline is due to relatively slow electricity consumption and the difficult nature of obtaining a permit to build new nuclear plants. Nevertheless, the industry is mature because it is a major source of electricity for the United States and will remain so over the next five years.

Most industry participants are well established but, in some cases, regulatory change has led them to focus their activities on either generation or distribution. Sometimes companies merely operate nuclear reactors, as opposed to owning them outright. Despite the static nature of the product,

the industry players are able to use power uprates to increase the volume of electricity sold. This trend is expected to persist as nuclear facilities aim to increase output and boost revenue.

While nuclear power has accounted for just under 20.0% of overall power generation over the past decade, no new power stations have been constructed since 1996. Limits to capacity expansions, the continued closure of older power stations and the lengthy time required to approve and build new nuclear power plants suggest that the share of nuclear power in total power generation is likely to decline over the next five years. However, growing concern over greenhouse gas emissions from fossil fuel-based power generators will lead to heightened interest in the construction of new nuclear power plants. In general, while nuclear power is not the central focus of the US energy policy, it will likely remain a significant component of total electricity generation over the next five years.

# Products & Markets

Supply Chain | Products & Services | Demand Determinants  
 Major Markets | International Trade | Business Locations

## Supply Chain

### KEY BUYING INDUSTRIES

<b>22112</b>	<b>Electric Power Transmission in the US</b>
.....	This industry distributes electricity to end users.
<b>31-33</b>	<b>Manufacturing in the US</b>
.....	Very large manufacturers can directly purchase power from businesses in the industry.
<b>32211</b>	<b>Wood Pulp Mills in the US</b>
.....	Wood pulp mills are highly energy-intensive and may directly purchase energy on wholesale markets.
<b>32511</b>	<b>Petrochemical Manufacturing in the US</b>
.....	Chemical manufacturing is highly energy-intensive, causing some businesses to purchase power on wholesale markets.
<b>32518</b>	<b>Inorganic Chemical Manufacturing in the US</b>
.....	Manufacturing of this nature is highly energy-intensive, causing some businesses to purchase power on wholesale markets.

### KEY SELLING INDUSTRIES

<b>21229</b>	<b>Molybdenum &amp; Metal Ore Mining in the US</b>
.....	Enriched uranium is the fuel used by nuclear power generators.
<b>23713</b>	<b>Transmission Line Construction in the US</b>
.....	Contractors construct power plants and other related utility infrastructure for industry operators.
<b>23799</b>	<b>Heavy Engineering Construction in the US</b>
.....	Heavy engineering contractors construct nuclear power facilities.
<b>54133</b>	<b>Engineering Services in the US</b>
.....	Engineering service providers help design nuclear power facilities.
<b>56291</b>	<b>Remediation &amp; Environmental Cleanup Services in the US</b>
.....	Remediation service providers help clean up potential environmental contamination.

## Products & Services

Since the Nuclear Power industry solely produces electricity, it is not segmented along product lines. Still, different types of producers operate in the market: utilities and independent power producers (IPPs). Additionally, companies in this industry may also provide other types of power, depending on the energy mix chosen and the pricing available. For instance, an industry player might opt to sell natural gas-generated electricity as it may cost less than nuclear-generated electricity at that time.

### Utilities

Utilities are companies that operate in the electricity generation industry and are usually heavily regulated. Although utilities still account for the bulk of

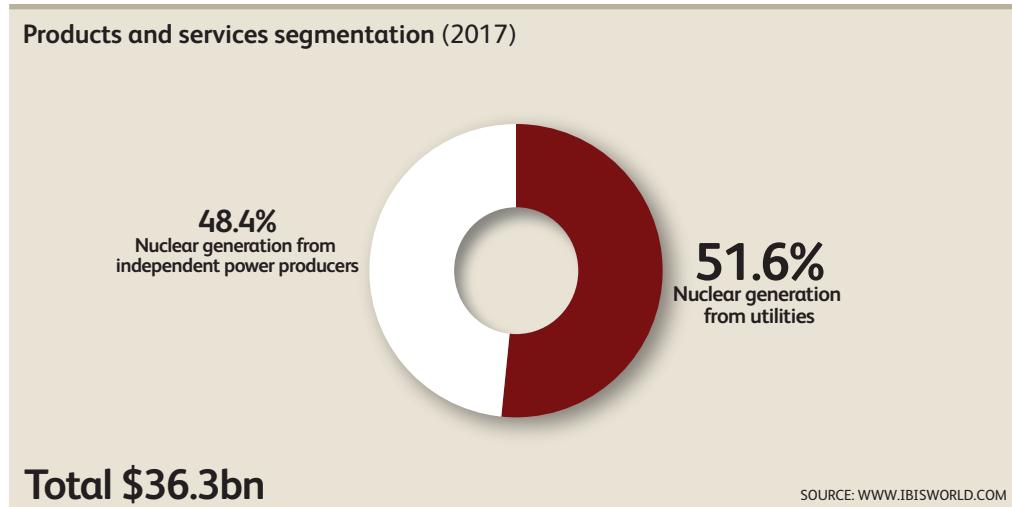
nuclear power generation in the United States (51.6%), their share has fallen since the mid-1990s (when it was at 100.0%). Industry-wide deregulation, which sought to separate electricity generation from distribution, forced utilities to sell several assets to other entities. As a result, this segment's nuclear power generation has fallen over the past five years.

### Independent power producers

IPPs are entities independent of direct government regulation and electricity rate setting. They operate on a competitive basis with regulated and unregulated electricity generators and distributors. The Energy Policy Act of 1992 opened up the electricity generating

# Products & Markets

## Products & Services continued



industry so that virtually any business could generate electricity and sell it on a wholesale basis. In addition, utilities in some states were required to divest some of their generating capacity. These changes underpinned the rise of IPPs, which entered

the Nuclear Power industry in 1999 and, were producing about 40.0% of its output by 2003. IPPs' share of nuclear power generation has strongly increased over the past five years, especially as regulated utilities divested generating assets.

## Demand Determinants

Users of electric power typically do not differentiate on the basis of the fuel used to generate that power. Price, however, drives electricity demand, and nuclear power often produces electricity at a lower price than other energy sources. In such cases, buyers will opt for nuclear power over its more expensive counterparts.

Households, industry and the commercial sector are the major consumers of electricity, together accounting for virtually all demand. Households, which account for 37.3% of electricity demand, form the largest single group of users. The factors that play a role in household electricity consumption include shifts in household disposable incomes; changes in the price of electricity and competing fuels; and the availability of a wider range of fuels. Fuel availability has increased through the extension of gas pipelines and

improvements in technology that have made solar power more accessible.

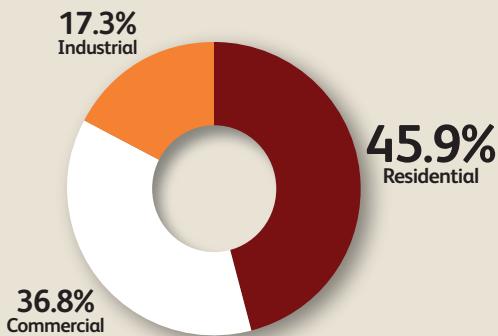
The commercial sector (i.e. businesses that are not manufacturers) accounts for about 36.0% of electricity demand. Commercial sector electricity is used in a range of applications similar to those of households.

The growth in demand for power by industry, which accounts for 16.3% of electricity demand, largely depends on the growth in output of electricity-intensive products such as metals and chemicals. Where companies are able to switch between fuel types (for example, between electricity and gas), movements in fuel prices also have an impact on demand. Over the past five years, persistently low domestic gas prices have resulted in greater gas-generated electricity usage, which hindered demand for nuclear power.

# Products & Markets

## Major Markets

**Major market segmentation (2017)**



**Total \$36.3bn**

SOURCE: WWW.IBISWORLD.COM

Generated electricity is distributed by utilities to end users or directly purchased through the wholesale markets. The main end users of electricity can be broken down into three markets: residential, commercial and industrial. Each of these downstream markets are charged different prices. Markets composed of members who buy electricity in the largest quantities generally pay the lowest prices; conversely the smaller the purchase the higher the price. In 2017, the Energy Information Administration (EIA) estimates that the residential market paid 12.7 cents per kilowatt-hour, while the industrial sector paid just 7.2 cents per kilowatt-hour.

### Residential

The residential market is composed of consumers who use electricity for lighting, refrigeration and to power appliances. As a result, such consumers typically require a minimum amount of electricity to power their homes. However, in times of economic distress, consumers may be extra cautious with things such as leaving the lights on, effectively reducing demand for electricity. Over the five years to 2017, the residential sector has increased its use of electricity as economic conditions

eased. The residential market is expected to account for 45.9% of industry revenue in 2017.

