Chapter 2 Energy and Environment

Isaac Orr and James M. Taylor

10 Principles of Energy and Environment Policy

- 1. Global warming is not a crisis.
- 2. End the war on fossil fuels.
- 3. Hydraulic fracturing ("fracking") is safe and beneficial.
- 4. National security requires affordable energy.
- 5. Energy self-sufficiency is achievable.
- 6. Air pollution is a fading challenge.
- 7. End subsidies to alternative energy producers.
- 8. Biofuels cannot replace oil.
- 9. Corporate Average Fuel Economy standards sacrifice lives for oil.
- 10. Replace the Environmental Protection Agency.

Introduction

The United States has a competitive advantage over every other nation in energy abundance. It has more coal, oil, and natural gas resources than any other nation. Only one country, Russia, has even half as much of these energy resources as the United States (EIA 2016b). It is solely due to poor political choices that the United States behaves and suffers like an energy-poor nation despite its natural advantages.

The large-scale use of oil and gas need not cause environmental harm. Modern technologies have reduced emissions of the six principal

pollutants tracked by the Environmental Protection Agency (EPA) more than 60 percent since 1980 (EPA 2016b). Today, virtually anything visible coming from the smokestacks of factories or electric generating stations is water vapor—steam—and poses no threat to human health or to the environment. The same is true of cars and trucks.

Despite these facts, many people live in fear that the world is getting dirtier and less safe with every passing year. Many people fear invisible poisons in the air, water, and the food they eat. They fear global warming will destroy the planet, if not in their lifetime then perhaps in their children's or grandchildren's. This fear is fanned by environmental groups, which use it to raise money and stay relevant in an increasingly clean and safe world, and by the media, which use it to sell newspapers and attract audiences to their broadcasts.

This chapter aims to correct these misconceptions. It presents 10 principles of energy and environmental policy: facts and policy recommendations we believe are essential to a fair and balanced understanding of the topic. Recommended readings appear at the end of each principle, and all sources cited in the body of the chapter appear in a bibliography at the end of the chapter.

1. Global warming is not a crisis.

Public policy should not be based on the exaggerated threat of man-made global warming.

Perhaps the biggest and most consequential environmental controversy of our age is "global warming," or more specifically, fear of man-made catastrophic climate change. Billions of dollars have been spent on scientific research trying to find a human impact on climate, and trillions of dollars have already been spent attempting to influence the weather. An agency of the United Nations, the Intergovernmental Panel on Climate Change (IPCC), claims to speak for all climate scientists when it pronounces on the subject, but it is politicized and unreliable. The elementary truth is that global warming is not a crisis.

Global warming fears arising first in the 1980s led to taxes, regulations, and subsidies aimed at reducing human emissions of carbon dioxide and other greenhouse gases. While climate is always changing and there is some evidence of a small human impact on regional weather, real-world observations and the best available scientific evidence do not support claims of an impending global warming crisis.

No Consensus

Rather than debate their numerous critics, global warming alarmists often appeal to a mythical scientific consensus. A frequent assertion is 97 percent of scientists agree humans are causing a global warming crisis. No survey of scientists has ever reached such a conclusion (Bast and Spencer 2014). The 97 percent figure is derived from just a few surveys with poor methodologies asking the wrong questions of the wrong people (Idso *et al.* 2016).

More meaningful surveys show only a minority of scientists believe humans are causing a global warming crisis. Two surveys of more than 500 climatologists and scientists reveal less than half are very concerned about global warming and believe the science justifies immediate political action (Bast 2010). In a more recent survey, fewer than 50 percent of climatologists and scientists working in related fields thought the potential was great or somewhat great for "catastrophe in the next 50 years resulting from climate change for the country in which you live" (Bray and von Storch 2016).

Two additional surveys of American Meteorological Society meteorologists reveal only a slim majority believe humans are primarily responsible for recent warming and only a small minority are very concerned about it (Taylor 2012). Finally, more than 31,000 scientists have signed a summary of the science explaining humans are not causing a global warming crisis (Global Warming Petition Project, n.d.).

Another frequent assertion is that every scientific association in the world has issued a statement saying humans are causing a global warming crisis. None of those societies surveyed its members, meaning these resolutions express the interests and opinions of the organizations' leaders and not actual scientists. Most of these societies didn't conduct their own scientific investigations, but instead say they endorse the findings of the United Nations' IPCC. But their own presidents are aware of the deep flaws in that organization's procedures. The InterAcademy Council, an organization composed of the presidents of the world's leading national science academies, published a stinging critique of the IPCC's studies pointing out violations of peer-review standards, use of gray sources, and political interference (IAC 2010).

Finally, many scientific associations have remained silent on the topic, and some have explicitly rejected the notion of a global warming crisis or a scientific consensus on the topic. The latter include the American Physical Society, Chinese Academy of Sciences, Danish National Space Center, Polish Academy of Sciences, and Russian Academy of Sciences.

What the Science Says

The Nongovernmental International Panel on Climate Change (NIPCC) is a more objective and reliable guide to climate science than the highly politicized IPCC. It has published five volumes in its *Climate Change Reconsidered* (CCR) series conclusively showing humans are not causing a global warming crisis (Idso *et al.* 2009, 2011, 2013, 2016; Idso *et al.* 2014). *CCR* constitutes thousands of pages of scientific summaries and thousands of citations of objective data and peer-reviewed scientific literature.

According to NIPCC, estimates of climate sensitivity to greenhouse gases appearing in the scientific literature since 2009 have fallen steadily below the estimates used by IPCC (Idso *et al.* 2016). Extensive peer-reviewed research shows recent changes in temperatures, sea level rise, and the frequency of extreme weather events are far from unusual in the historic and geophysical record (Pielke Jr. 2014; Hao *et al.* 2014; Zycher 2014).

The climate models relied upon by IPCC, EPA, and other sources of climate alarmism forecast twice as much warming as has been reported by satellites and weather balloons, meaning they have been invalidated (Christy 2016; Monckton *et al.* 2015). The climate models are programmed to assume human carbon dioxide emissions will set in motion a chain reaction that will cause a dramatic warming of Earth. They assume but cannot prove a causal connection between human carbon dioxide emissions and temperature rise (Green and Armstrong 2007).

According to the climate models, carbon dioxide emissions should be causing an uninterrupted increase in global temperatures at a pace of 0.2 to 0.3 degrees Celsius per decade (IPCC 2007). However, global temperatures fell from the 1940s through the 1970s, even though carbon dioxide emissions rose dramatically during this period (IPCC 1990). Also, global temperatures have remained essentially flat since late in the twentieth century, even though carbon dioxide emissions have risen faster than projected by the United Nations (Remote Sensing Systems 2015). The clear lesson is this: Carbon dioxide emissions have much less impact on global temperatures than computer models assume.

Costs and Benefits

Evidence shows the benefits of a modestly warming world outweigh the few observed harms in most parts of the world during the coming century or even longer. Bolstered by longer growing seasons, greater soil moisture, and enhanced atmospheric carbon dioxide, crop yields in the United States and around the world are setting records on an almost yearly basis (Idso *et al.* 2014; Taylor 2013a).

Tornadoes, hurricanes, droughts, wildfires, and other extreme weather events are becoming less frequent and less severe as our planet modestly warms, even assuming modest spurts of warming by some observations (Taylor 2013b). Deserts are receding, forests are expanding, and NASA satellites have documented a dramatic greening of the Earth (CSIRO Australia 2013).

