Single Source Energy Solutions

# Industry Report

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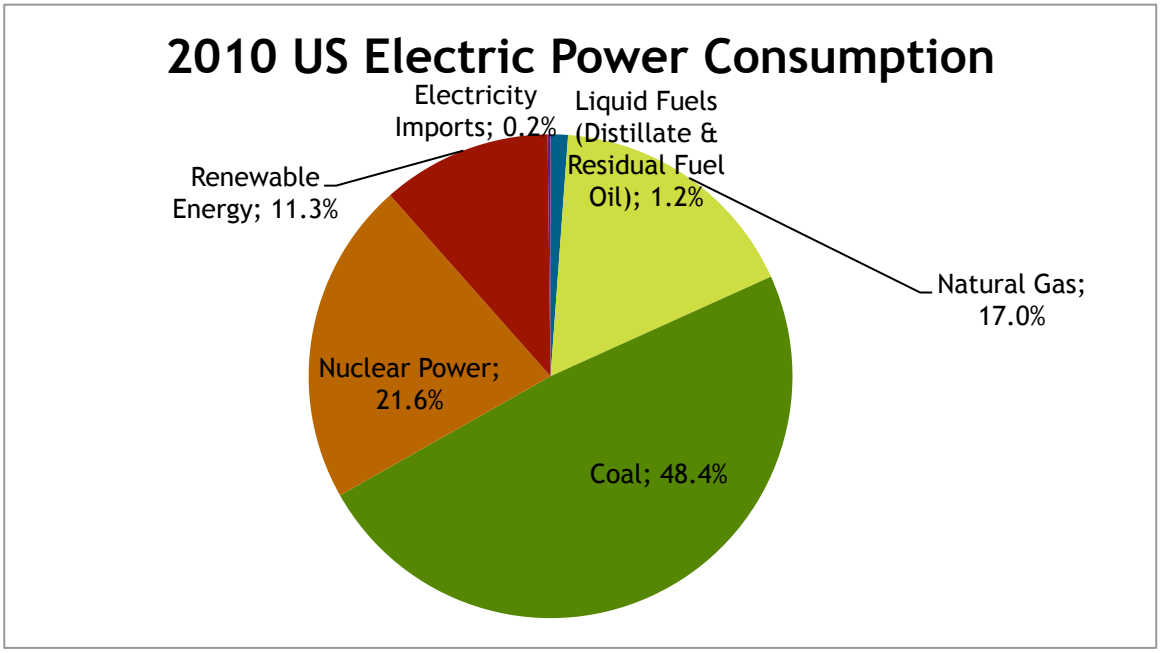
# US Energy Consumption: Energy demand and costs will continue to rise, so what can be done to stop it?

Energy consumption in the United States has risen by 27.5% since 1990, while, globally, the use of energy has increased by 46.8% over this same period. The dramatic rise in world demand is being driven by developing nations, particularly China and India. In fact, in the 20 years to 2010, the demand for energy within these two countries is forecast to rise by an astonishing 185.2% and 142.2%, respectively, according to the Energy Information Administration (EIA).

As a result of these trends, the cost of energy within the United States continues to rise, particularly with regards to fossil fuels, which are used for a variety energy needs, including transportation and electric power generation. In fact according to the EIA, approximately 67.7% of electric power consumed in the United States is from liquid fuels, natural gas and coal.