### Commercial

Consumers in the commercial market use energy to power business operations. This includes using electricity to power office space, computers and other necessary items to conduct business. Since there are less businesses than households, the commercial market uses slightly less electricity than the residential market. However, typical operators of commercial establishments purchase electricity in bulk, and therefore pay less per kilowatt-hour than consumers in the residential market. This segment is expected to account for 36.8% of industry revenue in 2017.

### Industrial

The industrial market is generally made up of manufacturers, which often use more energy per company relative to other markets. As a result, this segment pays the lowest amount per kilowatt-hour. Industrial users' share of industry revenue fell during the recession, as manufacturing activity came to a halt. However, the industrial recovery has gained some traction over the past five

# Products & Markets

## Major Markets continued

years, driving this segment's share of revenue to increase. The industrial market is expected to account for 17.3% of industry revenue in 2017.

## International Trade

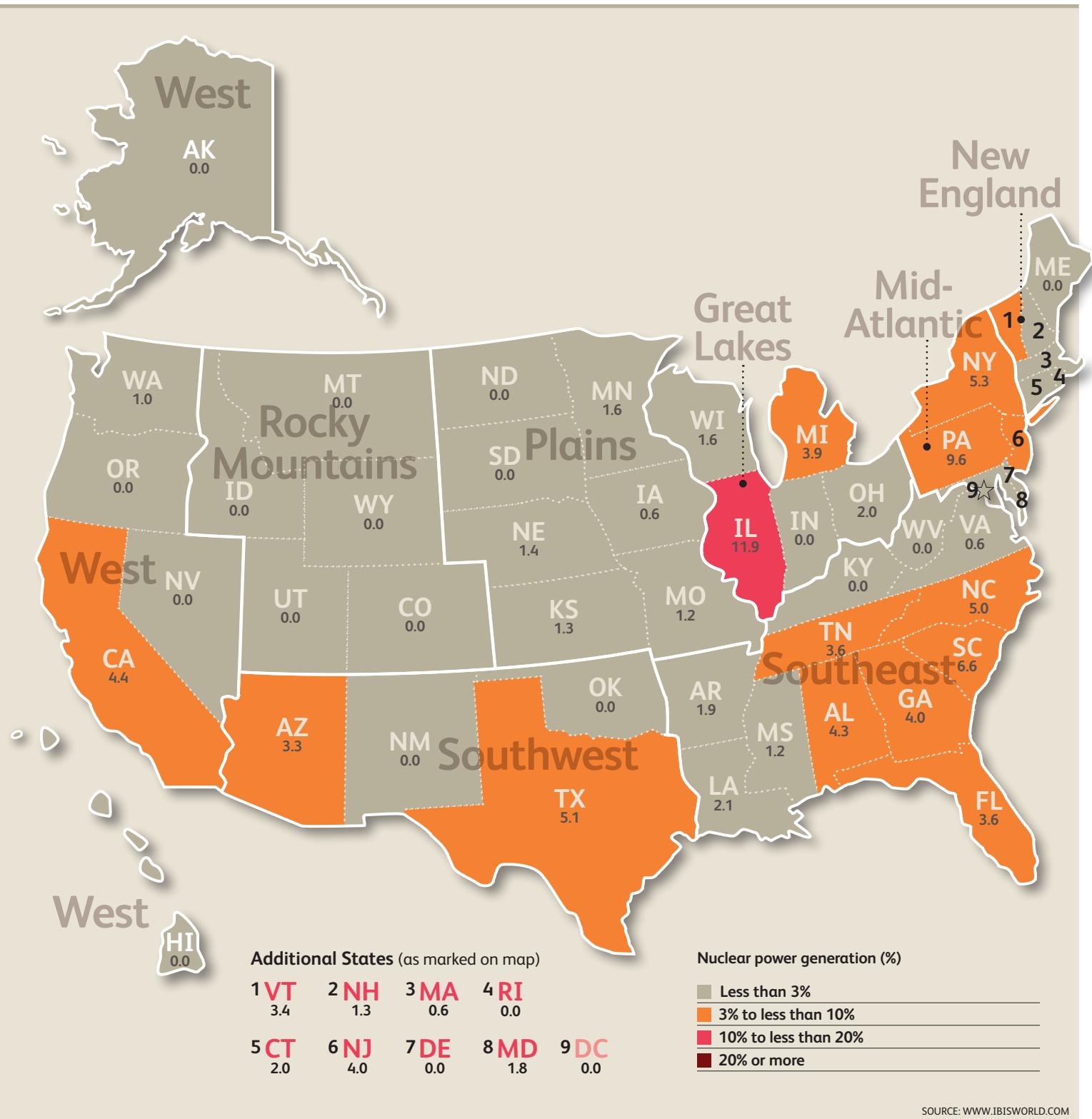
The industry does not export or import its energy because energy generated and delivered is not differentiated by its source. For example, nuclear power may be transmitted from Canada to the United States, but electricity delivered is not measured based on the country in which it was produced.

Nearly all imports of electricity to the United States come from Canada, where about 12.0% of electricity is generated in

nuclear-powered plants. Essentially, the trade in electricity between the United States and Canada reflects imbalances in electricity demand and supply along the US border. Large vertically integrated electricity utilities supply about 52.0% of nuclear power sold in the United States. These businesses not only generate electricity but also transmit and distribute it within set geographic areas.

# Products & Markets

## Business Locations 2017



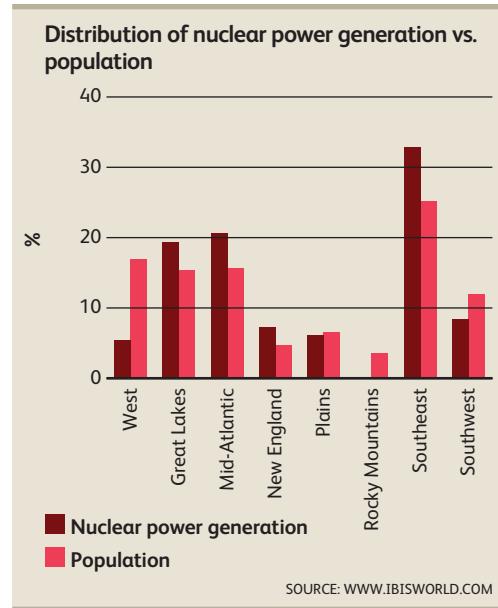
SOURCE: WWW.IBISWORLD.COM

# Products & Markets

## Business Locations

The top nuclear power-generating region in the United States is the Southeast, which represents 32.8% of output. Within the region, South Carolina (6.6% of output), North Carolina (5.0%) and Alabama (4.3%) are the main nuclear power-producing states. To a considerable extent, the substantial share held by the Southeast region is due to its large population, which totals about 25.0% of the US total. Accounting for the second- and third-most substantial shares of nuclear power production are the Mid-Atlantic (20.7% of output) and Great Lakes (19.4%) regions, both of which have substantial industrial bases and are major consumers of power.

Furthermore, the Southwest accounts for 8.4% of US nuclear power generation, with all regional production occurring in Texas (5.1% of output) and Arizona (3.3%). Next is New England, which accounts for 7.3% of US nuclear power generation, despite not being heavily industrialized and holding a relatively small share of the population. This is followed by the Plains and West regions, which account for a respective 6.1% and 5.4% of industry output. Both the Plains and West regions have opted for some nuclear power as a means of diversification away from fossil fuels. Nearly all the West's nuclear power is generated in California (4.4% of output). In conclusion, the Rocky Mountain region does not produce any nuclear



SOURCE: WWW.IBISWORLD.COM

power (0.0% of output), and is similar to New England in that it is also not a heavily industrialized region and holds a relatively small share of the population.

In most cases, power consumption closely matches generation (from all fuel sources), and there is limited interregional trade in power. The main exception is the West, which represents about 10.0% of the US electricity generation, but accounts for about 13.0% of total electricity consumption. Within the region, the largest supply shortage exists in California, reflecting both growing demand for and community opposition to power plant construction.

# Competitive Landscape

Market Share Concentration | Key Success Factors | Cost Structure Benchmarks  
 Basis of Competition | Barriers to Entry | Industry Globalization

## Market Share Concentration

**Level**  
 Concentration in this industry is **Medium**

The Nuclear Power industry in the United States has a medium level of concentration. Merger and acquisition activity has contributed to increasing concentration over the past five years, as industry players gained access to new nuclear facilities. However, most of the increase in industry revenue is attributable to uprates, when

companies increase the capacity of existing nuclear facilities by petitioning the Nuclear Regulatory Commission. In the coming years, market share concentration is anticipated to increase as the US government grants permits to existing players that have experience owning and operating a nuclear plant.

## Key Success Factors

IBISWorld identifies 250 Key Success Factors for a business. The most important for this industry are:

### Ability to pass on cost increases

Industry operators must not only cover their cash operating costs, but also their substantial capital charges. In several states, energy pricing is still strongly influenced by state government policy.

