

Power Switch

EDF is helping put the clean energy revolution within everyone's grasp.

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EXCLUSIVE

**MAKING
HISTORY
IN PARIS**

What comes next?

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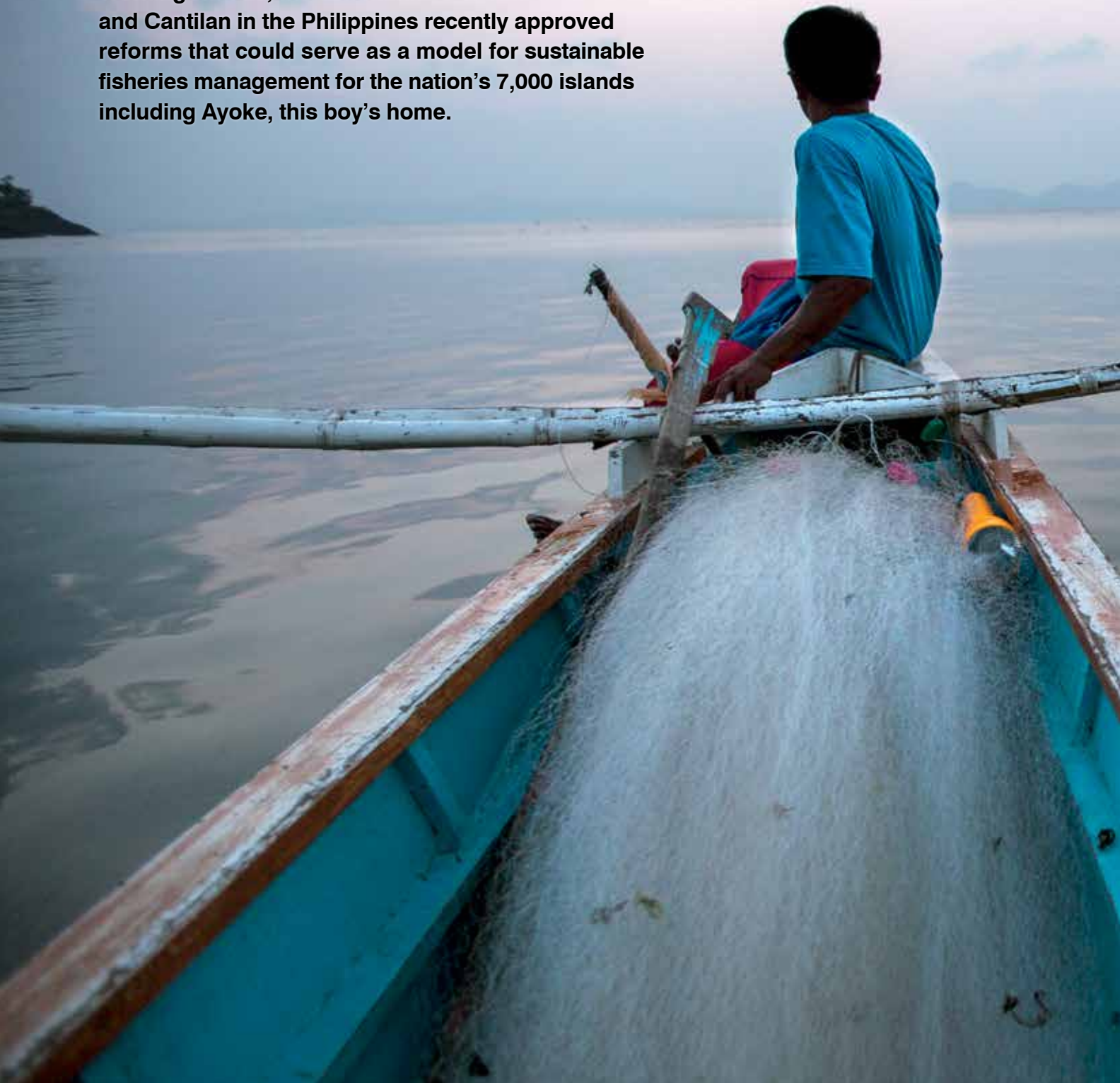
14 The town that said 'no' to dirty air

17 Is climate change killing cod?

18 Decoding those green product labels

Securing his future

Nearly half the wild fish people eat are caught in small-scale fisheries, many of which are unmanaged and in serious trouble. EDF has shown that secure fishing rights give fishermen an incentive to become better stewards of the sea. Working with us, the communities of Tinambac and Cantilan in the Philippines recently approved reforms that could serve as a model for sustainable fisheries management for the nation's 7,000 islands including Ayoke, this boy's home.



Staying true to the spirit of Paris



PARIS, THE CITY OF LIGHT, BECAME THE city of hope in December with the conclusion of the successful climate conference. Before speaking at one meeting, I found myself thinking about how far we've come in the climate fight since the 1980s, when EDF was among the first U.S. environmental groups with a climate scientist on staff—and about how far we still have to go.

The Paris agreement gives us the best chance yet to succeed because it lays the groundwork for transparency and accountability and markets. The power of visible, accurate facts on each country's pollution and cleanup efforts should inspire more ambitious national actions and deeper cuts in emissions. The market provisions of the agreement offer a way to lower emissions efficiently by harnessing the private sector to deploy clean energy. *(EDF's Eric Pooley comments on p. 6.)*

Until recently, coal, a 19th-century fuel, provided most of the electricity in the United States. Burning coal comes at a terrible price to public health, however, and today people want to see a world powered by clean, renewable energy. EDF is deeply involved in the transition in China and the United States.

We've made tremendous progress.

In 2014, the U.S. clean energy market grew 14%—nearly five times as fast as the overall economy—to nearly \$200 billion. In Connecticut, where I live, there's almost as much solar power today as there was in the entire U.S. in 2004.

Under the old model, coal-burning power plants generated electricity, which was sent hundreds of miles over power lines. Today, rooftop solar can be generated close to home, and microgrids (compact and highly efficient "mini" grids) can keep the lights on during storms. Our cover story offers a guide to this exciting new world and the role each of us will play in it.

It's coming sooner than you think, and the action is at the state level. New York is remaking its electricity system from top to bottom, turning its vision of a cleaner, more efficient and more affordable energy future into a reality that includes rooftop solar, battery storage and microgrids. Some of the most inspiring work is being done in communities such as Brooklyn, where EDF has enlisted the support of neighborhood leaders eager to create new jobs.

The Paris agreement marks a new beginning for worldwide, cooperative work to ensure a safer future. You and I are lucky to be part of such an essential and worthy effort.