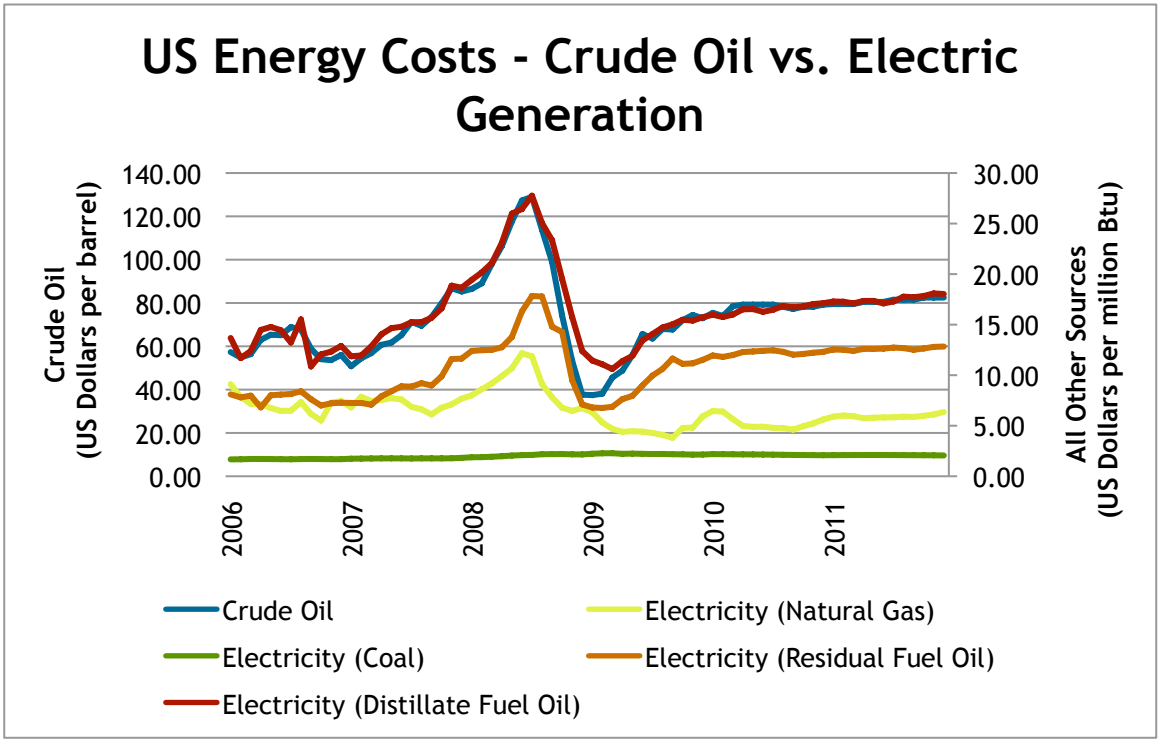
Graph: #1




Source: Energy Information Administration (EIA)

Due to the United States' reliance on fossil fuels, power generation fuel costs often fluctuate with oil prices. According to EIA data and Single Source Energy Solutions (SSES) analysis, the cost to produce electricity peaked in July, 2008, which was the same month as oil. During this period, oil prices reached $129.03.

