



## **Testimony of Michael D. Shellenberger, Founder and President, Environmental Progress**

For the House Oversight Committee

August 5, 2020

Good morning Chairwoman Maloney, Ranking Member Comer, and members of the committee.

My name is Michael Shellenberger, and I am Founder and President of Environmental Progress, an independent and nonprofit research organization.<sup>1</sup> As background, I am an invited expert reviewer of the next assessment report by the Intergovernmental Panel on Climate Change (IPCC) and a *Time Magazine* “Hero of the Environment.” In the early 2000s I co-created and advocated for the predecessor to the Green New Deal, the New Apollo Project, which President Barack Obama implemented as his \$90 billion green stimulus. In June, HarperCollins published my new book, *Apocalypse Never*, which reviews the science of climate change and other environmental problems, and which has been widely praised by leading climate and conservation scientists and scholars.<sup>2</sup> I am honored to address the Committee.

Before addressing the topic of today’s hearing, I would like to request to the Chairwoman that I and other expert witnesses be granted reasonable time to respond to any accusations made by members of this committee, or by other witnesses, before the hearing ends. I make this request in light of my experience with members of the House Democratic Caucus during last week’s hearing by the Select Committee on the Climate Crisis. I was called to testify as an expert witness. Then, at the very end of the hearing, two members of the caucus publicly

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<sup>1</sup> Environmental Progress is an independent non-profit research organization funded by charitable philanthropies and individuals with no financial interest in our findings. We disclose our donors on our website: <http://environmentalprogress.org/mission>.

<sup>2</sup> Michael Shellenberger, “Founder and President,” Environmental Progress, 2020, accessed December 8, 2020, <http://environmentalprogress.org/founder-president>.

impugned my motives. The chairwoman then denied me an opportunity to defend myself and instead gaveled the hearing to a close.<sup>3</sup>

In a letter to Speaker Nancy Pelosi after that hearing I noted that I am aware that Congressional hearings involve some political theater.<sup>4</sup> I have been told that Members from both sides sometimes act this way. That may be the case. However, I am not a political appointee. I do not represent a large trade association. I am merely the head of a small nonprofit dedicated to defending the environment. I did not expect to be drawn into political theater that violates basic civility. I did not expect to have my motives and integrity attacked.

I hope we can all agree that Americans are stronger when we listen to ideas we don't agree with, and openly debate them. We are weaker when we demonize people and deny them the chance to defend their ideas. I hope the chairperson will make clear during the hearing that expert witnesses will be given a reasonable chance to respond to any accusations made against them.

## I. Economic Growth, Climate Change, and Health

The IPCC notes in its most recent Assessment Report (AR5) that climate change is likely to be contributing to levels of ill health, and will do so increasingly in the future.<sup>5</sup> Climate change has had these impacts through rising temperatures, which have likely “increased the risk of heat-related death and illness,” and “altered distribution of some water-borne illnesses and disease vectors.” If climate change continues, it will likely increase the risk of death and disease from more intense heat waves and fires, and of food- and water-borne diseases and vector-borne diseases.

However, the IPCC notes that current impacts are “relatively small” compared to other “stressors on health,” namely lack of economic development. The IPCC’s prediction of higher risk of death and disease in the future is compared not to the present but rather to there being no climate change in the future. “The most effective measures to reduce vulnerability,” notes the IPCC, with “very high

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<sup>3</sup> U.S. House of Representatives, Select Committee on the Climate Crisis, “Solving the Climate Crisis: Building a Vibrant and Just Clean Energy Economy,” July 28, 2020, <https://climatecrisis.house.gov/vibrantandjusthearing>.

<sup>4</sup> Michael Shellenberger to Rep. Nancy Pelosi, open letter, July 29, 2020, <https://environmentalprogress.org/big-news/2020/7/29/open-letter-to-nancy-pelosi-expressing-concern-over>.

<sup>5</sup> K.R. Smith et al, “Human Health: Impacts, Adaptation, and Co-Benefits,” *Climate Change 2014*, p. 713.

confidence,” are “clean water and sanitation... health care including vaccination and child health services... disaster preparedness and response... and poverty alleviation.”<sup>6</sup>

None of that means climate change isn’t, and won’t continue to be, a factor in global health, particularly if action to prevent it also reduces air pollution, or removes other health stressors. The IPCC points to “reducing local emissions of health-damaging and climate altering air pollutants,” “providing access to reproductive health services,” and “designing transport systems that promote active transport and reduce the use of motorized vehicles” as examples of “co-benefits” of climate action.

