

KNOWLEDGE IS POWER

A SPECIAL REPORT FROM **JONATHAN SCOTT**
AND **THE CLIMATE REALITY PROJECT**



The Climate
Reality Project®



Knowledge **IS POWER**

What if the power went out and didn't come back on?

Most of us have experienced temporary blackouts, during a summer heat wave when a city's electrical grid gets overloaded, for example, or when falling tree branches take down power lines during a bad storm.

We swelter without our air conditioning, or pile on blankets and let the dog sleep on the bed until the furnace hums back to life. We cook all the frozen food on the verge of defrosting, bicker over who forgot to put batteries in the flashlights, and try to figure out how to reset the garage-door opener once things are back to normal.

But what if normal didn't come back?

What if the lights stayed off?

Maybe this merely sounds like the plot of a dystopian novel — a world without electricity. No way to charge computers or telephones. No TV to watch the news. Hospitals pitched into darkness. Factories idle. Subways and commuter trains silent. Air traffic grounded. Elevators inoperable. Grocery stores unable to keep any perishables.

With the figurative flick of a switch, every modern convenience we know could be rendered useless. We would be forced to live as we did over 100 years ago, before the electrical grid we rely on was built.

Here is another “what if” to consider:

What if you’re already living in a different kind of darkness, because what you’ve been told about the world’s energy supply is a lie? What if there are safer, cheaper, more reliable, and more plentiful options out there than the fossil fuels that rule our geopolitical landscape, threaten our health, and disrupt the environment?

The simple, undeniable fact is this: The sun can provide more energy in an hour than all of humanity uses in a year. We’re talking about an inexhaustible supply of clean, safe, reliable power that everyone across the planet is entitled to access, and anyone potentially could and should have the right to generate and sell back to the grid.

Most Americans don’t give a second thought to how we power our everyday lives, and probably don’t even realize that we live in a world where almost 1 billion people are still forced to live without electricity. Meanwhile, those of us fortunate enough to have it at our fingertips are denied free choice over generation types, and are hostage to prices that fluctuate considerably based on supply, demand, and — too often — corporate greed.

So why aren’t we investing in a future that would fulfill our energy needs by ultimately serving the largest number of people in the cleanest, most-democratic, and least expensive way?

Because fossil fuel utilities make billions of dollars from their dirty energy monopolies while the rest of us pay the consequences.



The simple, undeniable fact is this:

**THE SUN CAN PROVIDE MORE
ENERGY IN AN HOUR THAN ALL
OF HUMANITY USES IN A YEAR.**



Copying the propaganda playbook of the tobacco industry, fossil fuel utilities have been funding misinformation campaigns for decades to keep the public in the dark about how much damage fossil fuels cause both the planet and its people. Their deception disregards polluted air and the respiratory illnesses people suffer as a result, and mocks the scientists and worried citizens who fear our carbon emissions have triggered significant and dangerous changes in our climate. They cling to all kinds of woefully outdated and false notions about renewable energies, perpetuating the same myths over and over in the face of all facts.

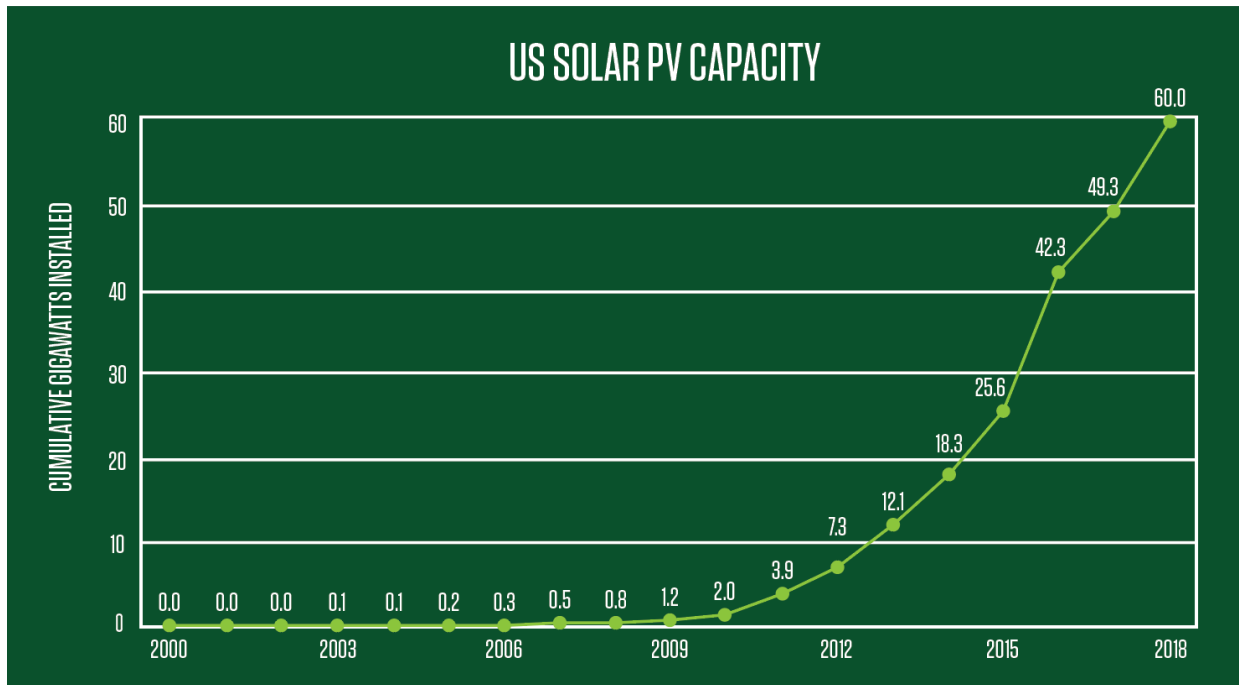
But here's some real news: Knowledge about our electricity is real power, and the truth is finally starting to shine through all this darkness.

THE SOLAR REVOLUTION IS HERE

For the past 25 years, the solar energy industry has ridden the wave of what some have dubbed a “sun rush,” with innovation and technology booming and prices plummeting. Images of “tree-huggers” insulating homesteads by hanging plastic jugs of water along the roof have long since been replaced by picturesque suburban communities powered entirely by solar. Whether it's homeowners installing solar panels on their rooftops or apartment dwellers reaping the benefits of solar energy through community solar facilities, there's no question that clean, renewable energy is in high demand.

On the corporate front, the Solar Energy Industries Association is seeing American businesses investing record amounts in solar as companies [such as](#) Target, IKEA, Kohl's, and Costco pursue their goals of shifting to 100 percent clean energy. States like California, New Jersey, Hawaii, and New York have set aggressive timelines for increasing their reliance on renewables.

PV SOLAR IS EXPLODING ACROSS THE US



Sources: <https://bit.ly/2EX8m5v>, <https://bit.ly/1TAUBwP>

In fact, so far 29 US states, Washington DC, and three territories have adopted a Renewable Portfolio Standard, which requires that a specified percentage of the electricity that utilities sell comes from renewable resources. California's new law mandating carbon-free energy generation by 2045 makes the Golden State the world's largest economy to make such a commitment.

In 2018, [a new solar project](#) was installed every 100 seconds in the United States. Total solar capacity is expected to double in size by 2023, boosting state revenues and creating numerous new job opportunities. Innovators and entrepreneurs large and small have normalized greener lifestyles (like the solar panels helping to generate power at scores of neighborhood elementary schools and churches) and made them more exciting. Consider the potential impact worldwide of something like Stanford University's miniscule solar filters, which [purify water](#) in 20 minutes compared to four to 48 hours typical UV purification takes.

Despite promising advances, though, the solar future is still hampered by stubborn myths and misconceptions as well as very real obstacles in both the political and scientific arenas. So let's talk about what's really going on, because once you have the facts, you'll see for yourself how and why powerful special-interest groups with dubious agendas are trying to manipulate us all.



First, **THE BASICS**

What exactly is solar energy, and how does it work?