Graph: #2

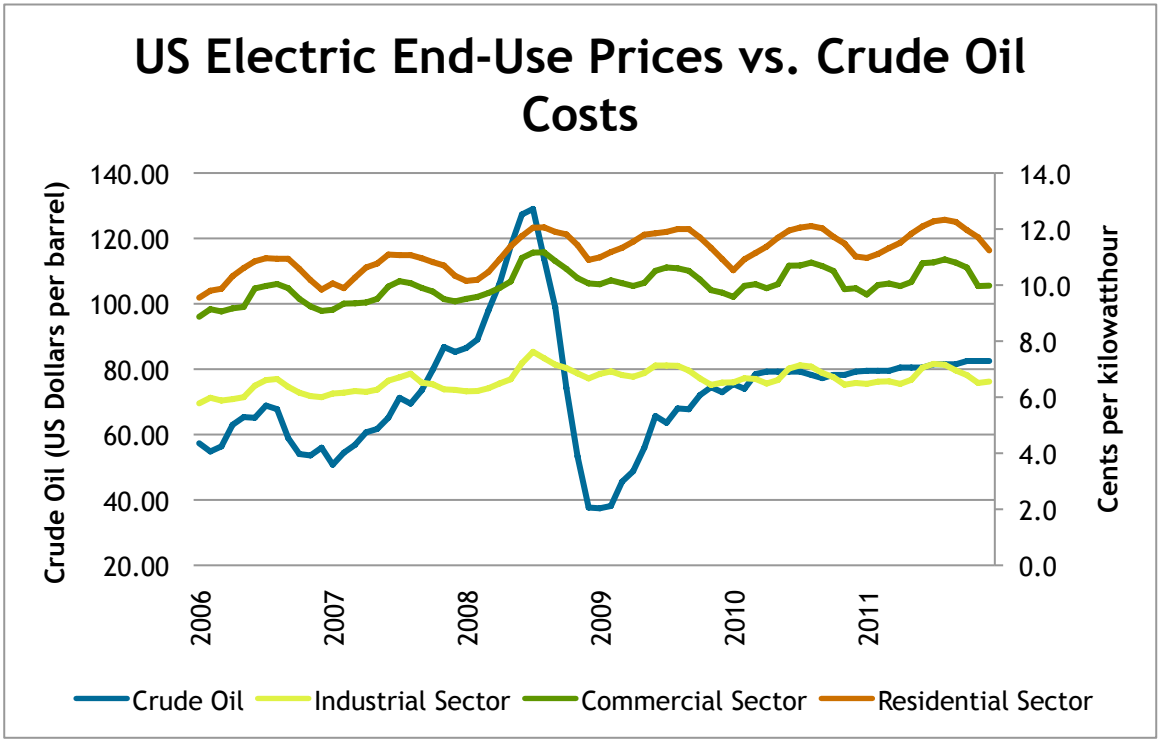



Source: EIA

Similarly, end-use prices for electric consumption also spiked during this period, according to EIA data. However, end-use costs are not as volatile in comparison to generation costs due to government regulations. Nonetheless, it is important to highlight input costs for energy generation as prolonged periods of elevated prices generally lead to price increases for end-users, particularly in deregulated energy markets such as California, Massachusetts and Pennsylvania.

Additionally, changes in fossil fuel prices still impact end user costs. For example, end-use costs, for all three major sectors (industrial, commercial and residential), peaked in July, 2008, which was the same month as oil costs. Similarly, elevated energy prices began to dramatically decline after July, as the Great Recession began, and the demand for energy faltered.

Graph: #3




Source: EIA

**The Great Recession**

Despite being relatively inelastic, the demand for energy generally fluctuates with economic cycles. Consequently, energy consumption has fallen significantly since 2007, when the subprime mortgage crisis developed. According to EIA data and SSES research, consumption dropped by 5.9% in the two years to 2009. During this period, the US economy sank into a recession as the housing bubble burst and lending tightened. As the Great Recession developed, the US economy shed more than 15.7 million jobs, while unemployment jumped to 10.2% in October 2009, according to the Bureau of Labor Statistics.

However, despite these trends, the US economy has slowly started to recover. According to the Bureau of Economic Analysis, the US economy has grown consistently since the third quarter of 2009. As a result, the demand for energy is expected to rebound in 2010, as consumption is forecast to rise by about 1.0%, according to SSES analysis and EIA data.

**The upward trend continues**

In addition to economic cycles, the demand for energy is also impacted by population growth, government regulations and technology changes. Population growth in particular, is an important component of energy demand and pricing as the need for resources generally rises in relation to growth patterns, according to SSES research. However, within developed nations, government regulations and technology advancements often offset these trends due improvements in energy efficiencies, particularly with regards to generation.

As a result, energy consumption in the United States is expected to increase at about the same rate as population growth over the next 20 years. In fact, according to SSES research, energy consumption in the United States is forecast to rise by 24.1% in the 20 years to 2030, while the US population is expected to grow by 20.4%.

