



# Michael Shellenberger Testimony to the House Committee on Oversight & Reform

For a hearing on: “Fueling the Climate Crisis: Examining  
Big Oil’s Prices, Profits, and Pledges”

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## Summary

Good morning Chairwoman Maloney, Environment Subcommittee Chairman Khanna, and Ranking Member Comer, and members of the Committee. I am grateful to you for inviting my testimony.

I share this committee's concern with climate change and misinformation. It is for that reason that I have, for more than 20 years, conducted energy analysis, worked as a journalist, and advocated for renewables, coal-to-natural gas switching, and nuclear power to reduce carbon emissions.

At the same time, I am deeply troubled by the way concern over climate change is being used to repress domestic energy production. The U.S. is failing to produce sufficient quantities of natural gas and oil for ourselves and our allies. The result is the worst energy crisis in 50 years, continuing inflation, and harm to workers and consumers in the U.S. and the Western world. Energy shortages are already resulting in rising social disorder and the toppling of governments, and they are about to get much worse.

We should do more to address climate change but in a framework that prioritizes energy abundance, reliability, and security. Climate change is real and we should seek to reduce carbon emissions. But it's also the case that U.S. carbon emissions declined 22% between 2005 and 2020, global emissions were flat over the last decade, and weather-related disasters have declined since the beginning of this century. There is no scientific scenario for mass death from climate change. A far more immediate and dangerous threat is insufficient energy supplies due to U.S. government policies and actions aimed at reducing oil and gas production.

The Biden administration claims to be doing all it can to increase oil and natural gas production but it's not. It has issued fewer leases for oil and gas production on federal lands than any other administration since World War II. It blocked the expansion of oil refining. It is using environmental regulations to reduce liquified natural gas production and exports. It has encouraged greater production by Venezuela, Saudi Arabia, and other OPEC nations, rather than in the U.S. And its representatives continue to emphasize that their goal is to end the use of fossil fuels, including the cleanest one, natural gas, thereby undermining private sector investment.

If this committee is truly concerned about corporate profits and misinformation, then it must approach the issue fairly. The big tech companies make larger profits than big oil but have for some reason not been called to account. Nor has there been any acknowledgement that the U.S. oil and gas industry effectively subsidized American consumers to the tune of \$100 billion per year for most of the

last 12 years, resulting in many bankruptcies and financial losses. As for misinformation about climate change and energy, it is rife on all sides, and I question whether the demands for censorship by big tech firms are being made in good faith, or are consistent with the rights protected by the First Amendment.

Efforts by the Biden administration and Congress to increase reliance on weather dependent renewable energies and electric vehicles (EVs) risks undermining American industries and helping China. China has more global market share of the production of renewables, EVs, and their material components than OPEC has over global oil production. It would be a grave error for the U.S. to sacrifice its hard-won energy security for dependence on China for energy. While I support the repatriation of those industries to the U.S., doing so will take decades, not years. Increased costs tied to higher U.S. labor and environmental standards could further impede their development. There are also significant underlying physical problems with renewables, stemming from their energy-dilute, material-intensive nature, that may not be surmountable. Already we have seen that their weather-dependence, large land requirements, and large material throughput result in renewables making electricity significantly more expensive everywhere they are deployed at scale.

The right path forward would increase oil and natural gas production in the short and medium terms, and increase nuclear production in the medium to long terms. The U.S. government is, by extending and expanding heavy subsidies for renewables, expanding control over energy markets, but without a clear vision for the role of oil, gas, and nuclear.

We should seek a significant expansion of natural gas and oil production, pipelines, and refineries to provide greater energy security for ourselves, and to produce in sufficient quantities for our allies. We should seek a significant expansion of nuclear power to increase energy abundance and security, produce hydrogen, and one day phase out the use of all fossil fuels. While the latter shouldn't be our main focus, particularly now, radical decarbonization can and should be a medium- to long-term objective within the context of creating abundant, secure, and low-cost energy supplies to power our remarkable nation and civilization.

## Climate Risk

Anthropogenic climate change is real and is something that governments, big oil companies, and other corporations should do much more to address. All else being equal, we would rather not change global temperatures at all, given that we have built a civilization of cities, farms, and protected nature areas within a specific temperature band. My own concern over climate change led me to co-found, in 2002, the New Apollo Project, now the Blue-Green alliance, an environmental-labor coalition, which successfully advocated for President Barack Obama's historic investment in renewables in his 2009 stimulus package<sup>1</sup>; advocate for the transition to natural gas from coal starting in 2011<sup>2</sup>; and advocate for a significant expansion of nuclear energy alongside climate scientists Tom Wigley and James Hansen, since 2013.<sup>3</sup> Since then, I have played an active role in keeping nuclear plants operating in Illinois, New Jersey, New York, Connecticut, and California.<sup>4</sup>

At the same time, climate advocacy grounded in flawed and misleading science has been self-defeating, since it has repressed natural gas production in the United States, which has resulted in a recent reversion to dirtier fuels. Between 2005 and 2020, U.S. carbon emissions declined by 21.5 percent, which is 4.5 percentage points more than what the U.S. promised as part of its United Nations Paris Climate Change commitments.<sup>5</sup> Emissions also declined by 4.5 percentage points more than what was promised had Congress passed Waxman-Markey "cap and trade" legislation, which died in the U.S. Senate, back in 2010.<sup>6</sup> Of that emissions reduction, 61 percent was due to the shift from coal to natural gas and electricity production, and the 39 percent reduction that came from intermittent renewables back-stopped by natural gas, which is required in most situations to provide power when the sun is

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<sup>1</sup> Michael Shellenberger, "New Energy for America," Center for American Progress, January 14, 2004, <https://www.americanprogress.org/article/new-energy-for-america-2/>

<sup>2</sup> Michael Shellenberger and Ted Nordhaus, "A boom in shale gas? Credit the feds," *Washington Post*, December 16, 2011; Kevin Begos, "Fracking boom: help or hurt climate change fight," *Washington Post*, April 29, 2013.

<sup>3</sup> Thom Patterson, "Climate change warriors: it's time to go nuclear," *CNN*, November 3, 2013; "Crossfire: Nuclear Energy: Ralph Nader and Michael Shellenberger are in the Crossfire," *CNN*, November 8, 2013.

<sup>4</sup> Uri Berliner, "Why even environmentalists are supporting nuclear power today," August 30, 2022; Debra Kahn, "The environmental apostate who backed nuclear energy before it was cool," *Politico*, June 8, 2022; James Freeman, "Is this man talking California into nuclear power?" *Wall Street Journal*, April 29, 2022.

<sup>5</sup> Kate Larsen et al., "Preliminary U.S. Greenhouse Gas Emissions Estimates for 2020," Rhodium Group, January 12, 2021, <https://rhg.com/research/preliminary-us-emissions-2020/>

<sup>6</sup> Center for Climate and Energy Solutions, "Waxman Markey Short Summary," June 2009, <https://www.c2es.org/document/waxman-markey-short-summary/>

not shining and the wind is not blowing.<sup>7</sup> But today, thanks to natural gas shortages, coal-fired electricity increased 22 percent in the U.S. in 2021, as compared to 2020, and will reach an all-time high, globally, this year.<sup>8</sup>

Moreover, widespread alarmism is contributing to anxiety and depression, particularly among young people, even though most environmental trends are going in the right direction. Today, 36 percent of Americans surveyed believe climate change will make Earth uninhabitable for all life and 31 percent believe climate change will lead to human extinction, claims that are causing severe anxiety in some children.<sup>9</sup> And yet neither the IPCC nor any other reputable scientific body makes such apocalyptic claims. Indeed, the best-available science finds: global carbon dioxide emissions were flat over the last decade<sup>10</sup>; U.S. landfalling hurricanes have declined since 1900<sup>11</sup>; there is no overall trend in U.S. heat wave frequency or magnitude since 1900<sup>12</sup>; and there is no increase in flooding, decreasing flood mortality, and decreasing flood costs as a proportion of GDP around the world.<sup>13</sup>

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<sup>7</sup> U.S. Energy Information Administration and International Energy Outlook, 2021, 2019.