The two main types of solar technology are photovoltaics, also known as PV, and concentrated solar power, or CSP. Photovoltaic panels are what you see around you every day – on rooftops, arrayed en masse on the ground in utility-scale solar farms, or set up in smaller installations like those used to power stoplights or the road signs that flash your speed as you drive past.

With PVs, sunlight is absorbed through glass panels containing a layer of semiconductor material — often silicon — that naturally frees electrons to create a current of electricity, which is then fed through an inverter onto the grid. Concentrated solar power (CSP) is strictly utility-scale at this point. A CSP tower uses mirrors or reflective devices known as heliostats to capture the sun’s heat to generate thermal energy, which creates steam that then turns turbines to produce electricity. (Traditional utilities burn coal or natural gas to create the steam for their turbines.)

Among the biggest benefits of CSP is its ability to store thermal energy and use it as needed to keep the turbines turning after the sun goes down, which is typically when consumer demand for electricity peaks as workers return home and appliance use ratchets up. Relying on renewables to help handle that spike means less dependence on small “peaker plants” that continuously burn fossil fuels on standby so utilities don’t have to keep firing their massive central power plants on and off.

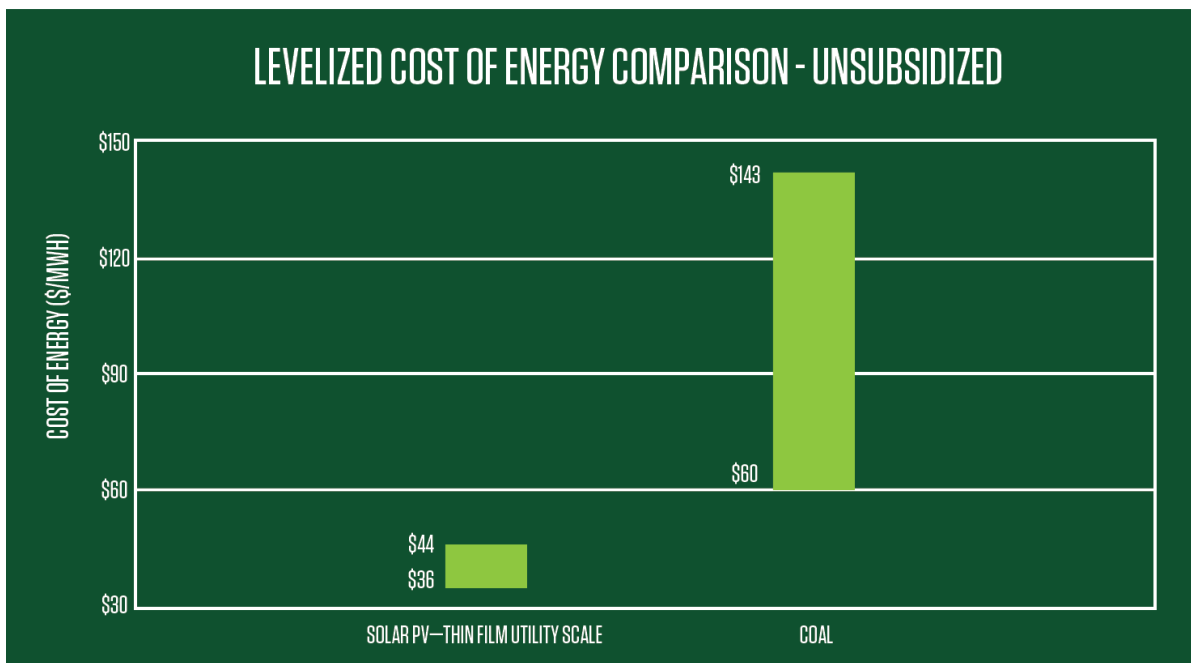
Both PVs and CSP use the nation’s existing electrical grid to deliver power to consumers. Unlike fossil fuels, prices for solar power don’t fluctuate wildly or unpredictably, because solar costs are tied to technology rather than to a commodity such as coal or natural gas.

Levelized Cost of Energy (LCOE)

It is often difficult to directly compare costs associated with generation technologies because there are big differences in capital costs, length of operation, maintenance, permitting and licensing, and much more. Enter the Levelized Cost of Energy (LCOE) metric, which analyzes how all those costs associate with a single unit of electricity to allow an “apples-to-apples” comparison.

The metric is an assessment of all costs to build, operate, and maintain a power-generating asset over its lifespan divided by the total energy output that technology produces. It allows for a standard method to compare technologies directly, even when their cost structures are entirely different.

The gold standard here is undertaken by the consulting firm Lazard, which recently released its annual analysis of the LCOE in the US for 2018. The firm found that even without subsidies **utility scale solar and wind are now cost competitive with conventional generation technologies, particularly coal**, as shown in the diagram below:



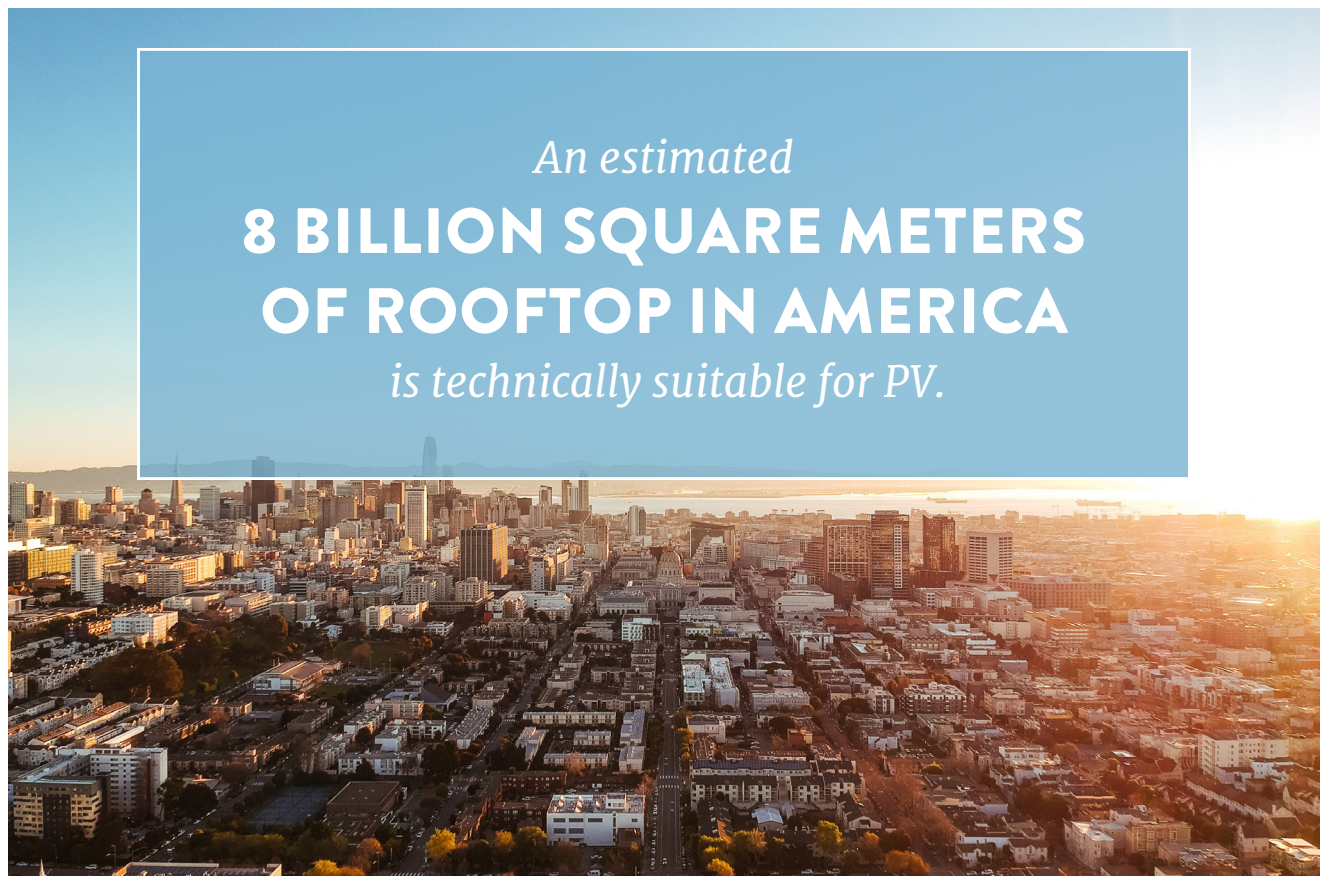
Source: <https://bit.ly/2POeolq>

FIRST, THE BASICS CONTINUED

Just like personal computers, once the technology advanced past the developmental stage, solar PVs became both more efficient and more affordable, and growing demand continues to drive prices down. [Industry statistics show](#) that the price to install an average-sized residential solar system fell from \$40,000 in 2010 to under \$18,000 today, before incentives.