Table: #1

| Energy Consumption vs. Population Changes | | | | |
|---|---|---|---|---|
| | Energy Growth | | Population Growth | |
| | 1990 - 2010 | 2010 - 2030 | 1990 - 2010 | 2010 - 2030 |
| **Total World** | 46.8% | 41.6% | | 20.1% |
| **United States** | 27.5% | 24.1% | 24.7% | 20.4% |
| **China** | 185.2% | 80.6% | 15.8% | 4.6% |
| **India** | 142.5% | 67.5% | 40.0% | 24.5% |

Source: US Census & EIA

In contrast to developed nations, technology advancements lead to higher energy demand in undeveloped countries, particularly as wealth improves. For example, in economies such as China and India, the need for energy will continue to rise as disposable incomes improve, because more individuals will increasingly be able to afford cars and modern homes. Moreover, the modernization of China and India also improves access to electricity and other utilities as power plants and distribution grids are developed by various government enterprises. As a result of this phenomenon, both China and India are forecast to gain significant ground on the United States in regards to energy consumption, with China surpassing the United States by 2030, according to EIA data.

Table: #2

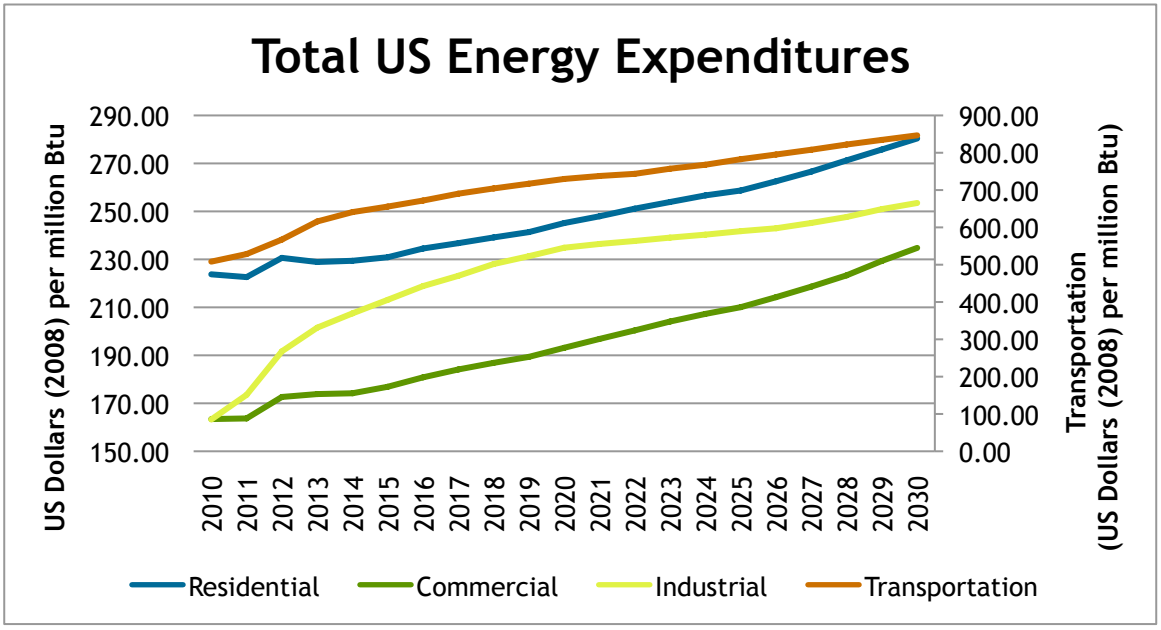
| Percentage of Total Energy Consumption | | |
|---|---|---|
| | 2010 | 2030 |
| Total World | 100.0% | 100.0% |
| United States | 25.8% | 18.6% |
| China | 15.1% | 19.3% |
| India | 3.8% | 4.5% |

Source: EIA

**What does this all mean for the end-users?**

According to EIA data and SSES research, total energy expenditures within the US are forecast to rise by 58.0% in the 20 years to 2030, or by about 2.3% annually. During this period, energy costs will be driven by world energy consumption. Within the US market, the greatest demand for energy will continue to be related to cars, but the other three sectors will also follow similar paths.

