

WHITE PAPER / **FORTUNE 500 COMPANIES' APPROACH TO RENEWABLE ENERGY**

DOCUMENTING THE RENEWABLE ENERGY STANDARDS OF TOP U.S. CORPORATIONS

by Mark Beauchamp, PE

Corporate America has made vast strides to integrate renewable energy into its facilities as sustainable goals.

Based on a review of how the top 25 companies on the *Fortune* 500 list incorporate all renewable forms of energy into operations, it's possible to identify and learn from the powerful impact of their leadership.



According to the U.S. Department of Energy, “a clean energy revolution is taking place across America, underscored by the steady expansion of the U.S. renewable energy sector.” Renewable energy systems are being built across the country at an increasing rate. As reported by the American Wind Energy Association and GTM Research and the Solar Energy Industries Association respectively, there are currently about 85 gigawatts of wind farms and more than 40 gigawatts of solar farms, including residential systems, operating in the U.S. While these numbers appear large, only 10 percent of the total energy consumption in 2016 was from renewable sources.

While electric utilities and renewables companies have historically taken the lead in providing renewable energy systems, corporations have now become a contributor to the generation of renewables. This is mainly due to sustainability opportunities through reducing their energy consumption and optimizing their operational costs. Corporations currently have several ways of incorporating renewable energy into operations: purchasing renewable energy certificates (RECs), building renewable energy systems outside facilities, or incorporating renewable resources into facilities. Each of these options, as adopted by companies on the *Fortune 500* list, are discussed further in this paper.

ROLE OF RENEWABLE ENERGY IN THE U.S.

The U.S. has used a variety of energy sources to heat homes and businesses since its inception. Wood was the major supply of the country’s energy needs through the mid-1800s. In the following years, more consumers began using coal, petroleum and natural gas, and the U.S. relied less on wood as an energy source. Today, the use of renewable energy sources is increasing, particularly biofuels, solar and wind which are slowly displacing natural gas and petroleum fuels. Figure 1 depicts the history of the use of energy sources to heat homes in the U.S. It is interesting to note that while renewables are a very small percent of the major sources, it appears to be increasing rapidly, similar to the rise in use of petroleum products.

It is safe to say that the U.S has enormous amounts of renewable resources — the most of which produced from strong winds and sunny skies. The Great Lakes and coastal states are excellent locations for wind farms because of the near constant wind that can be harnessed. The drier, more arid states like Arizona, California, southern Colorado, New Mexico, Nevada and west Texas are ideal for solar panels due to the high number of sunny days per year. Solar farms are less noticeable because they are built generally close to the ground and can be easily blocked by vegetation.

