Union of Concerned Scientists

Catalyst

Volume 20, Spring 2020

Ride-Hailing's Climate Risks

A Major New Source of Carbon Emissions

Uncovering a Hidden Coal Bailout

Solar Geoengineering: Who Decides?

A Note from the UCS President on COVID-19

[Union of Concerned Scientists]

Catalyst, ISSN 1539-3410, is published quarterly by the Union of Concerned Scientists. Text of articles from *Catalyst*, duly acknowledged, may be reprinted free of charge. Artwork may not be reproduced.

Catalyst is printed on chlorine-free recycled paper with 100% post-consumer content.

EDITORIAL DIRECTOR
Seth Shulman

MANAGING EDITOR
Bryan Wadsworth

PRODUCTION MANAGER
Heather Tuttle

CONTRIBUTING EDITOR
Pamela Worth

CONTRIBUTING WRITERS
Elliott Negin
Jiayu Liang

DESIGN
Rigsby Hull

FRONT COVER
NickyLloyd/iStockphoto.com

BACK COVER
Mike Simons/Tulsa World via AP

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.

This publication is financed by contributions from individual members; you can join UCS by sending a tax-deductible contribution of $25 or more to UCS Development, Two Brattle Square, Cambridge, MA 02138-3780.

CHAIR
Anne Kapuscinski

PRESIDENT
Kenneth Kimmell

NATIONAL HEADQUARTERS
Two Brattle Square
Cambridge, MA
02138-3780

PHONE
(617) 547-5552

EMAIL
ucs@ucsusa.org

WEB
www.ucsusa.org

What the Coronavirus Pandemic Teaches Us

By Ken Kimmell

The author (below left) and other senior UCS leaders share a smile during an all-staff meeting via Zoom. UCS staff members are working hard during this crisis (albeit from our living rooms and kitchens), sharing information, responding to attacks on science, and mobilizing scientists and UCS members virtually.

On behalf of all of us at UCS, I hope you and your families are well. Thanks to supporters like you, we are doing everything we can to make sure science is not sidelined during this crisis. You have our deep gratitude.

Because I have the good fortune in this column to draft it on a different timetable, I want to start by saying that much of the content in this issue was prepared long before COVID-19 upended the world. If you feel a disconnect while reading, it is only because of the vagaries of magazine printing.

While there can be no silver lining to this pandemic, catastrophes have a way of reminding us of plain but vital truths that get overlooked in calmer times. Coming to grips with these truths now will help us emerge stronger when the pandemic subsides.

LEADERS PUT OUR HEALTH AT RISK WHEN THEY DENY AND SUPPRESS SCIENCE

Suppression and denial by the Chinese government in the early weeks of the virus's spread allowed COVID-19 to gain hold and rapidly infect thousands in a densely populated city. Though the government later changed course, it was already too late to effectively contain the virus.

President Trump repeated these mistakes. He downplayed the seriousness of the pandemic. He and his administration attempted to discredit those who were issuing warnings—and certain media outlets then amplified and repeated this misinformation. As a result, we lost critical response time.

COVID-19 teaches us that a failure to provide accurate and timely information to the public is literally a matter of life and death.

WE PAY WHEN WE HOLLOW OUT GOVERNMENT

In 2014, the Obama administration established an office within the National Security Council to coordinate the federal government's future response to pandemics, and provide accountable and organized leadership.

In 2017, the Trump administration abolished this office—and perhaps as a direct result, its response to the coronavirus pandemic was initially haphazard, inept, and lacking in overall accountability. We don't have a clear sense of who is coordinating

(continued on p. 20)

WHAT OUR SUPPORTERS 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 THE TRUMP ADMINISTRATION'S MISHANDLING OF COVID-19

JoAnne McIntire:
They publicly minimized it and still failed to start adequately preparing the country. Absolutely unbelievable!

Russell Bixby:
Unfortunately it's the same approach to this pandemic as to global warming.

Deb Sparrow:
This is what we can call our senators and reps about now, whatever party they are from, and we can have an impact.

ON TOYOTA'S DECISION TO BACK A LAWSUIT OPPOSING STATES' ABILITY TO SET THEIR OWN EMISSIONS STANDARDS (SEE ADVANCES, P. 5)

Kelly Currier:
[I'm a] previous Toyota owner and lover, but I won't buy one again because of this. Unless they change their policy.

Michael Wangerin:
Since 1989 I had bought only Toyotas; this year I bought something different.

Jerry Klinken:
I've always been a Toyota fan. But I'll never buy another Toyota because of their stand on climate and electric vehicles. If we are going to survive the climate crisis, everyone needs to be part of the solution, not part of the problem.

ON THE US NAVY DISMANTLING ITS TASK FORCE ON CLIMATE CHANGE

Janet Baxstrom:
Unbelievable. Five years ago climate change was considered a top national security risk.

@CharlieSlang:
The Navy obeys its commander in chief, which is why it's so important that a president doesn't put donors before citizens, especially when the donors are the fossil fuel industry.

@nc_turn:
They know better. It's institutional cowardice.

ON THE ADMINISTRATION'S ROLLBACK OF WETLANDS PROTECTIONS

Mark McKenzie:
Unfortunately it doesn't take much to set this country's delicate wetlands behind by 50 years!

Joseph P Arco:
Wetlands are the most biodiverse system and deserve the utmost protection.

Betty Jean Jordan:
We wouldn't put poison in our capillaries because it would make its way into our veins and arteries, endangering the entire body. Similarly, we shouldn't remove wetlands and ephemeral streams from the definition of the Waters of the United States because this opens larger bodies of water to dangerous pollution.

[IN THIS ISSUE]

Science Is Rising Again

Science Rising is a network of partners and advocates including UCS that works to elevate the role of science in our democracy during election years, with a particular focus on the intersection of science, justice, and equity. In 2018, Science Rising helped thousands of people in the STEM fields connect and engage with their communities, and we are building on that success in 2020. This year—even with limitations on in-person gatherings—the movement is offering more opportunities for scientists and others to get involved.