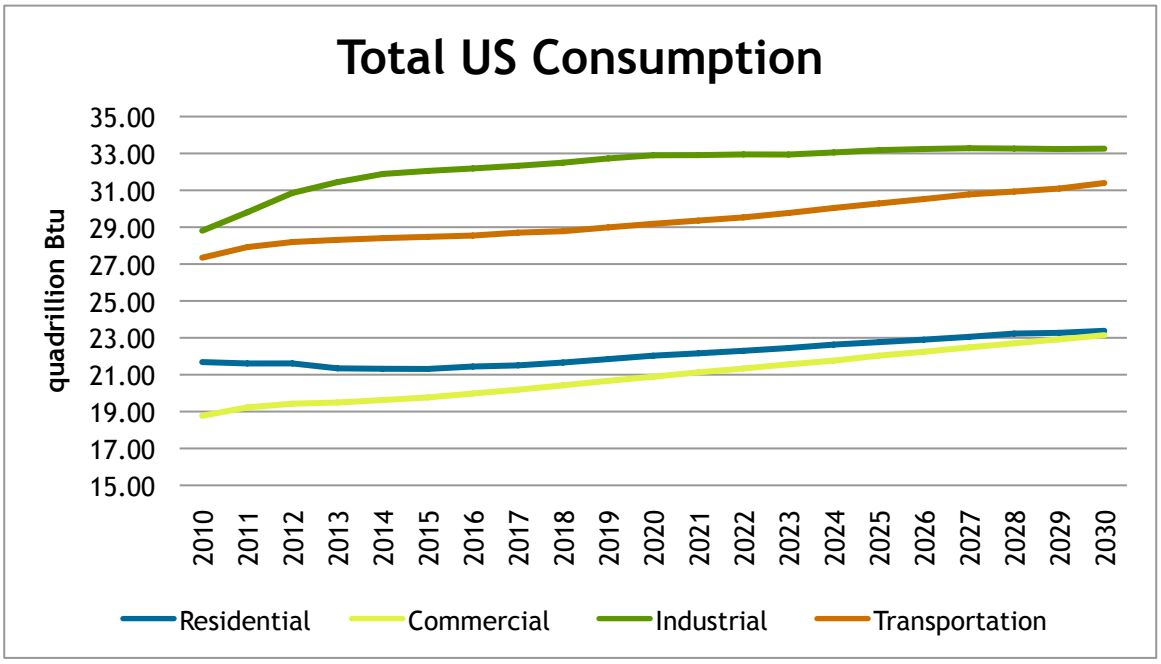
Graph: #3




Source: EIA

At the same time, it is important to note the cost differences associated with each individual segment. Generally, costs vary among residential, commercial and industrial end-users, with consumers typically paying the highest rates. In contrast, commercial and industrial enterprises are often able to purchase energy at lower rates because these entities often buy in bulk, or hedge costs with contracts, including future market purchases.