Fred Krupp
EDF President



Finding the ways that work

Environmental Defense Fund's mission is to preserve the natural systems on which all life depends. Guided by science and economics, we find practical and lasting solutions to the most serious environmental problems.

Our work is made possible by the support of our members.



On the cover: Technology is transforming the energy landscape, as solar and wind become cost competitive with fossil fuels. After the Paris climate pact, the U.S. is clearly

ready to slash carbon emissions, but can it do so with an antiquated 19th-century energy system?

Senior writer Leslie Valentine reports on how, with EDF's help, New York and other states are taking bold steps to overhaul their power systems.

Cover illustration: Janice Caswell

Solutions

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©2016 Environmental Defense Fund.
Published quarterly in New York, NY
ASSN 0163-2566

New York / Austin / Bentonville, AR /
Boston / Boulder / Raleigh / Sacramento /
San Francisco / Washington, DC /
Beijing, China / La Paz, Mexico / London

FIELD NOTES



AP IMAGES

What did they know and when did they know it?

Getting the facts on ExxonMobil

Recent investigative reports by the *Los Angeles Times* and *InsideClimate News* suggest that ExxonMobil knew about the dangers of climate change even as it funded groups that denied global warming was happening.

It's reminiscent of when Big Tobacco cast doubt on the cancer-causing effect of cigarettes even though its own scientists knew better. Those companies were found guilty of defrauding the public.

In October, EDF president Fred Krupp joined 49 other leaders from environmental, indigenous and civil rights groups calling on the U.S. attorney general to launch a probe into whether ExxonMobil knowingly

suppressed its own scientific findings on climate change.

"We don't have all the facts about what Exxon knew, and we're not prejudging what happened," said Krupp. "But these reports are detailed and deserving of further investigation. Let's get the facts on the table. EDF sometimes partners with energy companies—working with them, for example, to measure methane emissions from the natural gas system—so we feel a special responsibility to speak up for accountability."

In November, the New York Attorney General launched an investigation of the matter, issuing a subpoena to the corporation that demanded its records.



GETTY

Here comes Peter Cottontail

As its habitat declined, the New England cottontail was headed for the endangered species list. With EDF's help, today it's thriving.

"This shows how farmers and forest owners can help save a cherished species that otherwise might have disappeared."

—Eric Holst, senior director of working lands at EDF

THE MASSIVE COST OF CLIMATE INACTION



Transitioning to a clean energy economy would **save** an estimated **\$1,800,000,000,000**

SOURCE: CITIBANK

Mobilizing millennials



Raising the alarm: A popular new video is spurring youth to action.

Defend Our Future, a group backed by EDF, seeks to engage millennials on climate change. At a White House event in November, the group announced a target of mobilizing one million young people to take action on climate. Students at more than 250 colleges and universities have agreed to join the campaign. Defend Our Future also aims to win pledges from its million-strong cohort to persuade candidates to support climate action.

"This is a great way to pressure candidates to make climate part of their platform," says Nate LaTourette, a freshman at the University of

New Hampshire.

The group has released a short video on the urgent need to address climate change. See it at: defendourfuture.org. Partner organization Voto Latino is working in tandem with Defend Our Future to enlist Latino millennials in the climate fight.



Voto Latino rallies Hispanic youth to fight climate change.

BY THE NUMBERS
EDF MEMBERS
MADE A
DIFFERENCE
IN 2015

106,000

pushed to reform America's outdated toxic chemicals law

178,000

supported EPA's proposed nationwide rules to curb methane emission from oil and gas operations

480,000

helped beat back legislative attacks on the Clean Power Plan

2,000,000

communications to officials in defense of the environment.

>>> JOIN THE ACTION >>>

Sign up for our action alerts on urgent environmental issues at edf.org/help

Empowering women in Mexico



In Mexico's Gulf of California, EDF helped create a catch share program for curvina, a salmon-sized fish. As a result, fishermen are now earning 23% more per pound of fish. The program has also reduced the total catch, helping ensure the long-term health of this vital species. The success, however, caused a labor problem. Women who made their living untangling nets were put out of work because fishermen had more time. To help them maintain their income, EDF supported the creation of the first women-run cooperative in the Gulf to process curvina into fillets.



You are exposed to chemicals every day. Are they safe? Both the House and Senate passed urgently needed chemical reform bills.

Overhaul of chemical safety law enters the home stretch

In a rare moment of bipartisan agreement, the U.S. Senate in December passed the Lautenberg Act, a chemical safety bill that would replace a law so toothless it was unable to restrict even known hazards such as asbestos. The Act gives EPA the tools it needs to protect families from hazardous chemicals in everyday products.

EDF biochemist Dr. Richard Denison provided expert advice to cosponsors Senator Tom Udall (D-NM) and former Senator David Vitter (R-LA) as they made

hundreds of improvements to the bill. In the end the Lautenberg Act drew praise from both sides of the aisle.

"This bill succeeded because a bipartisan circle of senators saw the potential for a public health breakthrough and worked out a compromise, even in the most partisan of climates," Denison said.

The Senate bill will now be reconciled with the House version. Says EDF's Denison: "We will ensure the final bill is not weakened and protects all Americans."



Better protection for kids

In response to a lawsuit from EDF and our public health and environmental allies, EPA in October tightened the national ozone standard, from 75 parts per billion to 70 parts per billion. Ozone pollution, or smog, is caused when industrial and vehicle emissions react with heat and sunlight in the atmosphere. Smog is linked to premature

deaths, asthma attacks and other serious heart and lung diseases. Nearly 40% of Americans live in areas with unhealthy levels of smog.

"Although it's an improvement, the new standard falls short on adequately protecting public health," says EDF senior scientist Elena Craft. "We will continue to press EPA to do more."

WHAT SUCCESS LOOKS LIKE

California air regulations

have resulted in an estimated

76% decline in cancer risk

from toxic air pollution

in the state from

1990 to 2012



SOURCE: ENVIRONMENTAL SCIENCE & TECHNOLOGY

Why we won in Paris— and what's next



By Eric Pooley

Throughout the conference, EDF's Nat Keohane (lower right) was a go-to resource for the press corps. Our team pressed for strong language on markets and transparency.

The breakthrough deal harnessed a new spirit of climate cooperation—and built a framework for carbon reductions. But it will take people power to turn the promises into reality.

EVERY ONCE IN A WHILE something happens that you know you'll remember for the rest of your life. One of those indelible moments came my way Dec. 12, in a converted airplane hangar in Le Bourget, France, when the gavel fell on the most important U.N. climate deal ever: the Paris agreement, in which 187 countries representing almost 99% of global emissions committed to reducing carbon pollution.