THE SCIENCE RISING CHALLENGE

We're challenging STEM majors to vote at higher rates than ever before. To get out the science vote, we have created the Science Rising Challenge. All those in STEM fields can visit www.sciencerising.org/challenge to confirm that you're registered to vote, are planning to do so, and that you'll undertake one of several activities to promote science and democracy. It's fun and easy and, when you notify us that you've completed the activity, we'll send you a Science Rising Challenge button and enter you into a raffle to win a free registration to the 2020 SACNAS—National Diversity in STEM Conference, hosted by our partner the Society for Advancement of Chicanos/Hispanics and Native Americans in Science.

ONLINE ACTIVITIES

Science is rising online! Events listed on the Science Rising website include Zoom-hosted panels and virtual information sessions, trainings, and classes. Plus, our followers can use social media to help get out the vote, and to ask political candidates how they would respond to key science-related issues.

GET FUNDING

This year, we're providing grants of up to $1,000 for any individual or group looking to hold nonpartisan online or offline activities designed to increase voter turnout or inspire civic engagement. Apply for Science Rising event funding at www.sciencerising.org/fund.

Illustration: Nick Iannaco/UCS

Progress on Climate in the Bay State

Deploying solar panels in low-income neighborhoods (such as at this affordable housing complex outside Boston) is just one way Massachusetts is working toward its goal of net-zero carbon emissions by 2050.

Massachusetts kicked off 2020 by becoming the third state to commit to reducing its carbon emissions to net zero by 2050, a pledge announced by the Commonwealth's governor, Charlie Baker. To help chart a course to this goal, the state senate passed a comprehensive suite of bills aimed at strengthening climate action and clean energy.

Importantly, the legislation sets interim emissions reduction targets for 2030 and 2040; these nearer-term requirements will guide the trajectory toward net zero. UCS staff and supporters advocated for such milestones because they will steer the state away from decisions that might hold some appeal in the short term but would make it much harder and costlier to implement longer-term climate solutions. The legislation also includes a focus on reducing air pollution in marginalized communities (which are often burdened with the highest exposure levels), support for deploying solar power in lower-income neighborhoods, and a requirement that the state transit authority electrify its public bus fleet by 2040.

UCS Poll Finds Toyota Owners Unhappy with Company's Actions

After the automaker Toyota supported a lawsuit that would weaken state emissions standards, UCS polled 1,000 Toyota owners to find out how these actions affected their views of the company. We found a nearly one-third decline in the company's favorability, from 98 percent to 66 percent. The poll also found that Toyota's customers, regardless of party affiliation, firmly believe the company should support strong vehicle emissions standards, with 75 percent of Republicans and 90 percent of Democrats agreeing. The company's support for the lawsuit leads 4 in 10 loyal Toyota drivers to consider switching brands. But 72 percent of its customers also said that, if the company were to reverse course and oppose the lawsuit, their opinion of Toyota would improve. Read the full results at http://act.ucsusa.org/toyota-poll.

Photos: Marcia Cassidy Communications (solar panels); Nick Iannaco/UCS (ad)

Pressure Campaign Yields Results from BP

Four years ago, with the first *Climate Accountability Scorecard*, UCS began rating the major fossil fuel producers on the extent to which they were taking responsibility for their role in contributing to climate change. Since then, we have been working with public interest and shareholder groups to pressure coal, oil, and gas companies to dramatically reduce their carbon emissions and stop spreading climate science disinformation.

Our campaign made some progress in February with two major announcements by the British oil giant BP. First, the company's new chief executive, Bernard Looney, said the company will slash carbon emissions from its operations and the oil and gas it extracts to net zero by 2050. Two weeks later, the company announced it is severing ties with three US trade associations that misrepresent climate science and oppose climate action: the American Fuel and Petrochemical Manufacturers, Western Energy Alliance, and Western States Petroleum Association.

"We are aiming to earn back the trust of society," Looney said at a London news conference. "We have got to change, and change profoundly."

The most recent UCS climate accountability scorecard, issued in 2018, criticized BP for failing to set a companywide, net-zero emissions target consistent with the Paris climate agreement's global temperature goal, and for its memberships in the aforementioned trade groups.

BP's announcements did not completely address our criticisms, however. The company offered no details about how it will meet its 2050 goal, and its net-zero target does not include the carbon emissions from oil and gas extracted by other companies that BP processes, trades, or sells. Plus, BP is retaining its memberships in five trade associations that it acknowledges are only "partially aligned" with its climate positions, including the American Petroleum Institute, National Association of Manufacturers, and US Chamber of Commerce, all of which lobby against climate policies BP claims to support.

"Mr. Looney is absolutely correct that BP—and the rest of the fossil fuel industry—has to change, and fast," said Kathy Mulvey, UCS accountability campaign director. "BP's moves put pressure on US oil companies Chevron and ExxonMobil, but many questions remain unanswered. Since the Paris climate agreement was signed, BP has spent more than any other oil company on lobbying to block climate action and, as of last year, the company was planning to invest $71 billion in new oil and gas fields over the next decade. So BP has a long way to go to demonstrate that its business plans are consistent with keeping global warming below the Paris targets."

IN A PANDEMIC, UCS STAYS

UCS staff members have been working with our supporters to keep all of our important efforts going in these difficult times. Since the earliest days of the pandemic, we've been mobilizing our experts, scientists, and activists to demand a strong, science-based response, while following through on the crucial work that must continue on our core issues. We've called attention to the Trump administration's censoring of government scientists and public health experts. We've pushed back against the misinformation coming from the administration. And as the administration has attempted to quietly launch new attacks on science while few are paying attention,

Photos: Bloomberg (BP); Kristina Barker/NYT (pipeline), Mauricio Peña/Block Club Chicago (LVEJO)

The Trump administration wants to gut the law requiring environmental assessments for major new projects. In March, the Dakota Access pipeline (above) failed its environmental review under the law.

UCS Raises Outcry against Environmental Injustice

As the Trump administration moved to gut a bedrock environmental law, UCS sounded the alarm so our experts and supporters could speak out against the change. The National Environmental Policy Act (NEPA) mandates rigorous, science-based environmental impact reviews for major infrastructure and construction projects before they can receive a federal permit. For environmental justice communities—those already bearing an unfair share of pollution, and which are predominantly composed of people of color and people with low incomes, the administration's proposed changes promise particular devastation.