But the IPCC and all other reputable scientific bodies make clear that the benefits of economic growth and development in both developed and developing nations — better nutrition, better health care, and more air conditioning — massively outweigh climate change as factors determining health. The World Health Organization (WHO) predicts the global burden of disease will have declined 30 percent between 2004 and 2030 and that “mortality rates will continue to fall in most countries” — so long as economic growth continues.<sup>7</sup>

The predicted declining burden of disease long into the future, despite climate change, is similar to the declining deaths from natural disasters, and to the increase in food production. Death rates and economic damage dropped by 80 to 90 percent during the last four decades, from the 1980s to the present, and neither the IPCC nor any other reputable scientific body predicts that trend will reverse itself.<sup>8</sup> Today we produce 25 percent more food than we consume, and experts agree surpluses will continue to rise in a warmer world so long as poor nations gain access to fertilizer, irrigation, roads, and other key elements of modern agriculture.<sup>9</sup>

All else being equal, it would be best for global temperatures to remain stable. We should not want them to either rise or decline. The reason is because we have built our civilization based on current temperatures. But all else isn’t

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<sup>6</sup> K.R. Smith et al, “Human Health: Impacts, Adaptation, and Co-Benefits,” *Climate Change 2014*, p. 714.

<sup>7</sup> WHO, *Climate change and health: Resolution of the 61st World Health Assembly*, Geneva, World Health Organization, 2008a.

<sup>8</sup> Giuseppe Formetta and Luc Feyen, “Empirical evidence of declining global vulnerability to climate-related hazards,” *Global Environmental Change* 57 (July 2019), <https://doi.org/10.1016/j.gloenvcha.2019.05.004>.

<sup>9</sup> United Nations Food and Agriculture Organization (FAO), *The future of food and agriculture—Alternative pathways to 2050* (Rome: Food and Agriculture Organization of the United Nations, 2018), 76-77.

equal. The cause of climate change is rising energy consumption, and that energy consumption has been necessary for the 90 percent decline in natural disaster deaths, the 25 percent and rising global food surplus, and the 30 percent decline in the global burden of disease.

Better preparedness for heat waves, which could increase in a hotter world, will save lives. For example, the IPCC notes that France had 4,000 fewer deaths than anticipated from a heat wave in 2006 thanks to improved health care, an early-warning system and greater public consciousness in response to a deadly heat wave three years earlier.<sup>10</sup>

It's worth taking a closer look at the three diseases that are most likely to be affected by climate change: malaria, dengue, and Lyme.

- Malaria deaths and infections will continue to decline in the future. Climate change increases malaria deaths and infections compared to a hypothetical, "all else being equal" scenario, but, as the IPCC notes, "malaria is very sensitive... to socioeconomic factors and health interventions, and the generally more conducive climate conditions have been offset by more effective disease control activities."<sup>11</sup>
- The spread of dengue fever can be controlled through low-cost interventions similar to the ones that have for over 100 years been used to reduce malaria deaths. It's true that disease modelers predict higher temperatures will create favorable conditions for dengue. But again, notes the IPCC, "the adverse effects of climate change are balanced by the beneficial outcomes of development." And dengue can be addressed in simple ways. The IPCC notes that treating water drums with insecticide where dengue-infected mosquitoes breed is often all that is required.<sup>12</sup>
- Climate change does not explain the increase in tick-borne diseases, including Lyme disease, in North America, Europe, or other parts of

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<sup>10</sup> K.R. Smith et al, "Human Health: Impacts, Adaptation, and Co-Benefits," *Climate Change 2014*, p. 734.

<sup>11</sup> K.R. Smith et al, "Human Health: Impacts, Adaptation, and Co-Benefits," *Climate Change 2014*, p. 723. "At the global level, economic development and control interventions have dominated changes in the extent and endemicity of malaria over the last 100 years (Gething et al., 2010). Although modest warming has facilitated malaria transmission (Pascual et al., 2006; Alonso et al., 2011), the proportion of the world's population affected by the disease has been reduced, largely due to control of *P. vivax* malaria in moderate climates with low transmission intensity."