In 2018 alone, 314,600 American homeowners installed solar panels, and industry experts predict that the market will double over the next five years. But that doesn't even begin to tap the full potential of rooftop solar: A comprehensive study by the US National Renewable Energy Laboratory determined that an estimated 8 billion square meters of rooftop in America is technically suitable for PV. If all of that surface were put to use, theoretically, the amount of power generated courtesy of the sun would equal about 38 percent of the total electricity being sold today by utilities across the country.

For big fossil fuel companies and their backers, all of this spells competition, and in the face of this new energy revolution, their propaganda machines have kicked into overdrive.





Deceptive **TACTICS**

1. MISINFORMATION CAMPAIGNS

When Arizona voters were asked recently to decide whether the state should be required to get half of its electricity from renewable, non-nuclear energy sources, the largest utility company in the state, Arizona Public Service, spent more than \$30 million on a misinformation campaign to defeat the proposition in what became the most-expensive ballot fight in state history. In Louisiana, the power company Entergy was fined \$5 million last year for [hiring professional actors](#) to feign public support at a New Orleans city council meeting for a proposed \$210 million natural gas plant in that city.

Consider the fact that some of the states with the least sunshine, like Massachusetts and Vermont, rank much higher in terms of the percentage of electricity they generate from solar than states like Oklahoma and Kansas, which are among the top 15 states for amount of sunshine but are also in the bottom 10 for percentage of electricity they're getting from solar. Why is that upside-down? Because what happens in the statehouse has more bearing on solar energy in America than what happens in the sky.

2. EXAGGERATE IMPACT ON WORKERS

On the national level, one of the most manipulative tactics the dirty-fuel faction uses on the public is to vilify solar and other renewables for supposedly taking food out of the mouths of hard-working coal miners and their families.

US employment in coal mining [peaked](#) in 1923, when 883,000 workers were

employed, compared to [just 53,000 today](#) in an industry **propped up by \$20 billion in federal and state subsidies**. Despite its steady decline, however, coal isn't in as dire straits as many other industries. As a matter of fact, coal didn't even make the list of the top 25 dying industries USA TODAY compiled using Department of Labor Statistics from 2008 to 2017.


Coal has been mined for fuel in the Americas since the Aztecs, and coal is what carried us into the Industrial Age. There's no question that it holds an important place in our history, and the generations of miners who sacrificed their own health to power a nation deserve respect and gratitude.

3. BLAME RENEWABLES WHEN INDUSTRY TRENDS ARE THE REASON

What they also deserve is the truth, because it's not the miners' bank accounts the profiteers are worried about. Lobbyists may lie, but Department of Energy numbers don't: King Coal in fact lost its dominance of the US energy market not to any renewable energies, but to another fossil fuel — natural gas. And miners have lost their jobs mainly because coal companies have been replacing them since the 1980s with mechanization and explosives, in the process dynamiting the tops off hundreds of mountains across Appalachia.

What tipped the balance and put coal in second-place as the nation's electricity supplier in recent years was the advent of fracking, a cheaper, easier method of extracting gas from deep underground. The controversial practice uses a high-pressure mixture of water, sand, and chemicals to blast through rock.

While proponents correctly point out that natural gas is cleaner than coal (it emits about 50 percent less CO₂), it still emits greenhouse gases (GHGs) at a time when we need to be working toward net-zero emissions, and fracking adds a whole new layer of air and water contamination.

An aerial photograph of a wooden bridge spanning a river. A dark-colored car is driving across the bridge. The surrounding area is lush with green trees and vegetation.

Each year, solar energy generation offsets as much CO₂ emissions as:

- 1. PLANTING ABOUT 1.2 BILLION TREES.**
- 2. TAKING 15.6 MILLION VEHICLES OFF THE ROAD.**

Source: <https://bit.ly/2qhg5p0>



US ELECTRICITY IS GETTING CLEANER AND GREENER

Every year, the United States [generates](#) some 4 billion kilowatt hours of electricity. The most recent statistics show that fossil fuels comprise 63.5 percent of that total, with 35.1 percent coming from natural gas and 27.4 percent from coal. Nuclear energy accounts for 19.3 percent. Renewables — primarily hydropower, wind, and solar — make up the remaining 17.1 percent. Renewables [are on track](#) to surpass coal and nuclear before 2030.

CLEAN ENERGY CREATES GOOD JOBS

Perhaps the biggest myth-buster here is what solar generates besides electricity: Jobs.

Far from casting legions of hard-working people into unemployment, as coal and other pro-fossil fuel lobbyists would have you believe, the booming solar industry is creating steady work and bright futures for hundreds of thousands of Americans at every skill level, from high school dropouts to PhDs.

The latest [National Solar Jobs Census](#) shows *significant* expansion of the industry over the past eight years, suggesting that solar will continue to be a source of stable, well-paying careers. From 2013–2018 alone, the solar economy grew **six times faster** than the overall US economy, adding some 100,000 jobs to the national workforce. One in every 124 new jobs created in the United States in that time span was in solar.

Today, over 240,000 Americans [work in the solar industry](#), with the median wage for installers at \$32 hourly for mid-level workers. Among them are hundreds of veterans provided free training and apprenticeships through the federal SunShot Initiative.

What these trends and the science driving them tell us is that solar energy should no longer be treated as an outlier in our energy portfolio.

WHERE DO WE GO FROM HERE?

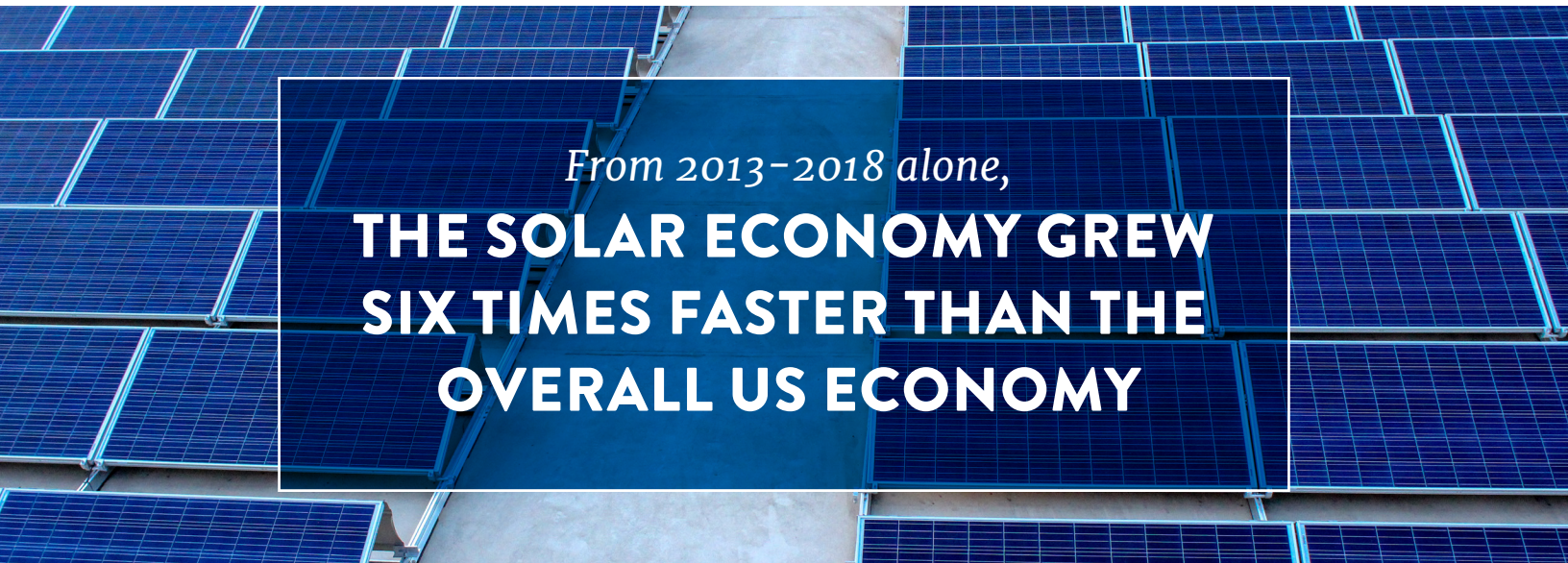
Right now, solar energy is in transition, claiming its rightful place in the mainstream as researchers around the world advance the technology in ways we never could have imagined.