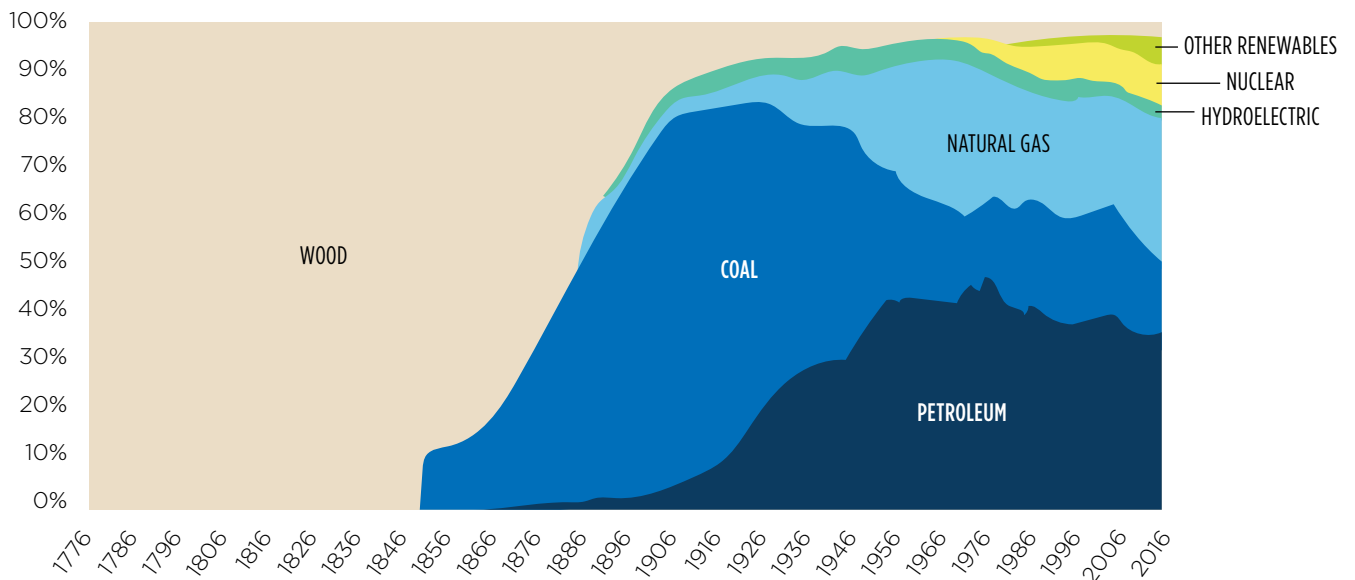


FIGURE 1: Share of U.S. energy consumption by major sources, 1776-2016. History of the use of energy sources to heat homes in the U.S.
 Source: U.S. Energy Information Administration, *Monthly Energy Review*, April 2017, preliminary data for 2016

RENEWABLE ENERGY DRIVERS

The adoption or increase of renewable energy portfolio standards by individual states, as illustrated in Figure 2, is one of the drivers for incorporation of renewable energy in the U.S. As of Aug. 1, 2017, 29 states have standards that require utilities to sell a specified percentage of renewable electricity. Hawaii is the highest with 100 percent renewable energy required by 2045, and Michigan and Wisconsin are the lowest at 10 percent by 2015. Other states with noteworthy goals include California with 50 percent by 2030 and Texas with 10 gigawatts by 2025.

Eight states have instituted voluntary goals for renewable energy. Kansas and Utah have the highest goals of

20 percent by 2020 and 2025 respectively, while South Carolina has the lowest goal of 2 percent by 2021.

As of Aug. 1, 2017, 13 states have not implemented any standards or goals for renewable energy.

Corporations can be an excellent asset to utilities within states. While corporations continue to find better ways to institute renewable energy into portfolios, utilities can offer services beneficial to both parties. Corporations can provide the capital needed to build new facilities and reap the benefits of increasing renewable energy usage, while utilities receive financing to help meet state-mandated renewable energy percentages. It's an excellent opportunity for both parties to meet their needs.