### Optimum capacity utilization

Higher capacity utilization of an individual plant generally yields lower unit costs.

### Superior financial management and debt management

The level of borrowing and interest rates has a major impact on the profitability of the operation.

### Fast adjustments made to changing regulations

Companies in this industry must be able to both deal with regulatory authorities and adjust their own operations to changes in the regulatory environment.

## Cost Structure Benchmarks

### Profit

The industry's profit, measured as earnings before interest and taxes, is estimated to account for 8.9% of revenue in 2017, a share that has increased over the past five years as electricity prices rose. Due to the recession, margins were slightly lowered in 2012, as demand and prices fell. A recovery in the US economy has slowly increased demand. Industry operators that use uprates (increases in the electricity generating capacity of a nuclear facility) tend to have higher profit margins because these operators create more energy. Despite rising fuel prices, higher capacities during favorable electricity demand periods can translate into healthy profit margins. Over the next five years, industry profitability is anticipated to remain relatively stable. Rising uranium prices will put pressure on industry margins, but uprates will likely make up for higher fuel costs.

### Purchases

The single largest cost incurred by the Nuclear Power industry is fuel, which is expected to account for 40.0% of total revenue in 2017. Fuel usually consists of pellets of uranium oxide arranged in tubes to form fuel rods, which are then arranged into fuel assemblies in the reactor core. Companies that use forward contracts to lock in uranium prices often benefit from lower fuel costs during periods of heightened electricity output. Due to falling nuclear power generation levels and increased mining activity, fuel costs have declined over the past five years, which has slightly reduced purchase costs for industry operators. Other purchase expenses include protective gear and material used by workers to service nuclear reactors. In 2017, purchase expenses are estimated to total 47.9% of revenue.

# Competitive Landscape

## Cost Structure Benchmarks continued

### Wages and maintenance

Wages are high in this industry, representing an estimated 16.1% of revenue in 2017, because industry operators must hire highly skilled employees to operate nuclear facilities within regulatory and safety requirements. As a result of the highly skilled nature of employees in this industry, the average wage per employee in 2017 is estimated to be \$117,431. Maintenance costs are also substantial due to the need to ensure the safe functioning of nuclear power plants. Maintenance expenses are estimated to absorb an estimated 15.0% of industry revenue in 2017. Over the past five years, wage costs have increased in line with growing safety concerns. Relatively high staffing levels reflect high regulatory compliance required from nuclear generators, particularly in the areas of health and secure disposal of spent fuel.

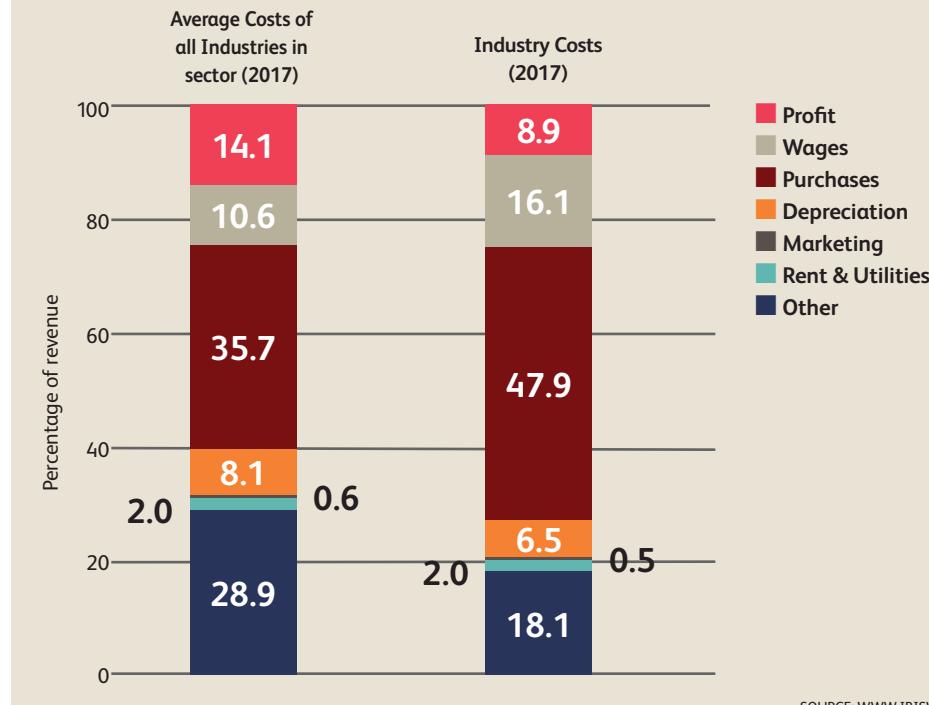
### Depreciation

Depreciation charges are estimated to account for 6.5% of revenue in 2017, representing the high capital cost of nuclear reactors. These costs have been declining over the past five years because no new reactors have been built since 1996. However, over the next five years, depreciation costs are anticipated to steadily increase because companies in the industry will be highly dependent on facility upgrades. Nuclear reactor construction will be minimal, making reactor upgrades the primary method for expanding generation capacity.

### Other

Other costs include rent and utilities, marketing, insurance, general administration and other miscellaneous expenses. Rent and utility expenses are minimal and marketing is not required, as

**Sector vs. Industry Costs**



SOURCE: WWW.IBISWORLD.COM

# Competitive Landscape

## Cost Structure Benchmarks continued

electricity is a necessity for the economy. Other expenses (excluding about 15.0% toward maintenance) are anticipated to total 5.9% of revenue.

## Basis of Competition

**Level & Trend**  
Competition in this industry is **Medium** and the trend is **Increasing**

Businesses generating nuclear power not only compete against each other for sales, but also against producers generating electricity from other fuels, such as fossil fuels or renewable sources. In addition, other energy sources that are delivered to households, such as natural gas, create competition.

Nuclear power stations operate around the clock generating base-load power. Their main competitors are coal-fired power stations, which continuously generate base-load power. Intermediate- and peak-load electricity generating capacity can be switched on or off to meet seasonal and daily fluctuations in demand. Although these plants, which are typically gas-fired or hydroelectric, produce electricity, they do not compete against nuclear power because these sources cannot produce energy for base-load power.

Power generators compete on price, but the different types of capacity (base load, intermediate and peak load) have different cost structures that feed into price levels. On average, base-load plants

have the lowest cost structure, rising through intermediate to peak load plants.

Competition between electricity producers using different fuel sources is blurred by the fact that some producers generate electric power using a range of plant types. For example, it is not unusual for the same company to operate hydroelectric and fossil fuel-fired plants as well as nuclear plants. Such diversification provides a means of reducing reliance on a particular type of plant, thereby reducing risk. Companies generating power from a variety of fuel types include Entergy and the Tennessee Valley Authority.

Electricity producers, including those operating nuclear plants, also compete with other energy sources, such as gas. This competition is particularly noticeable in applications such as space heating and water heating. Factors such as the availability of gas via a reticulated system and the relative prices of electricity and gas tend to determine the fuel chosen. Over the past five years, low domestic natural gas prices have resulted in greater external competition for industry operators.

## Barriers to Entry

**Level & Trend**  
Barriers to Entry in this industry are **High and Steady**

Prospective entrants to the Nuclear Power industry must obtain an operator's license from the US Nuclear Regulatory Commission before they can operate a nuclear power station; however, gaining a license is extremely difficult. Prospective entrants must also have large amounts of capital and considerable expertise.

Barriers to entry were somewhat reduced by the easing of regulations governing electricity generators and the

### Barriers to Entry checklist

Competition	Medium
Concentration	Medium
Life Cycle Stage	Mature
Capital Intensity	High
Technology Change	Medium
Regulation & Policy	Heavy
Industry Assistance	Medium

SOURCE: WWW.IBISWORLD.COM

# Competitive Landscape

## Barriers to Entry continued

move to a more competitive electricity market from the second half of the 1990s onward. Electricity utilities divested themselves of generating plants, either due to state government requirements that their market power be reduced, or voluntarily to focus on transmission operations, which remain regulated. However, no new nuclear plants have been built since 1996, highlighting the difficulties companies

face in this industry with regard to establishing new plants.

Although the Nuclear Power industry may benefit from growing concern over greenhouse gas emissions associated with fossil fuel-fired power plants, it also faces a substantial barrier to entry in the form of public opposition to nuclear power. In particular, establishing nuclear power plants typically gives rise to public opposition and protest.

