Union of Concerned Scientists

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Fighting Back against Attacks on Science

What Future for US Coal?

Climate Change Goes to Court

[Union of Concerned Scientists]

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The Union of Concerned Scientists puts rigorous, independent science to work to solve our planet's most pressing problems. Joining with people across the country, we combine technical analysis and effective advocacy to create innovative, practical solutions for a healthy, safe, and sustainable future.

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Climate Change Goes to Court

Fisherman's Wharf, in San Francisco, California. San Francisco County is one of several communities in the state suing fossil fuel companies for climate-related damages to public property. Learn more in our story on p. 18.

By Ken Kimmell

Courts are forced to take on problems when the legislative and executive branches' failure to act creates a crisis. In the United States today, the federal government has abdicated leadership on the central challenge of our time: global climate change. Given this dereliction of duty, will courts now step in to fill the void?

Several recently filed lawsuits—including ones by San Francisco and Oakland, California—suggest the answer could be yes. And the Union of Concerned Scientists is playing a supporting role in helping to answer one of the most difficult questions courts will face as climate litigation unfolds, namely: how to apportion liability for a harm that has so many sources? This is particularly relevant as irrefutable evidence shows that the fossil fuel industry has been aware for decades that their products contribute to climate change, and yet has worked to actively deceive the public.

A newly published paper by UCS scientists Brenda Ekwurzel and Peter Frumhoff, among others, attempts to answer liability questions with a robust scientific model that determines the portion of climate impacts such as temperature increases and sea level rise that can be traced back to the major fossil fuel companies (for more, see "Ideas in Action" on p. 18).

From civil rights and same-sex marriage to the regulation of tobacco, we've seen how powerful the courts can be in hastening widespread societal changes. So we should take some encouragement that lawyers and climate scientists are joining forces in court. It's too early to gauge the impact of the climate lawsuits now under way. But these cases are already sparking an overdue debate about the legal responsibility of the fossil fuel industry. With help from UCS, the rapidly emerging field of climate attribution science could help courts answer questions they are likely to face as they adjudicate these issues.

***Ken Kimmell** is president of UCS.*

Photos: m01229/Creative Commons (Flickr) (San Francisco); Richard Howard (Kenneth Kimmell)

WHAT OUR MEMBERS ARE SAYING

Here's a sampling of recent feedback from the UCS Facebook page (*www.facebook.com/unionofconcernedscientists*) and Twitter feed (*www.twitter.com/ucsusa*)

ON FOSSIL FUEL COMPANIES' RESPONSIBILITY FOR CLIMATE CHANGE

John Todd Waterman:
I don't blame the average voter for believing the fossil fuel companies' $1 billion-a-year disinformation campaign, which uses some of the same top PR firms Big Tobacco used. It looks just like legitimate science to anyone who doesn't have access to reputable, peer-reviewed science journals.

Maggie Freed:
And we support them with subsidies too! We should support clean renewable energy, biofuels, and everything else we can to stop pumping CO_2 into the atmosphere of the only planet we have!

@sok_tc:
So their internal reports reflected the public, peer-reviewed science of the time? And they kept it quiet? Yikes!

Teresa Mynko:
Being aware that we, in fact, have consumed and benefited from these products is the uncomfortable moment of truth many people are facing. It's the insult added to the injury. I hope that this discomfort will produce changes in thinking, consumption, behavior, purchasing, voting, etc.

ON THE SIDELINING OF SCIENCE

Denis Davis:
The suppression of the science about human-caused climate change grows in the Trump administration. Just like "cigarettes don't hurt anyone." Are we unable to learn from our past blunders?

Ken Grondell:
Science tries to find the truth of things. I suspect this administration finds the truth inconvenient at best.

@RunnerGirl_Ray:
The American people are being threatened by this administration on all fronts. [It is] literally supporting policies that will kill us.

ON HURRICANES HARVEY, IRMA, AND MARIA

Steve Thompson:
Another major storm pushing into the United States. I think these will be the new norm as climate change accelerates.

@E_Mary1019:
I'm a very concerned Floridian—Harvey was devastating and now seeing what Irma has turned into, climate change just can't be ignored/denied.

[IN THIS ISSUE]

Extreme Weather Hits Home

Hurricane Harvey dropped more than 50 inches of rain in some parts of Houston, Texas, inundating infrastructure, damaging homes and businesses, and creating a toxic chemical soup from flooded industrial facilities within city limits. Just days before, President Trump rescinded an Obama-era executive order that discouraged building bridges, roads, and other infrastructure in flood-prone areas.

Millions of people in Texas, Louisiana, Florida, and Puerto Rico—as well as in dozens of other now-decimated Caribbean islands—are still reeling from the devastation wrought by Hurricanes Harvey, Irma, and Maria. As of this writing, millions are still without power, and US cost estimates for the three storms run well into the hundreds of billions of dollars. Our thoughts are with all those affected as *Catalyst* goes to press.

One of the more painful aspects of the recent spate of extreme weather is how blatantly our federal officials—and many state leaders—disregarded warnings and evidence-based analysis about how climate change and rising sea levels increase the threats posed by these kinds of storms. In one well-reported example, just 10 days before Harvey struck, the Trump administration rescinded an Obama-era executive order that discouraged building in flood-prone areas.

As Irma worked its way toward the Florida coastline, EPA Administrator Scott Pruitt even told CNN it was "insensitive" to discuss the role climate change may have played in strengthening these hurricanes. Needless to say, we strongly disagree with Scott Pruitt. Only by accepting the scientific evidence about human-caused climate impacts can we fully prepare for and mitigate what is to come.

For years, the Union of Concerned Scientists has been working hard to help communities become aware of—and prepare for—the threat posed by human-made climate change. To name just one example, the 2015 UCS report *Lights Out?* showed that storm surge from a Category 3 hurricane could expose nearly 40 electric substations in Miami and southeastern Florida to flooding. We urged action to harden these substations and avoid long power outages after such a storm.