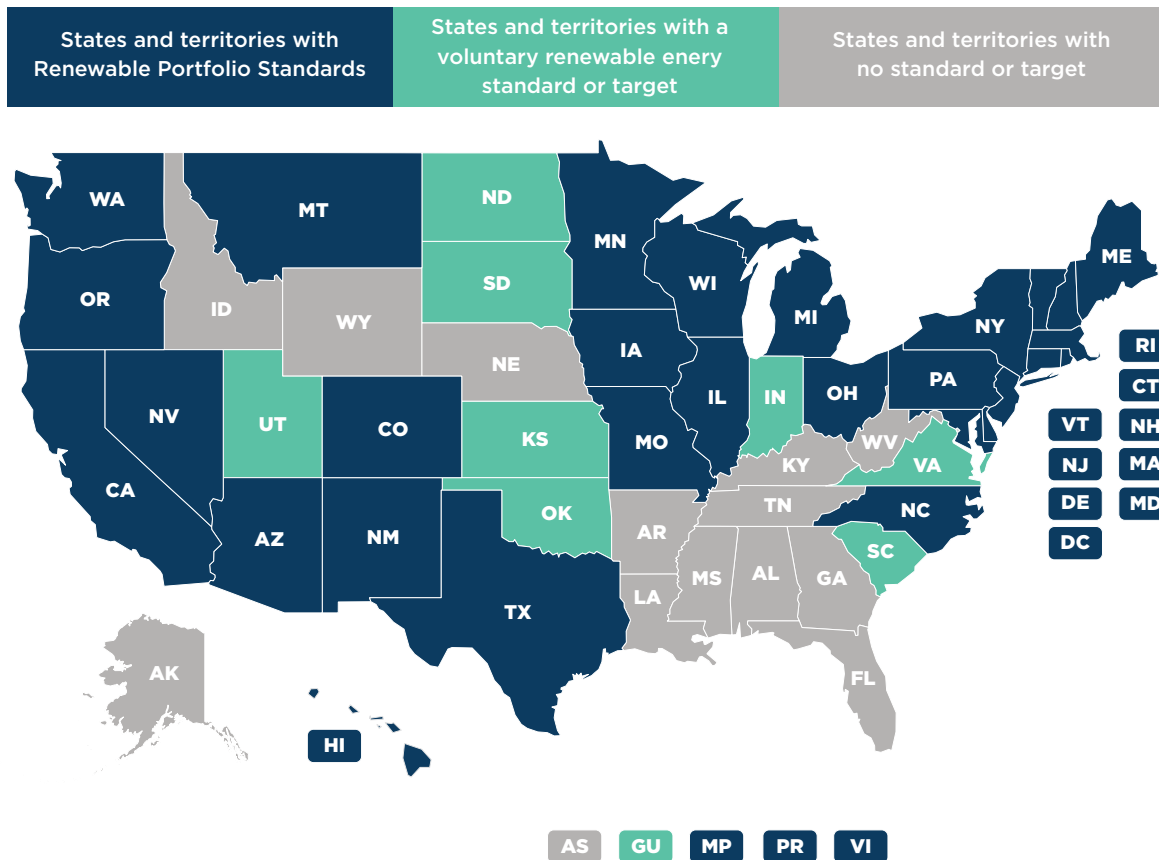


FIGURE 2: State breakdown for renewable energy standards and goals. Source: National Conference of State Legislatures (2017)

WHY DOESN'T THE U.S. USE MORE RENEWABLE ENERGY?

So, if renewable energy is so plentiful in the U.S., why not use more of it? The cost of producing electricity from renewable energy is one of the main reasons. It is still cheaper to generate electricity from fossil fuels than natural renewable resources. In addition, favorable renewable resources are located in remote areas where installation of wind or solar farms may also require the installation of many miles of electrical transmission lines to connect the renewable energy to the electric grid. Likewise, wind farms in the rural areas of the eastern U.S. have fallen out of favor as local residents band together to fight against the installations, claiming noise pollution, damage to the ecosystem and obstruction of scenic views.

According to the U.S. Energy Information Administration, other than challenges with residents, renewable sources also face the following challenges:

- Clouds reduce electricity from solar power plants.
- Days with low wind reduce electricity from wind farms.
- Droughts reduce the water available for hydropower.
- Renewable sources cannot typically be scaled up to match increased peak load on a given day.
- Solar plants cannot be operated at night.

Figure 3 identifies the historical and projected cost trends for wind and solar power between the years of 1980 and 2025. While the graph does show that further cost decreases are likely, the reduction in costs will be much

slower than previous years. This would suggest that the future cost of renewable energy will become more predictable, which is not the case for fossil fuels.

BENEFITS OF RENEWABLE ENERGY CERTIFICATES

Renewable energy certificates (REC) provide a means for companies to participate in renewable energy by purchasing credits or certificates from renewable energy generators who have built wind farms or solar farms. Each REC represents a specific amount of electricity produced and delivered to the electric grid by renewable resources such as wind or solar. For example, every 1 MWh of electricity produced by renewable resources generates one REC. This REC can be kept or sold by the producer. When an REC is purchased, the purchaser is now the owner of that green power.

RECs are a part of every purchase of renewable energy and represent a credible way to purchase or sell renewable electricity. In addition, RECs can be uniquely numbered and tracked. When RECs are sold, there are systems that track the sale and record each transaction. Once an REC is purchased, it can no longer be sold or used by another company. The Environmental Protection Agency (EPA) recommends only purchasing RECs that are certified and verified. This process confirms that the REC purchased was from a quality renewable resource. RECs are considered the currency of the Renewable Energy Market. They allow companies to purchase cleaner sources of energy as well as reduce their carbon footprint when other avenues are not available.