## Industry Globalization

### Level & Trend

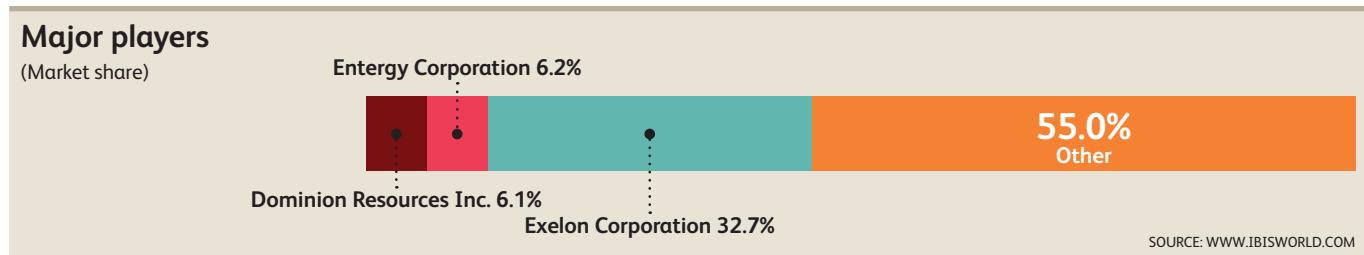
Globalization in this industry is **Low** and the trend is **Steady**

The Nuclear Power industry has a low level of globalization. Virtually all the businesses that operate in it are based in the United States and tend to have few

overseas electricity interests. In addition, both exports and imports are limited and only include the sale of electricity across national boundaries.

# Major Companies

Exelon Corporation | Entergy Corporation  
Dominion Resources Inc. | Other Companies



## Player Performance

### Exelon Corporation

Market share: 32.7 %

Chicago-based Exelon Corporation is the largest generator of nuclear power in the United States, in addition to being one of the country's largest electric utilities. The company was formed in October 2000 through the merger of Unicom Corporation and the PECO Energy Company. Exelon is composed of five business units: Exelon, generation, ComEd, PECO and BGE. However, only the generation segment falls within the scope of the Nuclear Power industry. Exelon's electricity-generation activities are focused in the West and Mid-Atlantic regions. Generation directly owns an electricity generation capacity of 32,265 megawatts, including 19,316 megawatts of nuclear capacity. It also controls an additional 9,574 megawatts of capacity through long-term contracts.

Exelon has ownership interests in 14 nuclear-generating stations currently in service; they comprise 24 units and

19,316 megawatts of capacity. The operation's nuclear fleet (located in Illinois, Pennsylvania and New Jersey) and ownership interest in the Salem Nuclear Generating Station (operated by PSEG Nuclear LLC) generated 142,126 gigawatt hours in 2013, nearly 80.0% of the generation segment's total electricity output, excluding power purchased through long-term agreements. Generation also sells third-party purchased fuel for resale on wholesale or retail markets.

## Financial performance

Exelon's nuclear electricity generation revenue is expected to increase an annualized 9.2% to total \$11.9 billion over the five years to 2017. In 2011, Exelon agreed to merge with the diversified utility company Constellation Energy for \$7.4 billion. The merger became effective in 2012 and Exelon

## Exelon Corporation (industry-relevant operations) - financial performance

Year	Revenue (\$ million)	(% change)	Operating Income (\$ million)	(% change)
2012	7,651.6	N/C	589.9	N/C
2013	8,909.1	16.4	955.9	62.0
2014	11,653.3	30.8	787.9	-17.6
2015	13,011.8	11.7	1,547.0	96.3
2016	11,697.0	-10.1	1,388.5	-10.2
2017*	11,878.7	1.6	578.2	-58.4

\*Estimates

SOURCE: ANNUAL REPORT AND IBISWORLD

# Major Companies

## Player Performance continued

incurred high costs integrating Constellation's business into its own, cutting into profit margins in 2012. However, the company experienced strong revenue growth in 2013 as operations were consolidated. In 2014, the company completed the acquisition of Pepco Holdings Inc. which operates utilities in Delaware, Maryland and New Jersey, boasting a total of about 2.0 million customers. As a result, the company has seen substantial industry-relevant revenue growth since the merger was completed. While profit margins declined again in 2014 as a result of significant costs realized during the merger, they bounced back the following year in 2015.

The company's revenue broadly followed trends in the electricity-

generation markets as a whole. Exelon's prices for power produced were generally higher over the years before the recession, as energy demand rose sharply. Since Exelon sells and purchases third-party energy, profit margins were a mixed story for the company over the period. As energy prices rose, energy sold from Exelon's energy-generating capacity was offset by higher third-party energy purchases, despite that most of Exelon's retailed energy sells into the market is from its own generating resources. Exelon plans to upgrade several of its facilities by adding new capacity to nuclear-generating stations in the next five years. Over the same period, profit is set to increase as the merger with Constellation Energy pads the bottom line.

## Player Performance

### Entergy Corporation

Market share: 6.2 %

Entergy Corporation, which is headquartered in New Orleans, is the third-largest nuclear power generator in the United States; its nuclear-generating capacity amounts to nearly 10,000 megawatts. In addition to its own 11 nuclear power stations, Entergy operates Cooper Nuclear Station under a contract with Nebraska Public Power District.

Entergy also owns and operates fossil fuel-fired plants and one hydroelectric plant, bringing its electricity-generating capacity to about 30,000 megawatts.

Entergy has two business segments: utility and wholesale commodities. The latter owns and operates six nuclear plants in the northeastern United States and sells the generated power to

### Entergy Corporation (industry-relevant operations) - financial performance

Year	Revenue (\$ million)	(% change)	Operating Income (\$ million)	(% change)
2012	2,139.4	N/C	270.2	N/C
2013	2,377.9	11.1	282.9	4.7
2014	2,489.2	4.7	399.8	41.3
2015	2,275.3	-8.6	-59.1	N/C
2016	2,143.4	-5.8	240.1	N/C
2017*	2,239.2	4.5	80.5	-66.5

\*Estimates

SOURCE: ANNUAL REPORT AND IBISWORLD

# Major Companies

## Player Performance continued

wholesale customers. The combined capacity of these six nuclear plants amounts to about 5,000 megawatts. The utility segment both owns and operates nuclear plants; owning five plants, which have a combined capacity of about 5,100 megawatts, and operating six (including the 778-megawatt Cooper Nuclear Station). The segment also manages Entergy's fossil fuel-fired plants as well as its one hydroelectric plant. In addition to generating electricity, the utility segment transmits, distributes and sells electricity in a four-state service territory that includes portions of Arkansas, Mississippi, Texas and Louisiana. It also operates a small gas distribution business.

### Financial performance

Entergy's nuclear-generation revenue is expected to increase at an annualized rate of 0.9% to \$2.2 billion over the five

years to 2017, remaining below prerecessionary levels. Company revenue has struggled due to lower prices received for the energy sold and an increase in outage days (i.e. days in which a plant is not operating). The abundance of low-priced natural gas has suppressed electric prices over the five-year period, constricting revenue growth for the company. Additionally, the sale of Entergy's Harrison County plant in 2010 decreased the volume of power sold in 2011, contracting industry revenue in this segment. Company profit declined over the five-year period due to rising company-specific costs. In 2012, profit declined 36.3%, driven by a \$223.5-million impairment charge to write down carrying values of its Vermont Yankee Nuclear Power Plant, which was decommissioned at the end of 2014.

## Player Performance

### Dominion Resources Inc.

Market share: 6.1 %

Dominion Resources Inc. is a fully integrated gas and electric holding company headquartered in Richmond, VA. The company primarily operates in the energy-intensive Northeast, Mid-Atlantic and Midwest regions of the United States through four segments: Dominion delivery, Dominion energy,

Dominion generation and Dominion exploration and production (E&P). Dominion generation operates within the Nuclear Power industry and its electric utility and merchant fleet includes about 27,500 megawatts of generation capability. Dominion generation manages a diverse mix of power sources, including

### Dominion (industry-relevant operations) - financial performance

Year	Revenue (\$ million)	(% change)	Net Income (\$ million)	(% change)
2012	2,318.1	N/C	204.7	N/C
2013	2,403.9	3.7	344.6	68.3
2014	2,296.2	-4.5	369.8	7.3
2015	2,157.0	-6.1	376.6	1.8
2016	2,167.0	0.5	378.4	0.5
2017*	2,206.4	1.8	377.4	-0.3

\*Estimates

SOURCE: ANNUAL REPORT AND IBISWORLD

# Major Companies

## Player Performance continued

coal, nuclear, gas, oil, hydro and purchased power and is focused on the Northeast and Mid-Atlantic regions. The company's nuclear power plants account for about 33.0% of its electricity generation. Dominion generation also includes energy marketing and price-risk management activities.

Dominion generation has three nuclear power plants: North Anna Nuclear Generating Station in Mineral, VA, with a capacity of 1,672 megawatts; Surry Nuclear Power Plant in Surry, VA, with a capacity of 1,676 megawatts; and Millstone Nuclear Power Plant in Waterford, CT, with a capacity of 2,001 megawatts. The company's Keweenaw Power Station in Keweenaw, WI, with a capacity of 556 megawatts, closed in early 2013. Both Virginia plants are part of

utility operations, which sell power at the retail level; the Millstone plant sells to the wholesale market.