Thankfully, despite the many climate change deniers now leading federal agencies, recent UCS work seems to be drawing widespread public attention to the growing threat. Our recent report *When Rising Seas Hit Home*, featured on the cover of the summer issue of *Catalyst*, received extensive coverage in the media: more than 500 stories, including some 200 on radio and television news. The analysis made two appearances on the CNN homepage, Bloomberg used the downloadable data to design maps to complement its coverage, and the analysis was prominently featured in many outlets including *Scientific American*, Univision, and the *Washington Post*—drawing more than 121,500 views on the UCS website in July alone.

The main lesson from the report is that hundreds of coastal communities are at risk from rising seas—even without storm surge—and the time to prepare is now. Communities rebuilding in the aftermath of this season's hurricanes must bear these new risks prominently in mind.

Photos: REUTERS/Richard Carson (Houston); monkeybusinessimages/iStock (gas pump); Audrey Eyring/UCS (UCS store)

Analysis Reveals Who Benefits Most from Fuel Economy Standards

Under President Trump, the EPA and the US Department of Transportation have chosen to reopen a review of fuel economy standards that require automakers to produce more fuel-efficient cars. Since the implementation of these standards, all Americans have saved money at the pump. UCS is helping showcase a study by the University of Tennessee that found vehicle efficiency standards benefit low- and middle-income Americans the most, as they save a greater percentage of their income on transportation compared with higher earners.

Improvements in fuel efficiency saved low- to middle-income households an average of 2 percent of their income from 1980 to 2014—a significant amount for millions of Americans. The standards especially help drivers in rural areas who often face longer commutes and higher fuel costs. "When rural Americans can save money on fuel, that matters even more because they may not have access to other forms of transportation besides driving," says Senior Policy Analyst Josh Goldman.

The current vehicle efficiency standards, if maintained, are forecast to continue saving *all* American drivers money. Learn how you can help protect the standards at *www.ucsusa.org/fuel-economy-low-income.*

Announcing: A New Way for All to Stand Up for Science

At UCS, we've started a new "Science Champions" initiative to help our members and supporters fight back against attacks on science, public health, and the environment.

Science Champions volunteer to get the word out by engaging with reporters in their communities or calling or meeting with their members of Congress. UCS offers Science Champions all the tools they need to make a difference, including exclusive invitations to join calls with our top scientists and experts at critical moments and learn about the most effective tactics for fighting back.

In the months to come, our Science Champions will be helping to protect vital science programs from crippling budget cuts, and preventing the rollback of progress on vehicle standards, among many other efforts.

So far, the response has exceeded expectations. Our call-in event to kick off the program this summer drew more than 6,000 attendees, demonstrating the pent-up demand among our supporters for ways to take action. More than 2,200 people have now signed up from all 50 states and the number continues to grow.

You don't have to be a scientist to join the ranks of UCS Science Champions! Sign up now on our website at *www.sciencechampions.org.*

A Spate of Successes on the West Coast

This summer, while UCS actively fought rollbacks of safeguards at the federal level, on the West Coast we managed to celebrate victory after victory on clean energy, clean transportation, and emissions reductions. Our work is meaningful even when the goal is defending previous gains, but it's sweeter when we push hard for new policies and win. Here's a roundup of the progress we've made:

UCS Western States Director Adrienne Alvord (far right) at the official signing ceremony for AB 398 with California Governor Jerry Brown (seated). UCS played a major role in the bill's passage, and was one of just a few nongovernmental organizations invited to appear with Governor Brown at the event.

NEXT STOP: ELECTRIC BUSES

The Los Angeles Metropolitan Transportation Authority in July committed to a goal of converting its entire fleet of transit buses to zero-emissions technologies by 2030. Leading up to this decision, UCS conducted an analysis on making public transit greener, coauthored an op-ed on how electric buses contribute to cleaner air and create jobs, testified before the agency, and mobilized our supporters to support the switch.

CLIMATE PLANNING GROUP TO INCLUDE UCS SCIENCE NETWORK MEMBERS

In 2016, California adopted AB 2800, a UCS-sponsored bill requiring state agencies to take climate change into account when planning, maintaining, and investing in public infrastructure. The bill also requires the creation of a Climate-Safe Infrastructure Working Group that will make science-based recommendations to the state's decision-makers; it was launched over the summer with several UCS-recommended experts on board, including two UCS Science Network members.

An artist rendering of an electric bus on the Los Angeles Metropolitan Transportation Authority's Orange Line. UCS mobilized supporters in the area to support the agency's proposal, and provided analysis and testimony on the benefits of greener public transit.

CLEANER FUELS AND CARS FOR OREGON

After UCS mobilized supporters to attend a summer listening tour conducted by Oregon legislators and prepared them to provide public comments in support of clean transportation, lawmakers passed a transportation package that provides incentives for electric car buyers, and protects the state's clean fuels program.

NEW BILLS TARGET CLIMATE, INDUSTRIAL EMISSIONS

After participating in talks with environmental justice, faith, labor, and business groups, along with Governor Jerry Brown and California legislators, UCS helped pass an extension of the state's landmark cap-and-trade climate law by a two-thirds vote. The bill (AB 398) went hand in hand with a second bill (AB 617) that strengthens laws and penalties aimed at reducing air pollution from industrial facilities in low-income communities and communities of color.

Photos: Jane Tyska/Bay Area News Group (bill signing); Los Angeles County, Metro (electric bus)

Breathing Easier on Ozone and Climate Science

These days, UCS works overtime to try to avert the worst of the Trump administration's misguided or ill-considered plans, and we take heart when we succeed in doing so. Two recent developments fit that bill. First, we raised the alarm about EPA Administrator Scott Pruitt's plan to delay implementation of a new, stricter 2015 ozone standard (see Gretchen Goldman's column "Why Is the EPA Delaying the Ozone Rule?" in the summer issue of *Catalyst*). As the article noted, the new standard was backed by decades of scientific research and the delay would have needlessly and illegally threatened public health.