Cheers erupted and I leapt to my feet inside the makeshift conference center, hugging and high-fiving other EDF staffers who had worked tirelessly to make this moment possible. With the support of EDF members and climate advocates around the world, we had helped make history: closing a deal that will speed the transition to clean energy by building a new framework for climate action that ratchets up ambition over time. It won't "solve" the crisis—no single deal can do that—but it gives us a chance to turn the

corner toward a safe and stable climate.

For EDF, a key component of the Paris accord is language encouraging the use of markets to spur investment in clean energy and drive down pollution at the lowest cost. The agreement sent a strong signal to global investors to accelerate the transition from fossil fuels to clean energy sources such as wind and solar. The pact includes provisions ensuring that emissions reductions will be accurately measured, reported and accounted for—crucial rules of the road that will allow markets to thrive. Countries pledged money and technical aid to help the most vulnerable nations adapt to climate change and recognized the critical role of tropical forests in stabilizing climate, something EDF has long advocated.

The overall goal is to bring down pollution levels so that the rise in global temperatures is kept below 2 degrees Celsius (3.6 degrees Fahrenheit), beyond which the most disruptive consequences

of climate change are likely to kick in. These pledges will get the world about halfway to that goal. The delegates also added language urging that the increase be limited even further, to 1.5 degrees Celsius, if possible.

It's the single biggest step we have ever taken in the international arena. And the moment was made even sweeter by memories of the disappointing summit in Copenhagen in 2009, another high-hopes conference, where climate negotiations ran aground and the world failed to find agreement.

What a difference six years makes. What happened since Copenhagen to allow the big breakthrough in Paris? I see five factors.

Change in China and the U.S.

A new spirit of climate cooperation has taken hold between the U.S. and China, beginning with a November 2014 joint announcement on climate action that broke a 20-year deadlock. Instead of blaming each other for inaction, the world's two biggest emitters now encourage each other to clean up—and that has inspired many other nations to step up. EDF has played a key role in both countries: in the

JENNIFER ANDRESEN

U.S. with the Clean Power Plan, which cuts emissions from U.S. power plants; and in China with seven pilot carbon-trading programs, which gave President Xi Jinping the confidence to announce a national cap-and-trade program for carbon beginning in 2017.

Clean energy became cost competitive in many places

In 2009, mainstream renewable energy still seemed far off. Not anymore. The cost of U.S. solar power has dropped 80% since Copenhagen, and global solar capacity has grown sixfold. For the first time in history, energy from the sun is as cheap as energy from fossil fuels in states such as Arizona, California and Texas. Compelling research also shows that the clean energy economy is an engine for job growth.

Extreme weather got the world's attention

Since the Copenhagen deal collapsed, the Intergovernmental Panel on Climate Change (IPCC) has confirmed with greater clarity the role of climate change in extreme weather. The deadly parade of floods, droughts and heat waves has become impossible to ignore. We are in the race of our lives, and in Paris the world finally said, "We're going to run faster." That's why two-thirds of Americans, including half of Republicans, support the international climate agreement, according to a December *New York Times* poll.

The diplomats learned from their past mistakes

Two decades ago in Kyoto, only 37 rich nations pledged to make climate

“The heart of the deal is the process it establishes to review countries' climate progress, and to ratchet up commitments over time.”

—Nat Keohane, VP International Climate

commitments; that agreement covered just 12% of current global emissions. In Paris, virtually all the nations of the world promised to do their part. What's more, earlier summits like Kyoto and Copenhagen simply tried to do too much, negotiating both a framework and national commitments at the same time. This year, nations were required to put their pledges on the table before the conference began—so the heart of the agreement was in place before the talks began.

The public turned up the volume

The voices of climate activists, including EDF members, have become too strong for politicians to ignore. EDF members and millions of other activists have taken to the streets around the world, written and emailed and called their lawmakers, and made their voices heard. In the U.S., polls show that being pro-climate action is a winning position for candidates, especially among the younger generation.

When I was cheering in that conference hall in December, I was bearing witness for everyone who has been part of this fight. Paris never would have happened without the passion and engagement of our

members. And we must remain vigilant, because Paris is only a foundation for future efforts. The framework is in place, but the rules have to be written and acted upon, starting early this year.

The signatories agreed to convene every five years to take stock, revisit their pledges and strengthen their commitments. Only strong public pressure will hold them to account. And as the inevitable attacks against the Paris agreement crop up in the United States, we'll be counting on the support of EDF members. Thank you!



ALAMY

Intense hurricanes and other extreme weather events raised the ante for action.



GETTY

During the conference, Beijing issued its highest warning for hazardous air, reminding everyone of what's at stake.



AP IMAGES

Activists sounded the drumbeat for change. Now we need to pressure countries to keep their promises.

Welcome to the new world of energy



By Leslie Valentine

Over 3,000 electric utilities make up the U.S. power grid, which is sometimes called the largest machine in the world. But it's an antiquated system—largely unchanged from horse-and-buggy days. Because of this, electricity generation is today the single largest contributor to U.S. global warming pollution. Now, change is coming. Big energy states are boldly reimagining how electricity is produced and distributed, making the system cheaper and cleaner. With EDF's help, they're providing a model for the rest of the country—and the world.

WALLY BAZEMORE NEVER WANTS a repeat of what he and his neighbors went through three years ago, when Superstorm Sandy battered his Brooklyn community of Red Hook, leaving its 11,000 residents without power for weeks. At the time, he was caring for his 93-year-old bedridden mother. "It was rough," he says. "She was wrapped in Red Cross blankets to keep warm—she looked like a refugee."

These days, Bazemore is meeting with officials to get an energy system in place that will keep the electricity on the next time the central power grid fails.

Superstorm Sandy was a wakeup call not only for Red Hook residents. New York Gov. Andrew Cuomo openly criticized his own state's energy system and vowed to reform it.

There's a lot to reform. Today, the power grid uses the same one-way model that Thomas Edison designed more than a century ago. Typically, a power plant burns fossil fuel to produce electricity, losing power by the time it reaches customers, who have a single energy choice: on or off. Moreover, most utilities are monopolies that profit by selling more electricity and by building more

infrastructure—substations, polluting power plants, poles and wires—and passing the cost on to customers. That is a road to climate disaster—and a recipe for more blackouts. Add a tangle of public utility rules and you have formidable barriers to a clean, reliable power system.