<sup>8</sup> U.S. EIA, "Annual U.S. coal-fired electricity generation will increase for the first time since 2014," October 18, 2021; International Energy Agency, "Global coal demand is set to return to its all-time high in 2022," July 28, 2022.

<sup>9</sup> YouGovAmerica, "Nearly two in five Americans say it's likely climate change will make the Earth uninhabitable," April 13-19, 2022, <https://today.yougov.com/topics/society/articles-reports/2022/04/22/americans-say-climate-change-earth-uninhabitable>; Jason Plautz, "The Environmental Burden of Gen Z," *Washington Post*, February 3, 2020; Reuters, "One in five UK children report nightmares about climate change," March 2, 2020; Michael Shellenberger, "Why Climate Alarmism Hurts Us All," *Forbes*, December 4, 2019.

<sup>10</sup> Zeke Hausfather, "Global CO2 emissions have been flat for a decade, new data reveals," Carbon Brief, April 11, 2021, <https://www.carbonbrief.org/global-co2-emissions-have-been-flat-for-a-decade-new-data-reveals/>

<sup>11</sup> [Philip J. Klotzbach](#) et al, "Continental U.S. Hurricane Landfall Frequency and Associated Damage: Observations and Future Risks," *Bulletin of the American Meteorological Society*, July 2018.

<sup>12</sup> U.S. Global Change Research Program, "Chapter Six: Temperature Changes in the United States," Fourth National Climate Assessment, 2017; <https://science2017.globalchange.gov/chapter/6/>

There is evidence that heat waves, temperature extremes, and heavy precipitation are increasing at a global scale, but heavier rainfall does not necessarily mean more flooding, and IPCC expresses low to medium confidence in changes to meteorological and hydrological droughts, and to agricultural and ecological droughts, respectively. United Nations Intergovernmental Panel on Climate Change, Assessment Report 6, Working Group I, 2021.

<sup>13</sup> The IPCC has "low confidence" of climate change influence on flood events. Sonia I. Seneviratne, et al., "Weather and Climate Extreme Events in a Changing Climate," IPCC, Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change; Shiqiang Du, "Brief communication: Rethinking the 1998 China floods to prepare for a nonstationary future," *Nat. Hazards Earth Syst. Sci.*, 19, 715–719, 2019; Muhammed Yaseen et al., "Contemporary Trends in High and Low River Flows in Upper Indus Basin, Pakistan," *Water Journal*, January 24, 2022; Roger Pielke, Jr. "US Flood Damage as

While some extreme weather events are increasing globally, namely heat waves and extreme precipitation events, data collected by EM-DAT in Belgium, the main source for data on global disasters, show that weather-related *disasters* declined by at least 10 percent between 2000 to 2021.<sup>14</sup> The reason for this is because EM-DAT, the United Nations Intergovernmental Panel on Climate Change (IPCC), the U.S. National Climate Assessment, and every other reputable scientific body measures disasters as deaths and economic costs relative to GDP, both of which have been declining as societies have become more resilient and less vulnerable.<sup>15</sup>

Again, all things being equal, we should want to reduce temperatures and emissions as much as possible. But we should also acknowledge the progress that has been made protecting ourselves, and our ecosystems, from the consequences of higher temperatures. Deaths globally from natural disasters declined from an average of 550,000 per year in 1920, when the global human population was less than 2 billion, to 8,200 in 2020.<sup>16</sup> We prevent flooding through flood management. We survive droughts through water storage, water recycling, and desalination. And we prevent high-intensity fires through forest management, such as through selective mechanical cutting and prescriptive burns.<sup>17</sup>

## Energy Security

Having established that climate change is a matter of public concern, but not an apocalyptic threat, we should place it within a broader framework within which to think about energy. The security of energy supplies, and reducing energy prices, are urgent priorities. Russia's invasion of Ukraine shows the serious danger of nations

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Proportion of GDP, 1940-2019 based on US National Weather Service flood loss database, *Natural Hazards Review*, 6, 2020; D. Paprotny et al, "Trends in flood losses in Europe over the past 150 years," *Nature Communications*, 1985.

<sup>14</sup> EM-DAT, The International Disaster Database, Centre for Research on the Epidemiology of Disasters, Accessed September 14, 2022, <https://www.emdat.be>

<sup>15</sup> Hannah Ritchie and Max Roser, "Natural Disasters," Our World in Data, accessed September 14, 2022. As the authors of a major 2019 paper note, "Improved protection against hazards has counter-balanced the effects of increasing exposure on disaster risk, with the global average 2007–2016 multi-hazard human mortality and loss rates dropping of about 6.5 and nearly 5 times as compared to the period 1980–1989, respectively." Giuseppe Formetta et al., "Empirical evidence of declining global vulnerability to climate related hazards," *Global Environmental Change*, July 2019.

<sup>16</sup> Munich Re, "Natural Catastrophes in 2020," January 2021, [https://www.munichre.com/content/dam/munichre/mrwebsiteslaunches/natcat-2021/2020\\_Jahresuebersicht\\_Welt\\_e.pdf/ jcr\\_content/renditions/original./2020\\_Jahresuebersicht\\_Welt\\_e.pdf](https://www.munichre.com/content/dam/munichre/mrwebsiteslaunches/natcat-2021/2020_Jahresuebersicht_Welt_e.pdf/jcr_content/renditions/original./2020_Jahresuebersicht_Welt_e.pdf); Hannah Ritchie and Max Roser, "Natural Disasters," Our World in Data, accessed September 14, 2022; Giuseppe Formetta et al., "Empirical evidence of declining global vulnerability to climate related hazards," *Global Environmental Change*, July 2019.

<sup>17</sup> Michael Shellenberger, "Forests that survive megafires prove good management trumps climate change," *Forbes*, September 13, 2020.

becoming overly dependent on hostile foreign powers for their energy supply. Europe not only became over-dependent on natural gas, it over-invested in weather-dependent renewables, which cannot replace fossil fuels, and under-invested in nuclear. People think Europe depends on Russia for energy because it lacks its own, but 15 years ago Europe exported more natural gas than Russia did before its invasion of Ukraine. Now, Russia exports three times more gas than Europe produces.<sup>18</sup>

Why? Because European policymakers in the grip of environmental alarmism blocked fracking.<sup>19</sup> Former Secretary of State Hillary Clinton and former secretary general of NATO Anders Fogh Rasmussen both blamed Russia for funding the war on natural gas in Europe. "Russia, as part of their sophisticated information and disinformation operations," said Rasmussen in 2014, "engaged actively with so-called nongovernmental organizations—environmental organizations working against shale gas—to maintain dependence on imported Russian gas."<sup>20</sup> That same year, former Secretary of State Clinton said "phony environmental groups" funded by Russia led the campaign against fracking in Europe.<sup>21</sup>

The crisis in Europe makes clear that climate change cannot be our sole concern when it comes to developing energy policy, that energy independence must be understood as a national security priority, and that energy as the lifeblood of the economy, the master resource unlike any other commodity, must be cheap, reliable, and abundant, if the United States is going to insure its future prosperity. Moreover, it's clear that the U.S. must do much more to supply its energy-poor allies in Europe and Asia, who we are treaty-obligated to protect militarily. Had those allies been more energy-independent of Russia, Ukraine would have been significantly less vulnerable to attack, since Russia would have suffered even greater consequences for its aggression.

And, indeed, today there is a broad bipartisan consensus that the U.S. must export much more natural gas to Europe. *The Washington Post* reported on September 11, 2022, that the Biden administration is reviewing efforts to increase liquefied natural gas (LNG) to Europe. "The administration officials emphasized that the White House has for months been seeking any possible way to increase natural gas exports to Europe." Said Treasury Secretary Janet Yellen, "We're doing everything we can on the LNG front to be helpful." And, indeed, U.S. LNG exports

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<sup>18</sup> International Energy Agency, Key World Energy Statistics, 2021.

<sup>19</sup> Michael Shellenberger, "The West's Green Delusions Empowered Putin," *Common Sense*, March 1, 2022; "A lesson in energy masochism," *Wall Street Journal*, March 1, 2022.