Graph: #4

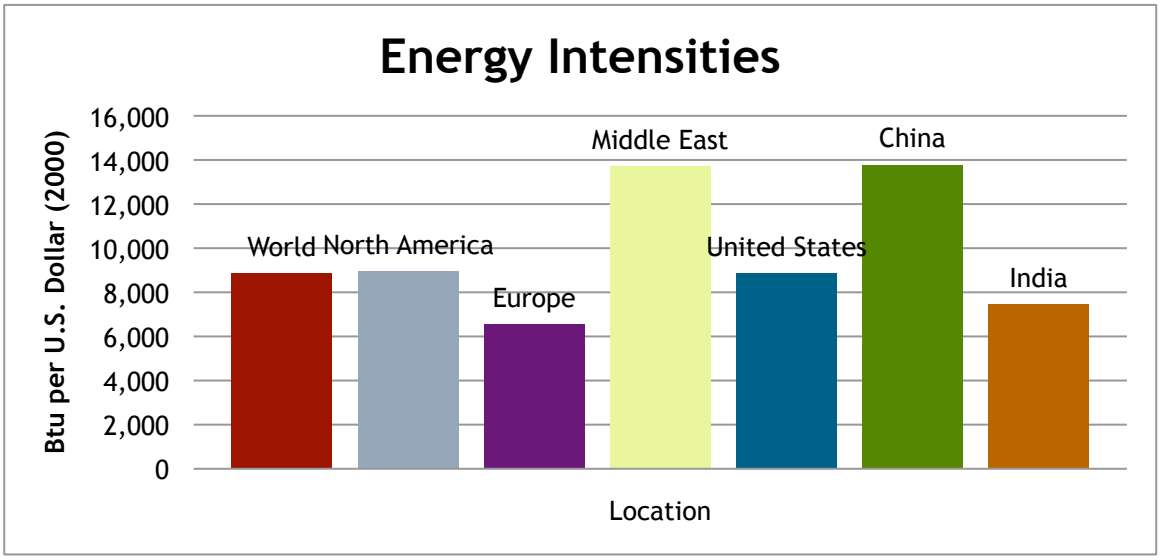



Source: EIA

**Energy intensity in the US: What can be done to reduce it?**

As mentioned earlier, the world demand for energy is expected to continue to rise over the next 20 years, driving up end-user costs. Furthermore, energy demand within the US is expected to continue to rise, despite an abundance of technology advancements. At the same time, the US continues to lag other nations in regards to energy intensity, which is an energy metric that calculates advancements in energy efficiency. Specifically, this economic metric is calculated as units of energy per GDP, with higher intensities indicating a high price or cost of converting energy into GDP, or vice versa.

Graph: #5




Source: EIA

Energy intensity is an important metric for measuring a nation's energy efficiency, but it is also influenced by a variety of factors, most notably standard of living and weather conditions. Typically, a country with an advanced standard of living is more likely to have a wider prevalence of consumer appliances and other technologies such as flat panel TVs or computers that impact energy intensity than countries with a lower standard of living. Similarly, countries in hot or cold climates may also have high energy intensities due to the need for heating and cooling systems in these areas.

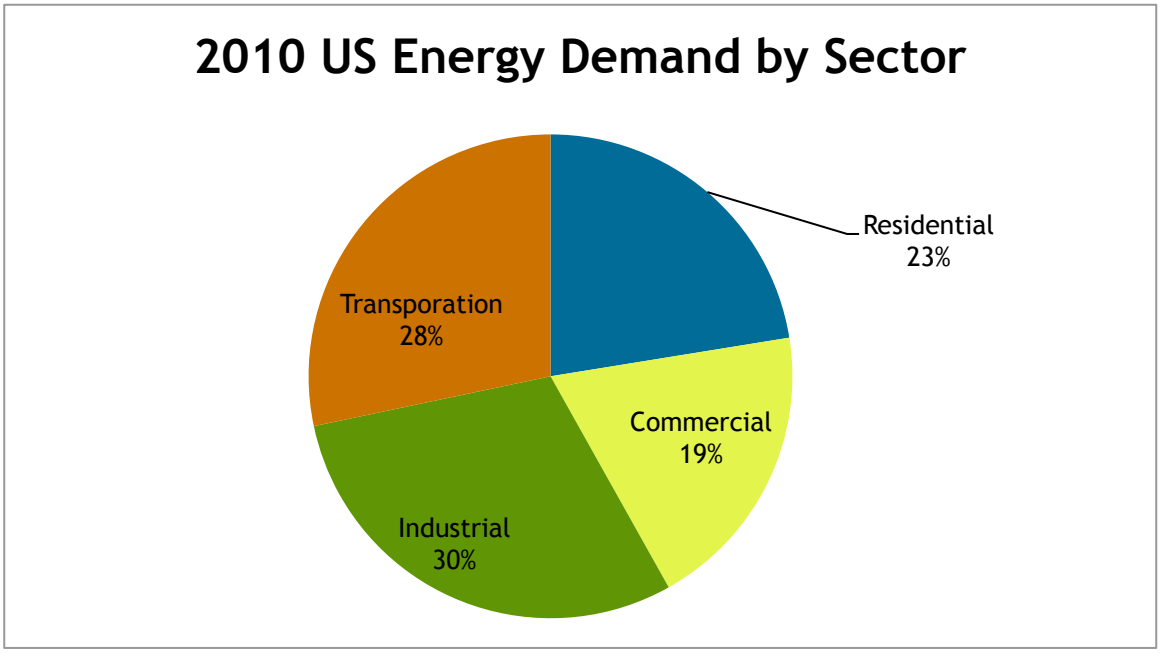
However, despite these two factors, energy intensity can largely be reduced, particularly in the US, where there is an abundance of technologies designed to reduce consumption or produce renewable power. For the transportation sector, energy intensity can be condensed by improving public transit systems and developing more efficient vehicles. Car companies can also decrease consumption by utilizing alternative fuels or renewable technologies such as hydrogen and batteries.