<sup>12</sup> K.R. Smith et al, "Human Health: Impacts, Adaptation, and Co-Benefits," *Climate Change 2014*, p. 724.

the world. The IPCC instead points to socioeconomic changes, particularly changes to land use from agriculture and recreation, as the main factors.<sup>13</sup>

The IPCC notes that these and other diseases might increase due to climate change, but the impacts of all of them are overwhelmed by non-climate factors, from broad land-use changes to the existence or non-existence of interventions.

Some have suggested that climate change will make diseases like COVID-19 more frequent or more severe, but the main factors behind the novel-coronavirus pandemic had nothing to do with climate change and everything to do with the failure of the Chinese regime to protect public health. Governments and farmers have known what “biosecurity” measures to take for decades, and enacted them, partly, in response to the 2005 avian flu (H5N1) epidemic. These measures include hardened facilities to prevent, for example, bats, from entering buildings; the regular testing of animals and workers; and disallowing live animals from being transported and sold at markets.<sup>14</sup>

It is sometimes claimed that environmental or climate policies are required for lower pollution, but recent events show that not to be the case. US electricity sector emissions decreased 34 percent from 2005 to 2019, including an astonishing 10 percent in 2019, which is the largest year-on-year decline in history.<sup>15</sup> By contrast, the Obama administration’s proposed carbon regulation of the power sector, the “Clean Power Plan,” proposed emissions reductions of 32 percent — by 2030.<sup>16</sup> Thanks in large measure to natural gas replacing coal, the International Energy Agency (IEA) forecasts carbon emissions in 2040 to be lower than in almost all of the IPCC scenarios.<sup>17</sup>

Carbon emissions are thus following the same trajectory as other air pollutants. As a result of cleaner-burning coal, the transition to natural gas, cleaner vehicles, and other technological changes, developed nations have seen major

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<sup>13</sup> K.R. Smith et al, “Human Health: Impacts, Adaptation, and Co-Benefits,” *Climate Change 2014*, p. 725.

<sup>14</sup> “Should We Domesticated Wild Animals to Prevent Disease Pandemics? An Interview with Peter Daszak,” *Environmental Progress*, May 21, 2020.

<sup>15</sup> Trevor Houser and Hannah Pitt, “Preliminary US Emissions Estimates for 2019,” Rhodium Group, January 7, 2020. <https://rhg.com/research/preliminary-us-emissions-2019/>

<sup>16</sup> Environmental Protection Agency (EPA), “Fact Sheet: Overview of the Clean Power Plan,” EPA, August 3, 2015. <https://archive.epa.gov/epa/cleanpowerplan/fact-sheet-overview-clean-power-plan.html>

<sup>17</sup> “World Energy Outlook 2019” (Paris: International Energy Agency, 2019), <https://www.iea.org/reports/world-energy-outlook-2019>.

improvements in air quality. Between 1980 and 2018, US carbon monoxide levels decreased by 83 percent, lead by 99 percent, nitrogen dioxide by 61 percent, ozone by 31 percent, and sulfur dioxide by 91 percent. While death rates from air pollution can rise with industrialization, they decline with higher incomes, better access to health care, and reductions in air pollution.<sup>18</sup>

## II. The Impact of Climate *Policies* on Health

Unfortunately, the US and nations around the world have put in place, or are considering adopting, climate policies that threaten economic growth, as well as social and racial equity, and will lead to greater air pollution. As such, climate policies in many cases may threaten human health and well-being more than climate change itself.

Subsidies and mandates for renewables result in higher electricity prices and the net transfer of wealth from lower to upper income citizens. Like taxes on food, taxes on energy are regressive. A former Obama administration economist at the University of Chicago found last year that consumers in states with renewable energy mandates paid \$125 billion more for electricity in the seven years after passage than they would have otherwise.<sup>19</sup>

Renewables contributed to electricity prices rising six times more in California than in the rest of the US since 2011, the state's "take-off" year for rapid growth in wind and solar — a price increase that occurred despite the state's reliance during the same years on persistently-low-priced natural gas.<sup>20</sup>

Renewables have the same impact everywhere in the world. They have caused electricity prices to rise 50 percent in Germany since 2007, the first year the country got more than 10 percent of its power from subsidized wind, solar,

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<sup>18</sup> United States Environmental Protection Agency, "Air Quality – National Summary," 2020, <https://www.epa.gov>.