On August 2, Pruitt reversed his decision to delay the standard. It is unclear whether he heeded our and others' scientific advice on this subject, or that of his lawyers—his move came after 15 states and the District of Columbia filed lawsuits to stop the delay. Either way, science-based protections from ozone pollution will be allowed to start now for all Americans.

Equally notable, UCS Senior Climate Scientist Brenda Ekwurzel publicized the fact that, in the coming year's budget, the Trump administration had quietly attempted to eliminate the United States' $2 million contribution to the Intergovernmental Panel on Climate Change (IPCC)—perhaps the single most respected scientific body assessing climate change. UCS encouraged our supporters in Maine and Tennessee to call their Republican senators (Susan Collins and Lamar Alexander, respectively) and urge them to break ranks with their party. They did, and the Senate voted to restore $10 million in funding to both the IPCC and the United Nations Framework Convention on Climate Change (UNFCCC)—the body responsible for the 2015 Paris climate agreement.

ONE FUNDRAISING CHALLENGE MET, ANOTHER TO COME

The UCS National Advisory Board supports and provides input on our work. Earlier this year, its members—recognizing the increased urgency of protecting science under the Trump administration—pooled their resources and issued a challenge to our members.

For every member who increased their level of giving, the National Advisory Board pledged to match that increase dollar for dollar. We're pleased to report that this first stage of the challenge was a success: more than 4,500 UCS donors stepped up to take advantage of this opportunity!

In the next few months, the National Advisory Board plans to present a new challenge for members, so stay tuned. In the meantime, if you were one of our many generous contributors earlier this year, we thank you.

Photo: Bill Brooks / Alamy Stock Photo


JUNE 2017
WITHDRAW— PARIS AGREEMENT
DELAY— OZONE RULE
DELAY— EPA RISK MANAGEMENT PLAN
DELAY— ADDED SUGARS LABELING
ACCOMPLISHMENTS
✓ AVOIDED SCIENCE ADVICE
✓ PUT PROFITS OVER PROTECTING PEOPLE
✓ REDUCED PUBLIC ACCESS TO SCIENCE
THE PRESIDENT

THE TRUMP ADMINISTRATION IS TRYING TO SIDELINE SCIENCE.

UCS IS FIGHTING BACK.

BY PAMELA WORTH

To understand the state of science in the Trump administration, look no further than the case of Joel Clement, a climate scientist and former director of the Office of Policy Analysis at the US Interior Department. This summer, Clement was abruptly removed from his position and reassigned to an accounting position, even though he is not an accountant. He filed a formal whistleblower complaint with the US Office of Special Counsel, alleging that his transfer came as retaliation for his work on behalf of Alaskan Inuit communities whose land is being lost to climate-driven sea level rise.

"Many of these people need to move out of harm's way, and soon," Clement says. "Without full engagement from the federal government, that's not going to happen. My role was coordinating that engagement." But now, Clement says, with his reassignment, no one is doing that work. "That's why I blew the whistle," he says. "The health and safety of these Alaskan natives is put at risk by ignoring this problem."

"In this case, the consequences will be felt by Alaskan native communities," Clement says. But he adds that his reassignment is symptomatic of a larger problem within the Trump administration—with dangerous broader consequences for public health and safety.

"There's a pattern of muzzling scientists," he says, "putting many more people at risk."

A Union of Concerned Scientists report released this summer, *Sidelining Science Since Day One*, exposes this broader pattern—chronicling dozens of examples of the abuse, manipulation, denial, and suppression of science during the first six months of the Trump administration.

"We knew there had been a number of incidents," says report coauthor Jacob Carter, a research scientist with the Center for Science and Democracy at UCS. "But even we were surprised when we compiled them; by our measure, there has been a new attack on science every four days on average."

By repeatedly choosing political convenience over truth or health and safety concerns, the Trump administration has waged a veritable war on science. The president and Congress have willfully ignored the evidence on harmful products and practices, targeted and demoted scientists like Clement for doing their jobs, attempted to cut funding for crucial research, appointed people with blatant conflicts of interest, and denied the threat climate change poses to our country and the world.

"UCS became familiar with abuses of science during the George W. Bush administration. But what we're witnessing now—the scale and pace—is on steroids," says Michael Halpern, deputy director of the Center for Science and Democracy.

While attacks on civil and human rights have deservedly claimed the media spotlight in this administration, attacks on science have equally serious consequences. Policymakers need scientific evidence to make decisions on the challenging issues we face today. Suppressing that science is reckless, shortsighted, and harmful to Americans' health and safety.

Photo: Alison Slattery & House9 Design

DEADLY CONSEQUENCES

Since January 20, 2017, the Trump administration has made several egregious policy choices that pose immediate threats to people's lives. For example, the Occupational Safety and Health Administration under President Trump has delayed and weakened protections for construction and shipyard workers who are exposed through their jobs to the carcinogens silica and beryllium. Rules intended to limit exposure to these chemicals were based on decades of research. Workers will inevitably sicken and die because these rules won't be properly implemented.

Farmworkers' and children's health will suffer as a result of a decision at the Environmental Protection Agency (EPA) to willfully overrule scientific evidence. Earlier this year, EPA Administrator Scott Pruitt went against the advice of his own staff scientists and canceled a planned ban on the pesticide chlorpyrifos, which is manufactured by Dow Chemical—whose CEO has donated to President Trump. The pesticide, prohibited for indoor use since 2001 but still widely applied in agriculture, has sickened farmworkers and hindered brain development in children who live near farm fields.

