

utilities out of business. That means utilities now have a choice. They can compromise with solar homeowners and find a way to make peace. Or, they can continue to fight rooftop solar, and risk losing their control over America's electricity system altogether, meeting much the same fate as King George III, whose stubbornness helped him to lose his American empire.

# Three

## WHY SOLAR IS PATRIOTIC

*There is a certain enthusiasm in liberty,  
that makes human nature rise above  
itself, in acts of bravery and heroism.*

—ALEXANDER HAMILTON

If you accept that patriotism is a love for the place where you live that always tries to make that place better, then it's easy to see how helping to spread solar power around the country is one of the most patriotic things you can do for America today.

Everybody knows that America has an energy problem. No matter how cheap they may be today, prices for the fossil fuels that provide most of our energy have

been high in the past. And they're certain to go up in the future. But even while energy is relatively cheap, getting that energy from fossil fuels hurts America in many ways. Replacing dirty energy with clean solar power increases America's security, health, and independence on every level. Just as solar gives our nation freedom from foreign energy sources, so solar also gives families freedom from control by monopoly electric utilities.

## Solar Fights Climate Change

Burning fossil fuels including coal, oil, and natural gas makes climate change worse. Hotter temperatures have already led to flooding in coastal areas, stronger storms, drought in some places, and flooding in others. Climate change may not have *caused* hurricanes and storms like Katrina that devastated New Orleans in 2005 and the hurricanes that hit in 2017, including Harvey that flooded Houston, and Maria that wiped out infrastructure including the electric grid in Puerto Rico. But climate change made those storms *stronger and deadlier*.

In the future, the effects of climate change on Americans will vary by state, and will be felt most strongly by low-income families and children, the elderly, and others vulnerable to heat stroke and tropical diseases that will start to expand into northerly areas.

This book isn't going to go over climate science, so if you don't believe in climate change you're welcome to skip down to the next heading. But if you happen to be someone who considers yourself a conservative and if you have doubted climate science in the past, then I hope you'll consider this story. It's about a conservative leader who used to think that climate science was a hoax but later changed his mind.

Like most of his Republican colleagues at the time, former South Carolina Congressman Bob Inglis worried that solutions to climate change would hurt the economy, so he simply dismissed the science. Then, after some time out of Congress, in 2003 Inglis decided to get back into politics and run for his old seat.

By now, his son Rob had reached voting age, but he gave his dad a shock when he said that he couldn't take his son's support for granted in the future. "Dad, I'll vote for you, but you have got to clean up your act on the environment."

All four of Rob's sisters agreed. So did Inglis' wife Mary Anne.

Inglis took his family seriously as a constituency, and so he decided to dig deeper into the issue of climate. As it turned out, his research went far beyond doing a few Google searches.

In the next few years, Inglis wound up on a couple trips to Antarctica to see ice-core data and saw that carbon dioxide, the main greenhouse gas, was at steady levels for millennia until it showed a sharp rise in the Industrial

Revolution. He even went scuba diving off the Great Barrier Reef, viewing devastating coral bleaching with an Australian climate scientist who shared Inglis' religious faith and love for God's creation.

After that, the conservative Congressman became convinced that climate change was real, that it was a major threat both to the environment and to civilization, and that humans were the main cause. That's when Inglis became an advocate for climate solutions. He even introduced a bill to Congress, the Raise Wages, Cut Carbon Act of 2009, that would impose a carbon tax on fossil fuels and then use the proceeds to reduce taxes for families hard hit by the recession. Inglis' legislation didn't go anywhere in Congress. But unfortunately, his support for climate solutions did hurt him with voters back home when he ran for reelection in 2010. At some town hall meetings, people booed when he tried to talk. Inglis lost to challenger Trey Gowdy in a runoff election by 71 to 29 percent.

But Inglis was not discouraged. After leaving Congress, he founded RepublicEn, a group for conservatives who accept climate science and support free-market solutions. One of those solutions, a fee on carbon, would make it more expensive for fossil fuels to emit carbon into the atmosphere, and would make clean energy cheaper by comparison. Inglis thinks this is the best way to spread solar power, as he explained to me:

The most powerful incentive is going to come when there are economic reasons apparent from our power meters as to why solar makes sense. That's when it's going to really take off. Of course, what we're talking about there is a price on carbon dioxide so we see the true cost of energy. And then we'll see that consumers will pursue their self-interest and they'll be dialing solar installers without anybody telling them what to do. It's going to change the way we do electricity in this country.

As Bob Inglis discovered, the bad news is that climate change doesn't care if you're progressive or conservative. Heat, storms, sea-level rise, and disease will affect all Americans at one time and place or another. The good news is that solar power is a climate solution for everybody—progressives, conservatives, and everyone else.