What if utilities were rewarded for managing and saving energy, not just generating it? Today, EDF's clean energy team

8,079 pounds



the amount of coal it takes to produce the electricity for the average household in the U.S. each year.

is working with the Cuomo administration to bring that vision to life with a new energy policy for New York. A key goal is to find ways for utilities to profit from fully integrating renewable energy into their operations and helping customers use energy more efficiently. The challenge is to cut pollution and lower customers' energy bills while creating a more reliable electrical system. To ensure the changes take effect nationally, EDF is working in eight other states that make up about half the nation's electricity market.



A modernized grid will promote homegrown power, as in this Austin, TX, neighborhood.

New York's goals are ambitious: The state aims to get half of its power from renewable sources by 2030 (up from roughly 25% in 2014) and increase the overall energy efficiency of buildings by 23%.

"This is a huge opportunity to remake the system so it is fair and affordable—and cuts climate pollution," says Rory Christian, who directs EDF's clean energy work in New York.

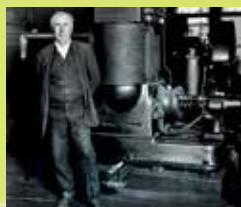
If successful, the policy solutions New York develops could be a model for other states looking for ways to meet the goals of EPA's Clean Power Plan (*see page 16*). Success in New York could also guide other countries aiming to meet their climate goals quickly and at low cost.

With the historic Paris climate agreement now signed, reform of the electricity system will be a critical component in many nations' plans to meet their obligations. It's no surprise then, that policy makers around the world are keeping a close watch on the New York experiment. Such sweeping reform to integrate clean energy into the entire system, from power plants to the power outlet on your wall, has never been attempted.

EDF is also leading the way in designing financing methods to pay for the

THE LONG ROAD TO CLEAN ENERGY

Ever since Thomas Edison flipped the switch on America's first central power plant in New York City in 1882, the business model has remained essentially unchanged. The goal: Add customers. Build coal-fired power plants. This archaic system is now being transformed.



1882: ELECTRIFYING THE NATION

The first power plant begins producing electricity, sparking a 130-year building spree of power plants and transmission lines across the country.

1954: SOLAR TECHNOLOGY IS BORN

Scientists at Bell Labs invent the first solar cell that uses the sun's energy to run everyday electrical equipment.



1987: SCIENTISTS WARN OF CLIMATE CHANGE

Atmospheric physicist Dr. Michael Oppenheimer, then at EDF, helped call international policy makers' attention to the problem of climate change.



DEREK GEE/BUFFALO NEWS

Winds of change: On Lake Erie in Lackawanna, NY, wind turbines are humming where a steel plant once stood.

renovations and innovations that New York's energy plan will entail.

"What we're doing here," says Richard Kauffman, New York's chairman of energy and finance, "is building a new market platform to unleash clean energy technology and the financing needed so that we can reach our greenhouse gas reduction goals and grow our economy."

The state has rolled out a number of initiatives to spur private investment and innovation, including the creation of a state Green Bank to help provide the billions of dollars needed to retool the system. Gov. Cuomo has committed \$1 billion to grow New York's solar industry. With EDF's help, the state also launched a \$40 million competition to help communities develop microgrids—highly efficient local power networks—and 83 winners have been announced around the state.

From Buffalo to Brooklyn, change is already evident. There are giant wind turbines along Lake Erie where a Bethlehem Steel plant once stood. In economically struggling Buffalo, one of the nation's

largest solar panel factories is being built. Red Hook and a number of other New York City communities are seeking to install microgrids that would keep the electricity on in hospitals, relief centers and other essential buildings if the larger grid shuts down.

Besides providing reliable energy more efficiently, microgrids open up the distribution system to local energy produced onsite, through rooftop solar or wind, for example. Ultimately this puts affordable clean energy into many more people's hands. What's more, New York City is becoming a thriving hub for the clean tech industry. Solar installations have tripled in the past two years, and Cornell University recently broke ground for a new high-tech campus on Roosevelt Island.

A seismic shift

Across the country, the clean energy market is booming, and not just in New York. Nationwide, in 2014, the industry expanded by 14%, to almost \$200 billion. The cost of solar panels has dropped 82% since 2009, and in some states energy

from the sun is cost competitive with conventional power. This signifies a fundamental shift toward clean energy produced locally, giving people true control over how they use, produce and interact with energy.

What does this mean for you? EDF sought to answer that in 2009, when we co-founded Pecan Street, Inc., centered on the Mueller neighborhood, a typical middle-class community in Austin, TX, with one big difference: It's a living laboratory for the technological future.

Pecan Street residents, many of whom live in homes with solar panels on their roofs and electric cars in their garages, can alter their energy usage in real time on their smart phones. They get a credit on their utility bill when they produce more energy than they use. Thanks in part to the work going on at Pecan Street, solar-powered dryers that shut off when the sun goes behind a cloud will be available in the not-too-distant future, and solar-powered homes will automatically switch to an alternate source of energy at night.

Not everyone is thrilled with the changes under way. Several states, including Florida (the Sunshine State), are charging fees to make up for lost revenue from rooftop solar customers, but poorly designed rate changes can impede adoption of solar and other renewables.

Other hurdles need to be cleared as well. Financing to upgrade buildings is lagging. That's why EDF developed a way to standardize how energy efficiency projects are developed and brought to market, similar to what was developed for solar, car loans and mortgages. California, New Jersey, New York and Texas are among the states starting to use the protocol, and we're adapting it for EU countries, including the UK and Germany.

And then there's the issue of justice.

2003: THE GREAT NORTHEASTERN BLACKOUT

A transmission line brushed against a tree in Ohio, shutting down the grid and leaving 50 million people in the Northeast and Midwest without power.



2006: CALIFORNIA OFFERS AN ALTERNATE FUTURE

California passes AB32, an EDF-cosponsored law that promotes renewable energy and efficiency, and requires reductions in climate pollution.

2008: EDF PIONEERS A SMART GRID

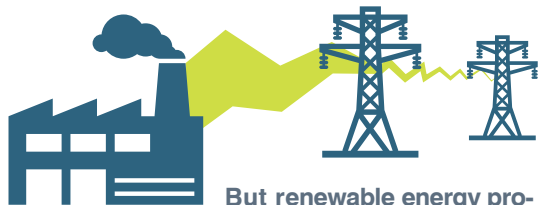
EDF helps launch Pecan Street Inc., an initiative with the high-tech industry and the city of Austin, TX, to develop a clean, smart grid.



2012: DISASTER IN NEW YORK CITY

Superstorm Sandy devastates the metropolitan area. The power grid fails, plunging much of New York into darkness and showing the system's vulnerability to climate change.

About 75% of energy generated from traditional power plants is lost...