For energy producers, it is important to increasingly utilize smart-grid technology, renewable systems and other equipment to reduce energy intensity. Similarly, builders should look to incorporate efficient appliances, renewable energy systems and other building materials to reduce the demand for energy by end users. Furthermore, builders that fully incorporate green technologies into structures may also apply for LEED status, which is a designation placed on "green buildings" as certified by the Leadership in Energy and Environmental Design professionals.

At the same time, an effective energy program must also be implemented by the end-users themselves. Businesses, manufacturers, colleges and even individuals must all look to current technologies to try and reduce energy consumption, particularly within the real estate sector. In fact, according to EIA data and SSES research, non-transit oriented energy consumption accounts for about 71.1% of total US demand. At the same time, the majority of buildings in the US are currently inefficient. In fact, most structures do not contain efficient appliances, electrical systems and

HVAC system. As a result, there is a tremendous opportunity to reduce energy demand and costs, by upgrading these buildings to today's technologies.

Graph: #6




Source: EIA

**Implementation strategies for end-users**

The most efficient way for property owners and managers to reduce energy consumption is to retrofit properties with new technologies and systems. Generally, retrofits encompass a wide variety of upgrades, which can be tailored to a specific budget and goal. These initiatives include appliances, building envelope, air quality systems, lighting, water heating and overall building design. A building envelope is the separation between the interior and exterior environments of a building.

According to the EIA data and SSES research, heating and cooling systems account for approximately 34.1% and 8.2% of energy use in US, respectively. Consequently, it is important for retrofits to focus on upgrades to walls, roofs, foundations, windows and doors to reduce heating and cooling costs. In addition to building envelope upgrades, firms should look to purchase energy efficient heating and cooling systems to reduce operational costs, as older systems are dramatically inefficient by today's standards.

At the same time it is important for building owners to monitor air quality within their properties, particularly as tighter building envelops and high-efficient windows make buildings more energy efficient. Lighting upgrades are another important component of retrofits, as these costs generally account for about 11.3% of energy consumption in US buildings, according to EIA data. Similarly, property owners and managers can reduce costs by redesigning building layouts.