## Financial performance

Dominion's nuclear generation business is expected to increase slowly, falling at an annualized rate of 1.0% to \$2.2 billion over the five years to 2017. Revenue has slightly declined due to low wholesale electricity prices over the five-year period. Additionally, Dominion's total electricity generation has moderately decreased, further contributing to revenue decline. However, nuclear power's share of total generation has increased over the past five years, which partly offset revenue loss from low electricity prices and falling generation.

## Other Companies

### The Southern Company

**Estimated market share: 2.0%**

The Southern Company is one of the largest electricity generators in the United States. It operates through subsidiaries Alabama Power, Georgia Power, Gulf Power, Mississippi Power and Southern Power. Savannah Electric, a former subsidiary, merged with Georgia Power in mid-2006. Southern Power constructs, acquires, owns and manages generation assets and sells electricity at market-based rates in the wholesale market. Alabama Power owns two nuclear units (Farley), while Georgia Power holds interests in, and contracts for, the operation of four nuclear units (the Hatch and Vogtle power stations each have two units). Georgia Power holds 50.1% of Hatch and 45.7% of Vogtle. In 2014, nuclear power accounted for about 16.0% of the company's generation capacity, down from 17.0% in 2013. The majority of the company's generation capacity comes from coal. The company is estimated to

generate \$730.0 million in industry-related revenue in 2017.

### Tennessee Valley Authority

**Estimated market share: N/A**

The Nuclear Power industry excludes all electric power generators that are wholly owned by the government. Therefore, major nuclear power generators like the Tennessee Valley Authority (TVA) are not included in this industry. Nevertheless, the TVA is a significant nuclear power generator in the United States and has an impact on industry operators through competition and government policy changes.

TVA differs from private-sector power companies in several key areas. TVA's board of directors is appointed by the president, with the advice and consent of the US Senate. The company holds its real properties as an agent for the United States. Additionally, TVA is required to make payments to the US Treasury as a repayment of and a return on the appropriation investment that the United

# Major Companies

## Other Companies continued

States provided for its power program; the company is not authorized to issue equity securities, such as common or preferred stock. Its board sets the rates it can charge for power. TVA is also exempt from paying federal income taxes and state and local taxes, but it must pay certain states and counties a sum in lieu of taxes.

TVA owns and operates a total of 33,716 megawatts of electricity-generating capacity. Coal-fired plants account for about 44.0% of TVA's generating capacity, nuclear plants generate about 20.0%, hydropower dams create about 16.0% and combustion turbine plants contribute the remaining 20.0%. The capacity of electricity fueled

by other sources is negligible. TVA's three nuclear power plants (Browns Ferry in Alabama, Sequoyah in Tennessee and Watts Bar in Tennessee) have a combined capacity of 6,624 megawatts.

TVA nuclear power revenue is estimated to have decreased at an annualized rate of 3.3% over the five years to 2017 to total \$3.4 billion. Revenue declines have been the result of lower volumes of nuclear generated electricity sold. Conversely, profit varies from year to year, partly due to the TVA's focus on keeping electricity prices as low as possible. Typically, price increases lag behind cost increases. Profit margins have grown over the past five years due to falling fuel costs.

# Operating Conditions

Capital Intensity | Technology & Systems | Revenue Volatility  
Regulation & Policy | Industry Assistance

## Capital Intensity

### Level

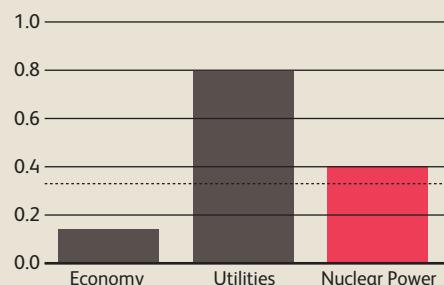
The level of capital intensity is **High**

Nuclear power generation is a capital-intensive process and the efficiency with which capital is employed has a major influence on the cost of generation. The key aspects of capital efficiency are the minimization of spare capacity and the maximization of plant availability. Generating plants have a long economic life (usually more than 30 years) and several year lead times are required for the installation of new plants. New generating plants also tend to come on stream in large units, which may produce a capacity overhang that takes years to absorb. In 2017, for every dollar spent on labor, industry operators are expected to spend \$0.40 on capital investments.

The available capacity margin provides a guide to the adequacy of existing

### Capital intensity

Capital units per labor unit

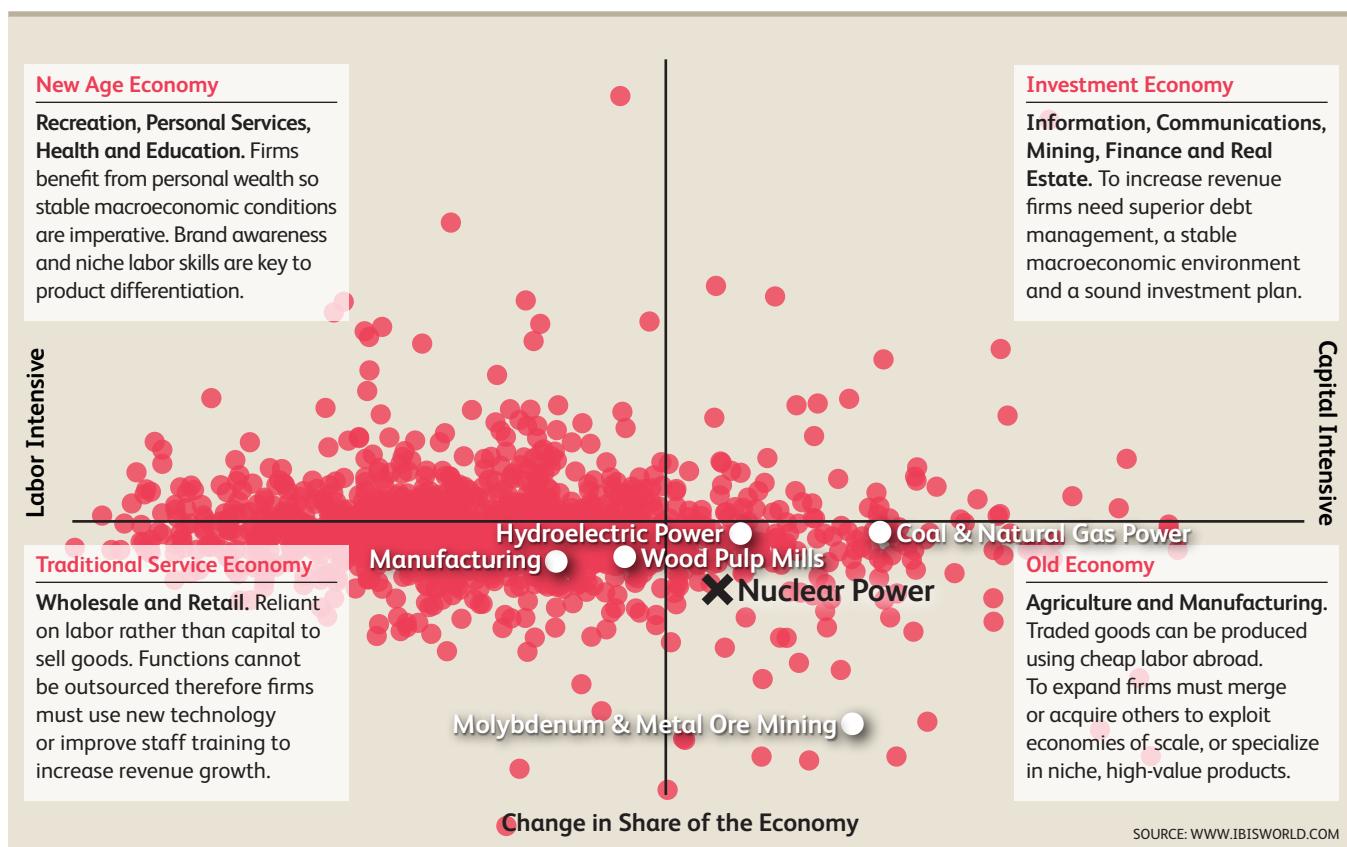


Dotted line shows a high level of capital intensity

SOURCE: WWW.IBISWORLD.COM

electricity generation capacity. According to data from the Energy Information Administration (EIA), US electricity

## Tools of the Trade: Growth Strategies for Success



SOURCE: WWW.IBISWORLD.COM

# Operating Conditions

## Capital Intensity continued

capacity margin has mostly remained between 15.0% and 20.0% over the past decade during the summer. Winter capacity margins mostly remain between 30.0% and 35.0%. A margin below this level suggests that new capacity is required, while a margin in excess points

to excess capacity, poorly performing plant, or in small systems, the recent addition of a large generating plant. Over the next five years, the EIA projects that capacity margins will decline, which may prompt additional capital investments from the electric power generation sector.