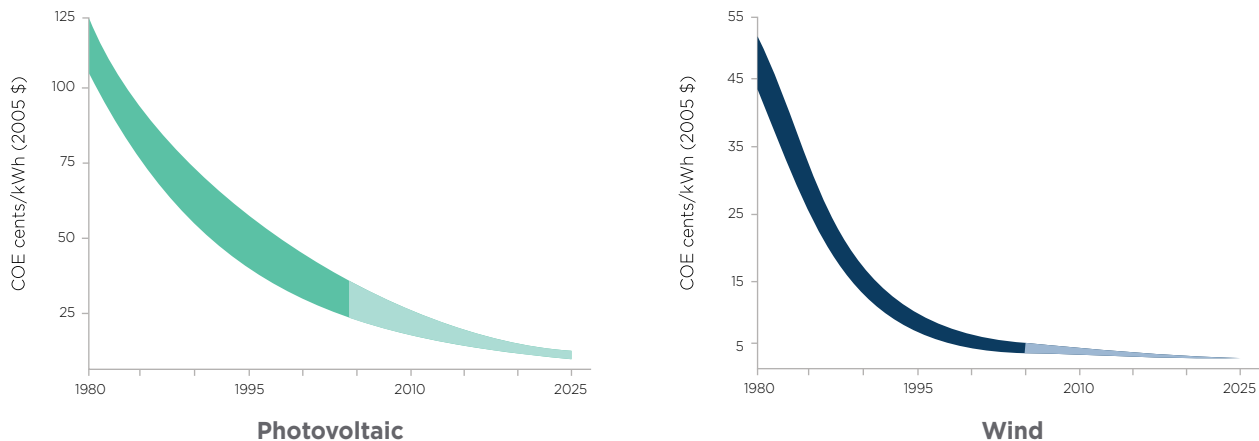


FIGURE 3: Declining costs of solar and wind energy. Source: National Renewable Energy Laboratories (2005)

RECs provide companies the opportunity to participate in renewable energy when they are unable to produce it themselves. When RECs are purchased, companies are providing revenue that supports renewable energy projects and helps to offset renewable energy generators' operations and maintenance costs. Thus, REC purchases promote the growth of the green power marketplace. RECs also provide the opportunity for corporations to showcase participation in renewable energy even without installing any renewable energy systems at their facilities. Benefits of RECs to corporations include the opportunity to state they are offsetting their electricity usage with renewable resources with low or zero emissions.

OFF-SITE RENEWABLE ENERGY

Not all companies have the capability to install renewable energy systems at their facilities. In large metropolitan areas where land is a premium, the use of the land for installation of renewable energy systems may not be a viable option. Other facilities cannot accommodate rooftop installations due to the structural integrity of their buildings.

Where a company's existing facilities do not warrant the installation of solar panels or other renewable resources, the installation of off-site renewable energy systems like solar or wind farms are considered. These farms are connected to the electric grid and the generated energy is sold to utilities or the grid.

Apple — No. 3 on the *Fortune* 500 list — is an excellent example. Apple has committed to bring 4 gigawatts of renewable energy online by 2020. In 2017, Apple announced that it would build a 200-megawatt (MW) solar farm near Reno, Nevada. It also has a fully operational 130-MW farm in Monterey County, California, and another large facility in North Carolina. Some of these facilities are built next to Apple's data centers to help meet its goal of becoming 100 percent renewable.

Another example of off-site renewable energy systems is Amazon. In 2016, it announced plans to build its largest wind farm to-date in Texas. This 253-MW wind farm will include more than 100 turbines and will produce enough energy annually to power almost 90,000 U.S. homes. Amazon also announced the construction of a 189-MW wind farm in Ohio and four other solar farms across the country with a capacity of 20 MW each.

ON-SITE RENEWABLE ENERGY

Another approach to renewable energy used by companies on the *Fortune* 500 list is to generate renewable energy at their facilities. Solar systems can be installed on the tops of warehouses or office complexes or on land around their facilities that is not being used. Some corporations build new facilities with the intent to incorporate renewable energy into it. This provides companies the direct opportunity to augment power consumption with green energy. Renewable energy generated from on-site systems can be considered an REC source, where the credits are used internally and not sold to others.

A relevant example of this approach is Amazon. Amazon had a goal to install 770 MW of renewable energy at its facilities by the end of 2017. This was accomplished by adding solar panels to the tops of its warehouses. Amazon has also set a goal to host solar energy system systems at 50 fulfillment network buildings by 2020.

Another example of this approach is the Ford Motor Company. Ford teamed with DTE Energy to build a solar carport at its facility in Michigan to generate 1 MW of renewable energy each year. The carport provides 360 covered parking spaces and 30 charging stations for plug-in electric vehicles. It is the second largest solar carport in the Midwest.