More recently, an executive order from President Trump threatens the safety of people living in flood-prone neighborhoods. The order, coming just days before the devastating impact of Hurricane Harvey to Houston and many other Texas communities, rolls back standards for flood risk management that had required federal agencies to factor in sea level rise when building infrastructure such as roads and bridges in low-lying areas.

President Trump hands the pen he used to sign an executive order aimed at limiting federal regulations—such as those that protect people from exposure to harmful chemicals—to Dow Chemical chairman and CEO Andrew Liveris.

THANK YOU

"Your support is helping me spread the word about the dangerous disregard for science at the highest levels of our government—and the consequences."

JACOB CARTER
RESEARCH SCIENTIST
CENTER FOR SCIENCE AND DEMOCRACY AT UCS

Moses Juarez, left, and Anselmo Padilla wade through floodwaters from Hurricane Harvey in Houston. Two days before Harvey made landfall in the United States, President Trump issued an executive order rolling back the Federal Flood Risk Management Standard, which could allow continued development in flood-prone areas and put more people and property at risk from storm damage.

"It's been made evident very quickly why we needed that federal flooding standard," says Clement. "This isn't a political debate."

The Trump administration's indifference to the role of science in policymaking couldn't have come at a more precarious time, says Carter.

"Look at the flood damage in Texas from Hurricane Harvey," he says. "Science is more important than ever for addressing global challenges like climate change.

SCIENTISTS FIGHT BACK

The good news: people are paying attention to UCS efforts to call out the Trump administration's attacks on science. As Halpern notes, the UCS *Sidelining Science* report has been cited repeatedly by journalists. And more importantly, he says, UCS is seeing a welcome eagerness among scientists to step out of their comfort zones and participate in public life.

"We've seen a shift in how the scientific community speaks about public engagement: before, scientists questioned whether to engage at all; now they are asking *how* to engage. There's a renewed and sustained culture of civic responsibility," Halpern says. "We were concerned that people would develop fatigue and retreat after a couple of months of the Trump administration—but what we're seeing is the opposite. People are saying, 'Not on my watch.'"

(continued on p. 21)

KEY TRUMP ADMINISTRATION TACTICS FOR ATTACKING SCIENCE

- Sidelining independent science advice.
- Appointing individuals with conflicts of interest to scientific leadership positions.
- Leaving key science positions vacant.
- Revoking science-based safeguards.
- Misrepresenting climate science and rolling back climate-related safeguards.
- Weakening science-based pollution standards without scientific justification.
- Undermining protections from hazards at work and home.
- Altering or deleting scientific content on federal websites.
- Reducing public access to data.
- Restricting federal scientists' ability to speak publicly.
- Creating a hostile environment for federal scientific staff.

For real-world examples of each tactic, as documented in the UCS report *Sidelining Science Since Day One*, go to *www.ucsusa.org/sidelining science*.

Photos: Jinning Li/Shutterstock (pesticides); Associated Press/Pablo Martinez Monsivais (Trump); Ja-Rei Wang/UCS (Jacob Carter); Associated Press/David J. Phillip (Houston)

Faith in Climate Science

INTERVIEW WITH KATHARINE HAYHOE

Dr. Hayhoe, you're a climate scientist and an Evangelical Christian. Many in your faith are among the loudest voices denying the reality of climate change in our country today. How do you personally reconcile your religion and your life's work?

KATHARINE HAYHOE: One of the most interesting things I have learned from talking to people is that every major world religion's core values are care for creation, nature, and the world, and care for people who are poor, who have fewer advantages. The Bible doesn't mention climate change, but it has a lot to say about our responsibility for this world that we live in, and our responsibility to care for people, especially the poor and vulnerable of this world, who are being disproportionately affected by a changing climate.

I'm a Christian, and my husband pastors an Evangelical church. If it weren't for the fact that the group that I'm part of disproportionately rejects the science on climate change, I don't think I would have ever told anybody where I go to church on Sunday—because that's not what scientists talk about when we gather around the water cooler! We talk about science, because that's what we love.

The reason I decided to make my faith public is the fact that, among Evangelical Christians, only about a third agree with the science of climate change, and two-thirds don't. That number is very similar among white Catholics. This doesn't have anything to do with people's faith, or what they believe about the Bible or God. It's the fact that in the United States, faith and politics have become so intertangled that for some people, their statement of belief is dictated first by their politics, and only second by the Bible. And if the two come into conflict, they'll go with their political ideology over what the Bible says, or what a religious leader such as the pope says.

How does your faith inform your work?

KATHARINE HAYHOE: I would say that my faith is what drives me to act on this issue. Science can tell us that climate change is real, it is serious, it is caused by us, and depending on the choices we make, this is what the most probable outcomes look like. But science can't tell us what to do. That comes from our heart, from our values, from what's important to us, from what we love, from what we fear. And so, for many of us—for more than 70 percent of us in the United States—many of our values come from our faith.

As a scientist, it's much more comfortable to live out our lives in the ivory tower: to do our research, to publish our papers, and to go home at night knowing that we haven't received any hate mail. The reason I study climate change is because it affects people. And I've realized that just doing the science today is not quite enough. My faith is what compels me to speak on this issue because I know it's the truth, and I know that it's affecting real people today.

What are you working on currently?

KATHARINE HAYHOE: My research focuses on three different areas. The first is evaluating the ability of global climate models to reproduce the regional-scale dynamics that bring us a lot of our weather patterns, like extreme heat, heavy rainfall, drought, and

KATHARINE HAYHOE is a professor in the Department of Political Science at Texas Tech University, and director of the school's Climate Science Center. She's also the founder and CEO of ATMOS Research, a consulting firm that helps industry, nonprofit, and government clients understand how climate change will affect the way they work. Dr. Hayhoe also hosts a biweekly YouTube series called "Global Weirding," which explains climate change in short, manageable chunks.