## Technology & Systems

### Level

The level of Technology Change is Medium

Power station capacity generally takes one of three basic forms: base-load, intermediate load and peak load. Base-load capacity operates constantly and generates the bulk of electricity used. In contrast, intermediate and peak load capacity can be switched on or off to meet seasonal and daily fluctuations in demand. Most base-load electricity generating capacity in the United States is either provided by nuclear power stations or fueled by black coal. Hydroelectricity and gas generally provide intermediate and peak load power.

Nuclear reactors in the United States are either pressurized water reactors or boiling water reactors. The two types of reactors share some common features. In each case, the reactor core contains fuel assemblies that are cooled by water, which is force-circulated by electric pumps. Emergency cooling water is supplied by other pumps, which can be powered by on-site diesel generators. The reactors are also held within a containment system, typically a concrete structure.

In a pressurized water reactor, the reactor core creates heat, which is carried to the steam generator by pressurized water in the primary coolant loop. Inside the steam generator, heat from the primary coolant loop vaporizes the water in a secondary loop, producing steam, which is used to drive a turbine generator, producing electricity. In a commercial boiling water reactor, the reactor core also creates heat, but in this case a steam water mixture is produced

when very pure water (reactor coolant) moves upward through the core absorbing heat. The steam-water mixture leaves the top of the core and enters the two stages of moisture separation where water droplets are removed before the steam is used to turn the turbine generator, producing electricity. In both cases, unused steam is exhausted to the condenser where it is condensed into water, pumped out, reheated and pumped back into the steam generator.

The nuclear power plants operating in the United States are described as Generation II reactors. Generation III reactors are operational in Japan (since 1996) and Generation IV reactors are still in the design phase. The main distinguishing feature of Generation III designs is the incorporation of passive or inherent safety features that require no active controls or operational intervention in the event of malfunction. Typically, these features rely on gravity, natural convection or resistance to high temperatures. Traditional reactor safety systems are “active” in that they involve electrical or mechanical operation on command. They require parallel redundant systems to provide backup if a malfunction occurs. Many Generation III reactors are also larger than their predecessors.

An international task force is developing six nuclear Generation IV reactor technologies for deployment before 2030. All these technologies involve higher temperatures than today's reactors and four of the six technologies are designated to also produce hydrogen.

# Operating Conditions

## Technology & Systems continued

The six reactor technologies were selected in 2002 by the Generation IV International Forum (GIF). Membership of GIF at the time included the United States, Argentina, Brazil, Canada, France, Japan, South Korea, South Africa, Switzerland, the United Kingdom and the European Union. Russia and China joined the group in 2006. Most of the six technologies use a closed fuel cycle to maximize the resource base and minimize high-level wastes. Three of the six are fast reactors and another can be built as a fast reactor.

Only one style of reactor is cooled by water, while two are helium-cooled and

the others have lead-bismuth, sodium or fluoride salt coolant. The latter three operate at low pressure, which offers significant safety advantages. The reactors operate at much higher temperatures than current plants (510 degrees Celsius to 1,000 degrees Celsius, compared with less than 330 degrees Celsius), enabling four of the designs to produce hydrogen.

The Energy Policy Act of 2005 authorizes loan guarantees for up to 80.0% of the cost of innovative technologies (such as advanced nuclear reactor designs, as well as clean coal and renewable energy) that avoid or reduce greenhouse gases.

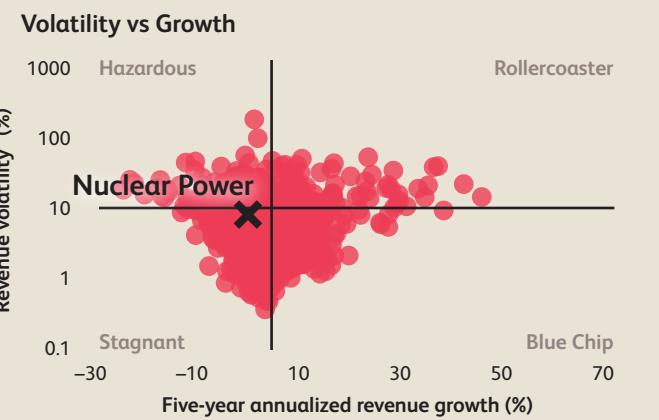
## Revenue Volatility

**Level**  
The level of  
Volatility is Medium

The Nuclear Power industry experienced moderate revenue volatility over the past five years. Since electricity is a necessity for most businesses and consumers, demand for electric power exhibits minimal year-to-year volatility. However, independent power generators, which participate in volatile wholesale electricity markets, account for about 50.0% of nuclear power generation. Wholesale price fluctuations contributed

to some revenue volatility, with revenue falling early in the current five-year period as wholesale prices fell. Additionally, the government and public have become more concerned regarding the safety of nuclear power following the Fukushima disaster in 2011. Public concerns led to a decline in nuclear power generation early in the period, which caused revenue growth to be sluggish in 2012 and fall significantly in 2013.

A higher level of revenue volatility implies greater industry risk. Volatility can negatively affect long-term strategic decisions, such as the time frame for capital investment. When a firm makes poor investment decisions it may face underutilized capacity if demand suddenly falls, or capacity constraints if it rises quickly.



SOURCE: WWW.IBISWORLD.COM

# Operating Conditions

## Regulation & Policy

### Level & Trend

The level of Regulation is Heavy and the trend is Decreasing

The Nuclear Regulatory Commission (NRC) is responsible for the safety regulation of civilian uses of nuclear materials and was established under the Energy Reorganization Act of 1974. The NRC licenses all commercially owned nuclear power plants that produce electricity in the United States. After the initial license is granted, the license may be amended, renewed, transferred or otherwise modified, depending on activities that affect the reactor during its operating life. The NRC monitors and evaluates the performance of commercial nuclear power plants, focusing on plant activities most important to safety. The NRC is also responsible for regulating the storage of spent nuclear fuel. There are two acceptable storage methods for spent fuel storage: spent fuel pools and dry cask storage. Most spent nuclear fuel is stored in specially designed pools at individual reactor sites around the United States. If pool capacity is reached, licensees may store waste in above-ground dry storage casks.

In general, regulated activities that cross state lines are subject to federal authority, while regulated intrastate activities are subject to state authority. These broad categories of regulation apply to the Nuclear Electric Power Generation industry. Wholesale electricity rates (for sales and purchases of power between electric utilities), waste disposal issues and environmental regulation are all federal concerns. The states deal with issues such as plant and transmission line construction and also regulate retail electricity charges.

State governments have jurisdiction over the large, vertically integrated, investor-owned electricity utilities. The states grant investor-owned electric utilities service monopolies in set geographic areas and the utilities are obliged to serve all consumers in those areas. State regulators require that the utilities charge reasonable, comparable

prices to similar types of consumers and give consumers access to services under similar conditions.

### Opening up the industry

Nonutility electricity generators also operate in the United States. The Public Utility Regulatory Policies Act of 1978, which was in part intended to decrease the intensity of energy use in the United States, encouraged electricity generation by nonutility suppliers. Other regulatory changes followed. The Energy Policy Act of 1992 (EPACT) removed some constraints on the ownership of electric generation facilities and thereby encouraged increased competition in the wholesale electricity market. It gave rise to wholesale electric power producers. EPACT also amended the Federal Power Act (FPA) to enable any electricity utility to apply to the FERC for an order requiring another electric utility to provide transmission services (also known as wheeling). Prior to EPACT, FERC could not mandate that an electricity utility provide transmission services for wholesale trade in electricity. The change in the law enabled electricity generators to sell wholesale power to noncontiguous utilities. The changes flowing from EPACT opened up the electricity generating industry so that almost any business could generate electricity and sell it on a wholesale basis.

In April 1996, FERC issued two orders providing for choice of electricity supplier by purchasers. One order addresses equal access to the transmission grid for all wholesale buyers and sellers, transmission pricing and the recovery of stranded costs. Stranded costs relate to investments (mostly in generation) made by utilities prior to the introduction of a more competitive environment. The old system of pricing based on costs, including capital costs, enabled investment spending to be recouped over time. However, this may not be the case

# Operating Conditions

## Regulation & Policy continued

in a competitive environment with market-based rates. State governments are compensating companies with stranded assets, mainly those with large electricity utilities. Methods used to value these assets vary from state to state. The second order requires jurisdictional utilities that own or operate transmission facilities to establish electronic systems to post information about their available transmission capacities.

Divestiture became common in states moving toward retail electricity

competition. Some states require utilities to divest their generating assets to reduce the market power that they can exercise in their franchised areas, or to arrive at a determination of potential stranded costs. In other states, divestiture is voluntary. In either case, utilities sold generating assets to nonutilities. The industry is also subject to a range of environmental legislation, including the Clean Air Act and the Clean Water Act.