## **Solar Boosts the Economy**

Even as the economy goes up and down, too many Americans still lack the good jobs that would allow them to enjoy the American Dream of homeownership and financial security for their families. After big manufacturers began outsourcing jobs in the 1970s, few of those jobs have returned to American towns and cities. More

recently, companies have kept their plants here but have replaced workers with robots and more automation. The trend towards automation is sure to continue in the future.

Fortunately, solar is stepping in to help. Jobs in the solar industry grew 17 times faster than the American economy as a whole in 2017, according to the International Renewable Energy Agency.

Most solar workers install solar panels on the rooftops of homes, businesses, and government buildings. Other solar jobs are found in sales and marketing, product development, and engineering. Overall, these days, there are twice as many people working in the solar industry as in the whole coal industry. Even though coal still provides more of America's energy than solar does, these days coal requires fewer workers than in the past. To save money on labor costs, over the last fifty years, coal companies have replaced workers with machines to do jobs like mining and processing coal. As a result of this automation, 40 percent of coal jobs have disappeared since 2011.

Meanwhile, solar is labor intensive, and jobs like installing solar panels on a roof cannot be automated. And while most solar panels are manufactured abroad in China and other countries, installing solar panels on a roof is a job that must be done on site and can't be sent to a foreign country. Even some unemployed coal miners have gotten jobs as solar installers. Job training programs along the lines of Solar Ready Colorado, established in Delta County, an area

where closed coal mines led to high unemployment, are popping up all over the country to help miners, oil workers, and even military veterans transition to careers in solar.

Paying \$20 an hour or more, solar jobs are attractive for many workers. "It seems to be one of the few areas of high-paying, blue-collar jobs — and you don't have to learn to code," Bryan Birsic, CEO of Wunder Capital, told CNN Money.

## **Solar Gives America Energy Independence**

While some of America's traditional energy sources, such as coal, are domestic, one of our most crucial energy sources today relies heavily on imports—oil.

Even as more people have gone solar at home and the solar industry has created more jobs, four decades after the energy crisis of the 1970s, America continues to depend on the same countries in the Middle East to provide much of our crude oil. Some people don't think there's anything that solar power can do about that, since most solar power provides electricity but most oil is used for transportation. After all, you can't fill up the tank of your gasoline car with electricity. Of course, if you have an electric car, it's a different story. That's where solar comes in. But first, let's talk about the problem of America depending on foreign oil.

Middle Eastern countries such as Saudi Arabia, Iraq, and Iran are breeding grounds for terrorists seeking to

attack the United States. Ironically, much of the funding for terrorist training and operations in the Middle East comes from the very oil that Americans buy to run our cars, trucks, and airplanes. It's a tragic fact that, in buying Middle Eastern oil, Americans are unintentionally paying people who want to do us harm. It's much the same situation in other countries like Nigeria or Venezuela that also supply oil to the United States. We send them billions of dollars a year for oil, and some of that money always seems to find its way into the hands of dictators, radical political groups, and violent religious extremists who recruit young men with the slogan "Death to America!"

When the United States is dependent on foreign oil, then there's always a chance that our country will get tangled up in conflicts like the two wars in Iraq or even suffer another energy crisis like that of the 1970s. The last time energy prices spiked, in 2007 and 2008, our country faced the Great Recession where millions of workers lost jobs and families lost homes in communities across the nation.

Oil, coal, and nuclear power companies offer their own solutions for America to achieve energy independence. These ideas, which involve using more of their product, might be good for their CEOs and shareholders. But they're bad for America in many ways.

Well, we've heard plenty of big talk from the dirty energy industry about producing more fossil fuels at

home, especially coal and natural gas. But since fossil fuels create so much pollution and because their supply is limited, doing more mining and drilling domestically is not a long-term solution to make the United States energy independent or to make America a better, healthier place to live for its citizens. Coal is on its way out just because other energy sources are more affordable. And natural gas is more polluting than the industry would have us believe. With methane gas leaks at gas wells, natural gas has turned out to be as polluting as coal.

The biggest non-fossil fuel option, nuclear power, has always been dangerous to operate, and plagued by unmanaged radioactive waste that will last centuries. And despite a short-lived nuclear "renaissance" over the last few years, now it's become too expensive to build new nuclear plants, with most new projects put on hold or cancelled outright. Once touted as able to produce electricity that would be "too cheap to meter," today, additional nuclear power would not be able to compete on price with solar and wind.

Now, back to oil. In the United States, 70 percent of all oil is used for transportation. This means that, if we can start to run more of America's vehicles on electricity powered by solar, then we can greatly cut down our use of oil, especially foreign oil.