But renewable energy produced locally, like rooftop solar, is less wasteful.

How do you ensure that during blackouts people aren't forced to rely on diesel generators that are highly polluting? And how do you protect low-income families, for whom even a small, temporary rise in their utility bill can impact the food budget?

"It is crucial that low-income people and communities of color benefit from the coming changes and are not unduly burdened by pollution and higher costs, as they have so often been in the past," says Peggy Shepard, EDF trustee and director of Harlem-based WE ACT for Environmental Justice.

Changing an entrenched system requires delicate footwork. In 2014, New

York City's utility, Consolidated Edison (Con Ed), proposed a new \$1 billion substation to meet increasing demand for 700,000 residents of Brooklyn and Queens, who would have had to contend with higher utility bills as a result. EDF and our allies showed the state public service commission that there was a better way. By implementing energy-saving

strategies, such as paying people to use less electricity during peak demand hours, we could cut pollution and costs. State regulators agreed and directed Con Ed to pursue alternatives to the \$1 billion project, saving customers hundreds of millions of dollars and laying the foundation for the broader energy reform now under way.

EDF's Rory Christian enlisted community support for the cheaper alternative. "EDF's guidance in helping community activists frame their campaign around energy reform has been invaluable," says Eddie Bautista, executive director of New York City Environmental Justice Alliance. With EDF's support, a powerful coalition of community leaders is now working with Con Ed to develop projects that benefit residents.

One such initiative—and winner of state funding—is a community microgrid that could produce income for residents. "In projects like this, there is great potential not only for green job creation but also for an ownership stake for residents," adds Bautista.

Meanwhile, in Red Hook, Bazemore is happy that a microgrid is coming to his venerable waterfront community. "There's still a lot to do, and we must be vigilant," the father of three says. "We have to think of the world we're passing to the next generation."

Stuck in the past



THE ARRON BEACON JOURNAL

Across the country, a battle is playing out between vested interests in old, polluting energy and states and utilities adapting to a new energy landscape. While many utilities are retooling to join the clean tech revolution, Ohio-based FirstEnergy is fighting tooth-and-nail to keep the antiquated system in place.

Over the last decade, FirstEnergy, which operates in five states in the Midwest, has made a series of bad bets in the coal industry—for example, investing \$1.8 billion to retrofit a 50-year-old coal-fired power plant. These poor business decisions have led to a financial fiasco for FirstEnergy. Now, it is asking for a \$3 billion bailout, leaving customers to foot the bill. Not content with that, the company is trying to force Ohio to scrap its energy efficiency standards and other energy-saving programs.

"That's a losing strategy if ever there was one," says Dick Munson, director of EDF's Midwest clean energy program. EDF is fighting to stop FirstEnergy's desperate gambit to derail reform. We've rolled out ads in Ohio and mobilized supporters to urge Ohio's Public Utility Commission to reject the utility's request. A decision is imminent as we go to press.

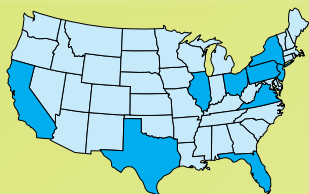


MICHAEL FRIEDMAN

EDF's Rory Christian (right) teamed up with community leader Eddie Bautista.

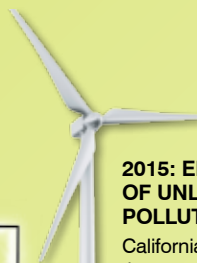
2013: LAUNCHING A PLAN FOR CLEAN ENERGY REFORM

EDF launches a project in nine states to knock down barriers to a clean power system. New York announces plans for a total overhaul of its energy system.



2014: THE REVOLUTION IS UNDER WAY

Solar and wind provide more than half of added U.S. generating capacity in 2014.



2015: ENDING THE ERA OF UNLIMITED POLLUTION

California passes a bill to up the state's renewable energy mix to 50% and double energy efficiency. EPA unveils the Clean Power Plan requiring states to develop plans to cut power plant emissions.

2018: ENERGY USE IS DEMOCRATIZED

Nearly 20 million New Yorkers can now manage their energy use, opt for renewable energy and gain access to microgrids. EDF's target states are on track to transform their energy systems.



Bringing new energy to the energy revolution

ELISE DESTOUT



EDF Climate Corps fellows are driving the transition to new power sources.

ON A SATURDAY AFTERNOON IN 2013, a power outage at Chicago's venerable Shedd Aquarium put 32,000 animals in danger, from penguins and otters to dolphins. Although electricity was restored an hour later, the event exposed the aquarium's vulnerability to a power interruption.

To protect its animals, the aquarium, as well as the nearby Field Museum and Adler Planetarium, plan to install a microgrid—a compact, highly efficient

electric grid that incorporates local clean power, like on-site solar, to keep essential systems running during emergencies.

Last summer, the aquarium enlisted EDF Climate Corps fellow Jayson Uppal, a graduate student at Yale, to advise it on installing a microgrid at the facility.

For a microgrid to be feasible given the limited room for solar panels on site, Uppal recommended more efficient lighting and pumps to reduce overall demand. The three institutions, which cover

several city blocks along Lake Michigan, are in the process of implementing his recommendations. By 2018 they plan to generate enough power to support a microgrid.

“Energy efficiency and solar power are going to allow us to declare independence from the grid during a power outage,” says Uppal.

Launched in 2008, the EDF Climate Corps program pairs graduate students with companies, cities, universities and other institutions looking to use energy more efficiently. Over the course of a summer, fellows recommend ways for their host institutions to cut green-

house gas emissions while lowering utility bills. Last summer, fellows worked on projects ranging from skyscrapers in Chicago to a sneaker factory in China. New Balance Athletic Shoes enlisted fellow Ian Huang to scour the company's production lines in China for energy savings. Huang found that fixing compressed air leaks and installing efficient sewing machine motors offered the best opportunity for energy savings. New Balance is on track to implement his recommendations.

For companies as different as Walmart and Google, the Climate Corps experience can be eye-opening. Many are repeat customers. Says Christina Page, director of climate and energy strategy at Yahoo!, “We jumped at the chance to sign up again.”

Sometimes, the work is urgent. In New Jersey in 2012, Mayor Dawn Zimmer said Hurricane Sandy “filled up Hoboken like a bathtub.” The epic storm flooded hundreds of homes and caused more than \$100 million in damage, leaving 90% of the city without power for days.