Photo: Artie Limmer/Texas Tech University

> *"I've realized that just doing the science today is not quite enough. My faith is what compels me to speak on this issue because I know it's the truth, and I know that it's affecting real people today."*

floods. I want to know: can we trust the climate models when they give us these projections? I also develop new ways to downscale global climate model output to the local level.

The third thing is a foray into social science research. I'm trying to figure out if it makes a difference—in talking to people about a certain issue—if we start with debunking myths and misconceptions first before we tell them the true information, or if it's better to start with the true information.

I'm doing this work because I've learned that the barrier to action on climate change is not in the physical sciences. We have known for decades that the climate is changing, that humans are responsible, and that the impacts are serious; it's been 51 years since scientists were sure enough about this to formally warn the US president. So, the barrier to action is in the social sciences: in understanding our human psychology, the way we interact with information, and our political system.

What do you say when confronted by climate change deniers?

KATHARINE HAYHOE: I can definitely tell people that this thing is serious, and real, and I can speak to it firsthand. And I think this is very powerful because I have been in situations before where people will say to me, "Well those scientists are just in it for the money." Or, "Those scientists are just making up the data." And I can say to them: I'm right here and I'm looking you in the eye. I am a scientist. I analyze the data myself. Here's how much money I make—which is a fraction of what I would make in industry. When we're in that situation, they can no longer use those convenient excuses. Because they're looking at me, and I am real, and they can't say I'm making it up as a hoax, or that I'm part of a so-called liberal agenda.

What reactions have you received from fellow Evangelical Christians to your work?

KATHARINE HAYHOE: Well, first of all, the situation in the United States is radically different from the situation in any almost other country around the world. When I went to Paris [for talks leading up to the Paris climate agreement], I went as a scientist. But I also met with the head of the World Evangelical Alliance, who was an official delegate for his country, the Philippines. I met with other evangelicals—from Europe, from Africa, from around the world—who were all there in Paris because their faith compelled them.

This strange situation where somehow being a white Evangelical or a white Catholic means you can't agree with the science of climate change, that is unique to the United States. And it is entirely because we have confused our faith with our politics. We are looking to our thought leaders in the political realm to dictate our position on issues on which the Bible is very clear. {C}

Photo: Loop Images Ltd/Alamy Stock Photo

A DWINDLING ROLE FOR COAL

DESPITE TRUMP ADMINISTRATION RHETORIC, UCS ANALYSIS SHOWS THAT US COAL-FIRED ELECTRICITY GENERATION CONTINUES TO STEADILY DECLINE.

BY ELLIOTT NEGIN

Repeating one of his well-worn themes at a late August rally in Phoenix, President Trump crowed about the opening of new coal mines. "We've ended the war on beautiful, clean coal," Trump said. "And it's just been announced that a second brand-new coal mine . . . is opening in the state of Pennsylvania."

Putting aside the fact that there is no such thing as "clean" coal, do these new mines herald a turnaround for the US coal industry?

The short answer is no.

Consider the facts: as recently as 2008, coal-fired power plants generated half of all US electricity. Since then, demand for coal has dropped steadily due to cheap natural gas, new wind and solar projects, and aggressive energy efficiency initiatives, forcing three of the four largest US coal companies—and many smaller ones as well—into bankruptcy. Today, coal accounts for about 30 percent of US electricity generation.

But what about those two new mines? President Trump failed to explain that they are the result of heightened Chinese demand for "metallurgical" coal to produce iron and steel, a variety of coal that comprises only about 10 percent of US reserves. This small spike in specialized coal production has led to a net increase of only 700 jobs between January and the end of June. A much more significant fact: the Bureau of Labor Statistics' preliminary coal industry jobs number for August—51,000—is still 41 percent lower than it was at the end of 2008.

Photo: Rich Carstensen/Creative Commons (Flickr)

> ***Closing more coal plants would especially benefit low-income communities and communities of color, which are disproportionately harmed by coal's toxic emissions.***

COAL CAN'T COMPETE

According to a new Union of Concerned Scientists analysis, *A Dwindling Role for Coal: Tracking the Electricity Sector Transition and What It Means for the Nation*, the rapid transition away from coal is likely to continue no matter what the Trump administration says or does.

"A significant portion of today's coal fleet can't compete economically with cleaner energy options," says Jeremy Richardson, a UCS senior energy analyst and lead author of the report. "That's particularly the case in the Southeast, where operational costs for coal units are considerably higher than what utilities would have to pay for natural gas or renewables."