<sup>20</sup> Michael Shellenberger, "The West's Green Delusions Empowered Putin," *Common Sense*, March 1, 2022; "A lesson in energy masochism," *Wall Street Journal*, March 1, 2022.

<sup>21</sup> Matthew Sheffield, "Is Putin funding anti-fracking groups?," *Salon.com*, July 16, 2017.

have increased significantly, with over twice the amount of LNG going to Europe this year over the same period of time last year.<sup>22</sup>

But by the time Biden had announced the Task Force to reduce Europe's dependence on Russian fossil fuels, in March, the additional flows of U.S. LNG to Europe had already occurred.<sup>23</sup> The reason was because the U.S. LNG industry created a new model of exports which allowed for ships to change their destinations in real-time based on changing market demands, which is a break from how Qatar and other LNG exporters had managed LNG exports. It was thanks to this model that the U.S. was able to supply natural gas to Brazil in 2021 after its drought reduced hydroelectricity production. Reallocation of LNG exports had already been occurring since Europe's energy crisis began in the summer of 2021, six months before Russia's invasion of Ukraine. The US increased LNG exports to Europe by 0.8 billion cubic feet per day (Bcfpd) in January and February 2022 as compared to January and February 2021. Nothing that the Biden administration has done was responsible for the shift of U.S. LNG to Europe.<sup>24</sup>

The Biden administration claims that it is limited in what it can do when in reality it could do much more to expand natural gas production and exports. It's true that it takes roughly three years to build an LNG export terminal and two years to get it approved by government regulators. But Biden could, if necessary, invoke the Defense Production Act to expedite the permitting of LNG export terminals, pipelines, and drilling. The regulation of new LNG terminals could occur concurrently with their construction. Expedited regulation might reduce obstacles in the way of expanding the size of liquefaction units, or trains. And Biden could announce trade agreements with other nations to supply them with LNG, which would incentivize natural gas production domestically.

It's true that the U.S. is already the largest LNG exporter in the world, but recent increases were underway before Biden took office and are a tiny fraction of what the U.S. could be producing.<sup>25</sup> U.S. natural gas production will increase from 95.1 billion cubic feet per day (Bcf/d) in October 2021 to 97.5 Bcf/d by December 2022, a record high.<sup>26</sup> U.S. exports increased by 12 percent in the first half of 2022.

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<sup>22</sup> Jeff Stein, "White House alarm rises over Europe as Putin threatens energy supply," *Washington Post*, September 11, 2022.

<sup>23</sup> White House, "US and EU announce task force to reduce Europe's dependence on Russian fossil fuels," March 25, 2022; US EIA, "[U.S. liquefied natural gas export capacity will be world's largest by end of 2022](#)," December 9, 2021.

<sup>24</sup> Scott Disavino, "Could the US ship more LNG to Europe?" March 25, 2022.

<sup>25</sup> US EIA, "[The United States became the world's largest LNG exporter in the first half of 2022](#)," July 25, 2022.

<sup>26</sup> US EIA, "EIA forecasts U.S. natural gas production will establish a new monthly record high in 2022," December 16, 2021.

But the largest U.S. natural gas producer, EQT, calculates that the U.S. could produce four times more LNG, 569 billion cubic meters (Bcm) per year.<sup>27</sup> The U.S. government estimates that the United States has 464 Tcf of proved reserves and 2,460 Tcf of technically recoverable reserves of dry natural gas.<sup>28</sup> As such, the U.S. could export an amount of natural gas (60 bcf/d) that would be equivalent to the oil production of Saudi Arabia, calculates EQT.

Not only is the Biden administration not taking the extraordinary measures it could take to produce and export more natural gas, it is actively preventing the expansion of natural gas production and exports. On September 8, three days before *The Washington Post* reported that the Biden administration was doing all it could to expand LNG exports, Treasury Secretary Yellen reaffirmed in Detroit the commitment by the Biden administration to end the use of fossil fuels.<sup>29</sup> Two days earlier, the Environmental Protection Agency (EPA) denied a request from LNG exporter Cheniere Energy, which accounts for half of US LNG exports, to exempt two turbines at its Gulf Coast terminals from a pollution rule, which means Cheniere may have to reduce exports of LNG in order to install new pollution control equipment. Cheniere said that the installation of the new pollution controls could take years.<sup>30</sup>

The Biden administration has issued fewer leases for oil and gas production on federal lands and off-shore areas, which produce one-quarter of all US production, than any other administration since World War II. The Interior Department distributed just 203 leases — just 126,228 acres — for oil and gas development during President Biden's first 19 months in office. By contrast, former presidents Obama and Trump approved 10 times as many leases during the same period. And no president since Richard Nixon has leased out fewer than 4.4 million acres during his first 19 months in office.<sup>31</sup>

It's true that the recently-passed Inflation Reduction Act (IRA) requires the Interior Department to offer a minimum of 60 million offshore acres and 2 million acres of federal lands to oil and gas producers, annually, in order for the administration to issue permits to wind and solar developers, but the Biden

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<sup>27</sup> EQT, "Unleashing U.S. LNG," March 2022, [https://www.eqt.com/wp-content/uploads/2022/03/LNG\\_Final.pdf](https://www.eqt.com/wp-content/uploads/2022/03/LNG_Final.pdf)

<sup>28</sup> US EIA, "How much natural gas does the United States have, and how long will it last?," Accessed September 14, 2022.

<sup>29</sup> Remarks by Secretary of the Treasury Janet L. Yellen at Ford Rouge Electric Vehicle Center, September 8, 2022, <https://home.treasury.gov/news/press-releases/jy0939>

<sup>30</sup> Valerie Volcovici, "Biden administration denies Cheniere's request to sidestep LNG pollution rule," Reuters, September 7, 2022.

<sup>31</sup> Timothy Puko, Federal oil leases slow to trickle under Biden," *Wall Street Journal*, September 4, 2020.

administration, or future administrations, could simply offer for lease federal lands unlikely to have much oil and gas on them. And, further reducing the incentive to expand production, IRA increased royalty fees on drilling.

## American Oil Policy

The Biden administration has similarly blocked expanded oil production, refining, and exports, even though many American allies are being forced to burn more fuel oil from petroleum given natural gas shortages. Japan's imports of fuel oil are at a four-year high because it can be used to generate electricity in the face of natural gas shortages, while Bangladeshi and Taiwanese purchases of fuel oil have doubled.<sup>32</sup>

Instead of expanding oil production to help meet U.S. and global demand, the Biden administration is urging oil companies to export less. In late August, Energy Secretary Jennifer Granholm urged U.S. oil refiners to export less. "Given the historic level of U.S. refined product exports, I again urge you to focus in the near term on building inventories in the United States, rather than selling down current stocks and further increasing exports," she wrote. "It is our hope that companies will proactively address this need. If that is not the case, the Administration will need to consider additional Federal requirements or other emergency measures."<sup>33</sup>

Since taking office, President Biden and his Administration have followed through on Biden's campaign promise, made in September 2019, to "end fossil fuel."<sup>34</sup> In January 2021, Biden revoked the permit for the Keystone oil pipeline from Canada to the United States.<sup>35</sup> In March 2021, the Biden Administration revoked a permit for a massive expansion of a refinery in the U.S. Virgin Islands,<sup>36</sup> and in May 2021, shut the refinery down.<sup>37</sup> In May 2022, the Biden Administration scrapped three major off-shore oil and gas lease sales in Alaska and the Gulf of Mexico.<sup>38</sup>

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<sup>32</sup> "Dirty-oil hoarding for winter begins in Asia as gas woes deepen," *Bloomberg*, September 12, 2022.

<sup>33</sup> "Granholm to Europe: Tough Luck," *Wall Street Journal*, August 24, 2022.

<sup>34</sup> Steve Peoples, "In intimate moment, Biden vows to 'end fossil fuel,'" Associated Press, September 6, 2019.

<sup>35</sup> Rod Nickel, "Biden revokes KXL permit in blow to Canada's oil sector," Reuters, January 20, 2021.

<sup>36</sup> Valerie Volcovici, "Biden White House blocks Virgin Islands refinery expansion permit over pollution concerns," Reuters, March 25, 2021.