The Trump administration's proposed changes would rewrite NEPA implementation guidelines so that, even in neighborhoods already packed with toxic industries, a proposed facility would only need to assess its own pollutants, not how much they might combine with those of nearby facilities to magnify impacts on local air, water, and soil quality. The proposed changes would also make it harder to account for a project's climate impacts. Before the public comment period closed this spring, UCS rallied more than 12,000 of our experts and activists to weigh in, submitting comments to the record, and writing letters to a key administration official asking that existing NEPA rules be preserved.

VIGILANT

we've remained vigilant, pushing back with our full suite of resources.

COVID-19 has potential implications for all the issues UCS works on: climate change, transportation, agriculture, global security, energy—as well as the 2020 election. For the latest insights from our experts, please check in at **http://act.ucsusa.org/coronavirus.**

UCS in the Community

After spending a decade fighting for a coal-fired power plant in the Little Village neighborhood of Chicago to finally shut its doors in 2012, residents were ready to breathe easier. But soon after, a real estate redeveloper purchased the lot with plans to build a large-scale warehouse distribution center for shipping—drastically increasing diesel truck traffic and air pollution in the neighborhood. UCS analysts worked with the Little Village Environmental Justice Organization (LVEJO) to provide data on inequitable exposure to harmful air pollution in Illinois, to help make the case against the increased vehicle traffic.

The analysis of fine particulate matter air pollution from cars, trucks, and buses found that people of color in Illinois on average are exposed to higher levels of harmful pollution. Asian Americans, African Americans, and Latinos in Illinois are exposed to pollution 32, 21, and 19 percent higher, respectively, than the state average. Using this and locally collected data, LVEJO is pushing for the mayor of Chicago and the Department of Planning and Development to restart the Little Village Industrial Corridor Modernization process to reduce emissions, prioritize the environmental health of Little Village residents, and enact citywide policies that would no longer overburden communities.

Environmental justice activists in Chicago brought attention to a proposed development project's impact on residents' health.

RIDE-HAILING: CONVENIENCE AT WHAT COST?

New UCS analysis shows how the growth of Lyft and Uber in the past decade make it more difficult to combat climate change—and what we can do about it.

BY JIAYU LIANG

For a transportation nerd like UCS Senior Analyst Elizabeth Irvin, Chicago is a great place to live. The city is a hub in the national highway and rail network, is home to one of the nation's oldest public transportation systems, and provides plenty of customers for the popular ride-hailing companies Lyft and Uber.

In a previous job, Irvin studied how ride-hailing and other emerging transportation technologies affect access to employment and other daily necessities in the greater Chicago area. She found that ride-hailing benefited the predominantly African American and Latino neighborhoods on Chicago's South and West Sides, where car ownership rates are low and transit options may not get residents where they need to go. "The data showed that ride-hailing was filling important gaps in transportation access," she explains. At the same time, however, ride-hailing was having a negative impact on Chicago's already congested roads. "People were choosing Uber or Lyft instead of taking a bus," she noted, lamenting the decreasing public transit ridership and increasing congestion.

Meanwhile, UCS transportation experts were beginning to study another aspect of ride-hailing that had been overlooked: its contribution to climate change. They reached out to Irvin—who had worked for UCS previously on campaigns, and then as a consultant—given her familiarity with the technology. She rejoined the team and, shortly after, she and her colleagues released *Ride-Hailing's Climate Risks*, the first study to quantify the industry's effect on carbon emissions.

Illustration: Nickolas Peter Chelyapov

Riders can reduce ride-hailing's climate impact by pooling rides or using public transportation for part of the trip; state and city governments can help incentivize these lower-carbon options too. Ultimately, though, it's up to ride-hailing companies to foster sustainable options such as using electric vehicles.

A DANGER HIDING IN PLAIN SIGHT

The team was surprised by just how much Lyft and Uber are making the problem worse.

Ride-hailing's outsized emissions are due primarily to "deadheading," a practice that riders never see in person. This is the miles drivers travel while roaming the streets between customers, and the distance they have to drive to pick up their next passenger.

As a result of deadheading, UCS found that ride-hailing trips produce 47 percent more carbon emissions than a similar trip taken in your own private car. Irvin and her fellow experts anticipated this result because they had already seen the practice in taxis. What they didn't expect, though, was their finding of the extent to which ride-hailing replaces not just private car rides but also walking, biking, public transit, and not taking a trip at all.

In surveys of California ride-hailing customers, 24 percent of solo riders and 36 percent of carpoolers reported that they choose ride-hailing in lieu of lower-emitting or non-emitting options. Taking this phenomenon and deadheading into account, the UCS team calculated that ride-hailing trips are 69 percent more polluting on average than the transportation options they displace.

If Lyft and Uber expand in a reopened economy at the rate they were previously, these climate shortcomings will be greatly amplified.

Transportation is already the number-one source of global warming pollution in the United States, and ride-hailing, which had provided more than 11 billion trips worldwide by 2018, was a hidden source of these emissions. The report *Ride-Hailing's Climate Risks* is a groundbreaking effort to quantify these effects and show cities exactly how Lyft and Uber are making both congestion and pollution worse. (Read the report online at http://act.ucsusa.org/ride-hailing-risks.)

"Ride-hailing services are likely to grow," says Don Anair, research director of the UCS Clean Transportation Program and study co-author. "So companies like Lyft and Uber, policymakers, and consumers all need to make smart choices now to steer ride-hailing in a cleaner direction."

THE CLEANEST CHOICES FOR RIDERS

There are two ways you can help reduce ride-hailing's climate impact.

Ride-hailing apps give passengers the option to request a pooled ride, which groups them with strangers traveling in a similar direction, consolidating trips. "Pooled rides can eliminate the climate disadvantage. Two people pooling a ride reduce emissions by 33 percent compared with solo ride-hailing trips" Irvin says, and also notes that pooled ride-hailing trips cancel out the effects of deadheading, so that pooled rides produce approximately the same amount of emissions as private vehicle trips. *[Editor's note: Irvin's report was completed before COVID-19 became a worldwide pandemic. Pooling rides is not currently a safe practice; Uber and Lyft have suspended all pooled service in the United States.]*

That's a step in the right direction, but switching to electric vehicles takes it even further. The report found that a solo ride-hailing trip in an electric vehicle reduces emissions by about 53 percent.