CORPORATE USE OF RENEWABLE ENERGY

The use of renewable energy by corporations to offset energy usage at facilities took off around 2010, earlier for some of the companies. Information on the top 25 companies on the *Fortune* 500 list were reviewed to determine their approach to renewable energy.

Here are a few highlights:

- **Walmart** — No. 1 on the *Fortune* 500 list with \$485.9 billion in revenue last year — claims to be one of America's leading on-site solar energy users. Approximately 26 percent of Walmart's energy consumption is provided by renewable energy. According to Walmart's 2017 Sustainability Report, they have added 600 MW of renewable energy capacity worldwide since 2007. Currently, Walmart has over 480 on-site and off-site projects in operation or under

development in seven countries and 16 U.S. states. Walmart uses power purchase agreements — hiring another company to build and operate its renewable facilities — to facilitate its renewable energy sources.

- **Apple** — No. 3 on the *Fortune* 500 list with \$215.6 billion in revenue last year — claims its power consumption in the U.S. is 100 percent from renewable energy sources and has been since 2014. Currently, Apple has approximately 1,000 MW of renewable energy systems installed in the U.S. and around the world, which equates to 96 percent of its power consumption. This effort began in 2010 when only 16 percent of its power consumption came from renewable resources. Apple's progression in renewable energy is shown in Figure 4.
- **Amazon** — No. 12 on the *Fortune* 500 list with \$135.9 billion in revenue last year — installed 770 MW of renewable energy as of the end of 2017, with more facilities planned. Currently, approximately 50 percent of Amazon's power usage is provided by renewable energy. Amazon is installing solar arrays on the rooftops of its fulfillment network buildings and expects to have solar panels on 50 of its fulfillment centers by 2020.
- **General Motors** — No. 8 on the *Fortune* 500 list with \$166.4 billion in revenue last year — has a power purchase agreement with a Texas wind farm to begin the purchase of 50 MW of renewable energy, which is enough to power 16 of its facilities in 2018.

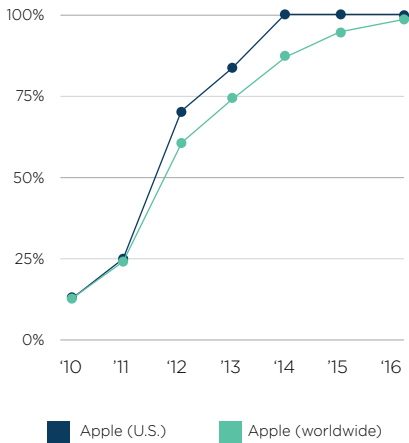


FIGURE 4: Apple's renewable energy use from 2010 to 2016.
 Source: Apple Environmental Responsibility Report (2017 Progress Report)

During the review of information for the top 25 companies on the *Fortune* 500 list, each company's 2016 Sustainability Report was reviewed as a means of identifying relevant information regarding the company's use of renewable energy. It was quickly determined that there is not a standard for sustainability reports. Companies focus on many different approaches to document their environmental goals in their sustainability reports.

Highlights include:

- Walmart has initiated Project Gigaton which seeks to reduce 1 gigaton of emissions from manufacturing, materials and use of products by Walmart and all of its suppliers in addition to a goal to increase its use of renewable energy.
- Ford Motor Company focuses more on producing vehicles that are more efficient than on generating renewable energy for its facilities.
- Berkshire Hathaway owns utilities that have incorporated renewable energies into their portfolio rather than incorporating renewable energy into its own facilities to reduce energy consumption.
- United Health Group has focused goals to reduce the amount of waste sent to landfills by 50 percent and has 1.7 million square feet of LEED-certified facilities. It also has energy improvement projects to upgrade exterior and interior lighting and improve building controls.
- General Electric's renewable energy focus is on improving the wind and solar generation equipment that it sells rather than using renewable energy to replace energy usage by the company.

It should be noted that each of the companies reviewed have sustainability goals that apply to their scope of services, and lack of renewable energy goals does not lessen focus on their own sustainability goals. While not all companies have renewable energy goals at this time, it is expected that in the near future, more companies will recognize the need to incorporate it into their operations as the cost for renewable energy continues to decrease.

The following table provides an overview of the renewable energy usage for each of the top 25 companies on the *Fortune* 500 list. Additional information can be obtained on sustainability goals from each company's website.