<sup>37</sup> Laura Sanicola, "U.S. halts operations at Caribbean oil refinery after breakdowns," Reuters, May 14, 2021.

<sup>38</sup> "U.S. scraps three offshore oil and gas drilling auctions," Reuters, May 12, 2022.

The Biden administration has recognized the hardship created by high oil and gas prices, including their role in driving inflation, and has taken measures to increase oil supplies. President Joe Biden in March announced the release of one million barrels of petroleum from the U.S. Strategic Petroleum Reserve (SPR) per day over six months. Energy Secretary Jennifer Granholm told Reuters a few days ago that The Biden administration is considering further SPR releases after October.<sup>39</sup>

But these measures have proven grossly inadequate to the need, and have been undermined by the administration's own actions. Shortly after Secretary Granholm told Reuters that the Biden administration was considering additional SPR releases after October, a DOE spokesperson said the White House was not considering new releases beyond the 180 million barrels it promised in March,<sup>40</sup> and on September 13, the White House said it may start refilling the SPR if crude oil prices decline to \$80 per barrel.<sup>41</sup> What, exactly, is the Biden administration's strategy with regards to oil supplied? Last week, the SPR released 8.4 million barrels of oil into the market. What will happen when SPR stops selling and turns to buying?

Confusion abounds. In May 2022, the Biden administration relaxed sanctions on Venezuela, including by lifting economic sanctions on the Venezuelan president's nephew, in order to increase oil production and exports by that nation.<sup>42</sup> In July, President Biden flew to Saudi Arabia and urged Arab leaders to produce more petroleum.<sup>43</sup> And the Biden administration successfully persuaded G7 finance ministers earlier this month to cap the price of Russian oil, so as to maintain global supplies while undermining Russian finances.<sup>44</sup>

But efforts to get others to produce more oil are having a mixed record. Biden in July failed to secure a commitment from OPEC to increase oil production.<sup>45</sup> In fact, OPEC just last week announced it would cut production instead by 100,000 barrels per day.<sup>46</sup> And widespread skepticism that the G7 can cap the price of Russian oil

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<sup>39</sup> Arathy Somaskhar, "U.S. emergency oil reserves tumble to lowest since 1984," Reuters, September 12, 2022.

<sup>40</sup> Arathy Somaskhar, "U.S. emergency oil reserves tumble to lowest since 1984," Reuters, September 12, 2022.

<sup>41</sup> Jennifer Jacobs, "Biden officials weight buying oil at around \$80 to refill reserves," *Bloomberg*, September 13, 2022.

<sup>42</sup> Lara Jakes et al., "U.S. to offer minor sanctions relief to entice Venezuela to talks," *New York Times*, May 17, 2022.

<sup>43</sup> Steve Holland et al., "Biden fails to secure major security, oil commitments at Arab summit," Reuters, July 16, 2022.

<sup>44</sup> Alan Rappeport et al., "Price cap on Russian oil wins backing of G7 Ministers," *New York Times*, September 2, 2022.

<sup>45</sup> Steve Holland et al., "Biden fails to secure major security, oil commitments at Arab summit," Reuters, July 16, 2022.

<sup>46</sup> Stanley Reed, "OPEC Plus agrees to cut production by 100,000 barrels a day," *New York Times*, September 5, 2022

appears warranted given that: China has, since 2020, been importing oil from Venezuela, in direct violation of U.S. sanctions;<sup>47</sup> Chinese and Indian imports of Russian oil have almost entirely offset western cuts;<sup>48</sup> and China has said it would not respect the proposed G7 price cap.<sup>49</sup>

The Biden administration's posture has confused the public since June. "Are you telling me you want them drilling for more oil?" CNN host John Berman asked Secretary Granholm in mid-June. "You want the refineries putting out more gasoline in five or ten years?" Said Granholm, "What we're saying is today we need that supply increased. Of course, in five or ten years — actually in the immediate — we are also pressing on the accelerator, if you will, to move toward clean energy, so that we don't have to be under the thumb of petro-dictators like Putin, or at the whim of the volatility of fossil fuels. Ultimately America will be most secure when we can rely on our own clean domestic production of energy through solar, through wind —" Said CNN's Berman, "But that's the problem for these companies. These companies are saying, 'You're asking me to do more now, invest more now, when, in fact 5 or 10 years from now, we don't think that demand will be there, and the administration doesn't even necessarily want it to be there.'"<sup>50</sup>

I have discovered something similar. A senior executive at a major U.S. bank that finances oil and gas exploration told me in June, "If you were an oil company, why would you invest hundreds of millions of dollars into expanding refining capacity if you thought the federal government or investors would shut you down in the next few years?"

All of this raises a question for this committee. Is your concern really with the high profits of American corporations? If so, then why have you not held hearings demanding lower profits by high-tech companies such as Meta (Facebook), Apple, and Google? Their earnings last year were \$39 billion, \$30 billion, and \$76 billion, respectively, as compared to \$23 billion, \$21 billion, and \$16 billion for Exxon, Shell, and Chevron, respectively. And does your concern only extend to profitable years or unprofitable ones? From 2010 to 2020, U.S. shale frackers lost \$300 billion. From 2002 to 2012, industry leader Chesapeake never had positive cash flow and lost \$30 billion. From mid-2012 to mid-2017, the 60 largest fracking companies lost an

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<sup>47</sup> Chen Aizhu et al., "Chinese defence firm has taken over lifting Venezuelan oil for deb offset," Reuters, August 26, 2022.

<sup>48</sup> Andy Lin et al., "India and China undercut Russia's oil sanctions pain," *Financial Times*, September 7, 2022.

<sup>49</sup> Reuters, "China foreign ministry urges dialogue, not price cap, on Russian oil," September 5, 2022.

<sup>50</sup> John Berman and Secretary Jennifer Granholm, CNN, June 15, 2022.

average of \$9 billion every quarter. From 2006 to 2014, they lost \$80 billion. Even when oil was \$100 a barrel, in 2014, they lost \$20 billion.<sup>51</sup>

The economic benefit to American consumers for the losses of the oil and gas industry were enormous. From 2010 to 2020, lower energy prices thanks to cheaper natural gas from fracking resulted in \$100 billion being added to the U.S. economy every year, for a total benefit of \$1 trillion between 2010 and 2020.<sup>52</sup> “The real story to be written,” noted a *Bloomberg* reporter, “is about the massive subsidy to consumers from everyone who financed Chesapeake and all the companies that lost money fracking last decade.”<sup>53</sup> The fracking revolution showed how energy security, economic growth, and environmental progress go hand-in-hand. The same cheap natural gas that drove American prosperity is also what allowed for the low-cost replacement of coal and the decline in carbon emissions by nearly 22 percent between 2005 and 2020.

But now, the decline in oil prices appears to be coming to an end, and neither the Biden administration nor Congress have a plan for dealing with it. A growing number of states are seeing the price of gasoline increase; 15 reported an increase in the last week, which is more than three times the number that saw gains at the end of the prior week. Nymex gasoline futures have been increasing, which suggests an increase in gasoline costs is coming. The worst price spikes have been in California, which has the most expensive gasoline in the U.S. at \$5.42 per gallon. This is straining low-income consumers especially, who have also been hurt by electricity prices that rose seven times faster than in the rest of the U.S. over the last decade, due to our heavy use of weather-dependent renewables.<sup>54</sup>

## Misinformation

Now would be a good time for the Biden Administration and Congress to host an open and honest conversation about how to deal with our energy future. Yet some members of the administration and Congress appear to be more interested in scapegoating oil and gas companies for behaviors that are entirely predictable given the policy environment within which Congress has asked them to work. “We have

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<sup>51</sup> David Wallace-Wells, “Hardly anyone talks about how fracking was an extraordinary boondoggle,” *New York Times*, July 27, 2022.

<sup>52</sup> Robert M. Ames, “The Arithmetic of Shale Gas,” *SSRN*, June 26, 2012; Ed Hirs, “The arithmetic of Fracking,” *Forbes*, Feb 21, 2020.

<sup>53</sup> David Wallace-Wells, “Hardly anyone talks about how fracking was an extraordinary boondoggle,” *New York Times*, July 27, 2022.

