

A Case for Residential Solar Power

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Outline

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 - B. Transitioning off fossil fuels is not only a climate concern, but is also in the countries national interest.
 - C. While residential solar is promising in many ways, such as a source of investment, there are some drawbacks to the technology.
 - D. Thesis. Residential solar power has noteworthy potential to improve the way power is generated and distributed throughout the United States. The proper level of government investment can ensure residential solar is a significant piece of the power equation as the US transitions off fossil fuels.
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For the past seven decades, people have been enamored with the idea of generating electricity from the power of the sun. Effectively harnessing the limitless power of the sun could be enormously beneficial to the United States. One potential method of effectively utilizing the sun's energy is through residential solar power systems. Residential solar power has the potential to change the power distribution landscape in the United States, relieving some of the strain on the power grid. Keeping in mind that fossil fuels, which are the current predominant method of power generation in the US are a finite resource and must be approached in a manner that takes in to account that this resource will not be around forever, a new power generation formula must be considered. Transitioning off fossil fuels must be part of that formula, as it is not only a climate concern, but is also in the country's national interest. While residential solar power is promising in many ways, such as a source of investment, there are some drawbacks to the technology. Residential solar power has noteworthy potential to improve the way power is generated and distributed throughout the United States. The proper level of government investment can ensure residential solar is a significant piece of the power equation as the US transitions off fossil fuels.

Energy independence is a term bandied about by those at the highest levels of the U. S. government. True energy independence will require the United States to transition from fossil fuel to something sustainable and collected exclusively within US borders. Solar power fits that model with the added benefit of being safe for the environment. While it is true that oil and gas production in the United States has never been higher than it is currently, this level of production cannot continue indefinitely. This increased production is not being stored in the U. S. for future use, as over the past several years, the U. S. has transitioned from a net importer of oil to a net

exporter of oil. Fossil fuel reserves in the U. S. will last for several more decades; however, this is a finite resource, and eventually the cost of extraction and low quantities will elevate the cost. This fuel source will go from plentiful to scarce in a relatively short amount of time; if the U. S. has not made the necessary investment to transition to more renewable sources, the nation could face truly serious problems. Current estimates by the U.S. Energy Information Administration, in its "Annual Energy Outlook 2013," project that by 2040, natural gas consumption will be just over 1 trillion cubic feet, oil consumption will be 18.9 million barrels per day and in its "AEO2014 Early Release Overview," coal production will grow to 22.6 quadrillion BTU 1,121 MMst, 2013. Already, major cities in the US have poor air quality due to the byproducts of burning fossil fuels. This situation will only worsen if nothing is done to reverse the trend. Continued business as usual will result in air quality similar to that of Beijing, China. Competition from China in the solar panel industry has caused somewhat of an upheaval in the US government: "The Obama administration argues that dumping of under-priced solar panels is a violation of World Trade Organization rules that has come at a high cost to US panel manufacturers. Several have already been forced to close domestic manufacturing facilities even though 2011 was one of the best years ever for US solar panel sales" (Clayton, 2012). It would seem that greater investment in the US solar industry would be helpful in combating this influx of products from China and take another step toward placing the country on a path to energy independence.

Relieving the strain on the national power grid is of utmost importance. Over the past several decades, brown-outs and complete power outages have increased, causing hardship and deaths across the country. The current grid is old and out dated and cannot handle the

increased demand of the growing population. There seems, however, to be no political will to make the necessary investment in improvements. Therefore, short of a complete overhaul, adding millions of small power stations to the grid, in the form of residential solar power systems, would relieve stress on the grid and ease the burden of power plants to produce enough electricity to support the increased demand, especially during peak consumption periods. These millions of residences producing electricity during hours of peak consumption will require less power from a centrally located production facility, and during off-peak consumption periods, will feed power into the grid, reducing the amount of fossil fuels the power stations will need to burn. This scenario would effectively reduce the pressure on the grid and lead to fewer power outages, making the system as a whole more reliable.

Starting to transition off fossil fuels is a process that needs to begin sooner rather than later. The science on climate change is in and apparently confirmed; the climate is warming. Some may dispute whether human activity is the cause; however, it is a fact that since the industrial revolution began, greenhouse gasses in the atmosphere have risen exponentially. While correlation does not automatically follow causation, if there is the slightest chance that human activity is a factor, something must be done. Either way, pretending the problem does not exist will not make it go away. The human species has significantly altered the landscape of the earth in a relatively short period of time. Collectively, humans have more power to affect the planet than some want to believe. However, just a fraction of the seven billion people of earth moving in a similar direction, such as reducing carbon output, can have profound changes on the planet. Because of the heavy reliance on coal, oil and gas, transitioning off fossil fuels will be a significant challenge, as evidenced by Amory Lovins, “Weaning the United States from

those fossil fuels would require two big shifts: in oil and electricity. These are distinct-nearly half of electricity is made from coal, and almost none is made from oil- but power plants and oil burning each account for over two-fifths of the carbon that is emitted by fossil-fuel use” (2012). Making this change will require political will; the political will “given” to politicians by the people they represent. Political will is necessary because transitioning off fossil fuels will require the recourses of government. While individual citizens can and should do their part, the scale of change required will need government intervention to be realized. The disinvestment in renewables, particularly solar, has hurt the industry and made it more difficult for the technology to get a firm footing. In West Virginia, for example, the state legislature has advanced policies that are unfavorable to solar. In a recent article on *Think Progress*, John Christensen, who is a lobbyist for Mountain View Solar, said “There used to be a \$2,000 tax credit for new solar projects, but the state legislature did away with it in the last legislative session” (Valentine & Kroh, 2014). In Los Angeles, the rebate program for residential solar installations was so popular that the applications more than doubled the allotted annual funds of \$30 million. As a result, the city’s Board of Water and Power approved a rebate reduction starting January 1, 2011, and extending through 2016. This reduction will take the rate from \$3.24 per watt, installed, to \$.60 (Carpenter, 2010). This is a trend across the US, reducing the level of rebates instead of increasing funds to meet the demands on the programs, effectively killing the government investment that could make all the difference in the transition off fossil fuels. State and federal government helping support the renewables industry, the way it supports the oil, gas and coal industries, will give renewables the support needed to compete with fossil fuels at a more equal level.