RANK	COMPANY	REVENUE (\$M)	ANNUAL RENEWABLE ENERGY GENERATED	COMMENTS
1	Walmart	\$485,873	145 MW	Walmart has committed to source 50 percent of its energy needs from renewable energy by 2025.
2	Berkshire Hathaway	\$223,604	7,336 MW	Could not identify a renewable energy goal with Berkshire Hathaway. It does own renewable energy generators which are part of the utilities operated by Berkshire Hathaway.
3	Apple	\$215,639	1,000 MW	Energy consumption in the U.S. is from 100 percent renewable energy power.
4	Exxon Mobil	\$205,004		Exxon Mobil identifies many ways that it is working toward reductions, but no goals are identified.
5	McKesson	\$192,487		No renewable energy goals are reported for North America; however, it does have goals in Europe.
6	United Health Group	\$184,840		Limited information was found regarding renewables. Its focus is on sustainability, such as an established landfill diversion target of 50 percent; energy usage improvement projects; reduced controllable energy use and greenhouse gas emissions; and energy and water energy conservation projects implemented.
7	CVS Health	\$177,526		CVS Health has five stores powered by rooftop solar. Its focus is on developing science-based emissions reduction targets; however, no specific goals are noted.
8	General Motors	\$166,380	125 MW	General Motors plans to generate or source all electrical power for its 350 operations in 59 countries with 100 percent renewable energy by 2050.
9	AT&T	\$163,786	40 MW	AT&T is working towards a 2020 goal of reducing electricity consumption of the company by 60 percent.

RANK	COMPANY	REVENUE (\$M)	ANNUAL RENEWABLE ENERGY GENERATED	COMMENTS
10	Ford Motor	\$151,800	1 MW	Focus is directed toward producing vehicles that are more efficient rather than on facilities.
11	Amerisource Bergen	\$215,639	1,000 MW	Started focus on carbon footprint in 2015. One LEED building. No focus on renewable energy identified.
12	Amazon.com	\$135,987	770 MW	Amazon's renewable energy goal is to install solar systems on the top of 50 of its fulfillment centers by 2020.
13	General Electric	\$126,661		Focus is more on improving the wind and solar generation that it sells than using renewables to replace energy usage by the company. GE has been installing solar systems at some of its sites but no goal for renewable energy usage could be identified.
14	Verizon	\$125,980	12 MW	Goal to add 24 MW of green energy by 2025.
15	Cardinal Health	\$121,546	24 MW	Since fiscal year 2011, Cardinal Health has invested in over 80 energy optimization projects resulting in a reduction of over 62,500 million kilowatt hours (kWh), with a corresponding cumulative CO ₂ e reduction of over 44,000 metric tons had these projects not been completed.
16	Costco	\$118,719	9 MW	Costco currently uses solar photovoltaic systems in 100 warehouses in Arizona, California, Colorado, Hawaii, New Jersey, New Mexico, New York, Ohio and Puerto Rico, as well as Spain, France, the UK, Taiwan and Japan. Some locations use solar power in parking lots. These systems are projected to generate 81 million kWh per year. No specific renewable energy goals were identified.
17	Walgreens Boots Alliance	\$117,351	2 MW	Walgreens Boots Alliance businesses generated close to 17,000 megawatt hours of electricity through solar panels during fiscal 2017. It has contracts to purchase electricity generated from renewable origins outside U.S. No specific renewable energy goal identified.

	COMPANY	REVENUE (\$M)	ANNUAL RENEWABLE ENERGY GENERATED	COMMENTS
18	Kroeger	\$115,337	1.2 MW	Kroeger produced more than 106 million kWh of solar and wind power in 2016. It has a goal to reduce energy consumption in stores by 40 percent by 2020, but no specific goals for renewable energy usage were identified.
19	Chevron	\$107,567	None Identified*	Focus on research in improving use of renewables.
20	Fanny Mae	\$107,162	None Identified*	Provides property owners with financing options for energy efficient systems.
21	J.P. Morgan Chase	\$105,486	None Identified*	It has plans to source renewable energy power for 100 percent of its global energy needs by 2020 and will facilitate \$200 billion in clean energy financing by 2025.
22	Express Scripts Holdings	\$100,288	None Identified*	No specific renewable energy goal identified.
23	Home Depot	\$94,595	50 MW	Through the use of a Power Purchase Agreement, Home Depot purchases 50 MW of renewable energy which is enough to power 100 of its stores. Its goal is to purchase 135 MW of renewable energy by the end of 2020.
24	Boeing	\$94,571	2.6 MW	Boeing mainly purchases RECs for nearly half of its total energy consumption from renewable energy sources.
25	Wells Fargo	\$94,176	Purchases RECs	Wells Fargo purchased more than 2 million megawatt hours of RECs to be powered 100 percent by renewable energy. Its goal is to transition into long-term agreements that fund new sources of greenhouse power by 2020.