## Industry Assistance

### Level & Trend

The level of Industry Assistance is **Medium** and the trend is **Increasing**

The Nuclear Power industry is not protected by either tariffs or nontariff barriers. The main limitation on imports is the availability of transmission links.

The Energy Policy Act of 2005 represents increased assistance for nuclear power generators. It authorizes loan guarantees for up to 80.0% of the cost of innovative technologies (such as advanced nuclear reactor designs, as well

as clean coal and renewable energy) that avoid or reduce greenhouse gases. The act also provides tax incentives, including a production tax credit of 1.8 cents per kilowatt-hour to qualifying advanced nuclear power facilities for eight years after being placed in service (until January 1, 2021). The legislation limits the national megawatt capacity for these production tax credits to 6,000 megawatts.

# Key Statistics

## Industry Data

	Revenue (\$m)	Industry Value Added (\$m)	Establish- ments	Enterprises	Employment	Exports	Imports	Wages (\$m)	Domestic Demand	Nuclear Power Output (Mil kWh)
2008	42,396.9	12,109.1	104	66	38,029	--	--	4,970.3	N/A	806.4
2009	38,341.3	11,634.1	104	66	41,502	--	--	5,202.1	N/A	806.2
2010	40,173.8	12,715.5	104	66	49,174	--	--	6,017.1	N/A	798.9
2011	37,569.4	12,663.8	104	66	50,778	--	--	6,239.4	N/A	807.0
2012	37,791.4	12,524.5	104	66	50,093	--	--	6,174.4	N/A	790.2
2013	34,453.2	11,889.2	100	63	50,410	--	--	6,195.6	N/A	769.3
2014	35,949.3	11,565.5	99	62	48,602	--	--	5,717.9	N/A	797.1
2015	38,603.5	12,263.5	99	62	51,077	--	--	6,077.4	N/A	797.2
2016	37,081.2	11,777.2	97	61	50,162	--	--	5,918.4	N/A	797.9
2017	36,317.8	11,461.4	96	60	49,783	--	--	5,846.1	N/A	792.1
2018	35,351.6	11,281.5	95	60	49,445	--	--	5,767.7	N/A	779.3
2019	35,326.4	11,335.3	98	59	49,821	--	--	5,801.5	N/A	769.9
2020	35,525.4	11,493.4	98	59	50,633	--	--	5,887.0	N/A	761.8
2021	36,216.3	11,720.9	98	59	51,552	--	--	6,006.9	N/A	772.3
2022	37,439.7	12,110.1	99	60	52,912	--	--	6,194.4	N/A	775.8
Sector Rank	6/10	6/10	10/10	9/10	6/10	N/A	N/A	5/10	N/A	N/A
Economy Rank	316/1608	265/1551	1385/1608	1402/1608	631/1608	N/A	N/A	317/1608	N/A	N/A

## Annual Change

	Revenue (%)	Industry Value Added (%)	Establish- ments (%)	Enterprises (%)	Employment (%)	Exports (%)	Imports (%)	Wages (%)	Domestic Demand (%)	Nuclear Power Output (%)
2009	-9.6	-3.9	0.0	0.0	9.1	N/A	N/A	4.7	N/A	0.0
2010	4.8	9.3	0.0	0.0	18.5	N/A	N/A	15.7	N/A	-0.9
2011	-6.5	-0.4	0.0	0.0	3.3	N/A	N/A	3.7	N/A	1.0
2012	0.6	-1.1	0.0	0.0	-1.3	N/A	N/A	-1.0	N/A	-2.1
2013	-8.8	-5.1	-3.8	-4.5	0.6	N/A	N/A	0.3	N/A	-2.6
2014	4.3	-2.7	-1.0	-1.6	-3.6	N/A	N/A	-7.7	N/A	3.6
2015	7.4	6.0	0.0	0.0	5.1	N/A	N/A	6.3	N/A	0.0
2016	-3.9	-4.0	-2.0	-1.6	-1.8	N/A	N/A	-2.6	N/A	0.1
2017	-2.1	-2.7	-1.0	-1.6	-0.8	N/A	N/A	-1.2	N/A	-0.7
2018	-2.7	-1.6	-1.0	0.0	-0.7	N/A	N/A	-1.3	N/A	-1.6
2019	-0.1	0.5	3.2	-1.7	0.8	N/A	N/A	0.6	N/A	-1.2
2020	0.6	1.4	0.0	0.0	1.6	N/A	N/A	1.5	N/A	-1.1
2021	1.9	2.0	0.0	0.0	1.8	N/A	N/A	2.0	N/A	1.4
2022	3.4	3.3	1.0	1.7	2.6	N/A	N/A	3.1	N/A	0.5
Sector Rank	10/10	9/10	9/10	10/10	10/10	N/A	N/A	10/10	N/A	N/A
Economy Rank	1527/1608	1453/1551	1367/1608	1429/1608	1399/1608	N/A	N/A	1448/1608	N/A	N/A

## Key Ratios

	IVA/Revenue (%)	Imports/ Demand (%)	Exports/ Revenue (%)	Revenue per Employee (\$'000)	Wages/Revenue (%)	Employees per Est.	Average Wage (\$)	Share of the Economy (%)
2008	28.56	N/A	N/A	1,114.86	11.72	365.66	130,697.63	0.08
2009	30.34	N/A	N/A	923.84	13.57	399.06	125,345.77	0.08
2010	31.65	N/A	N/A	816.97	14.98	472.83	122,363.44	0.09
2011	33.71	N/A	N/A	739.88	16.61	488.25	122,876.05	0.08
2012	33.14	N/A	N/A	754.42	16.34	481.66	123,258.74	0.08
2013	34.51	N/A	N/A	683.46	17.98	504.10	122,904.19	0.08
2014	32.17	N/A	N/A	739.67	15.91	490.93	117,647.42	0.07
2015	31.77	N/A	N/A	755.79	15.74	515.93	118,985.06	0.07
2016	31.76	N/A	N/A	739.23	15.96	517.13	117,985.73	0.07
2017	31.56	N/A	N/A	729.52	16.10	518.57	117,431.65	0.07
2018	31.91	N/A	N/A	714.97	16.32	520.47	116,648.80	0.06
2019	32.09	N/A	N/A	709.07	16.42	508.38	116,446.88	0.06
2020	32.35	N/A	N/A	701.63	16.57	516.66	116,268.05	0.06
2021	32.36	N/A	N/A	702.52	16.59	526.04	116,521.18	0.06
2022	32.35	N/A	N/A	707.58	16.55	534.46	117,069.85	0.06
Sector Rank	8/10	N/A	N/A	6/10	3/10	1/10	1/10	6/10
Economy Rank	773/1551	N/A	N/A	263/1608	927/1608	12/1608	67/1608	265/1551

Figures are in inflation-adjusted 2017 dollars. Rank refers to 2017 data.