<sup>54</sup> Sophie Caronello, “Pumpprice declines in US show signs of coming to an end,” *Bloomberg*, September 13, 2022.

tried to expand production and processing capacity throughout the years, but constantly get sued by environmental groups or the government,” said the oil and gas banker I spoke to in June. “Now that the consequences of that come to roost, we get blamed for ‘price gouging’?”

As troubling are the efforts by the Biden administration and some members of Congress to label as “misinformation” opinions with which they disagree, and to demand that the Big Tech companies censor them. In April, the Biden Administration proposed a “disinformation bureau” to be housed at the Department of Homeland Security. Then, in June, Biden Administration Climate Advisor Gina McCarthy said, “The tech companies have to stop allowing specific individuals over and over again to spread disinformation,” pointing to those who criticized the failure of weather-dependent renewables during the blackouts in Texas in February 2021.<sup>55</sup>

But many of those criticisms were factual. Over the last decade in Texas, investors spent over \$53 billion on weather-dependent energy sources, mostly wind turbines, which alongside frozen fossil fuel plants were largely unavailable during the cold snap in February.<sup>56</sup> That was only partly because of the cold and mostly because of low wind speeds.<sup>57</sup>

McCarthy claimed that the critics of renewables are funded by “dark money” fossil fuel companies, which she compared to Big Tobacco, but offered zero evidence for this claim. Instead, she demanded that Google, Twitter, and Facebook censor views with which she disagrees. “We need the tech companies to really jump in,” she said, because criticizing renewables is “equally dangerous to denial because we have to move fast.”<sup>58</sup> Notably, McCarthy’s interview with Axios was sponsored by 3M, a major supplier to the solar industry that has lobbied directly for climate and energy legislation that would benefit 3M.<sup>59</sup>

I would like to know if this committee is headed in a similar direction. Is it the intention of this Committee, at the time of the worst energy crisis in 50 years, to shut down public debate, or widen it? In its press release, the Committee wrote that this

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<sup>55</sup> Ben Geman, “Top Biden Aide prods big tech to crack down on climate change misinformation,” Axios, June 9, 2022.

<sup>56</sup> Powering Texas, accessed September 14, 2022, <https://poweringtexas.com/#revenue-generator>

<sup>57</sup> Michael Shellenberger, “Testimony before the United States Senate Committee on Energy and Natural Resources,” March 11, 2021, <https://www.energy.senate.gov/services/files/B3F496B5-ADF4-457F-94C8-4257680DCB32>

<sup>58</sup> Ben Geman, “Top Biden Aide prods big tech to crack down on climate change misinformation,” Axios, June 9, 2022.

<sup>59</sup> “About 3M Solar Energy,” [https://www.3m.com/3M/en\\_US/power-generation-us/solutions/solar-energy/](https://www.3m.com/3M/en_US/power-generation-us/solutions/solar-energy/), accessed September 14, 2022; “Bills lobbied by 3M, 2021,” Open Secrets, <https://www.opensecrets.org/federal-lobbying/clients/bills?cycle=2021&id=D000021800>, accessed September 14, 2022.

hearing “is part of the Committee’s investigation into the fossil fuel industry’s long-running campaign to spread disinformation about climate change and greenwash its role in causing global warming.”<sup>60</sup>

However, as the committee also noted, the big oil companies have long acknowledged that fossil fuels contribute to climate change, to which the Committee appears to be coping with by widening the scope of what counts as “disinformation,” noting that the big oil companies “refused to stop spending money to block climate action.” Is the suggestion here that disagreement over policy now constitutes “misinformation” that Big Tech companies should censor? If not, then what is the committee seeking to achieve with this line of argumentation?

If the concern is genuinely with misinformation, then the committee should expand its scope to the claims of the Biden administration and renewable energy advocates. On June 21, Biden claimed, “We need more refining capacity,” and said, “This idea that [oil and gas companies] don’t have oil to drill and to bring up is simply not true.” In fact, as noted, Biden’s EPA killed a refinery on May 14 and killed a one million acre oil and gas lease in Alaska on May 12, and has issued fewer leases than any other president since Truman. If Biden and his aides are going to demand that Facebook, Twitter and other social media companies censor “misinformation,” those companies should start by censoring Biden’s claim that he has issued sufficient oil and gas licenses. He hasn’t. If he had, he wouldn’t have needed to request that Saudi Arabia and Venezuela increase production.

If we are going to ask Facebook and Twitter to censor misinformation, they would need to censor Biden’s claim that he killed the Alaska oil and gas lease due to “lack of industry interest.” “Citing a ‘lack of industry interest’ is nothing more than fantasy from an administration that shuns U.S. energy production,” responded Sen. Lisa Murkowski (R-AK). “I can say with full certainty, based on conversations as recently as last night, that Alaska’s industry does have interest in lease sales in Cook Inlet. To claim otherwise is simply false, not to mention stunningly short-sighted.”<sup>61</sup>

But is it really the intention of this committee to get into the job of policing political debates in society, or demand that big tech play that role? Doing so would seem to be a significant drift of mission at a time of the worst energy crisis in 50 years.

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<sup>60</sup> House Committee on Oversight and Reform, “Chairs Maloney, Khanna to Hold Hearing on Big Oil’s Profits and Climate Disinformation,” September 12, 2022, <https://oversight.house.gov/news/press-releases/chairs-maloney-khanna-to-hold-hearing-on-big-oil-s-profits-and-climate>

<sup>61</sup> Sarah Cook et al, “Biden Administration cancels Alaska oil and gas lease sale,” CBS News, May 18, 2022.

## The Limits of Renewables

In 2012, 2017, and 2021 the National Academies of Science and Engineering published three separate reports on threats to the grid, resilience, and the future of electricity.<sup>62</sup> In its 2017 report, the Academies warned that U.S. electrical grids were increasingly “complex and vulnerable.”<sup>63</sup> Over the last 25 years, increasingly decentralized electricity generation in restructured electricity markets, along with growth in the number of regulatory institutions, has resulted in “divergent interests of federal, state, regional and local authorities,” wrote the Academies in the 2021 report. Electricity experts are not able to clearly answer the question, “who is in charge of planning, developing and ensuring the integrity of the future power system?”<sup>64</sup>

A crucial question for Congress to consider is whether the increased use of weather-dependent renewables today is increasing the risk of blackouts. According to the North American Electric Reliability Council (NERC) and Midcontinent Independent System Operator (MISO) which manages the Midwest electrical grid, lack of reliable power plants may force it to cut power.<sup>65</sup> In Texas, the grid operator warned of similarly tight conditions during a heat wave. In May, NERC warned that large regions of the U.S. are at high risk of blackouts.<sup>66</sup>

While energy sources across all categories failed in Texas in February 2021, they didn’t all fail equally. The capacity factors for nuclear, natural gas, coal, and wind in Texas during the four days of load shedding during the cold snap were 79 percent, 55 percent, 58 percent, and 14 percent, respectively.<sup>67</sup> Even if all Texas wind turbines had been winterized, it is unlikely they would have contributed significantly to

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<sup>62</sup> National Academies of Sciences, Engineering, and Medicine, *Terrorism and the Electric Power Delivery System* (Washington, DC: The National Academies Press, 2012);

National Academies of Sciences, Engineering, and Medicine, *Enhancing the Resilience of the Nation’s Electricity System* (Washington, DC: The National Academies Press, 2017), <https://doi.org/10.17226/24836>

National Academies of Sciences, Engineering, and Medicine, *The Future of Electric Power in the United States* (Washington, DC: The National Academies Press, 2021).

<sup>63</sup> National Academies of Sciences, Engineering, and Medicine, *Enhancing the Resilience of the Nation’s Electricity System* (Washington, DC: The National Academies Press, 2017), <https://doi.org/10.17226/24836>, p. vi.

<sup>64</sup> National Academies of Sciences, Engineering, and Medicine, *The Future of Electric Power in the United States* (Washington, DC: The National Academies Press, 2021), p. 51.

<sup>65</sup> Robert Walton, “MISO prepares for ‘worst-case scenarios,’ heads into summer with insufficient firm generation,” *Utility Dive*, April 29, 2022.