Even if the costs of global warming exceeded the benefits, there still would be no case for trying to restrict carbon dioxide emissions because the human contribution to atmospheric carbon dioxide levels is so small. Dramatic reductions in our emissions, imposed at enormous cost, would have almost no impact on climate and temperature (Michaels and Knappenberger 2013).

Integrated assessment models based on IPCC's own (flawed) science suggest the benefits of global warming will exceed the costs for the next century, and only then begin to turn negative if warming exceeds 2°C. With improved models suggesting warming may never reach 2°C, this suggests only good will come from some modest warming. Economists look at this scenario and conclude, given the time value of money, that the best plan of action today and for decades to come is to do nothing at all (Kreutzer *et al.* 2016).

Policy Agenda

The action items that follow from the preceding discussion include the following:

- Create a President's Council on Climate Change charged with cutting through the politics and bias that infected climate science and policymaking during the Obama administration and advising the president on what policies to repeal and what policies to pursue.
- Build on the country's withdrawal from the Paris Climate Accord by withdrawing from the Framework Convention on Climate Change and ceasing funding for the United Nations' Intergovernmental Panel on Climate Change (IPCC) and Green Climate Fund.
- Withdraw and suspend implementation of the Endangerment Finding for Greenhouse Gases and the Clean Power Plan.
- Support legislation removing the fictitious "social cost of carbon" from federal rulemaking and regulatory consideration.
- End the climate profiteering in America's energy sector by ceasing billions of dollars a year in direct and indirect subsidies to wind and solar companies.

Dramatically reduce government funding of climate change research. When funding such research, require that equal amounts go to studying natural and man-made climate change.

Recommended Readings: Roy W. Spencer, The Great Global Warming Blunder: How Mother Nature Fooled the World's Top Climate Scientists (New York, NY: Encounter Books, 2010); Craig D. Idso, Robert M. Carter, and S. Fred Singer, Why Scientists Disagree About Global Warming (Arlington Heights, IL: The Heartland Institute, 2016).

2. End the war on fossil fuels.

Elected officials and agency regulators at the national, state, and local levels should repeal subsidies, taxes, and regulations aimed at reducing the use of fossil fuels.

Abundant and affordable energy promotes human health, happiness, and prosperity. When energy is abundant, falling energy prices work like an across-the-board tax cut, goods and services become less expensive to produce and transport, and lower prices result in greater consumer purchasing power. People are able to buy more goods and services such as education, health care, nutritious foods, quality housing, and durable consumer goods, making lives healthier and more enjoyable.

When energy prices rise, as happens when government policies make energy less plentiful or reliable, almost all goods and services become more expensive to produce and transport. The resulting higher prices make consumer products less affordable, destroy jobs, and lower living standards.

The War on Fossil Fuels

During his campaign for president in 2008, Barack Obama famously told the editorial board of a newspaper, "if somebody wants to build a coalpowered plant, they can. It's just that it will bankrupt them because they are going to be charged a huge sum for all the greenhouse gases that they emitted" (Obama 2008). This was the first shot in what would be an eight-year war on fossil fuels led by President Obama.

Between 2008 and 2014, the Obama administration reduced the number of acres leased for oil and natural gas production on federal lands by more than 25 percent, from 47 million acres to 35 million acres

(Bureau of Land Management 2014). The Obama administration further limited domestic energy production in late 2016 by removing 115 million acres in the Arctic and Atlantic Oceans from oil and gas development (Ware 2016). These policies have caused oil and natural gas production on federal lands to fall by 6 percent and 28 percent, respectively, and the average time to process an application to drill on federal lands increased 41 percent between 2006 and 2011.

These policies restrict supply and make production more expensive (Humphries 2014). The dramatic increase in U.S. oil and natural gas production since 2008 occurred *in spite of* federal government policies, primarily due to increases in production on private and state-owned lands.

According to environmental activists, stabilizing the global climate would require reducing carbon dioxide emissions 80 percent or even more by the middle of the century. Achieving this would require banning the use of fossil fuels—coal, oil, and natural gas—and relying instead on renewable fuels such as wind and solar. This is an impossible dream; wind and solar are intermittent and unreliable sources of energy that cannot be scaled up to meet current levels of demand for energy, much less the higher levels of demand that are expected to prevail decades from now (Clack 2017; Dears 2015).

Renewable energy typically costs two to three times as much as energy produced from fossil fuels. This enormous cost difference means access to energy in the Left's fantasy world would have to be rationed. Choices of housing and occupations and cars, among other goods and services, would be severely limited. Trucks and SUVs would be banned. Living more than five or 10 miles away from a workplace would be prohibited. Traveling by plane would be strictly limited, perhaps to one trip every decade or two. Population would have to be severely limited through policies even more severe than those used by China and other unfree countries.

Higher energy costs lead to slower economic growth, as affordable energy is the key to productivity growth and production of virtually all goods and services. The forced conversion away from fossil fuels already underway in Europe and other parts of the world has destroyed millions of jobs and trillions of dollars in wealth. The anti-fossil-fuel policies of the Obama administration caused serious harm to the U.S. economy, helping make the economic recovery since 2008 the slowest in the past 60 years.

If imposed on developing countries, anti-fossil-fuel policies would cause the premature death of millions of people (Driessen 2003). This doesn't worry the Left, because global population control is one of their highest objectives. But it should be of great concern to everyone with a sense of decency and concern for one's fellow man.

The Futility of Reducing Emissions

Despite the enormous costs, national and state-specific carbon dioxide restrictions have no discernible effect on global temperatures. IPCC data show completely eliminating *all* U.S. carbon dioxide emissions would alleviate only 0.13 degrees Celsius of warming by the year 2100 (Michaels 2013). Expensive carbon dioxide reduction mandates, like those contained in the Obama administration's now-halted Clean Power Plan, would reduce carbon dioxide emissions by only a small fraction of that already-tiny amount. Of course, completely eliminating all U.S. carbon dioxide emissions, or even a majority of them, is impossible (Dears 2017).

U.S. carbon dioxide emissions are not the reason global emissions continue to rise. U.S. emissions have fallen nearly 10 percent since the start of this century (EIA 2015a), yet global emissions have risen approximately 33 percent during that time (EIA 2015b). Emissions from China have more than doubled in this century (*Ibid*.). China emits more carbon dioxide than the combined total of every nation in the Western Hemisphere. Even if Argentina, Brazil, Canada, Mexico, the United States, and all other nations in the Western Hemisphere completely stopped using fossil fuels and eliminated all other sources of carbon dioxide emissions, new emissions from China would replace all those emissions in less than a decade.

Even more pointless are the actions of American city, county, and state officials who announce that even though the Trump administration is abandoning the Paris Climate Accord, they will adhere to it in their jurisdictions. Their actions will have no impact whatsoever on the alleged global warming problem but *will* harm their own economies and citizens. The so-called "We're Still In" movement might appear to be harmless "virtue signaling" by politicians and activists who want to be seen as standing for some supposedly noble cause, but the consequences of their efforts are higher energy costs and more restrictions on the economic liberty of enterprises and individuals.

Nations such as China and India produce much more of their electricity from carbon dioxide-intensive coal than does the United States. In an ultimate irony, high U.S. energy prices caused by regulations backed by environmentalists are chasing businesses and industries to these nations, *increasing* global carbon dioxide emissions. China and India do not require coal plants to employ basic technologies that reduce sulfur dioxide, soot, and other pollutants, resulting in higher emissions of real pollutants.

