Renewables are Competing and Winning in Electricity Markets

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JOINT ECONOMIC COMMITTEE
DEMOCRATS
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Ranking Member

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Renewable energy is rapidly gaining market share in America's electricity markets. In 2017, renewable energy sources were used to produce nearly one-fifth (17 percent) of the electricity generated in the United States. This is almost twice the market share renewables had in 2008 (9 percent).[1] And this is just the start, as renewables are projected to continue to grow and take market share from more traditional energy sources.

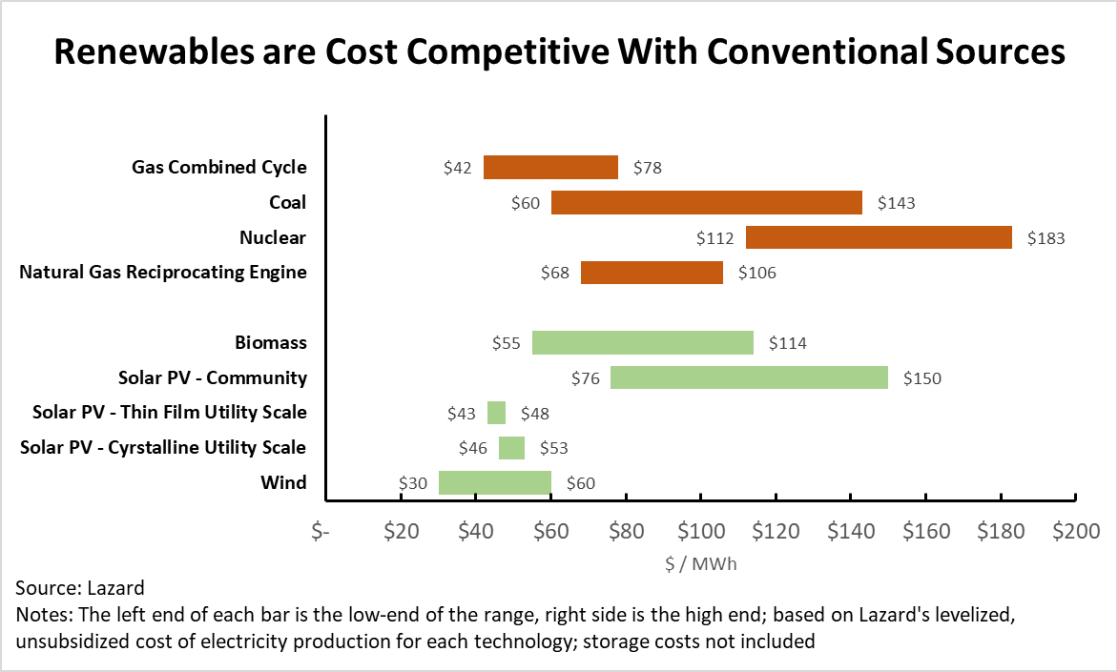
This surge is being driven by rapid declines in the price of renewable energy. In many parts of the country, utilities are discovering that solar or wind energy comes in below the cost of conventional energy sources. As innovation continues, and prices continue to decline, the case for renewables will become even clearer. A companion fact sheet shows communities across the country are coming together to make the choice to switch to 100 percent renewable power. Even a coal museum in Kentucky installed solar panels to reduce costs.[2]

Despite these trends, many utilities plan to invest billions in replacing retiring conventional power plants with other traditional fuel sources.[3] In doing so, these utilities risk these investments becoming "stranded"—where the cost case for renewables becomes so strong that utilities will end up abandoning natural gas plants before their projected lifecycle ends. Fully accounting for renewable cost trends would lead many of these utilities to make financial decisions that are better for their consumers and their own bottom line in the long run.

Renewable Prices are Competitive with Fossil Fuels

The price of producing electricity through renewable energy has declined precipitously over the past few decades. Installing new renewable capacity is now often on par with or cheaper than the total costs of building and operating a traditional power plant.

Lazard, a financial advisory firm, conducted an analysis of new energy generation projects in the United States using a variety of conventional and alternative sources. The analysis finds that utility-scale solar and wind energy are already cheaper than coal and on par with or cheaper than natural gas, after factoring out tax preferences. This is even before factoring in the cost of externalities associated with many conventional sources of fuel, such as high levels of air pollution and climate change-induced effects of carbon emissions.[4]



Source: Lazard
Notes: The left end of each bar is the low-end of the range, right side is the high end; based on Lazard's levelized, unsubsidized cost of electricity production for each technology; storage costs not included

The International Renewable Energy Administration (IRENA), an intergovernmental organization founded in 2009, came to a similar conclusion in their most recent report on global renewable costs. Most of the new renewable projects launched in 2017 came in with costs per unit of electricity in the same range as fossil fuel costs, with some projects coming in even cheaper. The agency projects that renewable costs will continue to decline even further, and will be consistently cheaper than conventional sources within a few years.[5]