Put these two strategies together—a pooled ride in an electric vehicle—and you have a trip that's 68 percent less polluting than a trip in the average personally owned, gas-powered car.

The climate benefits of electric vehicles are magnified in the ride-hailing arena because Lyft and Uber vehicles travel so

Photos: miodrag ignjatovic/iStock (carpooling); Elizabeth Irvin/UCS (Chicago); Anthony Eyring/UCS (video)

many more miles a year than private cars do. Research from the University of California–Davis estimates that electrifying a ride-hailing vehicle produces three times the emissions savings of electrifying a private vehicle.

"Through electrification of vehicles and increased use of pooled rides," says Anair, "ride-hailing services still have the potential to be part of a cleaner, low-carbon transportation future."

WHAT THE COMPANIES MUST DO

Although ride-hailing's explosive growth has left policymakers scrambling to keep up, Irvin hopes her team's data can help cities respond to their rapidly changing transportation patterns. In her own city, for example, the Chicago City Council has designed a ride-hailing fee structure that encourages more pooled rides. "Riders pay higher fees for solo trips to or from downtown during weekdays and lower fees for pooled rides," she explains. Meanwhile, pooled rides that start and end outside the downtown area, where there are fewer transportation options, have the lowest fees. This allows ride-hailing to remain convenient for people who need it while reducing its negative climate impacts. Smart policy decisions like this make transportation better for both communities and the environment.

For their part, Lyft and Uber argue that their companies already are eco-friendly, pointing to their ongoing efforts to increase pooling, get more electric vehicles on the road, and support carbon offsets. But Irvin says the data show an industry that is currently increasing pollution. Only a small number of rides are pooled, and electric vehicles make up only a tiny fraction of ride-hailing fleets—in California, electric vehicles account for only 1 percent of all ride-hailing miles.

(continued on p. 21)

SURPRISED ABOUT RIDE-HAILING'S IMPACT? YOU'RE NOT ALONE

As national campaign coordinator for the UCS Clean Transportation Program, Katherine Catalano is well acquainted with inefficiencies and sources of emissions in the transportation system. But even she was surprised by the findings in her team's report *Ride-Hailing's Climate Risks*—especially that ride-hailing trips produce 69 percent more carbon emissions than the trips they replace.

"As a personal user of these services," Catalano says, "I had no idea." She wondered how other ride-hailing customers, whose jobs don't require them to think constantly about transportation emissions, would react to these findings.

That curiosity brought her to San Francisco, home to both Lyft and Uber. "We wanted to capture riders' reactions," she explains. So with a videographer in tow, Catalano shared a few rides with residents of San Francisco who proved eager to talk. She asked what they knew about the climate impacts of their trips, and what they thought of some of the strategies the UCS team identified for reducing emissions, primarily electric vehicles and pooled rides.

At the end of each ride, Catalano and her fellow passengers would go their separate ways, and she would do her best to navigate from wherever she ended up and find someone else to talk to. "We were at the whim of where people were going," she laughs. "But at the end of the day it was easy for us all to agree on the magnitude of this issue. Transportation is the highest-emitting sector when it comes to climate pollution in this country, and riders want companies like Uber and Lyft to take responsibility for the increased emissions they're causing."

Curious what people said? Watch the video here: http://act.ucsusa.org/ride-hailing-video

Nuclear Weapons Have Not Gone Away

INTERVIEW WITH DAVID WRIGHT

In the midst of the COVID-19 pandemic, people surely have other pressing things on their minds besides the world's nuclear arsenals. But the existential threat they pose obviously remains. What do we know about how voters and candidates are thinking about nuclear weapons?

DAVID WRIGHT: Before COVID-19 began spreading so widely, UCS did a series of polls on nuclear weapons in some of the early primary states. Interestingly, we found that more than 80 percent of the survey respondents in those states wanted to hear US presidential candidates talking about their policies to reduce the risk of nuclear weapons. In each of those states, we also found a majority of people from both parties think the United States should never use nuclear weapons first in a crisis. This is something voters care about. One of the ways we've responded has been to interject these issues into presidential campaigns by bird-dogging candidates, asking them questions, and letting them know that voters want to hear that they've thought about this.

You've been writing and speaking about the five ways in which the United States could enter into in a nuclear war. Why are they important for people to understand even in the midst of our current health crisis?

DAVID WRIGHT: If we know how these situations could end, we can also figure out how to keep them from starting. And we can look at the policies the United States has in place that make some of these scenarios more likely—and improve them to make them less likely.

So what are the five ways, and how could they play out?

DAVID WRIGHT: The most likely way a nuclear war could start is by mistake. For example, there could be a nuclear launch as a result of a false warning. The United States thinks there's an incoming attack, we launch in response, and then we find out the warning was wrong. The systems giving the warnings—radar and satellite sensors—they go through computers and get processed, and that's all fallible. We've seen this historically: that technical and human errors have very nearly started nuclear war. [*Editor's note: See our interactive feature detailing such errors at http://act.ucsusa.org/nuclear-close-calls.*]

The second scenario is the one I call the ambiguity scenario. It's referred to as conventional-nuclear entanglement in a crisis. Suppose a conventional war starts. The United States, Russia, China, and other countries have doctrines that call for attacking the adversary's communication nodes, command and control centers, and warning sensors. The problem is that the US Pentagon uses some of the same systems for both conventional and nuclear forces. If an adversary attacked those facilities as part of a conventional warfighting strategy, the United States may think the attack was trying to limit our ability to respond with nuclear weapons, and we'd better go first while we still have the capability to order a strike. When you're in the middle of a crisis, you don't have a lot of information and you don't have a lot of time. It's easy to imagine how things could escalate.

Are the other three also about human error and misunderstandings?

DAVID WRIGHT: That depends! The third case, which is quite relevant these days, is the idea of using tactical nuclear

David Wright recently stepped down as senior scientist and co-director of the UCS Global Security Program, though he continues to work on nuclear weapons issues and collaborate with UCS. A nationally known expert on the technical aspects of nuclear weapons policy, missile defense systems, missile proliferation, and space weapons, he has authored numerous articles and reports on arms control and international security, including *Toward True Security: Transforming U.S. Nuclear Weapons Policy*, and *The Physics of Space Security*. You can listen to the full interview on the *Got Science?* podcast at http://act.ucsusa.org/got-science-ep78.