<sup>66</sup> NERC, “2022 Summer reliability assessment,” May 2022, [https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC\\_SRA\\_2022.pdf](https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_SRA_2022.pdf)

<sup>67</sup> EIA, “Electricity Data Browser: Hourly Electric Grid Monitor,” EIA.gov, accessed March 08, 2021, [https://www.eia.gov/beta/electricity/gridmonitor/dashboard/electric\\_overview/US48/US48](https://www.eia.gov/beta/electricity/gridmonitor/dashboard/electric_overview/US48/US48).

electricity supply because wind speeds in cold snaps are so low. It is for that reason that grid operators do not rely on wind turbines to provide more than trace amounts of power during those periods. And, indeed, while wind turbines north of Texas functioned more or less as intended, during the cold snap, they produced very little power for their grids.<sup>68</sup>

While the switch from nickel-cadmium to lithium-ion batteries allowed for the proliferation of cell phones, laptops, and other electric appliances, it has not allowed and will not allow for the cheap storage of the grid's electricity. One of the largest lithium battery storage centers in the world is in Escondido, California. But it can only store enough power for about twenty-four thousand American homes for four hours.<sup>69</sup>

And storage does not easily solve the problem of long-term, seasonal variability. In January and February of this year, Germany's renewables produced just two-thirds of the electricity they produced in January and February of 2020, despite a four percent increase in solar panel and wind turbine capacity, simply because of annual variability of wind and sun.<sup>70</sup> Germany has only been able to manage the seasonal fluctuations from intermittent renewables by maintaining a large and diverse fleet of coal, natural gas, and nuclear power plants. Germany added 150 percent of its total capacity in coal, natural gas, and nuclear in the form of new wind and solar capacity, which was part of why Germany's electricity prices have risen to the highest levels in Europe.<sup>71</sup>

One study by a group of climate and energy scientists found that when taking into account continent-wide weather and seasonal variation, for the United States to be powered by solar and wind, while using batteries to ensure reliable power, the battery storage required would raise the cost to more than \$23 trillion.<sup>72</sup>

Most proponents of variable renewable energy thus look elsewhere for storage solutions. The most influential proposal for 100 percent renewable energy in the U.S. was created by a Stanford professor who relied on the conversion of existing

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<sup>68</sup> Bill Magness, "Review of February 2021 Extreme Cold Weather Event," Presentation before the Texas House Joint Committee on State Affairs and Energy Resources ERCOT, February 25, 2021, [http://www.ercot.com/content/wcm/lists/226271/Texas\\_Legislature\\_Hearings\\_2-25-2021.pdf](http://www.ercot.com/content/wcm/lists/226271/Texas_Legislature_Hearings_2-25-2021.pdf)

<sup>69</sup> Julian Spector, "California's big battery experiment: a turning point for energy storage?" *Guardian*, September 15, 2017, <https://www.theguardian.com>. In 2018, according to the US Energy Information Agency, 134 million residential electricity accounts used about 11,000 kilowatt-hours per year, or 1.25 kilowatts on average throughout the year.

<sup>70</sup> Fraunhofer Institute for Solar Energy Systems ISE, "Net electricity generation capacity in Germany," Eurostat, accessed March 7, 2021; Kerstine Appunn, "What's New in Germany's Renewable Energy Act 2021," *Clean Energy Wire*, last modified January 6, 2021,

<sup>71</sup> Fraunhofer Institute for Solar Energy Systems ISE, "Net installed electricity generation capacity in Germany" and "Electricity Price Statistics". Eurostat. Accessed March 7, 2021.

<sup>72</sup> Matthew Shaner, "Geophysical constraints on the reliability of solar and wind power in the United States," *Energy and Environmental Science* 11, no. 4 (2018): 914–925, <https://doi.org/10.1039/c7ee03029k>.

hydroelectric dams into giant batteries.<sup>73</sup> But in 2017, scientists writing in the Proceedings of the National Academies of Science observed that the 100 percent renewable proposal rested upon the assumption that we can increase the amount of power from U.S. hydroelectric dams ten-fold when, according to the Department of Energy, the real potential is just one percent of that. Without all that additional hydropower, the 100 percent renewables proposal does not work on its own terms.<sup>74</sup>

California is a world leader when it comes to renewables and has a major network of dams but hasn't converted them into batteries because you need the right kind of dams and reservoirs, and even then, it's an expensive retrofit. In addition, there are many other uses for the water that accumulates behind dams, namely irrigation and water supply for cities. Without large-scale ways to back up solar energy, California has had to curtail electricity coming from solar farms when it's extremely sunny, or pay neighboring states to take it, in order to avoid adding too much energy on the grid during hours of peak solar production.<sup>75</sup>

Germany will have spent \$580 billion on renewables and related infrastructure by 2025, according to energy analysts at *Bloomberg*,<sup>76</sup> and Germany generated 37.5 percent of its electricity from wind and solar in 2020, as compared to the 70 percent France generates from nuclear.<sup>77</sup> Had Germany invested the \$580 billion it's spending on renewables and their grid upgrades into new nuclear power plants instead, it could be generating 100 percent of its electricity from zero-emission sources and

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<sup>73</sup> Mark Z. Jacobson, Mark A. Delucchi, Mary A. Cameron, Bethany A. Frew, "Stabilizing the grid with 100% renewables 2050," *Proceedings of the National Academy of Sciences*, Dec. 2015, 112 (49) 15060-15065; DOI:10.1073/pnas.1510028112.

<sup>74</sup> Christopher Clack et al., "Evaluation of a proposal for reliable low-cost grid power with 100 percent wind, water, and solar," *PNAS* 114, no. 26 (2017): 6722-6727, <https://doi.org/10.1073/pnas.1610381114>; Chris Mooney, "A bitter scientific debate just erupted over the future of America's power grid," *Washington Post*, June 19, 2017, <https://www.washingtonpost.com>.

<sup>75</sup> Ivan Penn, "California invested heavily in solar power. Now there's so much that other states are sometimes paid to take it," *Los Angeles Times*, June 22, 2017, <https://www.latimes.com>.

<sup>76</sup> William Wilkes et al., "Germany's failed climate goals a wakeup call for governments everywhere," *Bloomberg*, August 15, 2018, <https://www.bloomberg.com>;

Mark Nelson et al., "With Nuclear Instead of Renewables, California & Germany Would Already Have 100 percent Clean Electricity," *Environmental Progress*, September 11, 2018, <http://environmentalprogress.org/big-news/2018/9/11/california-and-germany-decarbonization-with-alt-ernative-energy-investments>.

<sup>77</sup> Fridolin Pflugmann et al., "Energy Transition Index," McKinsey & Company, November 2019, <https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/germanys-energy-transition-at-a-crossroads>; BP Energy Economics, "BP Statistical Review of World Energy 2019, 68th Edition," BP, June 2019, accessed January 16, 2020, <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2019-full-report.pdf>.

have sufficient zero-carbon electricity to power all of its cars and light trucks (if electrified) by 2025, as well.<sup>78</sup>

From this information we can gain a clearer picture of electric reliability, resiliency, and affordability. What tends to make electric grids more reliable, resilient, and affordable is the generation of electricity by a few large, efficient plants with the minimal amount necessary of wires and storage. What tends to make grids less reliant, resilient, and affordable is significantly increasing the number of power plants, wires, storage mechanisms, people, and organizations required for operating them.

As a result, places with heavy renewables penetration are reaching their limits. On August 30, five days after California regulators passed a bill banning the sale of internal combustion engines by 2035, the state's grid operator urged residents to not charge their electric vehicles from 4 pm to 9 pm for fear of blackouts.<sup>79</sup> The amount of zero-carbon electricity California generated has declined by 10 percent over the last decade, because of less hydroelectricity from drought, and the 2011 closure of San Onofre nuclear plant, which was 9 percent of the state's total electricity generation.<sup>80</sup> To generate sufficient electricity to fuel 30 million electric cars and trucks, California will need nine nuclear power plants the size of its last nuclear plant, Diablo Canyon, and that assumes no increase in population, and no increase in electricity use, including for cooking and heating, even though the state is trying to encourage the latter.<sup>81</sup>

The impact of variable renewable energy sources on electricity prices can be seen in the more than two-dozen states that have had in place renewable energy mandates. "Cumulatively," wrote the authors of a University of Chicago report on the impact of variable renewables on electricity prices, "consumers in the twenty-nine states studied paid \$125.2 billion more for electricity than they would have in the absence of the policy." The study authors concluded that higher variability was the

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<sup>78</sup> Mark Nelson and Madison Czerwinski, "With Nuclear Instead of Renewables, California and Germany Would Already Have 100 percent Clean Electricity," *Environmental Progress*, September 11, 2018, <http://environmentalprogress.org>.