NEW MATERIALS AND USES

New materials are being developed to make solar cells lighter, thinner, and flexible enough to be applied directly to the sides of buildings, or as a transparent film on windows. Roof shingles with built-in solar cells are already being manufactured by a handful of US companies. Solar sidewalks, solar bike paths, and solar roadways are generating power in modest pilot projects around the world, and solar canopies over parking lots are popping up more and more in the United States.

The city of Santa Cruz, California [shaves](#) \$73,000 annually off its electric bill thanks to the solar carports it erected over parking lots at city hall and the police department. The excess power the canopies generate in the summer is credited at peak rates to offset power costs at night. Over their expected 25-year lifespan, those two modest, no-maintenance carports will reap the city several million dollars in savings.

Solar technology isn't limited to structures, though. Researchers from Vanderbilt University, the University of Texas at Dallas, and Georgia Institute of Technology in Atlanta all [report](#) promising results in their experiments weaving microscopic solar cells into energy-harvesting yarns. That's right: Electric clothing. Someday your shirt may charge the cellphone in your pocket with voltage created by sunlight and motion from you simply drawing breath.



From 2013-2018 alone,

**THE SOLAR ECONOMY GREW
SIX TIMES FASTER THAN THE
OVERALL US ECONOMY**



ENERGY STORAGE IS THE KEY

Still, for all the exciting and rapidly unfolding advances in solar technology, the race is still on to achieve the Holy Grail for renewables: Storage.

Sunlight may provide a freely replenished source of clean energy, but it's also intermittent – there's no way to harvest it at night and it's much less efficient with heavy cloud cover. In an ideal scenario, utilities would be able to save sunlight to use at the proverbial push of a button whenever the grid needs it most.

In California, where state clean-energy mandates have spurred rapid growth of solar, an excess of electricity generated in the middle of the day sometimes has to be unloaded from the grid at a loss because it's more economical to keep power plants running than to shut down and later restart when demand picks up. The ability to store that excess solar electricity instead of discharging it at a loss would alleviate the need to rely on polluting natural gas plants after sundown, plus it would give solar the kind of consistency and resiliency needed to truly compete with fossil fuels or nuclear power.

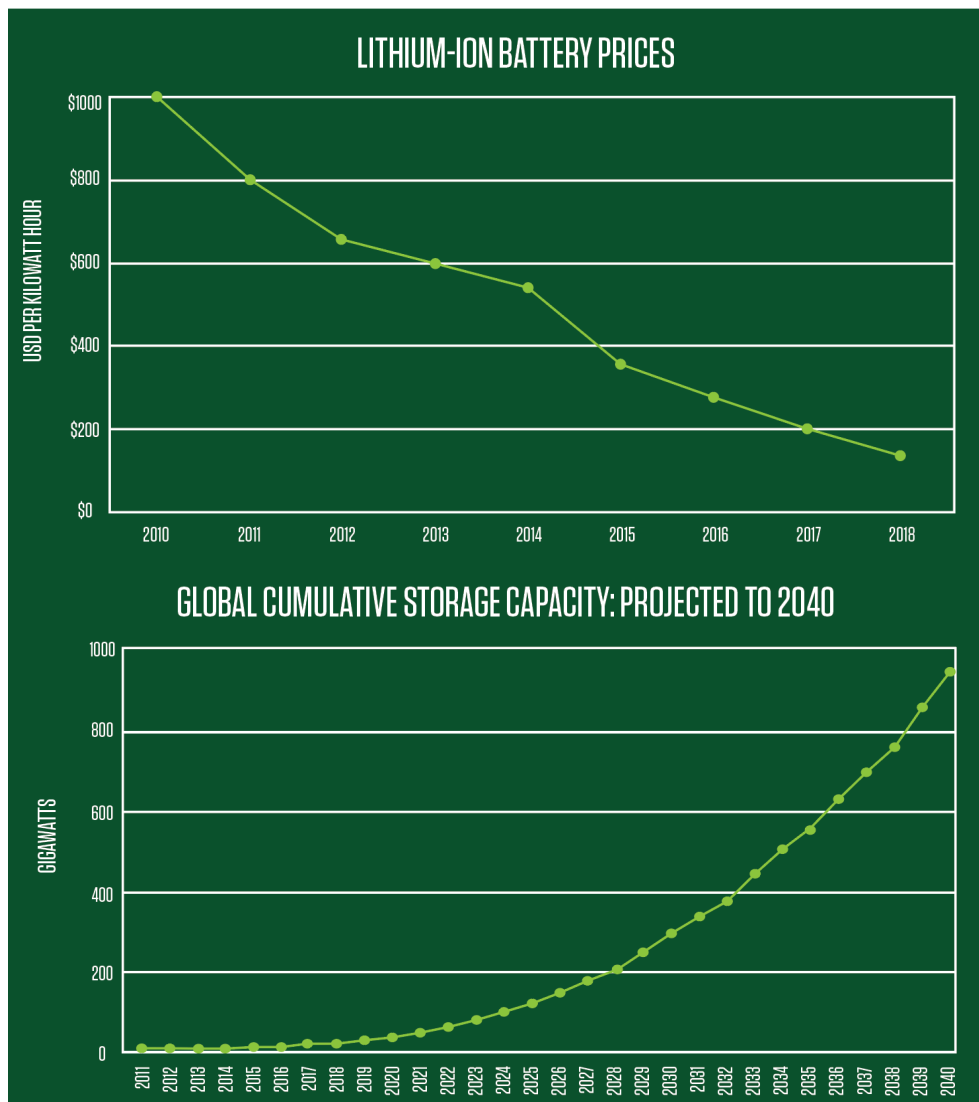
To date, the largest battery that exists is Tesla's 100-megawatt giant, which CEO Elon Musk unveiled to great fanfare last year in Australia. But that record may soon be shattered.

Florida Power and Light (FPL) [announced plans](#) just last month to build a 409-megawatt battery system (the equivalent, the company noted, of 100 million iPhone batteries). Charged by an existing FPL solar plant and slated to begin serving customers in late 2021, the utility expects its behemoth battery to accelerate the retirement of two natural gas plants, eliminate more than

1 million tons of carbon dioxide emissions, and save customers more than \$100 million in costs over 25 years. If all of that comes to pass, Florida, once considered a serious straggler among states in adopting renewable energy, could become a top producer.

But “if” is the operative word. The fine-print in the [utility’s press release](#) announcing its big solar push included a 1,500-word disclaimer basically saying it might never actually happen and they couldn’t be held accountable if it didn’t.