<sup>19</sup> Michael Greenstone and Ishan Nath, "Do Renewable Portfolio Standards Deliver?" *Energy Policy Institute at the University of Chicago* 62 (May 2019): 1-45, <https://epic.uchicago.edu/wp-content/uploads/2019/07/Do-Renewable-Portfolio-Standards-Deliver.pdf>.

<sup>20</sup> "California," *Environmental Progress*, accessed July 25, 2020, <https://environmentalprogress.org/california>. Calculations based on data from "Electricity Data Browser: Retail Sales of Electricity Annual," United States Energy Information Administration, accessed January 10, 2020, <https://www.eia.gov/electricity/data/browser>.

and biomass. By 2019, German household electricity prices were 45 percent higher than the European average.<sup>21</sup>

Solar and wind make electricity more expensive because they are unreliable, requiring 100 percent backup, and energy-dilute, requiring extensive land, transmission lines, and mining, and more costs related to overcoming community opposition. Solar and wind developers do not pay for the costs they create but rather pass them on to electricity consumers and other producers.<sup>22</sup>

Poor people and people of color are disproportionately impacted by climate policies that restrict energy consumption. In May, a California civil rights coalition filed a lawsuit against the state to prevent implementation of climate law aimed at reducing driving. The coalition calculates that the proposed law will increase the cost of a home by anywhere from \$40,000 to \$400,000. “Latino, African American, and Asian American families,” the coalition wrote in a letter to the governor, “are disproportionately victimized by the confluence of massively destructive state, regional and local housing policy choices.”<sup>23</sup>

Making energy expensive is especially harmful to poor nations. Certain climate change policies are more likely to hurt food production and worsen rural poverty than climate change itself, found a large team of scientists, even at 4 to 5 degrees warming. The “climate policies” the authors refer to are ones that would make energy more expensive and result in more bioenergy (the burning of biofuels and biomass), which would increase land scarcity and drive up food costs.

“Although it is projected that the negative effects of climate change will increase over time, our conclusions that the effect on agriculture of mitigation is stronger would probably hold even if moving the time horizon to 2080 and considering the strong climate change scenario RCP8.5,” concluded the scientists. The scenario RCP 8.5 is the scenario that the IPCC says would lead to a 3 to 5 degree warming.<sup>24</sup>

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<sup>21</sup> Eurostat, “Electricity prices for household consumers - bi-annual data (from 2007 onwards)” December 1, 2019, accessed January 20, 2020, [https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nrg\\_pc\\_204&lang=en](https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nrg_pc_204&lang=en).

<sup>22</sup> Steven M. Grodsky, “Reduced ecosystem services of desert plants from ground-mounted solar energy development,” *Nature*, July 20, 2020.

<sup>23</sup> Jim Jakobs, “Latest State ‘Green’ Edict Discriminates Against Minorities: Lawsuit,” *GV Wire*, May 7, 2020.

<sup>24</sup> Hans van Meijl, “Comparing impacts of climate change and mitigation on global agriculture by 2050,” *Environmental Research Letters*, 2018. <https://iopscience.iop.org/article/10.1088/1748-9326/aabdc4/pdf>

Other scientists find similar outcomes. The UN Food and Agriculture concludes that food production will rise 30 percent by 2050 unless “sustainable practices” are adopted — in which case it would rise just 10 to 20 percent.<sup>25</sup> And a paper published in *Nature* last month found that “agro-ecological” farming, which has long been promoted by European governments, US NGOs, and the UN, does not improve the agricultural productivity of small African farmers.<sup>26</sup>

Finally, the premature closure of nuclear power plants, often in the name of fighting climate change, results in greater air pollution. For example, the Green New Deal proposed by Rep. Alexandria Ocasio-Cortez last year called for the closure of US nuclear power plants. The written statement distributed by the office of Rep. Ocasio-Cortez said, “the plan is to transition off of nuclear.”<sup>27</sup>

And yet study after study finds that closing nuclear plants increases air pollution and harms public health.