Why Reducing Emissions Is So Costly

Global expenditures to "stop global warming" exceeded \$1.5 trillion a year in 2015, or approximately \$4 billion a day (Hinderaker 2014). Expenditures in the United States to comply with existing climate change regulations and mandates are approximately \$500 billion a year, or \$4,275 per household.

Power generation, transportation fuels, and agricultural activity are the most significant sources of human greenhouse gas emissions. Restrictions on transportation emissions are especially problematic because there are currently few feasible alternatives to gasoline and the internal combustion engine. Those alternatives that do exist, such as ethanol and electric vehicles, emit as much or more carbon dioxide as gasoline and diesel when full energy use is taken into account. The lack of feasible alternatives to gasoline for transportation is one reason global warming restrictions, such as the Obama administration's Clean Power Plan, tend to target carbon dioxide emissions from power plants rather than transportation.

The principal mechanism for reducing power plant carbon dioxide emissions is inducing or mandating a transition from inexpensive coal power to more expensive low- or zero-carbon alternatives. Hydropower would provide an emissions-free source that is cost-competitive with coal, but environmental activist groups have strong-armed new hydropower facilities out of the political equation by persuading politicians that such facilities do unjustifiable harm to ecosystems.

Natural gas emits about half as much carbon dioxide as coal when burned and is, in some cases, less expensive than coal. However, environmental activist groups oppose natural gas production, and they convinced the Obama administration to reduce drilling permits on federal land and persuade many state and local governments to ban or restrict the use of hydraulic fracturing drilling technology. Trump is attempting to reverse these policies.

Nuclear power is the next least expensive available power source, has the best safety record of any form of electricity generation in the world, and is emissions-free. However, many environmental activist groups oppose nuclear power and have convinced states to enact nuclear power moratoria and persuaded the Obama administration to block approval of a permanent storage site for spent nuclear fuel in Yucca Mountain, Nevada. Trump has said he will open Yucca Mountain, but as of this chapter's writing that had not yet happened.

This leaves the most expensive energy sources of all, wind and solar power, as global warming activists' preferred means of producing energy without carbon dioxide emissions. Given their intermittency and scaling properties, it is simply impossible for today's electric grid to operate in

an all-wind and -solar scenario (Dears 2017). A 2014 study published by the Brookings Institution found replacing conventional power with wind power would double electricity costs and using solar power would triple the costs (Frank 2014). The U.S. Energy Information Administration (EIA 2010) confirmed these higher costs and projected the price premiums for wind and solar power would continue for at least the next few decades.

Germany's attempt to move away from fossil fuels and nuclear power is an object lesson for America in what not to do. Germany already has the highest electricity prices in Europe. Germans also must cover the \notin 20 billion costs of generating \notin 3 billion worth of electricity via solar, wind, and biogas plants. And factories have been asked at times to shut down when the electricity supply didn't correspond properly with use (Spiegel 2013).

Policy Agenda

American consumers and workers would benefit if governments would encourage rather than discourage energy production. The following policies should be adopted to end the war on fossil fuels:

- Oppose cap-and-trade and carbon tax proposals based on the fictitious notion of a "social cost of carbon."
- Repeal mandates at the national level that the Department of Defense and other agencies use biofuels and other alternative energies, and mandates at the state level requiring utilities to source energy from renewables.
- Oppose the premature closure of coal-fired electric generation plants around the country.
- Remove barriers to exploration and development of fossil fuels offshore and on public lands.
- Approve Keystone XL and other pipelines blocked by President Barack Obama.

Recommended Readings: Alex Epstein, *The Moral Case for Fossil Fuels* (New York, NY: Penguin Publishing Group, 2014); Kathleen Hartnett White and Stephen Moore, *Fueling Freedom: Exposing the Mad War on Energy* (New York, NY: Regnery Publishing, 2016).

3. Hydraulic fracturing ("fracking") is safe and beneficial.

Hydraulic fracturing ("fracking") is environmentally safe, is helping America become energy self-sufficient ,and should not be discouraged by policymakers.

Cheap and reliable energy is more plentiful today than ever before thanks to a technological revolution in oil and natural gas production. Technological advances in hydraulic fracturing (or "fracking") and directional drilling have made it economically feasible to tap into oil and natural gas trapped in shale rock formations. Environmentalists are attacking fracking on spurious grounds. The Trump administration is removing regulatory obstacles to this safe and beneficial technology.

The Fracking Revolution

Hydraulic fracturing, or fracking, is a technique used by oil and natural gas drillers for decades to increase recovery from their wells. It consists of pumping a fluid composed of 99.51 percent water and sand, and .49 percent chemical additives, to open and hold pores in shale deposits, allowing oil and natural gas to collect in the pores and then to be pulled out by the well. The chemical additives in fracking fluid are mostly soaps and ingredients found in household products to prevent corrosion in the well, reduce surface tension in liquids, stabilize clay particles, adjust pH, and eliminate bacteria (Smith 2014b).

The "fracking revolution" occurred when fracking was paired with new horizontal drilling and computer-assisted underground monitoring to make more economical the process of extracting oil and natural gas from vast reserves (Orr 2013). Between 2012 and 2014, the shale oil industry generated 1.6 million new jobs in the oil industry and another 3.0 million throughout the economy (Gilje *et al.* 2016).

Due almost entirely to the fracking revolution, U.S. oil production has almost entirely recovered from a 40-year decline. In 2014, U.S. crude oil production reached 3.2 billion barrels, just 10 percent below its 1970 peak (EIA 2015d). In 2015, the United States produced approximately 9.4 million barrels of crude oil per day, the most since 1972 (EIA 2017a). Fracking has made the United States the top producer of oil and natural gas in the world, increasing oil production on non-federal lands by 61 percent and natural gas production on non-federal lands by 33 percent between 2009 and 2014 (Humphries 2014).

Natural gas is an increasingly important source of electrical power generation, so changes in natural gas availability and pricing have a substantial impact on the U.S. economy. Without the dramatic decline in oil and natural gas prices since mid-2008, the United States might still be wallowing in economic stagnation rather than experiencing a modest recovery from the Great Recession of 2008–09. According to a report by the U.S. Chamber of Commerce (2016), without fracking "by 2022, 14.8 million jobs could be lost, gasoline prices and electricity prices could almost double, and each American family could see their cost of living increase by almost \$4,000."

Fracking also has a positive economic impact on local communities that allow the practice. A study conducted by researchers at the University of Chicago, Princeton University, and the Massachusetts Institute of Technology determined hydraulic fracturing activity brings \$1,300 to \$1,900 in annual benefits to local households, including "a 7 percent increase in average income, driven by rises in wages and royalty payments, a 10 percent increase in employment, and a 6 percent increase in housing prices" (Bartik *et al.* 2016).

Safety Concerns

Environmentalists claim methane (the main hydrocarbon in natural gas) and fracking fluid chemicals will contaminate groundwater aquifers and compromise drinking water supplies. An anti-fracking propaganda film titled "Gasland" featured someone lighting on fire the water running from the faucet of his Colorado home, allegedly due to nearby fracking. Like so much of the anti-fracking literature, "Gasland" is more fiction than fact. The Colorado Oil and Gas Conservation Commission (COGCC) determined the methane found in the well featured in the film was naturally occurring and unrelated to fracking (COGCC n.d.). The well did not test positive for chemicals used in the fracking process.

A study conducted by Duke University analyzed 68 water wells in the Marcellus Shale and found 85 percent of wells contained methane regardless of whether they were near gas industry operations. Here too, no evidence of fracking fluid was found in water samples (King *et al.* 2012).