**BETTER, MORE-AFFORDABLE, LONGER-LASTING SOLAR ENERGY
THE COST OF HIGH-QUALITY BATTERIES KEEPS ON FALLING.**



**SETTING THE STAGE FOR A BOOM IN THE INSTALLATION
OF ENERGY STORAGE SYSTEMS AROUND THE WORLD!**

Sources: <https://bit.ly/2HgHyAs>, <https://bit.ly/2QJg9Jp>

UTILITIES ARE JUMPING ON THE BANDWAGON

As battery capacities have gone up and costs have come down, utilities are also starting to sit up and take notice. A Texas power grid operator outlined plans to install a solar farm with a 495-megawatt battery storage system on an oil field outside Lubbock to help power drilling operations. And just a few months after successfully shooting down that Arizona ballot proposition to mandate 100 percent non-nuclear renewable energy in the state, the Arizona Power Service announced plans to add 850 megawatts of energy storage by 2025, so stored solar power can help handle peak demand at day's end. (The utility didn't disclose what percentage of the burden that solar is estimated to cover.)

But even as some big utilities begin to jump on the solar-plus-storage bandwagon, it's important to consider the bigger picture and question whether the hidden agenda might be more about maintaining control over renewables than fully embracing them. The utilities know that we are moving in the direction of renewable energy, so now they're fighting to hold onto their monopolies: They want to be the only ones to produce energy no matter how it's produced. It is cheaper to build wind or solar power plants now than it is to build natural gas or coal, so that makes sense for them. But they continue to fight rooftop solar, because the thought of David producing his own energy terrifies Goliath. Even the huge batteries on the immediate horizon still lack the capacity to provide full back-up for utility-scale solar plants, though, just as the strongest residential battery packs can't currently provide more than a few hours' worth of heavy use power for homeowners with rooftop solar systems.





Fossil Fuels: **A PUBLIC HEALTH CRISIS**

When the world gets warmer and more polluted, the results impact real people's lives. It's a truth that too often gets lost amid data points and science jargon, late-breaking news, and heated political handwringing. But we must not let it.

Put simply, emissions from burning coal, oil, and natural gas exacerbate existing threats to public health and give rise to new ones. However, transitioning from dirty fossil fuels to renewables like solar can help us improve quality of life around the world right now and work toward a healthier, more sustainable future for all.

Fossil fuel emissions not only pollute our air directly with irritants like particulate matter and soot, but as greenhouse gases accumulate in the atmosphere and average temperatures rise, they also contribute to higher levels of ground-level ozone that can cause acute and long-term respiratory problems. Moreover, rising global average temperatures also lead to longer pollen seasons in many places and — when combined with stronger rainfall events, flooding, and higher humidity — create the perfect environment for mold to flourish.

The result? More allergies, asthma attacks, and other respiratory health problems.

And that's just the start. The carbon dioxide driving the climate crisis isn't the only pollutant billowing from power plant smokestacks around the world. There's also lead. And sulfur dioxide. And ozone. You name it.

Moreover, the extraction process for fossil fuels can itself be rife with potential problems.

The process of hydraulic fracturing — aka “fracking” — for natural gas can contaminate groundwater supplies with dangerous chemicals like benzene. A recent report also revealed that nine out of every 10 US coal-fired power plants have reported unsafe levels of at least one coal ash pollutant in nearby groundwater. More than half of those facilities reported unsafe levels of arsenic, a carcinogen linked to multiple types of cancer.

Exposure to these pollutants can be particularly damaging to very young children. Many studies show links between fossil fuel pollution and neurological impacts no parent wants for their child.

The good news is Americans aren't the sort to sit on the sidelines when a pressing-but-solvable threat looms large.

We have a responsibility to the people we love to transition away from dirty, dangerous fossil fuels to clean, renewable energy sources like solar to protect public health and wellness for generations to come. We can be the generation that took on the greatest challenge humanity's ever faced — and won.



Emissions from burning coal, oil, and natural gas

**EXACERBATE EXISTING
THREATS TO PUBLIC HEALTH
AND GIVE RISE TO NEW ONES.**



Case Study:

THE PROMISE OF CRESCENT DUNES

Scientists and energy entrepreneurs are constantly exploring more viable storage solutions, and some intriguing projects are already up and running. Molten salt technology is just one example: In a desolate valley midway between Las Vegas and Reno, 10,347 mirrors the size of billboards surround a glowing 640-foot tower rising like a futuristic Stonehenge from the desert floor.

Mounted on tracks and guided by GPS and software algorithms, the heliostats follow the sun through the day, positioning its beam onto a receiver atop the tower. Molten salt flowing through pipes inside the receiver absorbs the concentrated sunlight, heating it to over 1,050 degrees Fahrenheit.

The salt is the kind you put on your rhododendrons, not your roast beef — it's sodium and potassium nitrates, essentially like garden fertilizer, and it can be either mined or manufactured. Unlike water, which would turn to steam, the molten salt remains liquid, which can then be stored. After passing through the receiver, 10,000 gallons of hot salt per minute flows down piping inside the tower and into an insulated thermal storage tank, where it's kept until electricity is needed. A demand for electricity sends the hot salt through a steam generation system to convert water to high-pressure steam, which in turn drives a conventional power turbine, which generates electricity. The salt then returns to a "cold" holding tank where it's kept at 550-degrees Fahrenheit until it's pumped back up the tower to the receiver to repeat the cycle.

Under a 25-year power purchase agreement with Nevada Energy, [Crescent Dunes provides](#) enough electricity per year to power 75,000 homes day and night purely on solar. It took seven years and a \$737 million federal loan guarantee for permitting, funding, and construction of the start-up, but additional costs such as interest during construction and transmission connections reportedly pushed the price tag closer to the \$1 billion mark.

While Crescent Dunes remains the only utility-scale salt power tower operating in the world today, several similar projects are in various stages of development around the globe.



Case Study: **FALLING PARTICLES COULD BE THE FUTURE**

At the National Solar Thermal Test Facility at Sandia National Laboratories in New Mexico, research engineer Clifford Ho is also working on the next generation of CSP with even higher efficiencies and lower costs. He's doing it by replacing molten salt with the same solid sand-like ceramic particles used in fracking.

In Ho's model, the particles are heated to a minimum of nearly 1,300 degrees Fahrenheit — Ho has gotten them nearly 150 degrees hotter — as they cascade down through concentrated sunlight being beamed through the direct-absorption receiver the scientists compare to a Pachinko board. The particles are directed to storage and a heat exchanger, to be hoisted back up to the receiver via a basic lift or bucket elevator. The higher temperatures mean more available energy, while storage costs drop because less material is needed to transfer heat.

Salt, Ho points out, degrades at around 1,100 degrees Fahrenheit and is too corrosive to be stored at that high a temperature.

The “falling particle” technology has potential beyond utility use, Ho believes. “I can imagine community-scale systems and each home could have its own battery pack,” he told us.

The Cost of Solar and Wind Keeps on Falling... Coal, Not So Much **AND WE'VE REACHED AN INFLECTION POINT**

- In 2018, 74 percent of existing US national coal capacity (211 gigawatts) was considered to be “at risk” from wind and/or solar that could provide the same amount of electricity *more cheaply*, according to [Energy Innovation](#).
- By 2025, that number increases to 246 GW — near the entirety of US coal capacity!



Case Study:

BUILDING COMMUNITY WITH SOLAR

Image Courtesy of Babcock Ranch

Meanwhile, in Florida, a former NFL football player is realizing his own vision of how solar energy can transform communities.

In [one of the largest](#) land conservation deals in state history, Syd Kitson purchased [Babcock Ranch](#) back in 2006 with 73,000 of its 91,000 acres (that's 143 square miles) reserved for preservation. He had a very green dream of building the country's first sustainable "new town" from the ground up. His starting point was solar energy.

"It only took 13 years," he laughs today. That and \$500 million, much of it recouped by selling 73,000 acres back to the state.