A 2017 study in *Nature Energy* found that the temporary closure of two nuclear plants led directly to lower birth weights, a key indicator of poor health outcomes later in life.<sup>28</sup> The study found that reduction in birth weight as small as 5.4 percent can result in a lower intelligence quotient and lower income, as well as higher rates of illness, stunted growth, and neurodevelopmental problems.<sup>29</sup>

In response to the Fukushima nuclear accident, the Japanese government shut down its nuclear plants and replaced them with fossil fuels. As a result, the cost of electricity went up, resulting in the deaths of a minimum of 1,280 people from the cold between 2011 and 2014.<sup>30</sup> In addition, scientists estimate that

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<sup>25</sup> United Nations Food and Agriculture Organization (FAO), *The future of food and agriculture—Alternative pathways to 2050* (Rome: Food and Agriculture Organization of the United Nations, 2018), p. 76-77.

<sup>26</sup> Marc Corbeels, et al., “Limits of conservation agriculture to overcome low crop yields in sub-Saharan Africa,” July 16, 2020. For examples of efforts to promote agroecology see Shiny Varghese, “Agroecological and other innovative approaches for sustainable agriculture and food systems that enhance food security and nutrition,” Institute for Agriculture and Trade Policy, June 26, 2019.

<sup>27</sup> “Green New Deal FAQ,” February 7, 2020, accessed August 3, 2020, <https://apps.npr.org/documents/document.html?id=5729035-Green-New-Deal-FAQ>.

<sup>28</sup> E. Severnini, “Impacts of nuclear plant shutdown on coal-fired power generation and infant health in the Tennessee Valley in the 1980s,” *Nature Energy*, 2017; Michael Shellenberger, “Nuclear Power: Unexpected Health Benefits,” *Nature Energy*, 2017.

<sup>29</sup> S.E. Black, et al, *Journal of Economic Perspectives*, 122, 2007, p. 409–439. M. Hack, *Future Child*, No. 5, 1995, p. 176–196.

<sup>30</sup> Matthew J. Neidell, Shinsuke Uchida, and Marcella Veronesi, “Be Cautious with the Precautionary Principle: Evidence from Fukushima Daiichi Nuclear Accident” (Working Paper 26395,

Japan's nuclear plant closures resulted in more than four thousand (avoidable) air pollution deaths per year.<sup>31</sup>

Unreliable electricity from solar and wind energies has been unable to compensate for the loss of reliable, near-zero pollution nuclear energy. A 2016 study found that the electricity lost from the closure of the San Onofre nuclear plant was mostly replaced by burning natural gas, which increased air pollution in southern California and raised the costs of generating electricity from natural gas by \$350 million.<sup>32</sup>

In 2005, Vermont legislators promised to reduce emissions 25 percent below 1990 levels by 2012, but instead the state's emissions rose 16.3 percent, over twice as much as national emissions rose during the same period, in part due to the closure of the state's sole nuclear plant under pressure from climate activists, and in part due to the inability of unreliable solar and wind to replace lost nuclear energy electrical generation.<sup>33</sup>

New York State is in the process of closing Indian Point nuclear power plant and replacing it with fossil fuels. Under pressure from elected leaders, Indian Point's operator closed one of its two reactors in April of this year, and intends to close the other one in April 2021. In May, a few weeks after calling for a phase-out of nuclear energy, Rep. Ocasio-Cortez said she wanted to leave "the door open on nuclear,"<sup>34</sup> but five months later called for closing Indian Point nuclear plant.<sup>35</sup> Environmental and climate justice advocates are protesting its closure.<sup>36</sup> They

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National Bureau for Economic Research (NBER), Cambridge, MA, October 2019), <https://doi.org/10.3386/w26395>.

<sup>31</sup> David E. Weinstein and Molly K. Schnell, "Evaluating the Economic Response to Japan's Earthquake" (Working Paper 301, Center on Japanese Economy and Business, Columbia University, New York, May 2012), <https://gsb.columbia.edu/cjeb/research>.

<sup>32</sup> Lucas Davis et al., "Market impacts of a nuclear power plant closure," *American Economic Journal, Applied Economics*, 2016, p. 92-122.