SOURCE: WWW.IBISWORLD.COM

Provided to: University of California - Berkeley (2127291013) | 04 October 2017

## Industry Financial Ratios

	Apr 2012 - Mar 2013	Apr 2013 - Mar 2014	Apr 2014 - Mar 2015	Apr 2015 - Mar 2016	Apr 2015 - Mar 2016 by company revenue		
					Small (<\$10m)	Medium (\$10-50m)	Large (>\$50m)
<b>Liquidity Ratios</b>							
Current Ratio	1.8	1.0	1.0	0.8	0.9	0.7	0.9
Quick Ratio	1.0	0.7	0.7	0.7	0.8	0.4	0.6
Sales / Receivables (Trade Receivables Turnover)	11.7	11.6	12.5	11.8	11.8	10.7	13.4
Days' Receivables	31.2	31.5	29.2	30.9	30.9	34.1	27.2
Cost of Sales / Inventory (Inventory Turnover)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Days' Inventory	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cost of Sales / Payables (Payables Turnover)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Days' Payables	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sales / Working Capital	6.8	-999.9	-445.4	-18.8	-24.8	-9.8	-999.9
<b>Coverage Ratios</b>							
Earnings Before Interest & Taxes (EBIT) / Interest	3.4	3.1	2.5	2.5	2.6	2.5	n/a
Net Profit + Dep., Depletion, Amort. / Current Maturities LT Debt	n/a	n/a	n/a	2.1	n/a	n/a	n/a
<b>Leverage Ratios</b>							
Fixed Assets / Net Worth	1.7	2.1	2.3	2.6	2.1	2.9	9.9
Debt / Net Worth	1.1	1.5	2.1	3.0	2.4	3.3	n/c
Tangible Net Worth	40.9	38.2	15.9	12.4	8.0	27.0	-5.8
<b>Operating Ratios</b>							
Profit before Taxes / Net Worth, %	6.9	8.9	9.0	8.4	7.0	10.5	n/a
Profit before Taxes / Total Assets, %	2.8	3.1	2.8	2.1	2.1	2.5	0.4
Sales / Net Fixed Assets	0.3	0.2	0.2	0.3	0.3	0.2	0.7
Sales / Total Assets (Asset Turnover)	0.3	0.2	0.2	0.2	0.2	0.2	0.5
<b>Cash Flow &amp; Debt Service Ratios (% of sales)</b>							
Cash from Trading	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cash after Operations	n/a	56.7	62.1	43.8	49.3	56.2	n/a
Net Cash after Operations	n/a	56.0	59.5	49.0	49.9	57.1	n/a
Cash after Debt Amortization	n/a	10.3	5.5	4.9	4.3	4.7	n/a
Debt Service P&I Coverage	n/a	1.8	1.5	1.4	1.4	1.4	n/a
Interest Coverage (Operating Cash)	n/a	5.3	3.7	3.1	2.8	3.1	n/a
<b>Assets, %</b>							
Cash & Equivalents	13.6	8.0	7.1	10.4	11.1	8.3	12.1
Trade Receivables (net)	3.9	3.8	3.6	4.4	4.9	2.8	6.5
Inventory	0.6	0.7	1.2	0.6	0.3	1.0	1.0
All Other Current Assets	4.0	2.4	2.7	2.7	1.4	4.1	8.2
Total Current Assets	22.1	15.0	14.6	18.0	17.7	16.3	27.8
Fixed Assets (net)	63.4	69.3	70.9	65.5	64.5	70.4	53.7
Intangibles (net)	2.6	4.6	3.8	7.2	7.1	6.5	10.3
All Other Non-Current Assets	11.9	11.1	10.7	9.4	10.7	6.8	8.2
Total Assets	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total Assets (\$m)	2,263.9	4,226.0	5,985.6	6,879.4	1,144.1	4,399.0	1,336.3
<b>Liabilities, %</b>							
Notes Payable-Short Term	0.8	2.5	1.2	1.2	1.5	0.9	n/a
Current Maturities L/T/D	3.3	4.5	5.8	5.2	4.6	6.7	4.7
Trade Payables	2.5	1.9	1.9	2.2	2.3	1.4	5.4
Income Taxes Payable	0.2	n/a	0.1	n/a	n/a	n/a	n/a
All Other Current Liabilities	5.4	3.4	4.1	9.8	10.3	6.1	20.5
Total Current Liabilities	12.3	12.2	13.1	18.5	18.7	15.1	30.6
Long Term Debt	38.2	40.3	58.1	53.3	57.6	45.6	46.0
Deferred Taxes	2.4	0.1	n/a	0.6	0.7	0.5	0.2
All Other Non-Current Liabilities	3.7	4.5	9.0	7.9	7.9	5.3	18.7
Net Worth	43.5	42.8	19.7	19.6	15.1	33.5	4.5
Total Liabilities & Net Worth (\$m)	2,263.9	4,226.0	5,985.6	6,879.4	1,144.1	4,399.0	1,336.3
Maximum Number of Statements Used	29	62	90	142	91	41	10

Source: RMA Annual Statement Studies, rmahq.org. RMA data for all industries is derived directly from more than 260,000 statements of member financial institutions' borrowers and prospects.

Note: For a full description of the ratios refer to the Key Statistics chapter online.



# Jargon & Glossary

## Industry Jargon

**BASE LOAD POWER** Electricity provided by power stations that run continuously.

**ELECTRICITY UTILITY** An integrated electricity generator and distributor supplying a defined area.

**KILOWATT HOUR** A unit of energy measurement, equal to one kilowatt expended over one hour.

**UPRATE** When a firm in the industry upgrades its nuclear facilities to include more electricity generating capacity.

## IBISWorld Glossary

**BARRIERS TO ENTRY** High barriers to entry mean that new companies struggle to enter an industry, while low barriers mean it is easy for new companies to enter an industry.

**CAPITAL INTENSITY** Compares the amount of money spent on capital (plant, machinery and equipment) with that spent on labor. IBISWorld uses the ratio of depreciation to wages as a proxy for capital intensity. High capital intensity is more than \$0.333 of capital to \$1 of labor; medium is \$0.125 to \$0.333 of capital to \$1 of labor; low is less than \$0.125 of capital for every \$1 of labor.

**CONSTANT PRICES** The dollar figures in the Key Statistics table, including forecasts, are adjusted for inflation using the current year (i.e. year published) as the base year. This removes the impact of changes in the purchasing power of the dollar, leaving only the "real" growth or decline in industry metrics. The inflation adjustments in IBISWorld's reports are made using the US Bureau of Economic Analysis' implicit GDP price deflator.

**DOMESTIC DEMAND** Spending on industry goods and services within the United States, regardless of their country of origin. It is derived by adding imports to industry revenue, and then subtracting exports.

**EMPLOYMENT** The number of permanent, part-time, temporary and seasonal employees, working proprietors, partners, managers and executives within the industry.

**ENTERPRISE** A division that is separately managed and keeps management accounts. Each enterprise consists of one or more establishments that are under common ownership or control.

**ESTABLISHMENT** The smallest type of accounting unit within an enterprise, an establishment is a single physical location where business is conducted or where services or industrial operations are performed. Multiple establishments under common control make up an enterprise.

**EXPORTS** Total value of industry goods and services sold by US companies to customers abroad.

**IMPORTS** Total value of industry goods and services brought in from foreign countries to be sold in the United States.

**INDUSTRY CONCENTRATION** An indicator of the dominance of the top four players in an industry. Concentration is considered high if the top players account for more than 70% of industry revenue. Medium is 40% to 70% of industry revenue. Low is less than 40%.

**INDUSTRY REVENUE** The total sales of industry goods and services (exclusive of excise and sales tax); subsidies on production; all other operating income from outside the firm (such as commission income, repair and service income, and rent, leasing and hiring income); and capital work done by rental or lease. Receipts from interest royalties, dividends and the sale of fixed tangible assets are excluded.

**INDUSTRY VALUE ADDED (IVA)** The market value of goods and services produced by the industry minus the cost of goods and services used in production. IVA is also described as the industry's contribution to GDP, or profit plus wages and depreciation.

**INTERNATIONAL TRADE** The level of international trade is determined by ratios of exports to revenue and imports to domestic demand. For exports/revenue: low is less than 5%, medium is 5% to 20%, and high is more than 20%. Imports/domestic demand: low is less than 5%, medium is 5% to 35%, and high is more than 35%.

**LIFE CYCLE** All industries go through periods of growth, maturity and decline. IBISWorld determines an industry's life cycle by considering its growth rate (measured by IVA) compared with GDP; the growth rate of the number of establishments; the amount of change the industry's products are undergoing; the rate of technological change; and the level of customer acceptance of industry products and services.

**NONEMPLOYING ESTABLISHMENT** Businesses with no paid employment or payroll, also known as nonemployers. These are mostly set up by self-employed individuals.

**PROFIT** IBISWorld uses earnings before interest and tax (EBIT) as an indicator of a company's profitability. It is calculated as revenue minus expenses, excluding interest and tax.

**VOLATILITY** The level of volatility is determined by averaging the absolute change in revenue in each of the past five years. Volatility levels: very high is more than ±20%; high volatility is ±10% to ±20%; moderate volatility is ±3% to ±10%; and low volatility is less than ±3%.

**WAGES** The gross total wages and salaries of all employees in the industry. The cost of benefits is also included in this figure.

At IBISWorld we know that industry intelligence  
is more than assembling facts  
It is combining data with analysis to answer the  
questions that successful businesses ask

**Identify high growth, emerging & shrinking markets**

**Arm yourself with the latest industry intelligence**

**Assess competitive threats from existing & new entrants**

**Benchmark your performance against the competition**

**Make speedy market-ready, profit-maximizing decisions**



**WHERE KNOWLEDGE IS POWER**

**Who is IBISWorld?**

We are strategists, analysts, researchers, and marketers. We provide answers to information-hungry, time-poor businesses. Our goal is to provide real world answers that matter to your business in our 700 US industry reports. When tough strategic, budget, sales and marketing decisions need to be made, our suite of Industry and Risk intelligence products give you deeply-researched answers quickly.

**IBISWorld Membership**

IBISWorld offers tailored membership packages to meet your needs.

**Disclaimer**

This product has been supplied by IBISWorld Inc. ('IBISWorld') solely for use by its authorized licensees strictly in accordance with their license agreements with IBISWorld. IBISWorld makes no representation to any other person with regard to the completeness or accuracy of the data or information contained herein, and it accepts no responsibility and disclaims all liability (save for liability which cannot be lawfully disclaimed) for loss or damage whatsoever suffered or incurred by any other person resulting from the use

of, or reliance upon, the data or information contained herein. Copyright in this publication is owned by IBISWorld Inc. The publication is sold on the basis that the purchaser agrees not to copy the material contained within it for other than the purchasers own purposes. In the event that the purchaser uses or quotes from the material in this publication – in papers, reports, or opinions prepared for any other person – it is agreed that it will be sourced to: IBISWorld Inc.