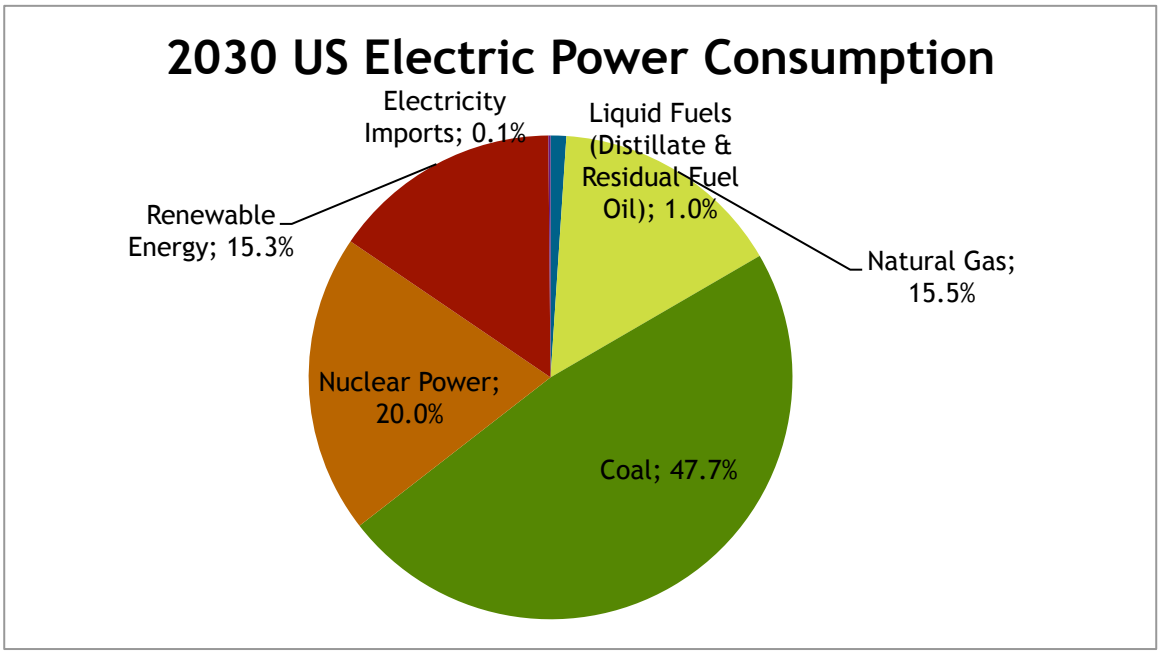
**Renewable energy: The new age of energy generation**

In addition to traditional retrofits, property owners and managers can also utilize a variety of renewable energy systems to help reduce energy costs. These systems include biofuels, wind systems and solar technologies. However, SSES believes solar technologies are the most applicable for small scale power generation, particularly if the property owner is looking to supplement or replace traditional energy consumption.

Solar technologies are categorized into two distinct groups,: photovoltaic cells (PV) and concentrated solar power (CSP). PV technology is simpler than CSP; it converts sunlight directly to electricity through the use of solar cells. In contrast, CSP technologies use reflectors to focus sunlight onto receivers that collect the sun's heat. The resulting thermal energy is then used to produce electricity by utilizing a steam turbine or heat engine.

According to the EIA, solar power generation has increased by 23.4% in the five years to 2010. Currently, solar power only accounts for a fraction of US energy generation, but this is not expected to continue as generation is forecast to rise by 362.3%, or 9.7% annually, in the 20 years to 2030. Overall, the renewable energy market is forecast to account for about 15.3% of total electric consumption by 2030. In comparison, renewable energy in 2010 is forecast to account for about 11.3% of electric power consumption in 2010.

Graph: #7




Source: EIA

**Don't forget about the impact of deregulation**

In determining the future of energy costs, it is also important to discuss the impact of deregulated energy markets. The deregulation of energy can be traced back to the 1970s, when members of the Organization of Arab Petroleum Exporting Countries or OPEC, issued an embargo against the US in retaliation for its support for Israel. The energy crisis led to greater interest in renewal energy and spurred research and investments in coal, wind, solar, nuclear and other alternative energy systems. As technology improved, electric generators were able to efficiently transmit power across long distances. At the same time, the rise in technology increased competition within the energy segment.

To spur advancements, the government slowly began deregulating energy markets to increase competition. Additionally, the Federal Energy Regulatory Commission delegated power generation responsibilities in 1992, under the Energy Policy Act, which ordered utilities to allow private electricity producers access to their markets. Since then, over half of the states have deregulated their energy markets, including electricity and gas.

As a result of this trend, electricity suppliers are now able to raise rates in relation to input costs, such as oil and other liquid fuels. Consequently, prices in some states have begun to fluctuate more readily than regulated markets. This trend has hurt the predictability of power costs, but in some locals it has even raised overall rates. At the same time,

these markets are now open, so it is important for new suppliers to enter the marketplace, so competition for business keeps prices low.