<sup>79</sup> California Air Resources Board, "California moves to accelerate to 100% new zero-emission vehicle sales by 2035," CARB, August 25, 2022;

Caiso, "Excessive heat starting tomorrow will stress energy grid, August 30, 2022.

<sup>80</sup> California Energy Commission, "California Electrical Energy Generation," April 2022, <https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/california-electrical-energy-generation>

<sup>81</sup> Of California's 30,398,249 motor vehicles, just 1.9% (563,070) are electric. The California Energy Commission calculates that the state will require 4.6 GW (minimum) of electricity to fuel 7.5 million EVs. Hence, to power 29 million more EVs it will need a minimum of roughly 17 GW of additional power and perhaps much more. California Energy Commission, "Report Shows California Needs 1.2 Million Electric Vehicle Chargers by 2030," June 9, 2021

main driver of higher costs.<sup>82</sup> Like food, energy cost increases are regressive, and so higher electricity costs impose a higher burden on lower-income American consumers.

New research makes clear that far higher material demands for solar panels, wind turbines, and electric cars raise serious questions about their ability to substitute for fossil fuels. Solar and wind energy projects require roughly 300 percent more copper and 700 percent more rare earths than fossil fuels, per unit of energy. Wind, solar, and batteries require 1,000 percent more steel, concrete and glass; 300 percent more copper; and 4,200 percent, 2,500 percent, 1,900 percent, and 700 percent more lithium, graphite, nickel, and rare earths, respectively, than fossil fuels, to produce the same amount of energy, according to International Energy Agency, and other analysts.<sup>83</sup>

Last week, 40 CEOs of European metal companies warned of the “existential threat” to their industries due to energy shortages and the “extra raw materials needed to shift away from fossil fuels.” They noted that “50 percent of the EU’s aluminum and zinc capacity has already been forced offline due to the crisis....Producers face electricity and gas costs over ten times higher than last year, far exceeding the sales price for their products. We know from experience that once a plant is closed it very often becomes a permanent situation, as re-opening implies significant uncertainty and cost.”<sup>84</sup>

China’s share of the global market for renewables and EV minerals is already twice OPEC’s share of the global oil market. The U.S. is dependent on imports for 100 percent of 17 renewables and EV-critical minerals; for 28 others, imports account for more than 50 percent of domestic demand. China already dominates solar and battery production. Minerals are 60 percent to 70 percent of the cost to produce

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<sup>82</sup> Michael Greenstone et al., *Do Renewable Portfolio Standards Deliver?* (Chicago: Energy Policy Institute at the University of Chicago, 2019); “Renewable Portfolio Standards Reduce Carbon Emissions—But, at a High Cost,” Energy Policy Institute at the University of Chicago, April 22, 2019, <https://epic.uchicago.edu/insights/renewable-portfolio-standards-reduce-carbon-emissions-but-at-a-high-cost/>.

<sup>83</sup> IEA, “The Role of Critical Minerals in Clean Energy Transitions,” 2021, <https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions>; Mark Mills, “The “Energy Transition” Delusion: A Reality Reset,” Manhattan Institute, August 30, 2022 <https://www.manhattan-institute.org/the-energy-transition-delusion>,

<sup>84</sup> Eurometaux, “RE: Europe’s non-ferrous metals producers call for emergency EU action to prevent permanent deindustrialisation from spiralling electricity and gas prices,” September 5, 2022. <https://eurometaux.eu/media/qnhn5k30/non-ferrous-metals-ceo-letter-on-energy-crisis-06-09-2022.pdf>

solar panels and lithium batteries.<sup>85</sup> China produces 95 percent of the world's polysilicon, solar wafer, and ingots and 80 percent of all components for solar panels. And it is home to the 10 top suppliers of solar panel manufacturing equipment.<sup>86</sup>

Meanwhile, the capital costs of solar, wind, and batteries have been rising since 2017 and are going to rise much more. Energy today only uses 10 percent to 20 percent of total global minerals. The IEA says its share must rise to 50-70 percent for the world to transition to renewables, which would be prohibitively inflationary.<sup>87</sup>

And there are human rights concerns and environmental concerns with renewables. The *Associated Press* reported on August 9 that rare earth mining in Myanmar is resulting in "environmental destruction, the theft of land from villagers, and funneling money to brutal militias, including Myanmar's secretive military government."<sup>88</sup> On August 17, *AP* reported that U.S. government scientists have concluded that the expansion of wind energy would reduce the golden eagle population by half.<sup>89</sup>

As troubling is evidence that cost declines of solar panels stem in large measure from the involuntary labor of a persecuted Muslim minority, the Uighurs, in Xinjiang province. In January 2021, the U.S. State Department deemed China's treatment of the Uighurs to be genocide.<sup>90</sup> Ninety-five percent of the global solar panel market contains Xinjiang silicon. While the Inflation Reduction Act creates incentives to bring solar manufacturing to the U.S. and Europe, doing so would significantly increase prices, given higher labor and environmental standards.<sup>91</sup>

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<sup>85</sup> IEA, "The Role of Critical Minerals in Clean Energy Transitions," 2021, <https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions>; Mark Mills, "The 'Energy Transition' Delusion: A Reality Reset," Manhattan Institute, August 30, 2022 <https://www.manhattan-institute.org/the-energy-transition-delusion>,

<sup>86</sup> IEA, "Special Report on Solar Supply Chains," p. 9, 2022.

<sup>87</sup> IEA, "The Role of Critical Minerals in Clean Energy Transitions," 2021, <https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions>; Mark Mills, "The 'Energy Transition' Delusion: A Reality Reset," Manhattan Institute, August 30, 2022 <https://www.manhattan-institute.org/the-energy-transition-delusion>,

<sup>88</sup> Dake Kang, et al., "'The Sacrifice Zone': Myanmar bears cost of green energy," *Associated Press*, August 9, 2022.

<sup>89</sup> Matthew Brown, "Wind energy boom and golden eagles collide in the US West," *Associated Press*, August 17, 2022.

<sup>90</sup> Austin Ramzey, "U.S. Declaration of China's 'Genocide' in Xinjiang Explained," *New York Times*, January 20, 2021. Ana Swanson and Chris Buckley, "Chinese Solar Companies Tied to Use of Forced Labor," *New York Times*, January 8 (Updated January 28), 2021.

<sup>91</sup> Aitor Hernández-Moralies, et al, "Fears over China's Muslim forced labor loom over Europe's solar panels," *Politico*, February 11, 2021.

The underlying problem is that sunlight and wind are energy-dilute and thus demand 300 times or more land than natural gas or nuclear plants.<sup>92</sup> The result is growing resistance to the large land use impacts both of renewable energy projects and with the long new transmission lines they will require. In 2021, 31 communities rejected wind projects, adding to the 323 U.S. communities since 2015 that have rejected or restricted wind projects.<sup>93</sup> A federal judge in 2020 blocked a transmission line proposed to be built straight through whooping crane habitat in Nebraska. Notably, transmission lines are the number one cause of mortality among whooping cranes.<sup>94</sup> If the United States were to try to generate all of the energy it uses with renewables, 25 percent to 50 percent of its land would be required, according to the best-available study.<sup>95</sup> By contrast, today's energy system requires just 0.5 percent of land in the United States.<sup>96</sup>

## A Way Forward

High uncertainties over what will happen over the next 3 to 6 years, and recognition of fundamental physical and economic realities, suggest a way forward that emphasizes expanded domestic oil and gas production in the short to medium term, and nuclear energy along with hydrogen production over the medium to long-term, with the re-shoring of solar panel, wind turbine, and electric car manufacturing and materials processing. Such a strategy will help determine whether the costs of solar, wind, and EVs can come down, or whether they are, for inherently physical reasons, namely their low power densities and correspondingly high material intensities, doomed to be too inefficient to substitute for fossil fuels.