Texas, a state known for oil, provides a prime example of how renewables are competing with and winning market share from other energy sources. Texas's electricity system shows that markets are starting to recognize that renewables will provide the most competitive generation options moving forward. The Electric Reliability Council of Texas (ERCOT), the independent operator of Texas's electrical transmission grid, estimates that, as a result of cost trends, solar energy will be the energy source to see the biggest gains in market share in the next 10 to 15 years.[6]

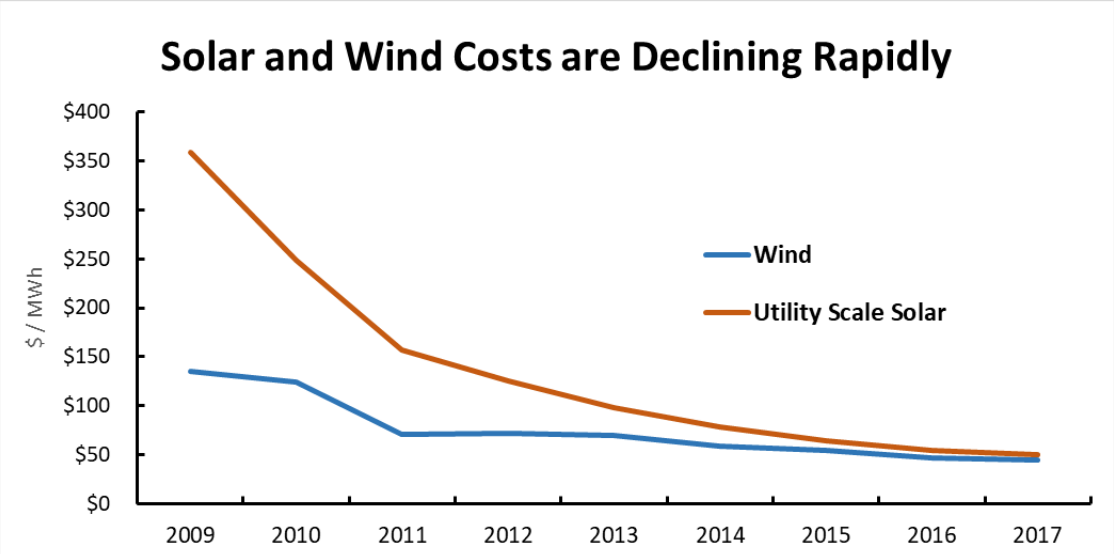
Innovation is Driving Costs Down

The rapid decline in the cost of renewables has been driven by both innovation and economies of scale—where production costs come down as production quantities rise. As solar and wind are deployed on larger scales, production techniques continue to develop, and grids become smarter, experts anticipate the costs of renewables will continue to decline.

Solar photovoltaic (PV) cells have dropped substantially in price and have become more efficient. System costs for PV fell by between 10 and 15 percent annually from 2010 to 2016, when measured on a per-watt basis.[7] These gains were driven by both improvements in production technologies and improvements in cell design leading toward more efficient cells.[8]

Estimates from IRENA show that solar projects will continue to converge on the lower end of the current cost range in the next few years, driving down the average cost of new solar projects.[9]

The cost of producing electricity from onshore wind turbines dropped nearly in half from 2009 to 2017.[10] Improved efficiencies in designs, like longer turbine blade lengths and higher hub heights, and more developed supply chains have pushed these costs down. Again, IRENA shows that onshore wind projects are moving toward the lower end of the current cost range, which will further drive down the average cost in coming years and make wind more competitive.[11]



Source: Lazard
Note: Shows the levelized cost of energy, not including subsidies.

Data on power purchase agreements (PPA)—contracts between energy providers and buyers—in the United States show a similar trend. In 2009, PPAs for wind averaged around $70 per megawatt hour (MWh). By 2017, that price had dropped to around $20 per MWh.[12] Similarly, prices for solar PPAs have dropped substantially since 2006. Some solar agreements are priced as low as $20 per MWh.[13] At these prices, solar and wind are competitive with any traditional energy source.

There are More Innovations to Come

Energy storage plays a key role in integrating renewables into electrical grids. Solar and wind production is variable, and storage is needed to bridge gaps in production, such as overnight when the sun is not shining. On a small scale, lithium ion batteries can help homes and mini-grids powered by solar store enough energy to meet their oversight needs.[14] On a larger scale, hydro storage facilities use surplus energy production to pump water into higher locations, which can then be released through turbines to generate electricity when renewable production is lower than demand.[15] More advanced utility-scale technologies are also being

brought to market to meet this challenge—a 100-Megawatt battery was brought online last year in Australia.[16]

As costs drop and new technologies emerge, energy storage will become cheaper and allow for longer durations. Costs for lithium-ion batteries already dropped by three-fourths from 2010 to 2016. And new advances in batteries could replace lithium-ion batteries with even cheaper and more efficient materials.[17] With these advances, the case for renewables will become stronger.