The growth of electric vehicles powered by solar could end all growth in demand for not just coal but also

oil around the world by 2020, according to researchers at Imperial College in London.<sup>8</sup> Meanwhile, other researchers predict that one out of three American cars, trucks, vans, and buses could be electric by 2030. Major automakers have started making and selling electric vehicles with a sticker price comparable to the cost of a gasoline car.

Battery technology is rapidly improving, with new model electric vehicles able to run for 200 miles or more on a single charge. And some car companies, including General Motors and Volvo, have pledged to phase out gasoline and diesel cars altogether and start making only electric cars in the future.

## Solar Makes the Electric Grid More Resilient

In the spirit of patriotism, solar is as good for America's electric grid as it is for individual households. The electric grid of poles, wires, and other equipment needed to move electricity from where it's produced to where it's used is essential to provide the power that homes and businesses need every hour of every day to run modern civilization. But this grid is vulnerable to many threats, from damage in storms to attacks by hackers and terrorists.

The Hill newspaper outlined a "nightmare scenario" if the grid went down<sup>9</sup>:

Stores are closed. Cell service is failing. Broadband Internet is gone.

Hospitals are operating on generators, but rapidly running out of fuel.

Garbage is rotting in the streets, and clean water is scarce as people boil water stored in bathtubs to stop the spread of bacteria.

And escape?

There is none, because planes can't fly, trains can't run, and gas stations can't pump fuel.

For something so important, the electric grid is surprisingly vulnerable to threats both big and small. Start with trees. On a hot day, power lines can sag and make contact with a nearby tree branch, causing an increase in current that can lead to a cascading failure that can produce a blackout in a local area. Overgrown trees around power lines were one of the causes of the Northeast Blackout of 2003 that shut down power for 55 million people in eight eastern U.S. states and the Canadian province of Ontario.

A software bug was another cause of that blackout. Unfortunately, the software that runs the electric grid is especially vulnerable to bugs since it's both complex and old—much of its code was written decades ago. Aging utility software is vulnerable to bugs and human error of operators. It's also vulnerable to a malicious attack by terrorists.

This is not a movie scenario, but something that has happened in real life. In 2015 hackers associated with the Russian government made a coordinated attack on the power grid of neighboring Ukraine, cutting electricity to a quarter million people. Since then, hacker attacks on Ukraine's grid have continued. China, Iran, North Korea, and even the terrorist group ISIS may also have malware capable of attacking America's electrical grid.

The U.S. grid would be harder to take down than the grid in Ukraine or other nations, experts say, but our electric grid would also be harder to bring back up once it's down. In the event of a major attack on the grid, large portions of the country could experience power outages for days, weeks, or even longer. The grid remains the most popular target for foreign hackers in the whole American economy according to *LIGHTS OUT: A Cyberattack, A Nation Unprepared, Surviving the Aftermath*, a book published in 2015 by veteran journalist Ted Koppel.

Yet cybersecurity experts quoted by Koppel say that federal authorities and electric utilities are not taking cyber threats to the grid seriously enough.

It's easy for hackers to target the software that runs the grid since the hackers just have to get into one of several dozen large computers around the country to get access to the whole grid for several states. In the same way, it's easy for terrorists to target major utility infrastructure like natural gas plants or electrical substations, because

those centralized facilities are easy to find. And terrorists only need to attack one centralized facility to create major havoc for millions of households and businesses. That's the problem with the traditional centralized electricity system that developed in the United States starting in the nineteenth century. Antiquated grid and power generation technology still in operation leaves the power grid vulnerable to hacker and terrorist attacks today.

Fortunately, there's an easy solution to make America's electricity system more resilient—rooftop solar power. Distributed on rooftops and in backyards all over the country, thousands of small solar arrays make difficult targets for terrorists. And even when distributed solar arrays are connected to the grid, modern software renders them a much less attractive target to hackers than a big centralized computer at a utility company office running on legacy software from the 1980s.

As to the ordinary threat to the grid from heavy demand, rooftop solar is also a promising solution. Solar produces the most electricity just when demands for power on the grid are at their highest—on hot summer afternoons when businesses and homes are blasting their air conditioning. Solar that's connected to the grid steps in with extra power when it's needed most. This extra power helps keep costs down and prevents blackouts.

Unfortunately, electric utilities don't usually reward or even recognize the value of solar to the grid. Even

worse, utilities often try to punish homeowners for getting solar by assessing a “standby charge” or other fee just to stay connected to the grid that only solar owners have to pay. Utilities claim that since solar homeowners buy little or no power from the grid during the day while still using the grid as their source of power at night, solar owners are getting a service that they’re not paying for. That makes solar homeowners free riders whose costs must be covered by other utility customers who don’t have solar, according to utilities.