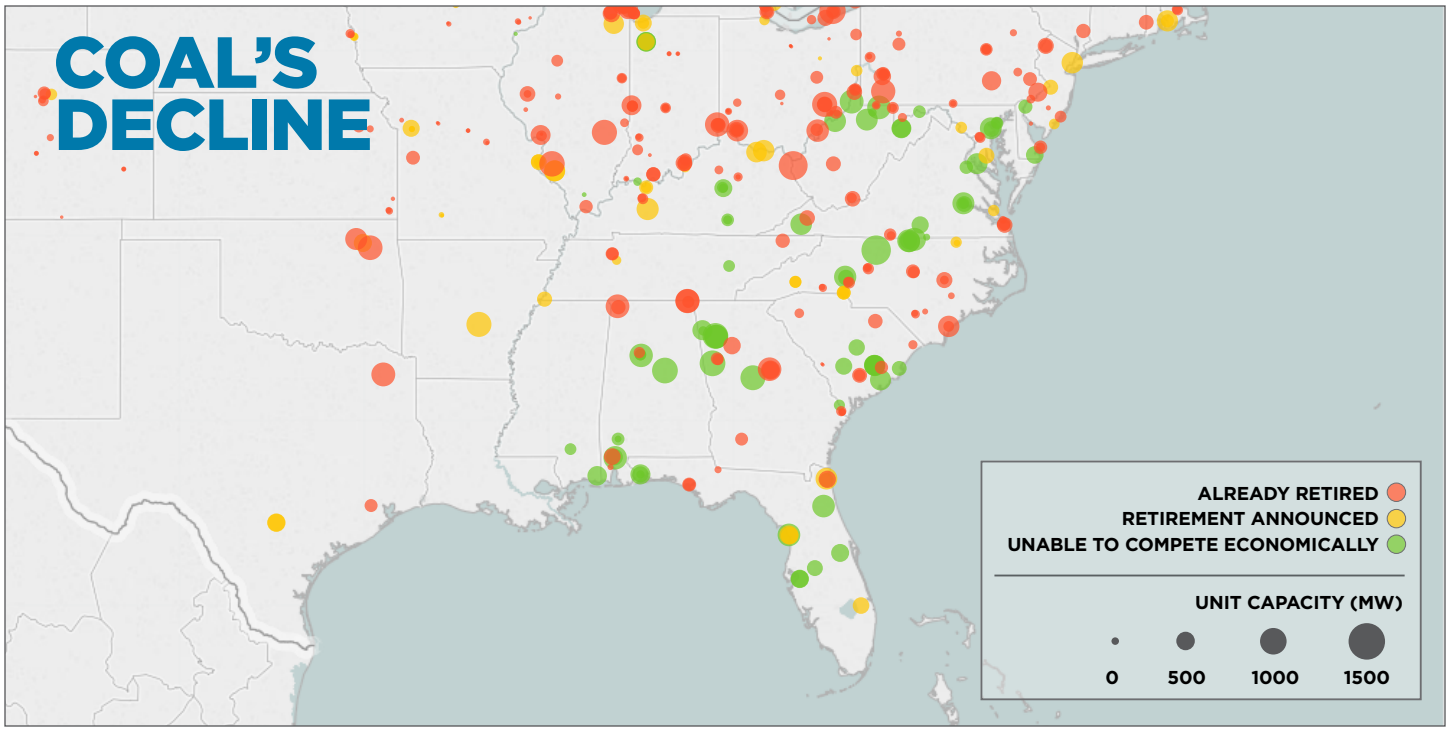
The numbers tell the story: nine years ago, 1,256 turbine units at 526 coal-fired power plants had a generating capacity of nearly 357 gigawatts (GW). (One gigawatt can power some 700,000 average homes.) Now, 706 units at 329 coal-fired power plants have a capacity of 284 GW—20 percent less. In the intervening years, utilities converted 98 units to burn natural gas and retired 452 others.

Of the remaining 706 units, utilities have already announced plans to either retire or convert 163 more by 2030, amounting to roughly 18 percent of total US coal capacity. But even that does not provide the full picture: UCS has identified another 122 units at 58 plants that are uneconomic compared with natural gas—an additional 20 percent of coal capacity that is ripe for retirement. Taken together, UCS analysis shows that US coal-fired electricity capacity could drop by more than a third in the next 15 years.

This inevitable decline will affect some states far more than others. Ironically, the state that consumes the highest percentage of uneconomic coal-fired electricity is West Virginia, one of the top US coal producers. UCS found that 12 of the 19 coal-fired units currently operating in the state are ripe for retirement—accounting for some 57 percent of the state's electricity. Four other states are generating more than 20 percent of their electricity from uneconomic coal-fired units: Georgia, Maryland, North Carolina, and South Carolina.

A BOON TO PUBLIC HEALTH

Shutting down more old, inefficient coal units or converting them to run on natural gas will undoubtedly have a significant impact on public health. The data show that tighter pollution controls and closures have already dramatically reduced toxic coal plant pollutants linked to cancer and cardiovascular, respiratory, and neurological diseases. Between 2004 and 2012, for example, sulfur dioxide and nitrogen oxide emissions—the main components of fine particulate pollution—dropped 68 percent and 55 percent, respectively, according to a 2015 Clean Air Task Force study. As a result, the study found, the number of asthma attacks attributable to coal plant pollution plunged 77 percent, heart attacks decreased 69 percent,



Virtually all coal power plants in the southeastern United States are either already closed, slated for retirement, or unable to compete economically with cleaner energy options. (View the full US map at www.ucsusa.org/coaltransition.*) The region should seize the opportunity to replace its aging, expensive coal fleet with renewable resources such as wind and solar. Note, this map does not include units that have been, or will be, converted to run on natural gas, or plants that were not analyzed due to insufficient data.*

hospital admissions plummeted 74 percent, and premature deaths declined 68 percent, from 23,600 to 7,500.

Closing more coal plants would especially benefit low-income communities and communities of color, which are disproportionately harmed by coal's toxic emissions. A 2012 NAACP study found that the nearly 6 million Americans who lived within 3 miles of a coal plant in 2000 had an average per capita income of $26,000 in today's dollars—15 percent lower than the national average—and 39 percent were people of color. According to UCS, by 2016 the number of Americans living within 3 miles of a coal plant was down to 3.3 million, and when the units scheduled for retirement are shuttered, fewer than 2 million will live that close.

According to an August 2016 Carnegie Mellon study in the journal *Energy*, converting all currently operating coal power plants to natural gas would further reduce sulfur dioxide and nitrogen oxide emissions by 90 percent and 60 percent, respectively. But coal plants are also one of the nation's largest sources of carbon dioxide emissions, accounting for roughly 20 percent. Replacing them with natural gas would not do enough to reduce the electric power sector's contribution to climate change, not only because the burning of natural gas produces carbon dioxide, but also because gas leaks at drilling sites, processing plants, and pipelines release methane, a more powerful heat-trapping gas than carbon dioxide. The UCS analysis recommends a better approach.