When the next big storm strikes, Hoboken will be ready. Over the summer, EDF Climate Corps fellow Devashree Ghosh helped develop a microgrid that will allow key buildings like pharmacies, senior centers and low-income housing complexes to run independently when the power goes down, while allowing citizens to safely shelter in place. Powered by solar and natural gas, the Hoboken microgrid will serve as a model for other cities that lie in the path of hurricanes.



Green leaders (from top): Ian Huang in China; Devashree Ghosh in Hoboken; and Jayson Uppal (left) in Chicago.

Did climate change cause that?

Scientists can now provide rapid analysis of global warming's role in certain extreme weather events.

DID CLIMATE CHANGE CONTRIBUTE to the California drought? Last summer's heat wave in India? Recent flooding in South Carolina?

Now, due to scientific advances in a field called "extreme event attribution," the world will soon know—possibly within days of when a disaster unfolds.

Until recently, it could take months to analyze whether global warming had exacerbated a heat wave or flood. Now, thanks to more powerful computers and advances in statistical methods, near-real-time attribution of extreme weather events will finally be possible.

"Identifying when there is a human role in individual extreme weather events has long been a major goal of the scientific community," says EDF climate scientist Dr. Scott Weaver, who leads our efforts in this area. "The recent scientific progress will allow us to inform decision makers and the public quickly and accurately."

A leader in the field is World Weather Attribution, a partnership of Climate



Drought, intensified by climate change, can turn wildfires into major conflagrations.

Central, the University of Oxford, the Royal Netherlands Meteorological Institute, the University of Melbourne and the Red Cross Red Crescent Climate Centre. "People impacted by extreme events need an accurate assessment of the causes," says Dr. Heidi Cullen, head of World Weather Attribution and chief scientist at Climate Central. "Our goal is to provide answers using multiple peer-reviewed methodologies so we can let the science speak for itself."

Last summer, the team concluded that the heat wave that stretched across Europe was linked to climate change. Using climate models and observational weather data, the team determined that such heat waves now occur twice as often over much of Europe than they would

without global warming. The analysis was conducted as the heat wave unfolded, using peer-reviewed methods.

Scientists are confident that global warming increases the risk of certain types of events, such as the amped-up power of North Atlantic hurricanes and the increase in intensity of heat waves. Some droughts, such as the prolonged event in Syria that helped trigger that country's civil war, and the ongoing drought in California, have been linked to climate change. Others, such as the recent Brazil drought, have not.

The National Academy of Sciences is fast-tracking a review of the technology and science of extreme event attribution and is expected to release its assessment in early 2016.

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A Wyoming town fights pollution—and wins

By [Peter Klebnikov](#)

PRIMARY PHOTOGRAPHY: TIM CONNOR

IT ALL STARTED WITH A CURIOUS 7TH grader and her project for the science fair. When Tracey McCarty found unhealthy levels of ozone smog around tiny Pinedale, WY, in the heart of Wyoming's natural gas drilling country, the townspeople were stunned. At first, some officials dismissed her testimony at a public hearing, but three years later, in 2008, on high ozone days a mustard-brown haze lingered over the valley and kids weren't allowed outside during recess.

Then the entire Upper Green River Basin failed federal ozone standards, and Wyoming had a crisis on its hands.

What happened next could have been the usual round of lawsuits and recriminations. Instead, residents of Pinedale began working together, with the help of EDF and the Wyoming Outdoor Council.

Many people who live here along the Wind River Mountains are descended from the original homesteaders. They live close to the land and don't give up easily. When children's health began to decline, Leslie Rozier, a nurse practitioner at the Pinedale clinic, persuaded colleagues to record ozone levels whenever there was a spike of respiratory illnesses.

Dave Hohl, a Pinedale civic leader, engaged state officials. "We own the minerals and we own the land, so we residents need to be heard from," he said.

“Smog levels in tiny Pinedale WY (pop. 2,030) often rivaled those of Los Angeles. Something had to be done.”

EDF helped the community organize and worked to get industry on board to accept some of the nation's strongest air pollution laws on oil and gas drilling in the giant gas fields south of town.

Jonah Energy, a leading gas producer, implemented leak detection and repair on its gas fields, dramatically cutting unhealthy, smog-forming pollutants. It also cut methane emissions 75%. Methane, the main component of natural gas, is responsible for a quarter of global warming experienced today. "We saw that changes were needed," says Jonah's Paul Ulrich. "So we sat down and hashed it out."

Today, ozone levels are down dramatically. As a bonus, says Ulrich, "There's less maintenance and more gas in the system. It's a huge business success."

"We never could have accomplished what we did without the help of EDF," says Mary Lynn Worl, cofounder of Citizens United for Responsible Energy Development. "They urged us to take a



stand, gave us legal advice, and pressed regulators to strengthen the rules."

Now the state has mandatory measures in place across the Upper Green River Basin for both new and existing wells, far stronger than EPA regulations. EDF is pressing for the rules to be applied statewide, and for EPA to tighten regulations nationwide.

"I hope others take the playbook developed here and take it to other gas fields," says Jonah Energy's Ulrich. "We need to do it collectively as an industry. Ultimately this is about our social license to operate."

Seven people who took charge—and made the victory possible

TERRY ALLEN



The student

“They didn’t take me seriously at first,” says **Tracey McCarty**, now 24, who in middle school conducted the experiment that shook up her hometown. “People said the ozone was coming from Salt Lake City. But the science was accurate.”



The nurse

“We saw a huge increase in asthma over ten years,” says **Leslie Rozier**. “It particularly affects young children with their beautiful, vulnerable lungs. It breaks my heart to tell brand-new moms we must take their babies back to a hospital because they live near the rigs.”



The community activist

“We were called un-American at first, but today the economy has not suffered and people are healthier,” says **Mary Lynn Worl**, a college professor with deep roots in Pinedale, who helped organize support for cleaning up the gas fields.



A business voice

“Wyoming boasts the most scenic views, clear water and blue skies in the nation, but air pollution threatens this,” says **Meredith Taylor**, who runs guided wildlife tours. “Improving air quality is fundamental to our health. It’s also good for business.”



The political leader

“I was a Pinedale councilman at the time,” says **Dave Hohl**. “They found emissions twice what industry had claimed. People asked me, ‘What are you going to do about it?’ So we sat down with the governor and said, ‘We need to fix this.’ I’m not anti-gas. I just want to see it done right.”



The problem solvers

“This is a small community. We all meet at the kids’ soccer games,” says **Paul Ulrich** (right) of Jonah Energy. “We saw changes were needed. EDF’s **Jon Goldstein** (left) gave us regular input on what we needed to do. Inflaming the debate has never been the answer here. Informing the debate is, and nobody’s better at that than Jon.”