AN ILLUMINATING ELEVATOR PITCH

The next big piece of Kitson's sustainability puzzle fell into place in 2006, after he buttonholed utility FPL's CEO, Eric Silagy, in an elevator after an event where Silagy was delivering a speech. Kitson quickly summarized his vision for a new town run on 100 percent solar energy provided by the utility, only to have it shot down as not cost-effective.

In Florida, utilities must get approval from the state public service commission for any new generating plants and have to demonstrate that they are using the least-expensive means for generating more power. Back then, the capital costs for solar were far steeper than natural gas, and the cost of land was a major factor.

"What if I give you the land?" Kitson countered.

"I think that's a fantastic idea. I'll get someone in touch with you right away," came the reply this time.

FROM VISION TO REALITY

Even with Silagy onboard, it took another six years for the price of solar panels to drop low enough — and their efficiency to improve dramatically enough — for Florida Power and Light (FPL) to win approval. Critically, the utility got approval

not only for the 75 megawatt solar array on the 440 acres Babcock donated, but also for two other solar plants elsewhere in Florida on land surrounding existing fossil fuel plants.

In the end, three solar plants went up at once, and as PV prices continued to plummet, the utility was able to build several more.

Under its agreement with FPL, the new town has first dibs on the electricity generated by the 343,000 solar panels erected next door, with any remaining energy then distributed across the grid to the power company's other customers. The result — and Kitson's goal — made Babcock Ranch a bigger provider than consumer of electricity from day one. In addition to powering Babcock's homes and businesses, the utility also provided a cluster of sculptural solar panel "trees" along Babcock's main street, where passersby can stop to charge their phones, laptops, or tablets. There's also free outside wifi throughout the development.

NEXT STEPS FOR BABCOCK AND FLORIDA

In the next few years, Florida Power and Light plans to double the size of its Babcock solar plant. Ten industrial-size batteries have already been installed, with enough juice to operate the plant at full power for four hours. Obviously, that's not enough to operate entirely on solar through the night or on overcast days, but the batteries and the energy they provide add value in another important way. Namely, by replacing dirty electricity from coal and natural gas-fired "peaker plants" that traditionally supply electricity on-demand when usage spikes above the load the grid is carrying.

Since ground was broken in 2016, Kitson reports that over 2,000 lots have been sold to developers to build green homes, and close to 500 houses have been built or are under contract. The fledgling community is projected to [build out](#) over the next two decades with a total of 19,500 homes and 50,000 residents. The town includes 6 million square feet of retail, commercial, and industrial space that could create 20,000 permanent jobs, including a health center that will offer the option of telemedicine.

Half of the development's footprint is set aside for greenways, parks, and lakes, with an emphasis on respecting or restoring natural habitats. All irrigation comes from reclaimed water, and every garage will have built-in wiring for electric cars. Each neighborhood promises community garden plots, and the town includes what Kitson describes as a "living laboratory" for innovative technologies to combat climate change.

“I’ve been to a hundred conferences over the years,” Kitson says, “and it’s time for us to stop with the conferences talking about what we need to do. We’re teaching our kids what this is all about, what this means to our future. It’s time for a call to action.”

“GREEN STEAM” EDUCATION

Ground zero for this philosophy is the Babcock Neighborhood School, a charter public school offering “Green STEAM” education focusing on science, technology, engineering, the arts, and math taught in hands-on, project-based lessons.

Principal Shannon Treece never thought that she would one day be raising her children in a sun-powered sustainable town where autonomous electric shuttles with no steering wheel buzz past “like something out of the Jetsons” and onsite environmental engineers happily agree to dig a 12-foot hole overnight so fourth-graders struggling to grasp geology could peer down to see the different layers of rock for themselves.

When the children are ready to learn about electricity, Treece anticipates a field trip to climb the observation tower high above the vast field of solar panels just down the road. And maybe, she thinks, this will be the generation that will never have to wonder what would happen if the lights went out and never came back on, because the answer, to them, will be obvious.





Jonathan Answers **CLIMATE REALITY'S QUESTIONS**

You and your brother, Drew, have built, bought, and sold houses across North America for the past 20-plus years. From a contractor's perspective, how would you describe the road to clean, renewable energy?

As building technology continues to improve and price points for that technology continue to drop, we will see renewable energy become more and more prevalent in the average home.

I believe we will see battery storage becoming a standard option, and smart systems that will allow you to store produced energy in those batteries or in your electric vehicle when plugged into your home. The prospect of claiming your energy independence, reducing your overhead, and protecting the planet — without even thinking about it — is very exciting!

Solar energy has been around for decades, hasn't it? Why the big push now?

First of all, I think the most crucial piece of the puzzle is public awareness. People have more options than ever before to do the right thing environmentally, whether it's recycling your old computer or putting solar panels on your roof. Until now, solar was considered too expensive to be a viable solution for everybody. But all of a sudden, the amount of energy produced by PV panels has increased substantially and the cost of



those panels has plummeted significantly — making it now cheaper than fossil fuel alternatives at both the utility scale and for residential use.

Do residential solar energy systems require a lot of maintenance?

No, solar systems are fairly straightforward and require little to no maintenance. The panels themselves generally last about 20 years, which is why major corporations and municipalities prefer them. The fixed costs are easy to plan around. Too much dust or debris on the panel surface can reduce energy production, but Mother Nature usually keeps everything clean with the occasional rain shower. Otherwise, you can just hose it down. I live in Las Vegas, and the panels on my house have withstood years of desert sand blowing around without needing any maintenance.

Will my home solar-electrical system work at night or on rainy days?

Though your solar system will not produce energy in the dead of night, it does still produce energy on cloudy, rainy days. In fact, Germany is one of the world's leading producers of solar power, with PVs [contributing](#) as much as 15 percent to the country's power mix in a given month. To put that in perspective, Portland, Oregon, [averages](#) 2,341 hours of sunshine per year, [while most German cities barely top 1,600](#).

What happens during a power outage? Does my solar-energy system just automatically kick in? Even in a storm?

If the grid power goes out for any reason, your power still goes out, unless you have back-up battery packs installed in your home, which I highly recommend.

One exciting trend I'm seeing in the building industry is a presumption that solar will be standard in the near future — new construction often includes installation of a home battery or two now, as well as an option, or, in the case of California, a requirement, to put up solar panels. With one or two unobtrusive battery packs hanging on a wall, you've

got a supply of solar to tap into during an outage. A battery also helps you spread your solar energy into the evening, but keep in mind that most residential battery units right now only cover four circuits in your home, so you'd have to decide what circuits are the most important for you to keep active during a blackout.

Are there ways to access solar power without investing in my own system?

There are many different alternatives, and it's worth checking out what options may be available where you live, since utilities differ in what they are willing to offer, and regulations vary from state to state and even municipality to municipality. There are two ways to look at solar: One is your ability to reduce your energy costs and put money in your pocket, and the other is your desire to do something environmentally responsible.

If you live in a region that allows net-metering and other credits when your system generates more electricity than you use and sends the excess back to the grid, then your best option is to buy the panels upfront. Most solar companies offer the option to finance the purchase, or to lease you the panels. They'll want their cut, of course, but you'll still get to benefit from lower rates and solar energy production for your home minus the burden of the upfront cost.

The third option is to go with a company like Solar City or Sunrun, which will install your system and handle all the maintenance at no cost to you when you sign a contract agreeing to purchase all your energy from them for the next 20 years. Usually, you'll shave a hair off your utility bill, paying around 95 percent of what you did pre-solar. The downside is that you won't be able to reap the mass of savings once the system is paid off — but you still get that greater reward of knowing you're doing something significant to help the environment.

Tell me more about net-metering

There's a lot of confusion surrounding net metering. It is not a subsidy. It is, however, one of the most beneficial programs that makes going solar worthwhile. Net-metering simply allows you to sell your excess energy back to the grid. Every state has different policies in place as to what they will or will not allow. Over 30 states currently offer net-metering, but the practice is continually under attack by special interests that don't want to fairly





share the economic and financial benefits of distributed energy with the customers whose panels have generated it.