Given that the proximate cause of the global energy crisis was Europe's over-dependence on Russian fuels, we must not repeat that same mistake by becoming dependent on China for the extraction and processing of the minerals needed to make solar, wind, and batteries. It is highly unlikely that energy's use of total global minerals will rise from 10-20 percent to 50-70 percent, with or without an energy crisis, given the significant inflationary impact it would have on energy prices.

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<sup>92</sup> Power density slide deck, Environmental Progress, <https://environmentalprogress.org/power-density-slide-deck>, accessed September 14, 2022.

<sup>93</sup> Robert Bryce, "Renewable Rejection Database," <https://robertbryce.com/renewable-rejection-database/>, accessed September 13, 2022.

<sup>94</sup> Thomas V. Stehn, "Whooping Crane Collisions with Power Lines: an issue paper," *Geography*, 2008.

<sup>95</sup> Vaclav Smil, *Power Density: A Key to Understanding Energy Sources and Uses* (Cambridge, MA: The MIT Press, 2015), 247.

<sup>96</sup> Vaclav Smil, *Power Density: A Key to Understanding Energy Sources and Uses* (Cambridge, MA: The MIT Press, 2015), 247.

Governments have always played a heavy role in shaping energy markets given that they determine, through regulatory permitting, how much oil, natural gas, and gasoline can be produced. And now, with the continued subsidies of renewables guaranteed by the Inflation Reduction Act, governments will increasingly be forced to subsidize all forms of electricity generation, including natural gas generators, which have already started going bankrupt due to renewables subsidies, as well as nuclear plants.

If the West is to protect itself, and compete globally with Russia and China, it must compete with Russia and China on energy. Nuclear power plants must be the backbone of a high-energy West. Russia's ability to make Europe dependent upon its natural gas required that it expand nuclear energy domestically so it could export more gas. With the world's largest oil and gas reserves, the U.S. is far better off than Europe and Asia, but our own energy security means nothing if our allies are insecure.

An organization of Western nations to expand nuclear plant building and oil and gas production is essential to building the overall strength of the West to compete with Russia and China. Such a high-energy Western alliance would attract rather than alienate non-aligned nations in Asia, Latin American, and Africa. Some worry that more energy exports will make energy more expensive domestically, but that need not be the case. Piped natural gas within the United States will remain cheaper than LNG sent to Europe, providing the U.S. with a long-term economic competitive advantage over European allies.

Expanded LNG exports would mean the U.S. would have surplus energy above ground already flowing through our pipelines, allowing the U.S. to respond to high prices rapidly, without having to permit, drill, or connect wells to get supply to market, which can take up to 18 months. This would reduce price volatility and insulate the US from price shocks from unforeseen geopolitical events.

Nuclear plants are among the most reliable components of America's power grids, and provide over half of America's zero-carbon power. Nuclear plants operate as a national fleet at 94 percent annual capacity factor, thanks to tightly choreographed refueling operations that barely interrupt eighteen-month continuous uptime at most facilities.<sup>97</sup> The hardening required of nuclear plants first in response to 9/11 and then in response to the Fukushima Daiichi disaster in 2011 has further ensured their contribution to reliability, resiliency, and affordability.<sup>98</sup>

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<sup>97</sup> Office of Nuclear Energy, Department of Energy, "Nuclear Power is the Most Reliable Energy Source and It's Not Even Close," April 22, 2020, <https://www.energy.gov/ne/articles/nuclear-power-most-reliable-energy-source-and-its-not-even-close>

<sup>98</sup> U.S. N.R.C., "Post-Fukushima Safety Enhancements," Nuclear Regulatory Commission, accessed March 8, 2021, <https://www.nrc.gov/reactors/operating/ops-experience/post-fukushima-safety-enhancements.html>

Although Texas lost one of four of its nuclear reactors after cold water affected a sensor, automatically shutting down the reactor, it returned to service within 36 hours, and thus in time to help end the power cuts. Meanwhile, nuclear reactors in other cold snap states, Nebraska, Kansas, Arkansas, Missouri, Illinois, Minnesota, Wisconsin, Ohio, and Michigan, operated normally.<sup>99</sup>

Nuclear's future will likely look like nuclear's past, given the national security issues surrounding the dual-use nature of nuclear energy, and the capital-intensive nature of nuclear power plant projects. Research over decades shows that the cheapest nuclear plants are large, standardized, and built by the same construction teams over multiple decades, thus requiring a long-term, bipartisan, and national commitment.<sup>100</sup> In the 1950s and 1960s, the federal government chose two national champions, Westinghouse and General Electric, to promote two competing designs. One obvious national champion would be a consortium of Westinghouse, Bechtel, and Southern Company, given their experience building AP-1000s in Georgia. Another might be a partnership with either the French, Japanese, or South Koreans, all of whom have strong experience building nuclear plants and view nuclear energy as essential to their national security.

The future of transportation remains open. It may be that electric vehicles are the future or it may be that hydrogen-fuel cell vehicles will predominate, which have long held major advantages over electric vehicles. The move from ICEs to hydrogen fuel cells is more consistent with the trend of past energy transitions than going from ICEs to EVs, which are material-intensive, heavy, and much worse for the environment than internal combustion engines. Hydrogen fuel cells are more expensive now but, over time, will become cost-competitive with gasoline, argued analysts with the International Institute for Applied Systems Analysis. The electrochemical process of combining hydrogen gas with oxygen is potentially 20% to 30% more efficient than today's gasoline-fueled internal combustion engines (ICEs). Hydrogen enthusiasts overly hyped the technology in the past, but that may mean that they were early, rather than wrong. A short-to-medium term commitment to natural gas (CH<sub>4</sub>) could be a pathway to creating hydrogen (H<sub>2</sub>) first from gas and then eventually from water (H<sub>2</sub>O), improving the economics of nuclear energy during non-peak hours.<sup>101</sup>

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<sup>99</sup> EIA, "Electricity Data Browser: Hourly Electric Grid Monitor," EIA.gov, accessed March 08, 2021, [https://www.eia.gov/beta/electricity/gridmonitor/dashboard/electric\\_overview/US48/US48](https://www.eia.gov/beta/electricity/gridmonitor/dashboard/electric_overview/US48/US48)

<sup>100</sup> Michel Berthélemy et al., "Nuclear reactors' construction costs: The role of lead-time, standardization and technological progress," *Energy Policy*, 2015.

<sup>101</sup> Jesse Ausubel, "Renewable and Nuclear Heresies," *International Journal of Nuclear Governance, Economy, and Ecology*, November 2007; <https://phe.rockefeller.edu/docs/HeresiesFinal.pdf>

Jesse Ausubel and Cesare Marchetti, "The Future of Transport," *The Industrial Physicist*, IIASA, 2001, <https://pure.iiasa.ac.at/id/eprint/13557/1/The%20Evolution%20of%20Transport.pdf>

It is in this context, grounded in energy security, first physical principles, and thus sound economics, that we can consider the long-term trend of radical decarbonization. Part of the trouble with climate alarmism is that it encourages short-term thinking around what is a long-term problem. Radical decarbonization is possible but it is easier to imagine in a context that involves a significant expansion of nuclear energy and natural gas, and the phase out of coal before the phase out of oil, occurs. We have already seen how natural gas can quickly and cheaply replace coal. Replacing oil will be more difficult, given the superior energy densities of petroleum over either electric vehicles or hydrogen.

Much of the misinformation that has come from large energy firms, including the oil and gas majors, has been a reaction to the poorly thought-through vision of phasing out natural gas and nuclear to achieve 100 percent renewables and electric vehicles. Such a vision was never warranted by the basic physics of energy production. Instead of seeking to stamp out disconfirmatory information, I encourage Congress to widen the debate to include a broader set of perspectives, particularly those that foresee a wider, not narrower, vision for natural gas and nuclear.