Since 2010, at least 18 studies have been produced on the possible impact of fracking on drinking water. All found no impact (Benson 2017a). This finding was confirmed by a \$29 million, six-year study by EPA of fracking's impact on groundwater sources, which failed to find any systemic impact caused by the 110,000 oil and natural gas wells that have been in use across the country since 2011 (EPA 2016a).

A 2017 peer-reviewed study of 112 drinking-water wells in Tyler and Hall Counties in northwestern West Virginia, led by researchers at Duke University and partially funded by the anti-fracking Natural

Resources Defense Council (NRDC), "found no indication of groundwater contamination over the three-year course of our study" (Harkness *et al.* 2017).

The large volumes of water required by fracking, typically between two million and four million gallons per well, also raises concerns. This sounds like a huge amount, but it is comparable on a gallons-per-btu basis to the amount of water used in coal mining and biofuel production, and it is small relative to household and agricultural use (Orr 2013). Hydraulic fracturing accounts for only about .3 percent of the total water consumed in the United States, compared to the .5 percent used to irrigate golf courses annually (*Ibid*.).

Another fear is that fracking causes earthquakes. A study of nearly 200 instances of manmade earthquakes found fracking was responsible for only three earthquakes large enough to be felt on the surface (Benson 2017b). Other human activities that triggered much larger earthquakes included building dams, filling reservoirs, and using explosives for mining. Injection wells used to dispose of wastewater from fracked wells can lubricate existing faults and cause small tremors. Reasonable regulation of injection wells, rather than restrictions on fracking, is the solution to this concern.

Policy Agenda

Environmental activist groups have called for state and local governments to impose aggressive regulation, moratoria, and even outright bans on fracking. New York implemented a fracking ban in 2014, and Maryland did so in April 2017 (Henry 2017). These policies are unnecessary and misguided. We recommend instead the following policy agenda:

- Repeal existing state bans and moratoria on fracking.
- Roll back unnecessary regulations on fracking offshore and on federal lands.
- Impose reasonable regulation on injection wells to reduce the risk of tremors.

Recommended Readings: Tim Benson, "Peer-Reviewed Study Says Hydraulic Fracturing Not Responsible for Groundwater Contamination in West Virginia," *Research & Commentary*, The Heartland Institute, May 15, 2017; Isaac Orr, "Bill McKibben's Terrifying Disregard for Fracking Facts," *Heartland Policy Brief*, The Heartland Institute, August 19, 2016.

4. National security requires affordable energy.

Our military and national security are put at risk by public policies that discourage the production of affordable, reliable energy.

During the Obama administration, every department of the national government was weaponized in the war against fossil fuels. The Department of Defense was told to "get on board" by classifying climate change as a "threat multiplier" and to write contingency plans in case coastal military bases were flooded. Hundreds of millions of dollars that could have been devoted to providing better body armor and support for American troops went instead to experiments using algae-based biofuels to power airplanes and ships.

Trump issued an executive order bringing some of the Obama-era nonsense to an end, but more needs to be done. Global warming is not, in fact, a genuine threat to U.S. security. As documented earlier (in Principle 1 on global warming), more rapid sea level rise and severe weather are unlikely to occur in a warmer world. Warmer temperatures historically have coincided with periods of relative peace and prosperity, not war. The best way to ensure U.S. military superiority is to guarantee an ample and reliable supply of fossil fuels.

Climate and War

The empirical literature examining the causes of conflict offers little support for the notion that climate change will increase the likelihood of armed confrontations. A recent review of the literature concluded, "Taken together, extant studies provide mostly inconclusive insights, with contradictory or weak demonstrated effects of climate variability and change on armed conflict" (Theisen *et al.* 2013, p. 613). Another survey found "… the climate-conflict literature suffers from a lack of theoretical connections between its main driver (climate) and its possible consequence (conflict)" (Raleigh and Kniveton 2012).

Slettebak (2012) looked at whether natural disasters offer an explanation for civil wars since 1950. His analysis encompassed a range of impacts frequently associated with rising temperatures in the climate-conflict argument, notably storms, droughts, floods, landslides, wildfires, and extreme temperatures. He tests six models incorporating a host of variables and reaches a startling conclusion:

I set out to test whether natural disasters can add explanatory power to an established model of civil conflict. The results indicate that they can, but that their effect on conflict is the opposite of popular perception. To the extent that climaterelated natural disasters affect the risk of conflict, they contribute to reducing it. This holds for measures of climaterelated natural disasters in general as well as drought in particular (p. 174).

Another approach contends that as climate change produces more powerful and more frequent storms, floods, and other disasters, economic growth will slow and economic hardship will lead to civil conflict as individuals lack opportunities and are subject to repression by other groups, and as states lose the ability to maintain order. Bergholt and Lujala (2012) tested the climatic disaster-economic growth-conflict relationship over the period 1980–2007 covering 171 countries and more than 4,000 country-year observations. While natural disasters certainly slow economic growth, Bergholt and Lujala conclude, "climate-related natural disasters do not have any direct effect on conflict onset" (p. 148). They found no evidence that "economic shocks caused by climaterelated disasters have an effect on conflict onset" (*Ibid*.).

Climate can affect economic growth in ways other than the onset of a natural disaster or storm. Koubi *et al.* (2012) tested how deviations in precipitation and temperature trends from their long-run averages relate to economic growth rates and civil conflict. Examining the 1980–2004 period, they found "climate variability … does not affect violent intrastate conflict through economic growth."

Two studies examined the long-run relationship between temperature and precipitation and violent conflict in China and Europe. Both reach conclusions that contradict the basic premise of the climate conflict argument. Zhang *et al.* (2007) determined conflict was more common during cold periods, with food scarcity being the likely reason. Tol and Wagner (2008) use climate data for Europe to replicate the Zhang work, concluding there is some evidence for the increased incidence of European conflict in cold periods, but not warm. Both studies suggest the rise of conflict in cold periods is associated with famine.

Tol and Wagner also found the relationship between temperature and conflict is declining over time. One could speculate that the introduction of modern agriculture and more responsive state structures mitigate the effect of temperature and climate over time. Famine remains a problem, but largely not in the developed world where modern agriculture provides stronger crops and food storage and management systems preserve food supplies more effectively.

To summarize the literature broadly, where climate has been a factor

in war and peace, it has been cooling rather than warming that appears to have triggered wars. A warmer world is apt to be a more peaceful and socially stable world.

Energy Policy and National Security

The Obama administration proclaimed climate change to be a present and future threat to the security of the United States. Two National Security Strategies articulate the case for environmental forces creating security challenges domestically and around the world, and two successive Quadrennial Defense Reviews show the U.S. military is shifting its strategic thinking as well as resource allocations to accommodate these new threats. Together, they demonstrate the institutionalization of environmentally induced conflict as a U.S. security concern (Roadmap 2017).

According the U.S. Department of Defense, "the impacts of climate change may increase the frequency, scale, and complexity of future missions, including defense support to civil authorities, while at the same time undermining the capacity of our domestic installations to support training activities. Our actions to increase energy and water security, including investments in energy efficiency, new technologies, and renewable energy sources, will increase the resiliency of our installations and help mitigate these effects" (DoD 2014, p. iv).