Photos: Richard Howard (David Wright); geniusksy/Adobe Stock (ad)

> ***Much-needed steps include: setting a no-first use policy, taking land-based missiles off hair-trigger alert, and getting rid of a launch-on-warning policy, among others.***

weapons on the battlefield and having that escalate. The United States and Russia have long had tactical nuclear weapons with shorter ranges and much smaller explosive yields than an ICBM [intercontinental ballistic missile]. During the Cold War, the thinking was that if we were in a conventional war and being overwhelmed—for example, a Soviet tank attack on Europe that might be difficult to stop—it could be useful to deploy small nuclear weapons. The hope was that you could use these tactical weapons for an advantage without escalating to a large-scale war. The problem is that nobody knows if that's true. It could get out of control and lead to a major exchange.

Unfortunately, this thinking is resurfacing today. The Trump administration has built a brand-new tactical nuclear weapon. This is the first time we've done this in a long time.

Almost afraid to ask what the last two could be.

DAVID WRIGHT: The other two are probably more standard things that people think about. You know, what might happen with North Korea, for example? And finally, what might happen as a consequence of a war between India and Pakistan?

North Korea is probably not going to indiscriminately lob a nuclear weapon at Japan, South Korea, or the United States. But I can imagine a few scenarios in which the country would consider using nuclear weapons on its own territory against invaders. And India and Pakistan have had nuclear weapons since the 1990s, and have been developing aircraft and ballistic missiles to deliver them. They also have a long-standing animosity and have had a number of conventional wars. Pakistan sees itself as having a conventional inferiority, and has talked about using nuclear weapons to stop a conventional Indian invasion. The question is what the Indian response would be.

So how can we keep any of these five scenarios from occurring?

DAVID WRIGHT: Things the United States could do quickly on its own will sound familiar to UCS members: setting a no-first-use policy, taking land-based missiles off hair-trigger alert, and getting rid of a launch-on-warning policy. The US president currently has sole authority to decide to launch nuclear weapons, and we could change that. Another no-brainer is arms control. Arms control gets people negotiating and puts limits on what countries can do.

We could save some of the treaties the Trump administration has pulled out of recently. We can work to preserve the New START treaty, which limits the deployment of long-range strategic weapons by the United States and Russia. And we could do a lot more negotiations and discussions internationally. This is important because if things heat up without good communication channels and the ability to take the temperature down, that matters when you're in a crisis. These are all things that anyone can ask candidates for office about and push for progress. UCS is certainly going to keep working for these changes. {C}

FIGHTING COAL

A HIDDEN BAILOUT

Photo: Kenn W. Kiser/morgueFile.com

A UCS analyst works to close a costly loophole that gouges ratepayers and harms the environment

BY ELLIOTT NEGIN

One jargon-filled comment during a 2016 Oklahoma utility commission meeting sent Joe Daniel, now a UCS senior energy analyst, on an odyssey that hopefully will result in more US coal-fired power plants cutting their carbon emissions.

The comment came in response to a Sierra Club query about a coal plant that had been running at 80 percent capacity before it suddenly stopped producing electricity. As Daniel remembers it, a utility expert explained that the utility temporarily shuttered the plant because it had "changed its operational paradigm from self-commitment to market-commitment."

"Nobody knew what that meant," he says. "We knew what those words were, but in that particular order, they didn't make sense."

Daniel eventually did make sense out of it, and the ramifications are far-reaching. That seemingly inscrutable response led Daniel to discover that regulated monopoly utilities have been overcharging millions of US ratepayers at least $1 billion annually by selling them power from coal plants instead of from cheaper, cleaner sources.

"It turns out that utilities have been ripping off their customers to prop up their uneconomic coal plants when wind and solar power are readily available," Daniel says. "In essence, ratepayers are paying unnecessary costs that enable utilities not only to cover their losses in the wholesale market but also to emit more toxic pollution and carbon emissions. It's bad for consumers, bad for public health, and bad for the environment."

FROM INDUSTRY INSIDER TO CRITIC

Daniel took a circuitous route to becoming a utility industry buzzword translator. Armed with a bachelor's degree in chemical engineering, he snagged a job in 2006 with a Fortune 500 oil and gas industry consulting firm to ostensibly help companies curb their air and water pollution. But he soon discovered he was instead helping them poison the very community he lived in, he says, "so they could increase their profit margins by fractions of a percent." After a few frustrating years, he says he "course-corrected," earned a master's degree in environmental science and policy, and eventually joined the Sierra Club's Beyond Coal campaign, which was in the midst of the Oklahoma utility commission proceeding.

From that day on—and continuing when he arrived at UCS in 2018—Daniel deciphered the meaning and real-world implications of the two operational paradigms that the utility expert had referenced. Simply put, the self-commitment paradigm is when a regulated electric utility, which builds and operates power plants that directly serve its retail customers, sells power from its own, uncompetitive coal plants at a loss instead of from cheaper, cleaner energy sources. Why would it do that? Because it figures it can recoup those losses when electricity market prices go up or by negotiating rate increases with its public utility commission, which sets rates designed to guarantee a profit and cover plant maintenance and operating costs.

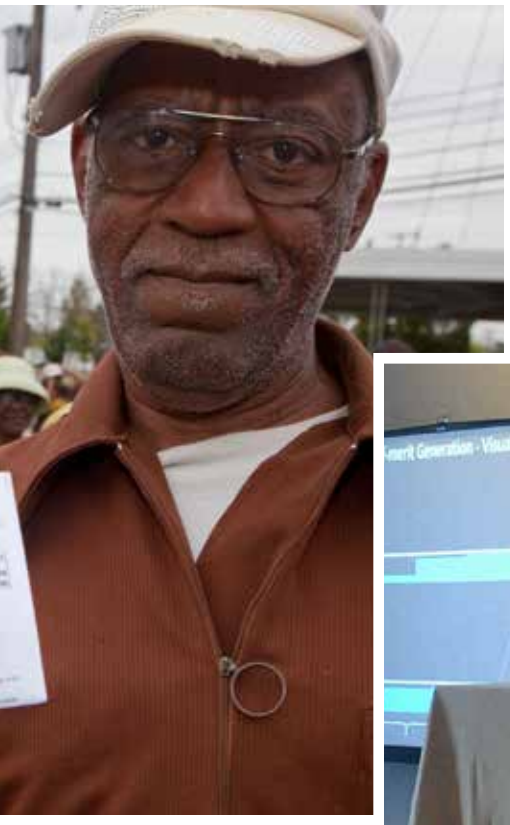
"Think of it this way," Daniel explains. "If the summer market price is $30 per megawatt-hour and it costs a utility's coal plant $25 per megawatt to generate electricity, the utility is making $5 for every megawatt. But if the market price drops to $20 in the fall when there is more wind—which is cheaper and cleaner—then the coal plant is losing $5 for every megawatt-hour it produces, eroding the utility's earnings."