THE CASE FOR RENEWABLE ENERGY

"In states where many outmoded coal units will likely be shuttered, a wholesale shift from one fossil fuel to another is tempting, but it would be a big mistake," says Sam Gomberg, a UCS senior energy analyst and coauthor of the new UCS report. "Aside from the fact that it wouldn't adequately combat global warming, there are other problems with relying too heavily on natural gas, including yo-yoing prices and utilities getting stuck with obsolete infrastructure." To avoid these pitfalls, Gomberg says, states should diversify their energy mix with renewable resources such as wind and solar power, energy efficiency, and emerging technologies including battery storage and smart meters.

Given the scale and scope of the energy transition now under way, the choices utilities make to replace coal will have a major impact on public health, the environment, and economic justice.

"Our analysis makes it abundantly clear that the transition away from coal is continuing and it's long past time for Congress and the administration to set aside the false promise that throwing away environmental safeguards will bring back coal jobs," says Richardson. "Cities and states need to prepare for this next wave of coal plant retirements and work with local community members to figure out how to avoid an overdependence on natural gas and ensure that the benefits of transitioning to a clean energy economy can flow to communities equitably." {C}

Photo: Image Source Plus/Alamy Stock Photo

Who's Responsible for Climate Damages? The Latest Science Offers Some Answers

By Seth Shulman

Brenda Ekwurzel (second from left), UCS director of climate science and senior climate scientist, participates in a September 2017 panel discussion about efforts to hold fossil fuel companies accountable for climate change impacts. The event was part of the ninth annual New York City Climate Week, coinciding with the annual United Nations General Assembly meeting.

As estimates of the damage from recent hurricanes and wildfires in the United States now run into the hundreds of billions of dollars and coastal communities confront the need for mitigation projects to address sea level rise, more people are recognizing the burden climate change poses to taxpayers. In New York City alone, officials estimate that climate-related adaptation measures will cost more than $19 billion. Globally, cost projections are astronomical: the UN Environment Programme calculates that climate adaptation will cost developing countries $140 billion to $300 billion *per year* in 2030.

Given the scale of these costs, many are also asking what responsibility the major fossil fuel companies should bear—especially given the fact that internal company documents show they have known for decades about the harm their products were causing to the climate and continued to spend millions misleading the public and blocking climate action.

A pathbreaking new peer-reviewed study published in the journal *Climatic Change* by a team including climate scientists from the Union of Concerned Scientists sheds new light on fossil fuel producers' liability. The authors have succeeded in tracing specific climate damages to the products sold by individual companies such as Chevron and ExxonMobil.

Brenda Ekwurzel, the study's lead author and climate science director at UCS, explains, "We've known for a long time that fossil fuels are the largest contributor to climate change. What's new here is that we've determined just how much specific companies' products have caused the earth to warm and the seas to rise."

PINPOINTING COMPANIES' IMPACTS

The team looked at the largest oil, gas, and coal producers and cement manufacturers and used sophisticated computer analysis to quantify the amount of sea level rise and global temperature increase attributable to carbon dioxide and methane emitted during the extraction, production, and use of these companies' products. The findings are striking. According to the study:

- Emissions traced to the 90 largest carbon producers contributed nearly 50 percent of the rise in global average

Photo: Ben Goloff/UCS

> ***We've known for a long time that fossil fuels are the largest contributor to climate change. What's new here is that we've determined just how much specific companies' products have caused the earth to warm and the seas to rise.***

temperature and around 30 percent of global sea level rise since 1880.

- Emissions traced to the 50 investor-owned carbon producers (including BP, Chevron, ConocoPhillips, ExxonMobil, Peabody, Shell, and Total) contributed around 16 percent of the global average temperature increase from 1880 to 2010, and around 11 percent of global sea level rise over that period.

- Emissions traced to these same 50 companies from just 1980 to 2010—the period in which fossil fuel companies were aware their products were causing global warming—contributed around 10 percent of the global average temperature increase and roughly 4 percent of global sea level rise.

IMPLICATIONS FOR THE COURTROOM

This study and others like it, part of an emerging field called climate attribution science, offer a powerful new tool that could help courts resolve the vexing problem of how to apportion responsibility for damages caused by climate change—potentially even damages sustained in an extreme weather event. For example, after Hurricane Sandy slammed into the East Coast in 2012, scientists determined that climate-driven sea level rise magnified Sandy's flood damage to property in New York City alone by $2 billion—more than $230 per New Yorker. This latest research could help pinpoint a particular company's share of that damage.

As we go to press, five California communities have filed lawsuits against fossil fuel companies. Most recently, San Francisco and Oakland have each sued five major fossil fuel companies for climate damages incurred on their cities. In another lawsuit already under way, three other California communities—Marin and San Mateo Counties and the city of Imperial Beach—are suing 37 oil, gas, and coal companies for climate-related damages to public property such as beaches and parks, and the possibility that some residents of these communities will lose their property and be displaced. These three communities are seeking not only recompense for costs already incurred and anticipated costs to address the ongoing threat, but also a portion of fossil fuel production profits and punitive damages for the alleged wrongdoing.

A decision on this case is years away, and it is far too early to predict how it might unfold. But it is easy to see how climate scientists' growing ability to apportion responsibility for climate damages could aid such claims. For now, with help from UCS scientists, these analyses are sparking a long-overdue public conversation about the legal responsibility of fossil fuel companies for the damage they knew their products were causing. {C}

Infographic: Underground Agency

UCS Helps Interpret the North Korean Threat

By David Wright

Since the middle of last year, North Korea has conducted nearly 30 ballistic missile launches, culminating in a July test of a missile with the range to reach the US mainland. If you've read about these tests, chances are you've been informed by UCS analysis—we have been mentioned more than 10,000 times since May in press coverage of the North Korean nuclear tests.

The Hwasong-12 missile, shown here in a North Korean military parade, has been tested twice recently in flights over Japan. UCS has been the go-to source for clear, reliable information about North Korea's missile capabilities.