Not everyone agrees with the Obama administration's fearmongering on the alleged relationship between climate change and national security. As Kueter (2012) wrote,

In summary, efforts to link climate change to the deterioration of U.S. national security rely on improbable scenarios, imprecise and speculative methods, and scant empirical support. Accepting the connection can lead to the dangerous expansion of U.S. security concerns, inappropriately applied resources, and diversion of attention from more effective responses to known environmental challenges. The danger of this approach is that it offers a sense of urgency which may not be warranted, given the gaps in the current state of knowledge about climate, the known flaws in the methods used to construct the scenarios on which these security scenarios are based, and confusion over the underlying causes of those security concerns (p. 5).

The historical record says global warming tends to promote social stability, as evidenced in the peer-reviewed papers discussed above. The predicted changes in temperature, sea level rise, extreme weather, and other adverse effects of climate change have failed to materialize, and the computer models that predict them have been invalidated and never were intended to be used to make forecasts. All this means U.S. military policy and strategies should not be determined by ungrounded fear of future climate change.

Real threats to U.S. security are restrictions on domestic exploration and drilling along with subsidies to renewable energies, enabling them to compete with and sometimes put out of business conventional fossil fuel producers, reducing our military's access to affordable energy. Forcing the U.S. military to utilize expensive alternative energy also reduces the funding available for personnel, weapons, and ammunition.

During the Obama administration, the U.S. Navy outfitted F/A-18 Super Hornet jet fighters to run on a mix of conventional jet fuel and biofuel from the camelina ("false flax") plant, costing \$67.50 per gallon (Biello 2009). When the U.S. military is required to squander its budget on prohibitively expensive fuels, less is available for genuine needs.

A strong economy helps to ensure national security by providing the funding and public support needed to sustain military spending. Lower energy prices sustain a vibrant economy, whereas higher energy prices stifle economic output (Bezdek 2016). Cheap domestic energy production also eliminates some reasons for our government to become involved in foreign clashes in oil-producing regions. By contrast, government policies that favor expensive energy sources and impede domestic oil, natural gas, and coal production put our military and our national security at unnecessary risk.

The U.S. military is the strongest in the world because of the United States' economic strength: China and India dwarf the United States in population, and Russia dwarfs the United States in land area. The United States produces 24.5 percent of the world's gross domestic product. China is second at 15 percent (Knoema 2016). Empowered by this economic dominance, the United States spends more money on defense than all other nations in the world combined.

The 2014–15 Ukraine conflict is a reminder of what can happen when countries are dependent on expensive or foreign energy sources. European nations largely depend on Russia for the natural gas that powers much of their electricity, and natural gas and electricity prices are typically three to five times higher there than in the United States. European political leaders were restrained in responding to Russian aggression in the Ukraine because the European Union feared Russia would cut back on natural gas deliveries (Anishchuk 2014).

Thanks to the fracking revolution and prodigious energy resources, the United States can pursue its foreign policy objectives with fewer concerns about other nations limiting its access to energy—provided the government does not significantly restrict domestic production.

Policy Agenda

- Stop basing military planning and strategies on the predictions of flawed climate models.
- Support legislation repealing Obama's Executive Order 13693, which requires the Department of Defense to create a number of climate change programs and policies.
- Expand U.S. exports of coal, liquefied natural gas, and oil as a way to reduce the reliance of allies and other countries on energy imports from Russia and other bad actors in the international community.

Recommended Readings: Thomas B. Hayward, Edward S. Briggs, and Donald K. Forbes, *Climate Change, Energy Policy, and National Power* (Chicago, IL: The Heartland Institute, 2014); Commission on Energy and Geopolitics, *Oil Security 2025: US National Security Policy in an Era of Domestic Oil Abundance* (Washington, DC: Securing America's Future Energy, 2014).

5. Energy self-sufficiency is achievable.

While we should not seek energy independence, energy self-sufficiency produces many benefits and is within reach.

Some nations, thanks to natural endowments, the right civil institutions and laws, and political leadership can become energy self-sufficient by producing domestically at least as much energy as they use. Donald Trump appears to be the first U.S. president to recognize the economic power of achieving what he calls "energy dominance."

Abundant and affordable energy gives U.S. manufacturers an advantage over competitors in other countries, lowers the cost of living (especially for the poor and people in rural areas), and gives America more leverage in foreign affairs. Trump's "America First Energy Plan" is designed to achieve "energy dominance" and harvest these advantages.

Abundant Natural Resources

The United States has more combined oil, natural gas, and coal resources than any other nation and twice as much as any other nation except Russia (Behrens *et al.* 2011). However, despite recent gains in energy production made possible by the fracking revolution, the United States still depends on energy imports, primarily in the transportation sector. In 2015, foreign oil accounted for approximately 24 percent of net oil consumption in the United States (EIA 2016c).

The United States is not dependent on imported fossil fuels for electricity generation. All electricity in the United States is produced from domestic energy sources. Domestic coal and natural gas account for the majority of U.S. electricity generation. Nuclear power and hydropower are also domestically sourced. The United States has already attained energy self-sufficiency in electricity production.

The United States is well-positioned to be an exporter of natural resources for electricity production. It possesses the world's largest coal reserves, with 257 billion short tons of recoverable coal reserves from a demonstrated reserve base of 481 billion tons, enough to power the nation for 256 years based on 2014 levels of production (EIA 2016b).

Coal can be and increasingly is burned cleanly, as evidenced by dramatically declining power plant emissions during recent decades. According to the U.S. Environmental Protection Agency (EPA 2015a), emissions of the six principal pollutants tracked by EPA declined by more than 60 percent since 1980.

In 2014, the United States briefly became the world's largest producer of oil, surpassing Saudi Arabia. U.S. oil production now ranks third, behind Russia and Saudi Arabia, respectively (Carpenter 2017). As noted in Principle 3 above, hydraulic fracturing and horizontal drilling have made previously uneconomic oil and natural gas deposits accessible for extraction. The United States has approximately 78 billion barrels of technically recoverable crude oil in shale formations (EIA 2015c).

Federal lands have an estimated 635 trillion cubic feet of recoverable natural gas, but production is severely restricted by federal government policies. For example, roughly 47 percent of the natural gas reserves in five energy-rich Rocky Mountain states—Arizona, Colorado, New Mexico, Utah, and Wyoming—are off-limits to development, and 87 percent of offshore acreage is closed to oil and gas exploration and extraction (Bentsen 2016).

Nuclear and hydropower provide additional sources of electricity production, each being less expensive and more reliable than wind and solar power. Nuclear and hydropower are emissions-free sources of power, fulfilling the most frequently asserted justification for wind and solar power.

Why "Energy Independence" Is Undesirable

Energy self-sufficiency is different from what often is called "energy independence." Complete energy independence implies no energy imports at all, regardless of price differences or comparative advantages. It would require energy *isolationism* behind barriers to free trade with other countries.

Energy isolationism would slow economic growth, invite retaliation by trading partners, and raise prices. Free trade, not isolationism, is the way to enhance energy security and world peace. Although recent natural resource discoveries and technological advances allow the United States to become energy self-sufficient and even a net energy exporter, it makes economic sense for U.S. consumers to continue to purchase lessexpensive oil produced in other nations when available.

Energy self-sufficiency means removing barriers to domestic oil and natural gas production and exports, enabling the United States to produce more oil and natural gas than it consumes. As a result, rising global energy prices would benefit the United States, as higher energy prices would mean more money from other nations pouring into the United States to purchase our surplus energy resources. Free trade makes that possible.