Conversely, if a regulated utility followed market signals, when wholesale electricity prices are too low to justify running a coal plant, the utility would shut it down until prices went back up. Doing so would save ratepayers money, and protect public health and the environment at the same time.

"The current economic reality is coal is no longer competitive with other energy sources," says Daniel. "Even without a carbon tax, most coal plants are losing money for extended periods of time during the year. The only way they can stay in business is if ratepayers bail them out through utility regulation. Utilities have a legal obligation to obtain their energy from the lowest-cost sources, but it is becoming increasingly clear that it doesn't work that way in practice."

CUSTOMERS FOOT THE BILL

Daniel published a UCS study in September 2018 analyzing coal plant electricity output on an hourly basis from 2015 through 2017 in four markets covering about half of the United States. All told, the coal plants in these markets suffered $4.6 billion in paper losses over the three years Daniel reviewed, and most of the losses were incurred by plants owned by regulated monopoly utilities. (In contrast, he found that merchant plants—unregulated plants without dedicated ratepayers that sell their power on the open market—were more likely than regulated coal plants to respond to wholesale price changes by



> ***For decades, utilities turned on their coal plants and left them on. But inertia is not a reason to allow them to continue business as usual.***

Left: Electric utility customers in Michigan wait in line to seek help with their electricity bills. Right: UCS Senior Energy Analyst Joe Daniel (seated far right) explains how utilities are helping old, uneconomic coal power plants continue to operate, increasing air pollution and leaving ratepayers to foot the bill.

providing the lowest-cost electricity available.) The regulated plants' losses were not absorbed by the utilities' investors or owners. They were covered by ratepayers—to the tune of at least $1 billion annually. "Ratepayers," Daniel says, "paid extra to enable coal plants to emit more pollution."

In a newer study, Daniel and his coauthors focus on one US electricity market, the Midcontinent Independent System Operator (MISO) grid, which provides power across 15 states in the middle of the country. Employing the same models and software MISO uses, the report examines what would have happened if energy resources were dispatched economically in 2018. The modeling shows there were enough lower-cost—and less-polluting—energy sources available to meet demand and that coal plants were not needed during much of the time they were online. If coal plant owners had switched to cheaper sources instead of taking losses, ratepayers in MISO states would have saved hundreds of millions of dollars.

AN OLD HABIT THAT NEEDS BREAKING

The billion-dollar question: Why don't regulated utilities shut down coal plants when wholesale prices are low to avoid losing money?

"One reason is inertia," Daniel explains. "For decades, utilities turned on their coal plants and left them on. That's how they've been operating since they were built. But the market has fundamentally changed. Natural gas prices have remained low for years and the cost of renewables has dropped dramatically. They were caught flat-footed."

Daniel is cautiously optimistic that regulated utilities either will address this market failure or regulators will force them to do so. "I describe this phenomenon as a 'bailout' to get the attention of regulators and the utility industry writ large and help them see that the traditional way utilities charge ratepayers needs tighter oversight," he says. "All too often we presume the industry is run purely on economics. That is obviously not the case."

Utility commissions have an obligation to fix this problem, Daniel says. "They're uniquely positioned to provide oversight on how these utilities operate. If they continue to allow utilities to recover losses without scrutiny, they are guilty of turning a blind eye to the damage it is doing. And groups like UCS, consumer advocates, and environmentalists have an obligation to press regulators to do the right thing. After all, it's in everyone's interest to cut coal plant losses. We just need to make them understand that." {C}

Photos: Gary Peeples/USFWS (ad); Jim West/Alamy Stock Photo (man holding bill); Anusha Narayanan/UCS (Joe Daniel)

Geoengineering Is Risky. Who Gets to Make the Call?

By Shuchi Talati

When I talk to audiences who are unfamiliar with solar geoengineering—ways to reflect sunlight back into the atmosphere to slow global warming—their first reaction is often alarm. Solar geoengineering can sound like something out of a science fiction movie: one approach would inject aerosol particles into the stratosphere to reflect a portion of solar radiation back into space, similar to the cooling effects of volcanic eruptions; a second approach would spray sea salt into low-lying marine clouds to enhance their brightness and reflectivity. The reason why these approaches are even being considered is also difficult to accept: worldwide efforts to cut carbon emissions have thus far not been drastic enough and may not work fast enough to keep temperatures under global targets.

UCS opposes deployment of this risky technology. However, because the direct costs are inexpensive and it is relatively simple to deploy, it is essential that we develop a thorough understanding of the environmental implications of this technology and develop effective governance for its use—before it is actually used.

A BAND-AID, NOT A SOLUTION

Solar geoengineering does not address the primary cause of climate change: the continuing increase of heat-trapping emissions. It won't stop ocean acidification, or calm the disruptive impacts of rising carbon dioxide levels on terrestrial ecosystems. Any solar geoengineering approach should only be a stopgap measure to buy time as carbon emissions are reduced and, potentially, as large-scale systems are developed to capture and store some of the carbon already in the atmosphere.

Because solar geoengineering is a drastic means of addressing a serious problem, it deserves public attention and debate, with careful thought given to the implications. However, there is little to no public understanding of the technology, its risks, or what our own roles could be in informing whether countries or

Clouds naturally reflect incoming solar radiation, as do fine particles in the stratosphere (such as those from volcanic eruptions). Solar geoengineering would artificially mimic these natural processes in an effort to lower temperatures and limit some impacts of global warming. But these strategies do not alter the increasing levels of heat-trapping emissions in the atmosphere and could carry major environmental and geopolitical risks.