Why does UCS analysis get so much attention? The short answer is that UCS has earned a reputation as an honest broker of technical information on this issue over nearly a quarter century. I began analyzing North Korean missiles in 1993 following an early test of its Nodong missile, which has the range to reach cities throughout Japan. In the years since, I have been part of a small community of nongovernmental experts who study these missiles' capabilities and technology, as well as options for reducing the threat. This work has put me in contact with key reporters who follow North Korean launches and are looking for a reliable assessment of the missiles and the threat they pose.

One especially useful aspect of the analysis UCS provides stems from the fact that Pyongyang has tended to conduct its recent test launches on highly lofted trajectories. Launching in this way obscures the missiles' military capabilities, but North Korea has done so for a practical reason: so the missiles will land in the Sea of Japan (at a relatively short distance from the launch site) without—until most recently—overflying Japan, which is seen as particularly hostile and reckless.

Based on early news and Twitter reports of the height and range of those lofted test trajectories, I use computer modeling to determine what range those missiles would have if flown on standard trajectories. Shortly after each test, UCS has posted this information on our blog, *AllThingsNuclear.org*, and sent it out to reporters, providing the first public assessment of the range of these missiles. For the test on July 4, our assessment showed early on that the missile would have a long enough range to be categorized as an intercontinental ballistic missile (ICBM). This assessment contradicted initial statements by US intelligence, which reversed itself the following day and agreed that the missile was an ICBM.

By serving as an honest broker of technical information and calm, evidence-based analysis, UCS has earned the reputation as a go-to source for reporters. This, in turn, has provided us the opportunity to discuss options for responding to the tests—with diplomacy being the only realistic approach to addressing the problem of North Korea's nuclear weapons capabilities. {C}

***David Wright**, a physicist and leading expert on missile technology, codirects the UCS Global Security Program.*

Photos: Richard Howard (David Wright); Kyodo News/Getty Images (missile); Ryan Green/Getty Images (ad)

The Trump Administration Is Trying to Sideline Science. UCS Is Fighting Back.

(continued from p. 11)

By our count, there has been a new attack on science every four days, on average, since January.

A surge of newly energized and new-to-UCS supporters includes experts and activists who are ready to fight back; we are actively working to provide the tools and support all of our members can use to stand up for science. To that end, UCS has created two networks of volunteers who have asked to do more to preserve the role of science in public policy. Some of the 20,000 members of the UCS Science Network have stepped up to watchdog the administration—leveraging their expertise to fight bad policies. Many more of our half-million supporters have volunteered to become "Science Champions," offering to rapidly respond to aid the organization's efforts to respond to attacks on science.

"We're building capacity so all our members have more ways to engage with public policy," Halpern says. "They are calling their members of Congress on a regular basis, organizing events, showing up at town hall meetings, and developing relationships with reporters to be sources of information."

In addition to our people power, UCS is using administrative and legal processes to push back against attempts to defund scientific enterprises within the federal government. This work has paid off in budget committee votes that, instead of defunding crucial federal science agencies, actually *boosted* funding.

"We're not able to stop every attack on science," Halpern says. "But we're raising the price for actions that diminish the role of science in public policy. We're making it politically unpalatable."

Scientists interested in playing an active role in defending science should visit *www.ucsusa.org/watchdog*; anyone can stand up for science by going to *www.sciencechampions.org*. {C}

A Defense against Extreme Weather Is Underfoot

By Andrea Basche

If you've read *The Grapes of Wrath*, you'll remember the catastrophic dust storms that arose in the United States during the droughts of the 1930s, causing farmers to abandon their land. These real events were driven by shortsighted farming practices that resulted in crop failures and bare soil that blew all the way to Washington, DC.

Today, similar shortsightedness—the practice of *intentionally* leaving fields bare much of the year—is once again making US farmers and their surrounding communities vulnerable to extreme weather including droughts and flooding. Faced with increasing rainfall variability and the damage it can cause, farmers and policymakers should take steps now to protect soil and prevent the worst Dust Bowl–like consequences. In the new UCS report *Turning Soils into Sponges*, we examine how smart farming practices can build rich, porous, sponge-like soils to help minimize the effects of both floods and droughts. Healthy, spongy soil holds more water, allowing it to reduce runoff during rainstorms and to hold water longer during dry periods.

By analyzing 150 field experiments from around the world, we found that keeping living roots in the soil year-round is a highly effective way for farmers to create valuable sponge-like soil. Farmers can achieve this by planting perennial crops and cover crops, as well as through improved livestock grazing practices. We also used a hydrology model to predict how much difference these practices could make if adopted on a large scale. Focusing on the state of Iowa as a representative example of midwestern agriculture, we showed that planting perennial or cover crops on the most-erodible croplands in the state would reduce rainfall runoff up to 20 percent in flood conditions, and make as much as 16 percent more water available to crops during droughts.

A soil scientist and a farmer inspect a Daikon radish cover crop grown as part of a federally funded sustainable agriculture research project. This plant's roots penetrate soil deeply, reducing compaction and increasing water infiltration.

Unfortunately, while many farmers are interested in building healthier, spongier soil, they face policy barriers that make it riskier and less profitable for them to try. Congress and the US Department of Agriculture can make it easier for farmers to adopt these beneficial practices through greater investments in research and technical support, and changes to the federal crop insurance program.

Even as climate change presents new challenges for farmers, soil can be an important part of the solution to minimizing flood and drought impacts—and creating a more sustainable US agricultural system. Find our report, along with a fun video demonstrating how healthy soils can mitigate the effects of drought and floods, at *www.ucsusa.org/SoilsintoSponges*. {C}

Healthy, spongy soil holds more water, allowing it to reduce runoff during rainstorms and to hold water longer during dry periods.

***Andrea Basche**, a specialist in sustainable agriculture, is a former UCS Kendall Science Fellow.*

Photos: UCS (Andrea Basche); USDA-SARE/Edwin Remsberg (farm); Simon Jerratt/Getty Images (ad)

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