Policy Agenda

The Trump administration's America First Energy Plan offers a broadstrokes blueprint for achieving energy self-sufficiency. Some recommendations consistent with that plan include the following:

- Rein in the Environmental Protection Agency (EPA), a rogue agency that routinely defies congressional oversight, abuses science, and imposes regulations whose costs vastly exceed their benefits.
- Repeal global warming regulations, subsidies, and taxes aimed at reducing carbon dioxide emissions. Give the American people an annual global warming "peace dividend" worth hundreds of billions of dollars.
- End climate profiteering by ethanol producers and wind and solar companies who have fleeced consumers and taxpayers out of billions of dollars while undermining our energy independence.
- Lift legislative obstacles to energy production and development on public as well as private land. Don't "leave it in the ground." Tap the wealth that is under our feet.

Repeal the Corporate Average Fuel Economy (CAFE) program and allow consumers to choose the cars and trucks they want to own.

Recommended Readings: Donald Trump, "An America First Energy Plan," 2017, https://www.whitehouse.gov/america-first-energy; Joseph Bast, "Pro-Environment, Pro-Energy, and Pro-Jobs," The Heartland Institute, August 10, 2016; Mark Green, "Unlock US Energy Potential: Offshore Oil and Gas," The Energy Collective, 2013.

6. Air pollution is a fading challenge.

Air quality in the United States has become so good that new regulations or tighter standards are unnecessary.

Concern over urban air pollution provides much of the impetus for the modern environmental movement. Few people realize how dramatically improved air quality is today ... and a combination of environmental activists, government bureaucrats, and yellow journalists are hard at work to make sure they don't realize it, otherwise they might all lose their jobs.

America's improving air quality is one of the great success stories of the twentieth century. Rather than waste billions of dollars chasing the last molecule of a possible pollutant, we ought to allow laws already on the books to gradually improve air quality even further and welcome back to the country the manufacturers who were forced to close or outsource their jobs to China and other developing countries.

The Clean Air Success Story

Air quality is better today in all parts of the United States than at any time since measurements began. Data cited by Steven Hayward (2011), Indur Goklany (2007, 2012), and Moore and Simon (2000), much of it derived from EPA and other government sources, document a dramatic improvement in environmental protection, and consequently a reduction in possible threats to human health.

According to EPA, emissions of the six "criteria" air pollutants have fallen by more than 60 percent since 1980 even while GDP increased 147 percent, vehicle miles traveled increased 97 percent, and energy consumption increased 26 percent (EPA 2015). Lead emissions have fallen by 99 percent since 1980. Sulfur dioxide emissions fell 81 percent. Carbon monoxide emissions fell 69 percent. Particulate matter (PM_{10}) emissions fell 58 percent. Nitrogen oxides fell 55 percent. Volatile organic compounds fell 53 percent.

The best available empirical research demonstrates current ambient levels of ozone and low levels of $PM_{2.5}$, a smaller form of particulate matter, have no adverse health effects. An important reanalysis of data from the American Cancer Society Cancer Prevention Study (CPS II) published in 2017 found no significant relationship between exposure and mortality in California or in the rest of the country (Enstrom 2017).

Similarly, Young *et al.* (2017) conducted a 12-year study of all major populations in California to determine death effects from small particle and ozone air pollution. The study looked at 2 million deaths, 37,000 exposure days, and multiple variables, including different lag times and a cloud program of data analysis that involved more than 70,000 data set ups and evaluations to assure reliability. The study concluded there was no small particle or ozone death effect in the eight most populous air basins studied in California.

A long-term government study that followed thousands of children in California found higher ozone levels were associated with a *lower* risk of developing asthma (Schwartz 2006). EPA's own technical analyses show reducing ozone levels in cities with the dirtiest air to levels necessary to meet the then-new federal eight-hour ozone standard would at best reduce respiratory-related hospital admissions and emergency room visits by only a few tenths of a percent (Hubbell *et al.* 2005).

Claims that ambient concentrations of $PM_{2.5}$ and other air pollutants cause fatalities are based on studies showing only very small statistical correlations between daily pollution levels and daily deaths. Such correlations fall well short of proving causation.

EPA's War on Science

Even though it can (and does) take credit for improving air quality in the United States, EPA has become the biggest single source of *misinformation* about air quality. Many EPA claims about the toxicity, lethality, and carcinogenicity of criteria air pollutants at ambient levels are simply false, intended mainly to advance the environmental movement's ideological campaign against fossil fuels (Chase 1995).

For example, EPA has claimed the Obama administration's Clean Power Plan will lead to climate and health benefits worth an estimated \$55 billion to \$93 billion in 2030, including avoiding 2,700 to 6,600 premature deaths and 140,000 to 150,000 asthma attacks in children (EPA 2015b). Then-EPA Administrator Lisa Jackson even claimed in 2011, "If we could reduce particulate matter to levels that are healthy we would have an identical impact to finding a cure for cancer" (quoted in Harris and Broun, 2011, p. 2). Cancer kills approximately 570,000 people in the U.S. annually, making this an astounding claim.

How does EPA justify its claim that air pollution is still a serious threat to human health when so much evidence points in the opposite direction? EPA relies on the "linear no-threshold assumption" that exposure to tiny amounts of substances that are toxic at higher doses produces adverse effects and even fatalities. This theory has been contradicted and rejected by many leading medical researchers (Tubiana *et al.* 2009; Calabrese 2015).

Failing to prove in toxicological studies that ambient levels of pollution pose a threat to human health, EPA relies on epidemiologic studies—studies that look for associations between exposure and health effects in large populations. But these studies, too, are very controversial (Kabat 2016). EPA has been shown to cherry-pick studies that support its point of view, sometimes overlooking scores or even hundreds of studies that have larger sample sizes and better methodologies and find no evidence of risk (Milloy 2016).

EPA combines these flawed epidemiologic studies with the equally flawed linear no-threshold assumption to claim hundreds of thousands of people die from air pollution every year, in flagrant violation of the Bradford Hill Criteria (Hill 1965) and guidelines set by the Federal Judicial Center (FJC), an education and research agency of the United States federal courts (FJC 2011).

There is no research properly evaluated that shows ambient air pollution caused by fossil fuels kills anyone, anytime in the United States. Even high levels of ambient air pollution that may be found in some areas of the world cannot be established by good toxicological studies to be acutely lethal. Air pollution death events are invariably extraordinary events caused by low-level inversions that trap very high levels of toxins, usually sulfur dioxide or heavy carbonaceous black soot—not the ambient small particulate air pollution targeted by EPA.

Policy Agenda

Air pollution is a rapidly falling health risk in the United States. Unnecessary regulations that impose huge costs on businesses and consumers pose a much bigger threat to our safety and prosperity. We recommend the following policy reforms:

- Dramatically reduce government funding of environmental advocacy groups that use misinformation to frighten the public, including funds delivered to such groups through the "sue and settle" scam.
- End the use of "secret science" by EPA and other regulatory agencies by requiring disclosure of databases used to justify excessive regulation.

- Formally end the use of the "linear no-threshold assumption" in determining safe levels of exposure to pollutants.
- End conflicts of interest on scientific review boards, whereby EPA grant recipients sit in judgment over their own work and block independent review.
- Delay or withdraw EPA's planned reduction in allowable groundlevel ozone levels from 75 parts per billion to 70 parts per billion.
- Enforce the Data Quality Act with respect to the junk science promoted and funded by EPA on air pollution and toxicology.

Recommended Readings: Indur Goklany, The Improving State of the World: Why We're Living Longer, Healthier, More Comfortable Lives on a Cleaner Planet (Washington, DC: Cato Institute, 2007); Steve Milloy, Scare Pollution: Why and How to Fix the EPA (Washington, DC: Bench Press, 2016).