A development that has facilitated the incorporation of renewable technology into grids and will likely become more important in the coming years is Distributed Energy Resources (DER) technology. These advancements incorporate a variety of physical and virtual technologies which enable a transition away from one-way centralized grids where power goes from power plants to consumers. Instead, DER creates smart microgrids where consumers and communities can feed unused power back into the grid, batteries store excess energy to cover production lulls, and other technologies are implemented to improve energy efficiency and better manage demand.[18] Nationwide DER capacity is expected to double from 2017 to 2023.[19]

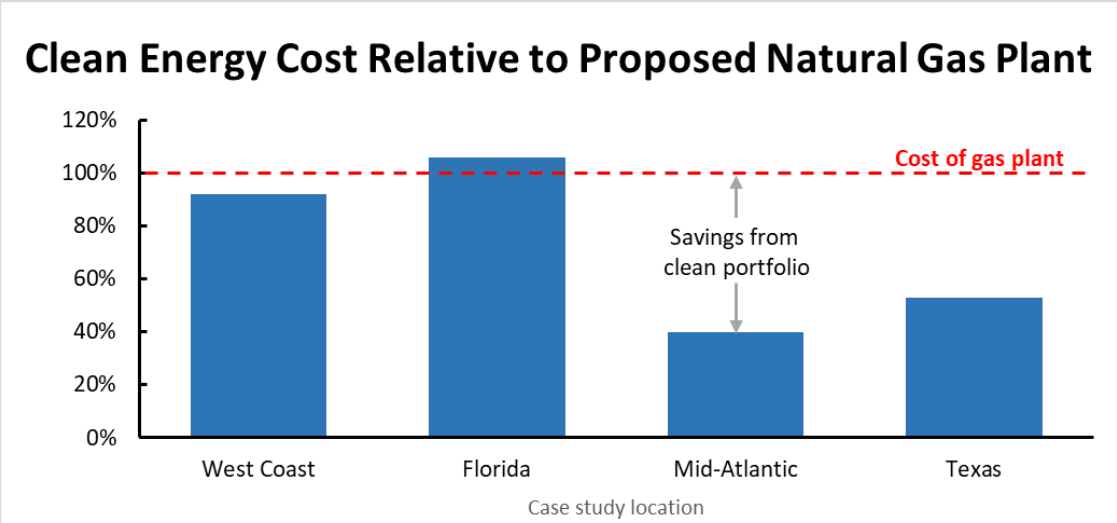
Clean Energy is Often the Best Choice for Replacing Retiring Coal Plants

In the coming years, utilities are going to be making decisions on what to do with aging conventional fuel power plants across the country—half of the country's coal, gas, and nuclear power plants are set to retire by 2030. While renewables will undoubtedly claim much of this capacity, many of these utilities are expected to invest in new natural gas plants due to the current low costs of the fuel. Altogether, nearly half a trillion dollars are expected to be invested in new natural gas facilities to replace those retiring plants. Those natural gas facilities will burn another half a trillion dollars in estimated fuel costs over their lifetime.[20]

Experts are warning, though, that these utilities may be thinking too short term when making these decisions. As renewable costs continue to decline, the cost of building utility-scale solar and wind energy will drop to the point that even companies that have already invested hundreds of millions in new natural gas plants will ultimately switch to renewables to see savings. This means that a substantial portion of the half trillion dollars about to be spent on natural gas facilities may end up "stranded"—retired before the projected end of life for the facility.[21]

In many of these cases, utilities would be better off in both the near- and far-term by moving to a clean energy portfolio. The Rocky Mountain Institute modeled four case studies of utilities looking to replace retiring conventional plants with natural gas plants. In three out of four, they found that a clean energy portfolio could provide lower costs than the proposed natural gas site (and therefore lower costs to consumers), even before factoring in further potential cost reductions in renewable technologies. Once factoring in further projected cost declines, the clean energy portfolio beats out natural gas in all four cases. Additionally, the clean energy portfolios produce societal benefits by reducing carbon emissions—for instance, in the Florida

case study, the clean energy portfolio would eliminate 66 million tons of carbon dioxide over 20 years.[22]



Source: Rocky Mountain Institute
Notes: Shows the modeled all-in cost of building and operating a 100% clean energy portfolio as a share of the cost of proposed gas plants. The West Coast and Florida gas plants are combined-cycle gas turbines, the Mid-Atlantic and Texas are combustion turbine power plants.

Conclusion

Renewables are succeeding in open, competitive markets. Policymakers should recognize and embrace this development. As clean energy continues to develop into a leader in America's electricity markets, the sector will create jobs, drive economic development, and lead to economic, social, and environmental benefits for consumers, workers, and entire communities. Utilities and regulators also must recognize that in the long run, clean energy will deliver benefits through reductions in carbon emissions, and in the short run, renewables can already deliver value to consumers.

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[10] https://energyinnovation.org/2018/01/22/renewable-energy-levelized-cost-of-energy-already-cheaper-than-fossil-fuels-and-prices-keep-plunging/
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