<sup>33</sup> Department of the Environment, Vermont, "Greenhouse Gas Emissions Inventory Update: 1990-2015. EPA, "Sources of Greenhouse Gas Emissions," 2020, [https://dec.vermont.gov/sites/dec/files/aqc/climate-change/documents/Vermont\\_Greenhouse\\_Gas\\_Emissions\\_Inventory\\_Update\\_1990-2015.pdf](https://dec.vermont.gov/sites/dec/files/aqc/climate-change/documents/Vermont_Greenhouse_Gas_Emissions_Inventory_Update_1990-2015.pdf).

<sup>34</sup> Jacqueline Toth, "Ocasio-Cortez: Green New Deal 'Leaves the Door Open' on Nuclear," Morning Consult, May 6, 2019.

<sup>35</sup> "AOC on Nuclear Power: 'Indian Point Should Have Been Shutdown a Long Time Ago,'" October 3, 2019, <https://grabien.com/story.php?id=254389>.

<sup>36</sup> "Governor Cuomo, a pandemic is the wrong time to shutter Indian Point," Climate Coalition, <http://climatecoalition.org/dear-governor-cuomo>.

point to a Harvard University study, which found that higher air pollution results in higher coronavirus death rates.<sup>37</sup>

The US could lose half to two-thirds of its nuclear energy over the next decade. By 2025, the US will close twelve reactors, which constitute 10.5 gigawatts of low-carbon power.<sup>38</sup> This should be extremely troubling for anyone who cares about air pollution and climate change. Deep decarbonization of US energy supply will require receiving 100 percent of electricity from zero-emissions sources as well as replacing all natural gas and petroleum used in transportation, cooking, and heating, which constitute roughly two-thirds of total primary energy. The cheapest and fastest way to achieve this decarbonization is to add nuclear reactors at existing nuclear power plants. Closing those plants will foreclose that future option.

### III. Recommendations

The dominant form of climate policy in international bodies and among nations around the world emerged from 1960s-era environmental policies aimed at constraining food and energy supplies. These policies are correctly referred to as Malthusian in that they stem from the fears, first articulated by the British economist Thomas Malthus in 1798, that humans are at constant risk of running out of food. Real world experience has repeatedly disproven Malthusianism. If it hadn't, there wouldn't be nearly eight billion of us. Worse, Malthusian ideas have been used to justify unethical policies that worsen socioeconomic inequality by making food and energy more expensive, including closing down nuclear plants.<sup>39</sup>

Policymakers should explicitly reject policies that significantly raise food and energy prices, directly or indirectly. Republicans and Democrats alike should affirm their commitment to human flourishing and prosperity, both of which depend on cheap food and energy, which depend on the rising productivity of inputs to agriculture and electricity generation, including labor, land, and capital.

The large reductions in air pollution, including carbon emissions, in recent decades came overwhelmingly from making natural gas cheap, not from making

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<sup>37</sup> Xiao Wu et al., "Exposure to air pollution and COVID-19 mortality in the United States: A nationwide cross-sectional study," Harvard University, April 24, 2020, <https://projects.iq.harvard.edu/covid-pm>.

<sup>38</sup> U.S. Energy Information Administration, "Despite closures, U.S. nuclear electricity generation in 2018 surpassed its previous peak," March 21, 2019.

<sup>39</sup> Michael Shellenberger, *Apocalypse Never: Why Environmental Alarmism Hurts Us All*, HarperCollins, 2020, p. 222-249.

fossil fuels more expensive. Short-term and focused subsidies and mandates may help accelerate technological innovation. But the main focus must be on making the new energy source affordable.

There are also national and economic considerations that must be taken into account alongside health. Nuclear energy is a dual-use technology, and if nations partner with China and Russia rather than the US or other Western nations to build nuclear plants, America's national security is undermined. Similarly, becoming overly dependent upon solar panels imported from China may not be in the best interests of American workers.

Congress has to date failed to take steps to keep America's nuclear plants operating, even as it has repeatedly subsidized industrial solar and wind energy. I urge Congress to take reasonable measures to keep all of America's nuclear plants operating. In addition, I encourage Congress to explore creating a state-owned enterprise to build new nuclear plants in the US and abroad, as it may be needed to compete with the Russian and Chinese state-owned companies.

American energy policy should be oriented toward global competitiveness and even "dominance," not just improved health outcomes. Such a plan would seek to replace the natural gas burned domestically with nuclear energy, and to increase the export of natural gas abroad. Such a policy would also support the health and climate goals of using natural gas rather than coal.

Thank you for inviting my testimony.