Photo: Alexander Gerst/ESA

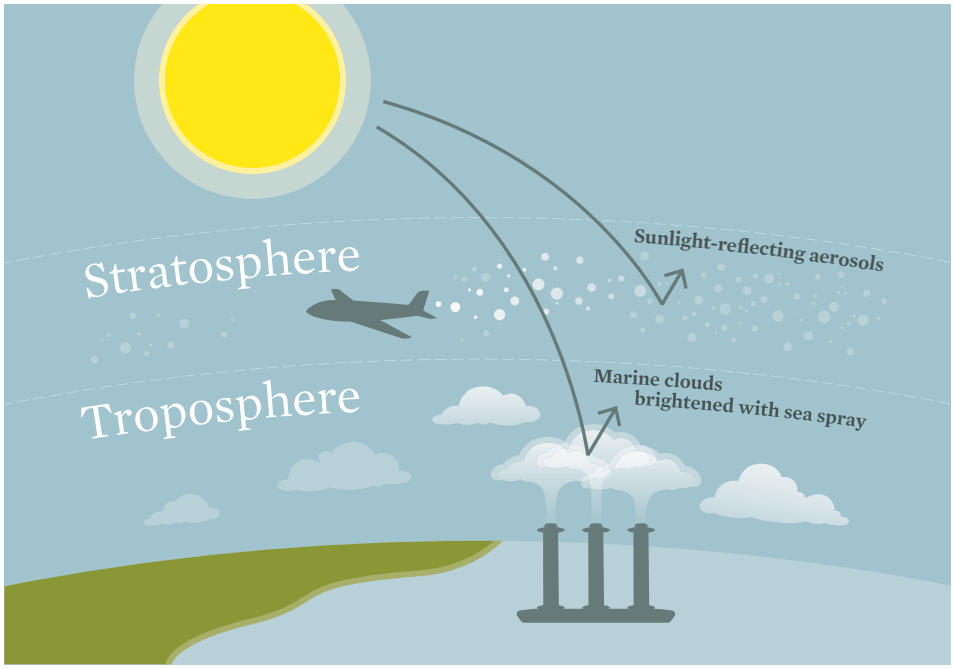
> ***We face difficult questions about who will make decisions affecting the entire planet's climate.***

institutions—such as universities or private research labs—use this technology. My work aims to broaden the conversation about solar geoengineering by providing recommendations for the research community and policymakers on how to effectively involve the public in discussions and decisionmaking.

AN EXPERIMENT ON A PLANETARY SCALE

Solar geoengineering presents profound environmental, ethical, and geopolitical risks that policymakers and others in our society must weigh against the potential destruction and disruption of climate change. Given that nations and communities across the world have different climate goals, interests, and vulnerabilities, we face difficult questions about who gets to make decisions that affect the entire planet's climate. One or more powerful nations, for example, might choose to deploy solar geoengineering in a way that aligns with their own self-interest, without obtaining international agreement and without any governance measures in place—even if doing so puts other nations' security and interests at risk.

From observations of volcanic eruptions, computer modeling, basic physics, and economics, researchers are confident that the method of solar geoengineering known as stratospheric aerosol injection could rapidly cool the earth at a relatively low direct cost. But it is difficult to predict its effects on regional precipitation patterns, and the associated impacts on agriculture and ecosystems. Other risks include the "moral hazard" that societies feel climate change has been solved and fail to further reduce emissions; the "slippery slope" that merely researching the technology leads to a feeling of inevitability about its deployment; and potential "termination shock"—rapid, disruptive increases in global temperatures if the deployment is stopped.



Potential solar geoengineering strategies include spraying seawater into the air to brighten clouds over the oceans, and releasing tiny particles in the stratosphere to reflect solar radiation and reduce temperatures.

Even within the solar geoengineering field, researchers disagree about its risks and potential benefits. These debates occur with little public awareness or meaningful input from governments, researchers, or other institutions—especially in developing countries. No framework currently exists for the national or international governance of solar geoengineering research or its potential deployment; the need for such a framework is growing.

A PUBLIC SAY IN RESEARCH

So far, solar geoengineering research has remained confined to computer modeling, but real-world, small-scale experiments are currently being considered and planned. Good governance requires broader public input into the decisionmaking process. If experiments go forward, there must be transparency and accountability, and oversight is needed of how experiments are conducted.

Emerging technologies such as solar geoengineering that carry both promise and potentially immense risks must be considered with the public's awareness, understanding, and participation. For more information about solar geoengineering, including my research and recommendations on governance, visit http://act.ucsusa.org/solar-geo. {C}

Shuchi Talati *is a fellow on solar geoengineering research governance and public engagement in the UCS Climate and Energy Program. Follow her on Twitter at @sktalati.*

Illustration: Farah Khan/House9 Design

What the Coronavirus Pandemic Teaches Us

(continued from p. 2)

We cannot respond to COVID-19, climate change, or any other major challenges if our leaders deny scientific evidence or keep scientists from doing their jobs.

federal agencies to address public health and safety. We do have bungled efforts, like the failure to arrange for an adequate supply of testing kits, a seemingly straightforward task that many other countries have handled effectively.

EFFECTIVE NATIONAL GOVERNMENT IS ESSENTIAL

Conventional wisdom holds that private markets are the best way to satisfy society's needs, and the role of government should be primarily focused on ensuring that markets work properly. COVID-19 puts the lie to this proposition. When a crisis hits, there is no substitute for collective action directed and mandated by government. Market signals alone will not ensure that the right people get tested, that emergency hospitals are set up, that ventilator manufacturing is ramped up, and so on.

A close cousin of this private market theology is the notion that government powers should be exercised primarily at the local and state level. But while governors, mayors, school superintendents, private businesses, and others have certainly worked hard to cope with this crisis, uncoordinated responses are no substitute for the scale and resources that the federal government can bring.

THERE IS NO SOLUTION THAT DOES NOT INVOLVE US ALL

A virus cannot be defeated if only one segment of the population is able to perform social distancing, or has access to treatment, and ultimately a vaccine. Defeating a virus means taking care of everyone. If we don't, the virus will linger.