Here's how it basically works: Many solar producers create more energy than they need during the day. That excess can be sold back to the grid for other people to use when demand is high. This "credit" can offset your energy usage at night when your solar panels are not producing.

I've heard that solar panels kill thousands of birds.

Actually, the Audubon Society is a big advocate of solar. In their words, "all energy development has some impact on habitats and wildlife, and in the big picture, the threat of climate change poses a greater risk to entire species than renewable energy installations generally pose to individual birds."

It's true that some birds occasionally mistake the reflection of a solar panel for water and make a crash-landing, and some developers are adding special patterns to their panels to reduce the risk of this so called "lake effect." And while any accidents are unfortunate, the number of fatalities linked to solar energy is so negligible, it doesn't even make the US Fish and Wildlife Department's annual estimate of non-natural bird deaths.

Here's what they do report: An estimated 599,000,000 birds on average die each year by flying into building glass and about 214,500,000 get killed by cars. Electrical lines claim 25,500,000. But the biggest danger by far is cats, which kill an estimated 2.4 billion birds a year.

Let's be honest: Any and all development impacts nature. Humans leave their mark on this planet and that's unavoidable — but it also can be responsibly reduced, aggressively mitigated, and thoughtfully controlled. We're seeing solar farms plant wildflowers to attract pollinators amidst their panels, and there's a lot of excitement right now about installing "floating panels" over reservoirs. Researchers at the National Renewable Energy Laboratory estimate that panels atop more than 24,000 man-made reservoirs in the US could generate about 10 percent of the country's annual electricity. That would not only spare millions of acres of land, it would also reduce water evaporation and algae growth.

Are clean renewables like solar and wind energy in position to completely replace existing conventional power systems anytime soon?

Until there is substantial improvement in energy storage technology, there will likely still be a need for diversity in energy production. But experts say we're closing in on solutions to that battery problem. There are actually hundreds of cities around the world that are 100 percent renewable already. It can be done.

Where do we go from here?

We need to focus on eliminating the dirtiest of the power-producing plants first, which include coal and natural gas. The public health threats they pose can no longer be overlooked or denied. To cite just one example, once burned, coal produces a toxic ash that is typically disposed of in waste ponds. But a [new investigation by Earth Justice](#) of the coal industry's own data found that most of those ponds have no lining, and 242 of 265 — that's 91 percent — of coal-fired plants with monitoring in place have leaked coal ash into groundwater. Contaminants include arsenic, lead, selenium, radium, and methyl mercury, all of which can cause cancer, heart disease, stroke, and permanent brain damage in children.

But fossil fuels have been around forever, literally. Isn't this like trying to put the genie back in the bottle?

Fossil fuels will still be around for decades to come — we just need to aggressively reduce our dependence on them. But many scientists say it is feasible that within 10 years, the country could be run by 60 percent renewables. That would be a huge step in the right direction. And seeing the trajectory of implementation, it would likely be that within about 16 or 17 years we could be 100 percent renewable...and a global leader in the energy revolution.

And as we substitute dirty energies for clean energies like solar and wind — in a decentralized fashion — we will see air quality improve and respiratory illnesses diminish while gaining far more stability in our national energy system overall.

Smart Grids

Not many folks really understand the grid, which refers to the network of transmission lines, substations, transformers, and more that connects power plants to your home to deliver electricity. The electricity grid [began](#) in the 1890s. Today, [it consists](#) of 1 million MW of capacity connected to more than 600,000 miles of transmission lines.

Unfortunately, our grid is aging and reaching maximum capacity to keep up with demand.

Enter: the smart grid.

Technological improvements in the twenty-first century have advanced the nature by which electricity is transmitted to consumers. Simply put, a “smart grid” allows for increased information sharing between utilities and customers through the use of controls, sensors, computer software, automation, and new equipment. It allows utilities to match demand nearly perfectly, even when it changes by the second. It also makes it so consumers can better manage their own energy use and costs due to greater access to data and information.

The benefits of a more reliable and efficient grid include:

- Improved integration of wind and solar both at the utility and residential scale.
- Better communication of consumer energy use.
- Reduction of peak demand through energy savings from smart meter systems and optimization of transmission timing.
- Quicker restoration from power outages.
- Reduced management and operations costs for utilities.
- Assurance that charging needs for electric vehicles are met.

In addition to those multiple benefits, a smarter grid will also allow for better management of the growing number of residential solar panels on homes across the country. The increased information sharing can allow utilities to better plan for distributed solar in the future and optimize assets sending electricity onto the grid.

Predictability in demand and supply is key and will be tremendously aided with the help of smart grid technology.



Jonathan's **FINAL WORD**

The truth should be obvious to everyone by now: Solar power isn't just a possible solution to our need for clean, renewable energy. It's already a provable one, thanks to the determined efforts of scientists, entrepreneurs, and activists around the globe. But the sun's full potential to create an energy democracy will never be realized unless the consumers it is meant to serve demand it.

This isn't a partisan issue. It's a human issue. Even one person standing alone can cause change. Ask yourself whether it's important to you to not only do something good for the Earth's environment, but for its people, too, by reducing pollutants that impact our health and quality of life while creating good, steady jobs and abundant clean, affordable electricity for everyone.

The first and most important step is to educate yourself. Get up to speed about what's happening on a local and state level when it comes to harnessing and distributing electricity. Realize that what you think you know may be nothing more than the self-serving spin that energy monopolies want you to believe so they can continue to hold consumers hostage to their greed and arrogance. Start with that power bill you pay each month and rarely question, and really dig to the bottom of it: Where does your electricity come from? What are you being charged for — and in the case of various fees, why?



One way utilities routinely try to snatch back the money consumers save by being more energy-efficient is to gouge them with unexplained “fixed fees.” The Natural Resources Defense Council found that utilities made 158 proposals to state utility commissions to impose or jack up fixed fees between 2015 and 2018 — and 31 utilities were seeking increases of at least 100 percent!

You should also be asking what percentage of energy from your provider comes from renewable sources like wind and solar, and what options customers have to harness that power or be credited for excess that they generate if they have a home solar system. If your company does offer consumer solar, keep asking questions: Some utilities put a cap on the number of customers they’ll “allow” to benefit from renewables. Not only will you not get credit for the excess energy your system produces and returns to the grid for the utility to sell elsewhere, but some will actually charge you extra for “grid use.” (That would be the same grid your tax dollars and lifetime worth of power bills helped pay to build.)

If you don’t have the rare option of shopping around for your electricity, contact the public service commission in your state to protest fee hikes — call the commission, start a petition, attend a public hearing. Don’t just silently fume over that fat utility bill.

When customers and consumer advocacy groups complained to South Carolina’s utility commission earlier this year about Duke Energy’s proposed 238 percent hike to its fixed fee, the utility giant sharply scaled back the money-grab.

If we don’t insist on transparency and fairness now, we will end up with little or no say in how this vital reconfiguration of how our electrical system will play out.

Learn how to read between the lines to separate fact from manipulation. Remember that lengthy disclaimer Florida Power & Light attached to their news release trumpeting plans to “build the world’s largest solar-powered battery and drive accelerated retirement of fossil fuel generation”? The 1,000-plus word caveat at the end of that release explained that the utility was using “forward-looking statements” that are “not a guarantee of future performance.”

Among the words it flagged as ones to essentially disregard? Will, expect, intend, plan, seek, target, goals, should, would.

We’ve made great strides at rapid pace these past few years on the solar front, but that doesn’t mean we’re where we need to be. To win, we must continue to move forward.

Go to town hall meetings. Add “renewable energy” or “alternative energy” to your news feed to stay abreast of developments. Learn everything you can about proposed ballot measures and their ramifications for consumers. Send an email to your legislators. Pick up the phone and call your representatives in Congress to ask what they’re doing to advance energy democracy and the use of renewables. If you don’t have net-metering, fight to get it. If you do have it, fight to protect it.