The good fight: Weaning the U.S. off coal

The Clean Power Plan is a historic opportunity to reduce carbon pollution from the single largest source of U.S. global warming emissions.

IN SOUTHWEST PENNSYLVANIA, COAL is still king. Just outside the rural town of West Finley, conveyor belts snake between the hills, carrying coal from nearby mines to Consol Energy's massive processing plant. Pennsylvania, the nation's third biggest greenhouse gas emitter, gets 36% of its electricity from coal.

Against that backdrop, it's encouraging that the Keystone State is racing full throttle to embrace the Clean Power Plan, President Obama's bold initiative to fight climate change by cutting carbon pollution from power plants. John Quigley, Pennsylvania's environmental protection secretary, says the state's compliance plan is an "opportunity to model sustainability to the nation."

Such forward thinking is a breath of



Replacing coal plants will go a long way toward meeting the climate pledges the U.S. made in Paris.



ISTOCK

The end of the line for dirty energy?

fresh air. Officially adopted on October 23, 2015, the Clean Power Plan aims to reduce U.S. electricity-sector emissions by an estimated 32% below 2005 levels by 2030. The plan establishes state-by-state targets for emissions reductions, and gives each state the flexibility to develop its own compliance plan to reflect local priorities and minimize costs.

At least 40 states are working to develop plans, even some such as Georgia, Missouri and South Carolina that are suing EPA in an effort to block the Clean Power Plan. Why? Because, if the law is upheld, states that have developed their own compliance plans will be able to cut carbon emissions their way, rather than having EPA make that determination. "The best way to protect Michigan is to develop a state plan that reflects Michigan's priorities," said Gov. Rick Snyder, a Republican. "We need to make sure Michigan's energy decisions are made in Lansing, not D.C."

The opposition lawsuit is led by West Virginia, joined by other states and industry groups, while EDF has joined a coalition of states and municipalities—as well as public health groups and power companies—to defend the plan.

"Fortunately EPA has a long history of successfully defending its rules against legal attacks," says EDF director of regulatory affairs Tomás Carbonell. Leading legal experts and former EPA officials

believe the Clean Power Plan falls within EPA's long-standing authority under the Clean Air Act.

"More attacks are sure to come," says EDF climate policy manager Mandy Warner, "whether through the courts, the Congressional budget process or stand-alone initiatives."

But despite the potential political challenges, the Clean Power Plan is already having an impact, influencing utilities to invest more in low-carbon energy.

Xcel Energy is among the power companies that continue to see opportunity in the changing landscape. The company has accelerated its investments in wind, solar and natural gas. "This is really a business decision for the future," said Chris Clark, president of Xcel's Minnesota regional operations. "It's what our customers want us to do."

Even in states suing to stop the rule, an average of 61% of adults say they support the policy, according to polling data analyzed by the Yale Project on Climate Change Communication.

EDF is working to ensure that their voices are heard. We are pushing states to submit their plans on time and are working with states and power companies to get strong plans in place.

"This can't wait," says Warner. "It is way too important for the health of the planet—and the billions of humans who live here."



Climate change hammers New England's cod fishery

NEW ENGLAND WATERS WERE ONCE so thick with cod that colonial fishermen bragged they could lower a basket and pull it up full of fish. But generations of overfishing and faulty management proved devastating for fish and fishing communities. Now, there's an additional threat: warming oceans.

A new study published in *Science* concludes that rising temperatures in the Gulf of Maine have decreased reproduction and increased mortality among Atlantic cod. The new research shows that climate change is compromising cod stocks' ability to rebuild. The region has seen water temperatures increasing steadily over the last decade as a result of climate change, and is known to be warming at a faster rate than 99.9% of the world's oceans.

In 2010, the New England cod fishery transitioned to a catch share program,

which EDF helped design. Catch shares have proven to be successful in rebuilding fisheries around the world. But in recent years, the biomass of Gulf of Maine cod has continued to decline, and was estimated in 2014 to be at just 3-4% of sustainable levels.

"We know the ecosystem is fundamentally changing and the cod stock is not recovering and that management has not been as effective as we hoped," says EDF's Dr. Jake Kritzer, who chairs the scientific and statistical committee of the New England Fishery Management Council. "Ultimately, the solution to New England's fishing crisis needs to be a global one."

Cod are cold-water fish. As the Gulf of Maine becomes warmer, it becomes less suitable for the species, the study found. Warmer water makes it less likely that freshly spawned cod survive. It also reduces the populations of zooplankton that they eat. At the same time, warmer waters mean an earlier spring and a later fall, which could result in more migratory predators present in the region.

Not just the cod are threatened. Warming water is throwing entire ecosystems off balance. The rising temperatures in the Northeast have also led to an explosion of green crabs, a non-native species that threatens salt marshes and has led to a near collapse of edible mussels and a decline in soft-shell clams.

Fishery stock assessments, used to determine how many fish can be caught each year, do not typically account for temperature and other environmental variables, and thus overestimate the size

of the Gulf of Maine cod population.

"Fisheries managers and scientists need to take temperature and other ecosystem factors into account when conducting stock assessments and setting catch limits," says Dr. Sarah Smith, EDF's manager for northeast coastal ecosystems. "We can no longer assume a static environment in which fisheries can return to where they were in the past."

EDF is engaged in a research project with our partners at the University of California at Santa Barbara to better predict what fisheries in New England might look like in the future under climate change. We also have a series of studies under way directed at how to integrate climate change into fisheries science for more accurate stock assessments.

The goal is to help the region's iconic groundfishing industry build resilience.

By promoting better science and management that is responsive to our changing environment and by shifting our focus onto healthy stocks, New England can support a resilient, profitable groundfish fishery and thriving fishing communities once again.

Help an iconic fish recover

Consumers can help by seeking out healthy, underutilized fish stocks caught in



New England waters such as haddock, pollock and redfish to support the beleaguered fishing industry. For more information on sustainable alternatives, see our Seafood Selector at seafood.edf.org.



For centuries, cod was the backbone of New England's economy.

Buying what's best for the environment

WHEN YOU SHOP, YOU TRY TO do the right thing for the planet. But with so many brands proclaiming greenness, how do you know what's really best? Take eggs. The labels read “all natural,” “cage-free,” “vegetarian-fed,” “pasture-laid,” “certified humane” and “free-range.” And all you want is a carton of eggs.

Today, over 400 green certifiers investigate product claims. Not all are equal. Here we survey some of the best.