7. End subsidies to alternative energy producers.

Policymakers should end subsidies to alternative energy producers and mandates on government agencies and utilities to use alternative energy sources.

Environmental activist groups often tout alternative energy sources such as wind and solar power as capable of protecting human health, protecting the environment, and creating jobs. Perhaps someday, as entrepreneurs improve these sources of energy, they will provide such benefits. But today, subsidizing or mandating the use of alternative energy sources raises energy prices, kills jobs, and create environmental damages on par with those of the fossil fuels environmentalists say they want to replace.

Problems with Alternative Energy

Sunshine and wind may be "free," but they are not efficient sources of energy for human use. Energy and capital must be expended to create the

solar and wind "farms" needed to collect the energy, and more is then required to transport the energy to where it is needed. Consequently, the fuel and total production costs of coal, oil, and natural gas power are much lower than the costs of converting "free" wind and sunlight into usable power.

Just as importantly, coal, oil, and natural gas can be converted into usable power on demand, 24 hours a day and seven days a week, whereas wind and solar power rely on the vagaries of unpredictable breezes and clouds. This intermittency is a critical shortcoming of alternative energy since electrical grids need a constant flow of energy to operate (Clack *et al.* 2017; Dears 2015). Fossil fuels store relatively large amounts of energy in a small area, allowing them to be stored and transported safely and inexpensively. Wind and solar, in contrast, need expensive battery technology to store energy during the day and on windy days in order to provide energy at night and when the wind doesn't blow.

Another problem with alternative energy sources is the relatively small number of locations suitable for their use. Whereas conventional power plants can be built almost anywhere, wind and solar power are severely limited by geography. The wind blows most frequently and usefully along mountaintop ridges, offshore coastal regions, and the open Upper Plains—places where there are few large urban centers. Solar energy is most abundant in remote desert areas that are unattractive places for most businesses and residents. Bringing alternative power to urban population centers is expensive, inefficient, and disruptive to ecosystems between the facilities and the urban population centers.

Environmental Impacts of Alternative Energy

If environmental activists weren't so focused on the mythical threat of global warming, they would likely oppose wind and solar power due to the unacceptable environmental damages they cause. Up to 40 square miles of solar power equipment is necessary to replace a single conventional power plant (Hayden 2000). Such extensive land development can adversely affect desert habitats crucial to endangered species. Large solar projects such as the Ivanpah project in the Mojave Desert incinerate thousands of birds each year in mid-flight (Knickmeyer and Locher 2014).

Solar thermal power facilities use two to four times more water than conventional power plants (Glennon 2009), and water is already in short supply in the arid regions where solar power is most economically produced. Desert tortoises and other protected species are disproportionately harmed by new solar facilities.

Up to 600 square miles of wind turbines are required to replace a single conventional power plant, requiring extensive development of

previously undisturbed lands (Hayden 2000). The most effective locations for wind power generation tend to be undisturbed landscapes and regions much loved by environmentalists as well as others: mountaintop ridges, coastal shorelines, and open plains. Those areas are often habitat or migration corridors for endangered bird species.

A 2013 peer-reviewed study found wind turbines kill 1.4 million birds and bats each year while generating just 3 percent of our nation's electricity (Smallwood 2013). Ramping up wind power production would greatly increase this death toll. Why do environmentalists, of all people, support commercial wind farms? Is it really about protecting the environment?

Renewable Power Mandates Drive up Energy Costs

Renewable power mandates (RPMs), which set aside a specified percentage of the electricity market for expensive, politically favored alternative power sources, are responsible for much of the growth in alternative energy production in the United States in recent years. These laws hide the higher cost of alternative energies in people's utility bills, making it less likely the public will object to their expense.

RPMs have caused electricity prices to increase dramatically in states that have enacted them. Data from the U.S. Energy Information Administration show nine of the 11 states utilizing the most wind power have electricity prices rising at a rate more than four times the national average (Taylor 2014b). A 2014 study by the Brookings Institution found replacing conventional power with wind power doubles the price of electricity (Frank 2014). The same study found replacing conventional power with solar power triples the price of electricity. Since 2008, electricity prices in states with RPMs have risen twice as fast as the national average (Burnett 2015).

According to a careful analysis by economist Timothy Considine (2016), RPS programs in 12 states in 2016 required expenditures of \$7.5 billion and generated savings of approximately \$1.7 billion, for total net costs of \$5.7 billion. Considine projected annual net costs in just these 12 states to rise to \$8.7 billion in 2025 and \$8.9 billion in 2040. He concludes, "These findings suggest Renewable Portfolio Standards for the twelve states examined in this study are a costly and inefficient means to reduce greenhouse gas emissions and they reduce economic growth and employment" (p. 6).

Kansas enacted RPMs in 2009, and the state's electricity prices rose eight times faster than the national average between 2009 and 2013. Had electricity prices in Kansas merely risen at the national average rate during that period, the state's electricity consumers would have saved \$557 million in electricity costs in 2013 alone. Between 2009 and 2013, the average Kansas household paid an extra \$506 in electricity costs, or nearly \$130 per household per year (Taylor 2014a). Faced with such rising electricity prices, the Kansas legislature in 2015 repealed the state's renewable power mandates, with many legislators who had previously championed the mandates leading the effort to repeal them.

Nuclear and Hydro Alternatives

Nuclear and hydroelectric power are far more economical and environmentally sound choices for persons seeking alternatives to fossil fuels. Curiously, both are opposed by environmentalists.

Nuclear power is moderately more expensive than coal, natural gas, and hydro power but significantly less expensive and more reliable than wind and solar power. Nuclear power also has an impressive environmental safety record. Contrary to popular opinion, the 2011 earthquake and tsunami at Fukushima, Japan are a testimony to how *safe* nuclear power has become.

In March 2011, the magnitude 9.0 earthquake 130 kilometers off the coast of Japan triggered a 50-foot tsunami that killed 16,000 people and resulted in severe damage to three of the six reactors at the Fukushima power plant. Safeguards typical of nuclear power plants limited the general public's exposure to radiation, prompting the United Nations Scientific Committee on the Effects of Atomic Radiation to conclude, "No discernible increased incidence of radiation-related health effects are expected among exposed members of the public or their descendants" (World Nuclear News 2014). Not a single person was killed or made seriously ill by the nuclear power plant damage.

Nuclear power plants produce no air pollution. Storage of spent nuclear fuel is the only significant environmental issue. Over the past four decades, the entire industry has produced 71,780 metric tons of used nuclear fuel, all of which has been safely stored at facilities across the nation (Nuclear Energy Institute 2014).

Permanent storage of spent fuel at Yucca Mountain, Nevada has been under consideration since the 1980s (Nuclear Energy Institute 2015) and would be safe (Cravens 2007), but the Obama administration terminated the licensing proceedings in 2010. Used nuclear fuel is currently stored in more than 100 aboveground facilities in 39 states. One centralized, underground, specially designed storage area would be inherently safer than having many inferior storage facilities near 39 population centers. Trump wants to revive the plan to use Yucca Mountain as a waste storage site.

Today's reactors utilize only 3 percent of the energy stored in uranium fuel pellets. Reprocessing spent fuel can recover up to 95 percent of the remaining energy. If the United States joined Britain, France, and Japan in recycling used fuel, existing and future spent fuel rods would provide a long-term supply of nuclear fuel while eliminating

most of the used fuel that poses storage challenges.