What matters most now is to make sure you’re marked “present” for the energy revolution that’s still unfolding. Don’t assume the battle’s been won.

Complacency will leave us all in the dark.

Knowledge is power, but not unless you act on it.

Sincerely,

A handwritten signature in black ink, appearing to be the initials 'JM' or similar, written in a cursive style.

A woman with brown hair tied back, wearing a white blazer and large white earrings, is smiling broadly. She is holding a certificate from the Climate Reality Leadership Corps. The certificate is titled "Certificate of Leadership in Green" and is signed by Eric Holthouser. The background is a blurred indoor setting, possibly a conference or event.

How Can I TAKE ACTION NOW?

We have the power in our hands to make a sustainable future powered by renewable energies like solar a reality. Support for bold action is there, both in the US and abroad — **but now we have to act.**

We have to use our voices to make energy security, our climate, and environmental justice issues no business leader or politician can ignore. We have to choose clean energy alternatives to dirty fossil fuels and work together in our communities and with activists everywhere to cut pollution and greenhouse gas emissions at every turn. This is how we'll win.

There's a place for you in this movement — and a way you can make a real difference by joining our work.

JOIN A CHAPTER IN YOUR COMMUNITY

Climate Reality has chapters across the US that are working to move their communities toward a healthier, more sustainable future powered by clean energy technologies like solar.

Many of our chapters work on [100% Committed](#) campaigns, collaborating with towns, counties, schools, and businesses to make the switch to 100-percent renewable electricity. Others work as part of statewide coalitions, advocating for [carbon-pricing policies](#) and other commonsense solutions to the climate crisis.

[Join a chapter today and help bring real climate solutions to your community.](#)

And when you're ready to take the next step, apply to become a Climate Reality Leader.

BECOME A CLIMATE REALITY LEADER

Each year, Climate Reality's founder and chairman, former US Vice President Al Gore, and teams of field-leading experts in communications, climate science, and organizing, train everyday people to become Climate Reality Leaders: powerful activists with the skills and knowledge to mobilize their communities for action.

All around the world, Climate Reality Leaders are working for the world we want. These Leaders come from many different walks of life — they're doctors, educators, community organizers, and police officers; electricians, computer programmers, construction workers, and so much more — but are united in their concern about the climate crisis and their commitment to taking action to solve it.

At a training, you'll learn how acting now to swiftly transition from dirty fossil fuels to clean energy can dramatically limit global warming. You'll also learn about the practical policies and technologies we can use to accelerate this shift and address climate change while there's still time.

[To find out how you can become a Climate Reality Leader, visit our training page.](#)

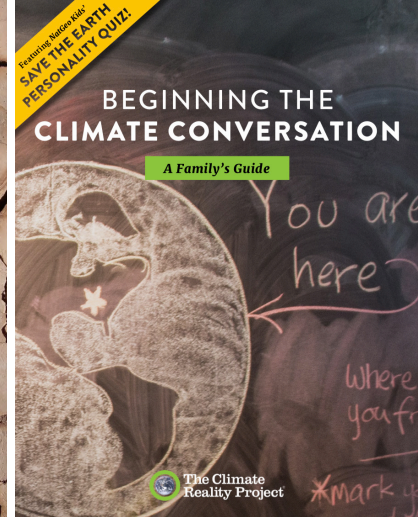
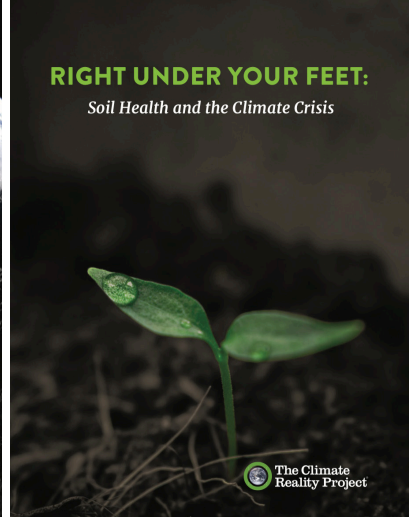
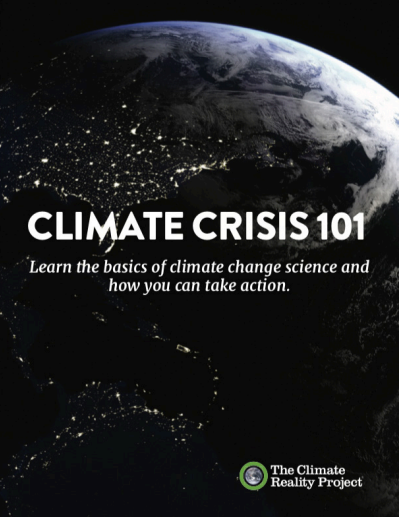
SPREAD THE WORD

There's no better messenger than you.

When you talk, your friends and family listen. That's why talking about solutions like solar energy is one of the best ways you can fight for a healthier, more sustainable future for the planet. Whether it's at the grocery store, after church, or over lemonade at a family picnic, talking about the reality of the climate crisis is your chance to change minds and ensure the people you care about hear the truth.

Talk to people about the things that matter to them. It could be how fossil fuels are [impacting the health of children](#) or [how natural gas isn't all it's cracked up to be](#) or the ["junk food effect."](#) Just make sure you're having these conversations — even when it's difficult.





Check out these additional resources from Climate Reality to arm yourself with the facts:

CLIMATE CRISIS 101:

In *Climate Crisis 101*, we outline the basics of climate change in plain language. This resource answers key questions like: What do we mean by “climate change”? What are the causes of climate change? And how do we know climate change is happening?

RIGHT UNDER YOUR FEET: SOIL HEALTH AND THE CLIMATE CRISIS:

Learn more about fossil fuel emissions’ impact on soil health, food security, and what you can do to support a world where we can provide our booming population with fresh, healthy food grown in a sustainable soil ecosystem.

EXTREME WEATHER AND THE CLIMATE CRISIS: WHAT YOU NEED TO KNOW:

Is climate change really making weather more extreme? In this e-book, we explain in plain language how burning fossil fuels is making our weather more intense and dangerous.

BEGINNING THE CLIMATE CONVERSATION: A FAMILY’S GUIDE:

Kids today will face the challenges of a warming world head-on. And as a parent, guardian, and/or caregiver, you have a responsibility to do your best to make sure they’re ready.

But don’t stop there. Speak up and demand that your elected officials at every level — from town or city council members to representatives and senators — take action to transition away from dirty fossil fuels and embrace clean energy solutions like solar every way they can.



Solar is powering **A BETTER TOMORROW**

Today, solar power is in more places than ever — from home roofs to Ikea superstores to the Nevada desert — and thank goodness. Solar isn't just the right choice for the planet — it can also be the smart choice for your wallet. Whatever fossil fuel companies and monopoly utilities might claim.

But the benefits of solar don't end with lower power bills. Cutting carbon pollution? Check. Empowering communities? Check. Creating good jobs? Check and check.

Around the world, cities, states, countries, and companies (and people just like you!) are making the switch to clean, renewable solar energy to help confront climate change — and because it just makes good economic sense.

It's a win-win solution to the climate crisis that creates jobs, saves money, and helps cut the carbon pollution changing our planet.



The Climate Reality Project[®]

Founded and chaired by former US Vice President and Nobel Laureate Al Gore, The Climate Reality Project is dedicated to catalyzing a global solution to the climate crisis by making urgent action a necessity across every level of society.

Today, climate change is standing in the way of a healthy tomorrow for all of us. But we know that practical solutions are right in front of us. We can create a healthy, sustainable, and prosperous future by making a planet-wide shift from dirty fossil fuels to clean, reliable, and affordable renewable energy. At Climate Reality, we combine digital media initiatives, global organizing events, and peer-to-peer outreach programs to share this good news with citizens everywhere and build overwhelming popular support for policies that accelerate the global transition to a clean energy economy.

To learn more, visit www.climaterealityproject.org