Geostellar Solar Index has estimated that the rate of return on installing solar panels on a typical home is higher than that of the annual growth rate of the S&P 500 over the past 50 years, five year certificates of deposit and 30-year US Treasuries:

The new quarterly index, released by Geostellar, shows the Northeast and Mid-Atlantic states offer the highest Internal Rate of Return on residential solar energy, an economic analysis that measures and compares the profitability of investments, with profits as high as 24 percent per year over the 25-year life of the solar array. By comparison, the S&P 500 has shown a 9.9 percent Compounded Annual Growth Rate over the last 50 years, 30-year U.S. Treasuries have a current yield of 3.7 percent, and five-year certificates of deposit (CDs) typically return just 0.75 percent annually. (2013)

Factors affecting these rates are the region of the country, amount of sunlight available, the efficiency of the solar panels installed, the initial cost of the system, available subsidies, and the local kilowatt rate of conventionally generated electricity in the region. This high return potential can serve to make installing a photovoltaic system more attractive. Viewing these systems as a form of long-term investment can broaden their appeal to individuals who would not normally see solar panels as a product of interest. The challenge is getting this information in the hands of the general public (“Geostellar; New geostellar solar energy index,” 2013).

Efficiency of a fuel source has implications beyond just price per unit; the space required to store or collect the fuel also has to be taken into account. The amount of fuel required to do a particular amount of work has to be factored into any equation where power production and consumption is involved. Photovoltaic solar collection systems are much less efficient than

fossil fuels, as stated on an MIT web page, “Right now, the average for solar panels is only 15-21 percent” (“How many solar panels do I need?,” 2013) Three-quarters of the energy is being wasted, graduate engineer student Mailoa says, because “the efficiency limit of a solar cell is fundamentally limited by its material properties” (qtd. in “How many solar panels do I need?,” 2013). Coal, on the other hand, which is the single largest source of electricity in the U. S., has a much higher efficiency rate. According to *Fresh Energy*, “The most efficient, modern coal plants are able to convert coal to electricity with approximately 37 percent efficiency...” (“The Energy We Don’t Use,” 2012). The low efficiency of solar panels means the space required to power a typical family home is also significant. The requirement for a large number of solar panels leads to the conclusion that there may not be enough space to contain all the panels required to fully power a residence, and a homeowner will still be reliant on other forms of power generation.

High initial investment cost has plagued the industry and looks to be an issue into the foreseeable future. What seems to be an active disinvestment in the solar industry by state and federal government only serves makes this situation worse. These high costs are due in part to the fact that solar power, in its current form, is a relatively new technology, and companies do not have the resources to offer systems at lower costs and still make a profit. The typical solar panel collection system on an average size family home can cost \$30,000 to \$40,000, well above what the average homeowner can afford. Even when viewed as an investment, the time required to achieve a “break-even” point can make potential investors balk at the extended time frame, upwards of 20 years or more, “... it would take the average American 364 months or around 30 years before the cost of the solar panels are justified!,” (“Do Solar Panels Really Save,” 2012).

The time and effort associated with constant maintenance of solar panels to maintain a clean surface could make these systems less attractive to some individuals. The drop in voltage output when panels become dusty means that they need to be regularly cleaned if maximum power production is to be maintained. For adults who are healthy and active, the continual maintenance may be just an inconvenience; however, for individuals of advanced years, the regular cleaning required may be impossible.

Considering that solar power panels produce power by collecting photons emitted by the sun, clear skies are a must to get the full potential out of photovoltaic systems. This reliance on the weather makes power generation less predictable than using fossil fuels. Cloud cover, rainy days and snow can all have a negative effect on the power output of a solar collection system. The reduction of output means some other form of power production will have to make up the difference:

Skeptics of solar and wind power warn of their fluctuating output. But the grid can cope. Just as it routinely backs up nonworking coal fired and nuclear plants with working ones, it can back up becalmed wind turbines or darkened solar cells with flexible generators....("A Farewell to Fossil Fuels," 2012)

While it is true that solar power has its issues, namely with inefficiency, maintenance requirements and weather reliance, the potential benefits of solar far out-weigh the negatives. Moving the US closer toward energy independence, helping to relieve the strain on an aging power grid, facilitating the transition off fossil fuels and the potential as a personal form of investment all combine to make solar power a smart choice for the United States' energy mix. Ideally 100% of residential dwellings would be equipped with some form of power-generating

solar collection system. While 100% is unlikely, a more realistic percentage would fall somewhere close to 100%. With a high percentage of residential buildings equipped with passive solar collection systems, the power landscape in the United States would effectively change from one of fossil fuel dependence to that of renewables. The noteworthy potential of solar power will, unfortunately, not be realized unless state and federal governments get serious about supporting the transition off fossil fuels and make the necessary investments in solar, investments that could make all the difference for the country and the planet.

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