■ Food

The Department of Agriculture's “USDA Organic” label guarantees rigorous standards that can be trusted. But that confidence could disappear if periodic attempts to dramatically weaken the rules succeed. With organics a \$39 billion business in 2014, the pressure to dilute the standards continues. So far, they're holding up.

One major chain, Whole Foods, uses its own “Responsibly Grown” label to guarantee that its products meet internal guidelines. But some growers complain that—with points awarded for such things as setting up a farm-based recycling system—the food at Whole Food is not necessarily organic.

■ Travel

There are more than 100 voluntary certification programs for sustainable tourism, but sadly some are green in name only. One that can be counted on for strict standards is The International Ecotourism Society (TIES), active in 135 countries. Also recommended is the “International Green Globe Standard,” which insists on 44 core criteria and more than 380 compliance indicators. Both TIES and Green Globe certify resorts that support both environmental and social initiatives in their host communities.

Likewise, the best green hotels do more than refrain from washing towels. One good rating program is Green Key Global, which is based on a thorough set of best hotel practices. It's active in both the United States and Canada.



What's in a label? Approach environmental claims with care.

■ Electrical tools and appliances

The “UL Listed” safety stamp from Underwriters Laboratory has earned a good reputation. But to support energy efficiency—and at the same time save consumers money—look for the Energy Star label. Launched by EPA as a voluntary labeling program for computers, Energy Star's familiar blue logo is now on major appliances, home electronics, office equipment and lighting.

What happens at the end of these products' life is also important. Unfortunately, many of the computers and TVs picked up on recycling day end up being irresponsibly handled overseas. Look for the “R2 Standard” from Sustainable Electronics Recycling International (SERI), which commits recyclers to reuse or recover materials

through dismantling and to avoid landfills or incineration “...unless no reuse or recycling options are viable.” So far, SERI has certified 530 facilities in 21 countries.

■ Home furnishings

The Carpet and Rug Institute's (CRI's) Green Label measures volatile organic compounds (VOCs)—which can have long-term health effects as they evaporate from carpets. The service also checks for recyclability and the presence of unhealthy PBDE flame retardant. Another organization, the Institute for Market Transformation to Sustainability, offers a “SMaRT Certified” label to guarantee that furniture, flooring and a variety of building products are PVC-free.

By Jim Motavalli

The certifiers

FOOD

- USDA Organic: 1.usa.gov/1P34DIP
- Whole Foods: bit.ly/1P2ifzG

TRAVEL

- International Ecotourism Society (TIES): ecotourism.org
- International Green Globe Standard: bit.ly/1RNjhjQ
- Green Key Global: greenkeyglobal.com

ELECTRIC TOOLS AND APPLIANCES

- Underwriters Laboratory (U.S.): bit.ly/1RNIUpd
- Energy Star: energystar.gov
- SERI-R2: sustainableelectronics.org

HOME FURNISHINGS

- Carpet and Rug Institute: bit.ly/1NRTaqd
- Market Transformation to Sustainability SMaRT Certificate: bit.ly/1mjOPSb

Jim Motavalli writes regularly about green products for leading publications. The opinions are the author's.

Your stories

Climate change in your backyard



Solutions asked EDF members to record how the environment has been changing where they live. From the responses we received, it's shockingly clear that the impacts of a warmer planet are hitting home, no matter where you live. Are elected officials listening?

I'm a serious gardener, and for years I've grown Savoy cabbages for harvest in December and January. This year it was so warm through November—daytime temps in the 80s, night time temps in the 50s—that the cabbages continued to grow until they burst open. This has never happened before.

—Merry Morgan

I started my residency 32 years ago in northwest Wyoming as a ranger in Grand Teton National Park, where we rarely saw rain from late October through March. Snow was dry and nearly unpackable for snowballs. The past two winters we've had rain each month of the year, and snowfalls are wet and heavy, very unlike the norm 30 years ago.

—Don Cushman

We have had our share of extreme weather in western Massachusetts, but the most alarming thing I've noticed is how the water table has decreased over the years. I walk our dog a lot in our many conservation areas, and places that were wet—vernal pools, streams and ponds, are mostly dried up. We used to get a great deal of rain here—not any more.

—Jay Alexander

I have lived in the same house for 18 years in Miami, FL. There was a time when the mango tree in my backyard would flower in May and produce fruit ripe enough to

eat in July and August. Now the mango tree flowers in February and March and provides ripe fruit in April and May. Don't tell me or the mango tree there is no climate change.

—S. Logan

Here in the UK, we are experiencing the warmest weather in 69 years.

—R.D. Peterson

Smallmouth bass migrations in rivers have changed due to the lengthened fall. They remain active into November, which was never true in the 1970s, 80s or 90s. In the past decade, they have stopped migrating all the way to reservoirs with the deepest water. Now they feel comfortable wintering wherever river depths approach 20 feet.

—Matt Straw

We have been breaking century-old records for high temperatures, in Oklahoma. Forecasts call for "June in November." Yet, people here don't care, and keep idling their cars while eating at a fast food place.

—Ed Parks

There are armadillos here in Nashville. Yep, we see the poor creatures hit on the road all the time. The first armadillo was apparently seen in Chattanooga in the 80s. So why are the armadillos here? Climate change. It is warmer and they are moving in.

—James Wohlgemuth

Letters



In a warming world, both corals and top predators are under threat.

Too optimistic?

I read the summer *Solutions* cover story "Sea Change" with interest. While I do appreciate the work that EDF is doing in combatting overfishing and helping to restore fish populations, I could not help but feel that the general tone was unrealistically optimistic. I have just read *The Sixth Extinction* by Elizabeth Kolbert, and she devotes two chapters to how the sea is being affected by climate change and man's enormous contribution to it. If things continue as they are, Kolbert says, the magnificent coral reefs could be destroyed in a matter of 50 years.

—Sol Glassberg

Dr. Doug Rader, EDF's chief oceans scientist, responds:

Without a doubt, the ocean faces serious threats, most notably acidification, warming waters and intensifying storms associated with climate change. EDF is actively engaged in both developing climate solutions and learning how to restore and manage healthy ocean ecosystems, while taking climate risks into account. For example, we've learned that rebuilding populations of reef fishes—from sharks and other top predators to herbivores that control algae—can help maintain reef integrity. We are seeing evidence that marine protected areas can enhance the resiliency of some keystone marine organisms, including corals. These hopeful projections will need to be tempered if commitments to slow warming aren't fulfilled, but for now there is reason to believe that a healthier future for fish and fishing communities is attainable.

We want to hear from you!
 Email us at editor@edf.org.



“I think having land and not ruining it is the most beautiful art that anybody could ever want to own.”

— Andy Warhol