FIGURE 5: Summary of renewable energy usage by the top 25 companies on the Fortune 500 list in 2017

UTILITIES CAN BE RESOURCES FOR CORPORATIONS

Sustainability is a strong current trend with large corporations in the U.S. that have concerns about their impact to the world climate and are looking for immediate ways to incorporate sustainability into a portfolio. For many corporations, this means replacing power sources with renewable energy to fulfill immediate and short-term goals, increasing their renewable energy usage percentage significantly. For the first time in 2015, major corporations and other non-utility customers purchased more than 50 percent — 52 percent or 2,074 MW — of wind power capacity through power purchase agreements. It has been noted that the number of corporate power purchase agreements have doubled each year for the past five years. This trend is expected to continue, although at a slower pace.

More than 50 percent of states in the country currently allow customers to use purchase power agreements to purchase electricity from entities other than their local utility.

One option for utilities to support the large corporation's sustainability goals is through the use of green tariffs. As stated previously, many utilities are required to incorporate renewable energy into their portfolio by state mandates. As part of these mandates, green tariffs allow local utilities to sell renewable energy, whether purchased or generated, to large corporations at a higher rate than utilities purchase or generate it at and at a generally lower or equivalent rate than large corporations are currently paying. Both parties

benefit from this opportunity: utilities have long-term, local clients willing to purchase the renewable energy, and large corporations are provided a local source for renewable energy that might be more cost efficient than constructing their own renewable energy or entering into power purchase agreements for renewable energy.

Google is a great example of the use of green tariffs. One of Google's subsidiaries is the first company to purchase renewable energy from Duke Energy in North Carolina using its green tariff program. Google is purchasing 61 MW of renewable energy from a solar farm located near its data center.

In 2016, Dominion Virginia Power and an Amazon affiliate set up a green tariff system allowing the affiliate to sign power purchase agreements with local renewable energy generators and pay Dominion Virginia Power a price similar to the cost of power in the wholesale market. This appears to be an opportunity for both parties to successfully use renewable energy beneficially.

Generally, green tariffs require long-term agreements between the utility and the customer and may have a minimum consumption requirement. Green tariffs are usually set up in a manner that does not shift the energy costs from the large corporations to other ratepayers. The only limiting factor is the number of states that allow them. In 2016, only six states allowed the use of green tariffs, with three others in development. This number is expected to grow as utilities recognize the opportunity to support the renewable energy need for large corporations.



CONCLUSION

With renewable energy providing only 10 percent of the current energy needs for the U.S., one might ask if it is possible to be 100 percent reliant on renewable energy. Further research should be completed to determine what the impact would be on the nation if wind and solar farms increased in usage from 10 percent to 50, 75 or even 100 percent. While there may be plenty of resources to support increasing the amount of energy generated from renewable resources, it's unsure if wind and solar are the right type of resources to capture or if other types would be less invasive and provide better results. Research and development should continue to identify new ways to develop our renewable resources, as well as improve capabilities of wind and solar systems. Based on the changes seen in the past 40 years, hopefully the next 40 years will open new and better doors.

Though the total installed renewable energy systems by the top 25 companies on the *Fortune* 500 list represent only a fraction of the total renewable energy generated, some of these companies have set significant goals for renewable energy to off-set energy consumption from non-renewable resources within the next 5 to 15 years, as shown in Figure 5. Some have even already sourced 100 percent of energy needs as renewable energy. As the cost of installation of renewable energy systems continues to decrease, it can be expected that more companies will look to renewable energy as a safe and viable alternative to current practices.

BIOGRAPHY

MARK BEAUCHAMP, PE, is a project manager focused on managing all aspects of engineer-procure-construct (EPC) projects for substations and overhead and underground transmission lines. His responsibilities include design and construction management, engineering oversight, review and retrofit, solicitation and award of subcontracts, project cost controls, costing and scheduling, and subcontractor management.