CLIMATE CHANGE REQUIRES A SIMILAR RESPONSE

COVID-19's lessons apply equally to threats such as climate change. We cannot respond to climate change responsibly if our leaders deny the science. And the threat of climate change demands a similarly massive mobilization of resources, coordinated by the federal government, working in tandem with governments worldwide, aimed at transitioning all of us to an economy built on clean energy and resilience.

As I see it, the job of the Union of Concerned Scientists in a post-coronavirus world will be to speak these truths so loudly and powerfully, and mobilize so many people around them, that they are never forgotten again. (You can read about our coronavirus-related efforts on p. 6.)

You, our readers and supporters, are important to us not only as fellow believers in science and members of our movement, but also as neighbors on this planet we are struggling to preserve. Our best wishes are with you in these difficult times. Stay well, and stay connected to UCS. {C}

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

The UCS team found that ride-hailing trips are 69 percent more polluting on average than the transportation options they displace.

In urban areas, many residents rely on mass transit, walking, and biking. As ride-hailing gains popularity, it often displaces these low- and zero-carbon transportation options, leading to higher emissions.

Ride-Hailing: Convenience at What Cost?

(continued from p. 11)

Irvin suggests that ride-hailing companies step up to make a bigger dent in their emissions: "Uber, Lyft, and other ride-hailing companies already offer less expensive lease rates for drivers who complete a certain number of trips," she says, "so why not provide similar incentives for drivers to lease electric vehicles?" The companies could also help provide charging infrastructure for drivers who don't have it at home. During the day, drivers can take advantage of charging stations around town.

Passengers can opt for pooled or electric options as available, and city governments can push to incentivize them, but ultimately, Irvin emphasizes, "The responsibility is on the ride-hailing companies to support more sustainable options. It's the right thing to do for their drivers, the communities they are operating in, and for the environment they're negatively affecting."

"Ride-hailing companies have ambitions to become a much, much larger fraction of transportation in the United States and globally," she adds. That's why it will be impossible to tackle our climate goals without tackling ride-hailing emissions—but with meaningful action and smart policies, ride-hailing can stop being part of the climate problem and become part of the clean transportation solution. {C}

Photos: Douglas Magno/Getty Images (lab); Dennis Otlink/Unsplash (ad); Eleanor Fort/UCS (traffic)

Extreme Heat Poses Increased Risks to Farmworkers

By Rafter Ferguson

As a scientist working on issues related to food and agriculture, I read last summer's *Killer Heat* report by my UCS climate scientist colleagues with growing unease. The report projects widespread and rapid increases in extreme heat across the United States, meaning potentially life-threatening conditions for outdoor workers, including the 2.4 million farmworkers who perform an estimated two-thirds of agricultural labor across the nation. Farmworkers are crucial to our food and farm systems, laboring outside to plant, harvest, and process much of the food we eat. And climate change is making their already difficult jobs more dangerous.

Farmworkers have been, and continue to be, socially and politically marginalized in the United States. Most are immigrants, some are undocumented, and the vast majority face dangerous working conditions, inadequate legal protection, and limited recourse to address violations of their rights. Heat and pesticides, in particular, pose a grave threat to their lives and livelihoods: farmworkers die from heat-related causes at a rate 20 times higher than the average of all other occupations, and thousands of farmworkers suffer from acute pesticide poisoning every year.

In full sun and wearing multiple layers of clothing, these workers harvesting lettuce in California are at risk of heat stress. Climate change will make this already difficult job even more dangerous.

ANALYZING THE RISKS

To understand what our changing climate will mean for farmworkers, my team drew on data from the Census of Agriculture, research on pesticide use and toxicity, and estimates from *Killer Heat*. We found that climate change compounds risks to the health and safety of farmworkers through both heat stress and exposure to hazardous pesticides. Our report, *Farmworkers at Risk,* examines these combined risks with a focus on California, Florida, and Washington—states that lead the nation in pesticide use, number of farmworkers, and production of fruits, nuts, and vegetables, which are among the most labor-intensive foods to grow.

In these states, we found that the counties contributing the most to the agricultural economy are also the hottest—they see more days of dangerous heat than the state average. We also found that heat stress amplifies the health risks of pesticide exposure in complex ways. As warmer temperatures allow new pests to reach US farms and increase some current pests' resistance to pesticides, the use of pesticides is likely to increase. At the same time, heat stress makes people more vulnerable to toxic substances and, in a catch-22, wearing pesticide-protective clothing increases the risk of heat stress.

Farmworkers are on the front lines of the climate crisis. They must be at the table as we chart a course for our food and farming system. Their historic exclusion from workplace protections must end, to help ensure their health and safety both now and as the climate continues to change. To read the full report, including recommended policies for protecting farmworkers from extreme heat and pesticides, visit http://act.ucsusa.org/Farmworkers-Heat. {C}

Rafter Ferguson *is a scientist with the UCS Food and Environment Program. Find more from Rafter on our blog,* The Equation*, at http://blog.ucsusa.org.*

Photos: Ja-Rei Wang/UCS (Rafter Ferguson); Bob Nichols/USDA (farmers); Aurora Photos/Alamy Stock Photo (ad)

Union of Concerned Scientists

PUT SCIENCE INTO ACTION

WITH YOUR LEADERSHIP GIFT

By joining the Henry Kendall Society with a contribution of $1,000 or more, you'll play a leading role in standing up for science, democracy, and a healthier planet and safer world.

You'll also receive benefits such as:

- ***Invitations to high-level teleconferences with UCS scientists***
- ***Special updates from UCS experts on current issues and events***
- ***Direct access to a dedicated staff member***

And did you know you can also join the Henry Kendall Society with a gift from your IRA or donor advised fund? For more information, or to join the Henry Kendall Society, contact Amanda Bennett at (617) 301-8092 or join online at www.ucsusa.org/kendall.

Union of Concerned Scientists
Science for a Healthy Planet and Safer World

Two Brattle Square
Cambridge, MA 02138-3780

Member of EarthShare

THANK YOU

Health-care professionals, first responders, essential workers: Science has your back. Thank you for having ours.

Stay connected at www.ucsusa.org

@UCSUSA

www.facebook.com/unionofconcernedscientists

@unionofconcernedscientists