But, as we saw from the Brookings Institution Report mentioned in the previous chapter, this just isn’t true. Solar homeowners actually give much more back to the electric grid than they get out of it.

Just take one example from a sunny state with a lot of homes that have solar, Arizona. For every dollar that solar customers cost the utility company Arizona Public Service, those solar homeowners provide \$1.54 worth of value to other customers of the utility. That’s because solar homeowners offer their neighbors several important benefits, according to a study by the Solar Energy Industries Association:

Benefits include savings on expensive and polluting conventional power and power plants; reduced investments in transmission and distribution infrastructure; reduced electricity lost during

transportation over power lines, as distributed solar power is generated and consumed locally; and savings on the cost of meeting renewable energy requirements.

Solar homeowners are not free riders on the electric grid. Instead, they’re the patriots who have invested their own money to help make the grid more resilient for everybody, all while saving their neighbors money.

## **Solar Makes Families More Resilient**

For most American families, their electricity bill is their second highest monthly expense at home after their mortgage or rent. Solar can save families large amounts of money on their electric bills. In hot areas like the Southwest with high air conditioning bills, solar at home can save a family thousands of dollars a year. Even in cooler, less sunny places like New York State or Massachusetts, solar has become popular because it still saves families money. Taking control of their electric bills is an important way for families to gain more financial security and autonomy.

Solar also makes households more resilient by offering them backup power in case of the kind of grid failure we talked about above. Even in the case of an ordinary blackout that only lasts a couple hours or a couple days, if solar

homeowners install batteries, they can keep the lights on even if the power goes down. Today, because of high costs for batteries, most homes with solar are connected to the grid without batteries. As a result, these homes don't have the ability to get power during a power outage. When the power goes out, a home solar system also cuts off and stops sending power into the grid. This is a safety measure to protect utility workers who may be working on nearby power lines.

If you add batteries to a home solar system, then you can get around this issue. In that case, when the grid goes off, the solar system can switch over to the batteries, and keep producing power. As battery technology becomes better and cheaper, more homes will have the ability to toggle back and forth between the grid and their own batteries. At some point, homes may even forgo connecting to the grid altogether. Utility companies won't like that, because it will cost them customers and profits, but solar with storage can allow families to cut the cord from their local utility, gaining them energy independence on the home level.

If monopoly utilities keep fighting against rooftop solar, in the future, more electricity customers may just decide to leave their utility behind and go totally off grid using solar with battery storage.



### FROM THE REVOLUTION: SONS OF LIBERTY

In response to attempts by King George's government ministers in London in the 1760s to impose new taxes on the American colonies, Samuel Adams and other patriots in New England started the Sons of Liberty to stand up for American traditions of self-government. The group began as a semi-secret club of patriots that led boisterous street demonstrations in Boston and New York, later spreading to Virginia and the Carolinas.

To be fair, the Sons of Liberty could be rough. But they were effective. "Through the use of mob rule, tactics of fear, force, intimidation, and violence such as tar and feathering, and the stockpiling of arms, shot, and gun powder, the Sons of Liberty effectively undermined British rule, paving the way to America's independence," according to the Boston Tea Party Museum.

The Sons of Liberty later morphed into or helped inspire more respectable groups throughout the colonies, such as the Committees of Safety and the Committees of Correspondence, composed of leading citizens who helped colonies work together to coordinate boycotts and other protests against King George's new taxes. These groups matured into shadow governments for each colony

that went on to take control away from royal officials in the early days of the Revolution.

Because of the revolution that the Sons of Liberty helped start in the 1770s, which ultimately gave Americans the democracy that we enjoy today, today's solar patriot does not need to resort to such rough tactics. Yet, the example of citizens across the country banding together to fight a seemingly unbeatable power and win against long odds is one that can inspire solar homeowners to stand shoulder-to-shoulder against monopoly utilities that would attack solar rights.

The Sons of Liberty can also inspire solar advocates to take up creative and powerful tactics hearkening back to the group's most famous action—the Boston Tea Party, which we'll cover in the next chapter.

# Four

## WHY YOU ARE THE BEST ADVOCATE

*A good example is the best sermon.*

—BENJAMIN FRANKLIN

**A**ctions speak louder than words. Many types of people advocate for solar power. These include environmentalists, solar industry representatives and employees, and local citizens. Their work is important. But unfortunately, they lack the credibility that you have as a solar homeowner. That's why they need your help!

It's a proven fact that solar spreads more quickly when neighbors can see that at least one neighbor has gone solar already. People who own solar companies already know this. That's why they tell their door-to-door salespeople