Hydroelectric power, typically produced by dams, is less expensive than nuclear power and substantially less expensive than wind and solar (EIA 2010). Like nuclear power it produces no air pollution. Unlike nuclear power and fossil fuel plants, there are a limited number of good sites for locating dams, and most of the best locations are already being used.

The most frequently heard objection to increasing hydroelectric power is that hydroelectric dams change the natural flow of rivers and impede fish migration. However, even the largest of lakes created by hydroelectric dams pale in comparison to how wind turbines transform the landscape. The Arizona Power Authority (2012) reports the Hoover Dam has the capacity to produce more than 2,000 megawatts of energy and a yearly average generation of 4.5 billion kilowatt hours to serve the annual electrical needs of nearly eight million people in Arizona, southern California, and southern Nevada. The environmental footprint of the Hoover Dam is Lake Mead, which is 247 square miles. The lake is home to fish and other animals, is used for recreation, and itself is an environmental asset.

By comparison, up to 600 square miles of wind turbines would be needed to replace a single conventional power plant. Moreover, the transformation of a stretch of river into a lake environment brings environmental benefits as well as challenges, whereas the effect of covering hundreds of square miles of virgin landscape with wind turbines that kill birds and bats by the millions is almost entirely negative.

For these reasons, Connecticut recently joined a number of states in including large-scale hydroelectric power in its renewable power mandates (American Council on Renewable Energy 2014).

Policy Agenda

Alternatives to fossil fuels exist and successfully compete for customers without subsidies or mandates. This diversity and competition are good for consumers and should be encouraged. Current state and national policies, however, go well beyond encouragement and impose huge costs on consumers, often without their knowledge, without producing any clear benefits. We recommend the following policies:

- Repeal state Renewable Power Mandates (RPMs) where they exist and oppose their adoption in states that don't currently have them.
- End national and state tax exemptions, tax credits, and subsidies for alternative energy producers.
- Hold solar and wind power producers to the same environmental

protection standards as are applied to coal and natural gas power generators.

Remove regulatory obstacles to the expansion of nuclear power and open the nuclear waste storage facility at Yucca Mountain.

Recommended Readings: Taylor Smith, "The Limitations on Solar Power," Research & Commentary, The Heartland Institute, 2014; Nuclear Energy Institute, "On-Site Storage of Nuclear Waste," 2014; Gwyneth Cravens, Power to Save the World: The Truth about Nuclear Energy (New York, NY: Alfred A. Knopf, 2007).

8. Biofuels cannot replace oil.

Policymakers should not subsidize or mandate the use of ethanol, biodiesel, or methanol fuels.

Biofuels are liquid or gaseous fuels—ethanol, biodiesel, and methanol made from organic matter such as corn, switchgrass, and sugar cane. Environmentalists and some parts of the agricultural industry lobby for subsidies, tax breaks, and mandates to replace petroleum fuels with biofuels. Their case does not stand up to scrutiny.

The Ethanol Boondoggle

In 2007, Congress mandated that ethanol be blended into gasoline supplies through a program called the Renewable Fuels Standard (RFS). The program will require 15 billion gallons of ethanol to be mixed into the fuel supply during the 2018 calendar year. The Trump administration maintained the level required by the Obama administration in its last year in office, ending what had been a trend of increasing the amount each year.

Federal and state subsidies for ethanol totaled \$6 billion in 2011, and an estimated \$58 billion in tax credits were given to ethanol producers from 1980 through 2012 (Stevens 2016). Additionally, in 2012 biodiesel subsidies of one dollar per gallon, totaling more than \$2 billion, were approved through 2013 in congressional trading for votes to pass legislation designed to avoid the "fiscal cliff."

Until 2012, Congress protected domestic ethanol producers by imposing a 2.5 percent tariff and 54 cents per gallon duty on imports.

Ethanol plants with annual production capacity of up to 60 million gallons were eligible for production incentives of 10 cents per gallon on the first 15 million gallons of ethanol produced each year. In addition to direct federal and state payments and protective tariffs, ethanol producers received a federal tax subsidy of 45 cents per gallon for blends (mixtures of gasoline and ethanol), amounting to tens of billions of dollars (Anderson 2012).

Although the subsidies and protective tariffs on ethanol expired in 2012, the industry still benefits from government intervention in the marketplace in the form of blending mandates. The Energy Independence and Security Act of 2007 mandated 15 billion gallons of corn-based ethanol and 21 billion gallons of non-corn biofuels in the nation's fuel supply by 2022.

Why Mandate Biofuels?

The ethanol industry has variously promoted its product as a means to reduce air pollution, greenhouse gas emissions, and energy costs; enhance national security (by replacing imported gasoline); and spur rural economic development. All these justifications come up short.

Studies show ethanol increases various forms of air pollutants and may have a net negative impact on air quality and carbon dioxide emissions. Using ethanol rather than gasoline reduces carbon monoxide emissions, but those are no longer a public health concern (Bryce 2016). Ethanol increases ozone production, which is still a problem in some cities at some times of the year. In addition, the lower gas mileage of ethanol means it requires greater use of fuel, thus increasing the amount of pollution in the air. Some environmental activist groups, including the Sierra Club, now oppose the use of ethanol (Cellarius 2015).

Research published in the peer-reviewed journal *Science* finds the production and use of a gallon of ethanol produces more carbon dioxide than does a gallon of gasoline (Fargione *et al.* 2008; Searchinger *et al.* 2008). A study published in the peer-reviewed journal *Nature Climate Change* found cellulosic ethanol increases carbon dioxide emissions by 7 percent over gasoline (Liska *et al.* 2014).

Algae biofuels are just as problematic as ethanol. Algae biofuels cost roughly \$240 to \$332 per barrel, approximately seven times the cost of oil in 2015 (Environmental News Network 2012). Algae biofuels are also environmentally destructive. A 2012 study by the National Research Council Sciences reports, "The scale-up of algal biofuel production sufficient to meet at least 5 percent of U.S. demand for transportation fuels would place unsustainable demands on energy, water, and nutrients with current technologies and knowledge" (National Research Council 2012).

Proponents of biofuels say greater production will increase the

supply of transportation fuels and therefore lead to lower prices. But after initially reducing the price of gasoline by about 5 cents per gallon, a 30 percent jump in ethanol prices drove up prices at the pump by about 10 cents per gallon. Researchers at Rice University found in order to replace 2 percent of the nation's gasoline with biofuels in 2008, taxpayers spent \$4 billion, the equivalent of \$1.95 per gallon for biofuels replacing gasoline (Loris 2013).

If gasoline costs \$1.59 before state and federal taxes are added and a gallon of ethanol costs \$1.49, some consumers may think ethanol is more cost effective. However, because drivers get 33 percent fewer miles per gallon with ethanol than gasoline, their costs are actually higher, the equivalent of \$1.98 per gallon compared to \$1.59 per gallon for gasoline ($$1.49 \times 0.33 = $.49. $1.49 + $.49 = 1.98) (Grunwald 2008).

Even if ethanol helped to keep the price of a tank of gasoline lower than it would otherwise be, those savings are likely to be offset by an increase in the price of food caused by the RFS. Most ethanol is created from corn, which otherwise would have found its way to consumers as food. The result is a higher weekly grocery bill (Kreutzer 2012).

Biofuels are unlikely to contribute much to national security since they can replace only a trivial percentage of gasoline used in the United States and worldwide. Approximately 19.4 million barrels of oil per day are consumed in the United States (EIA 2016a). Globally, 96 million barrels of oil are consumed daily, or about 35 billion barrels per year.

When one considers there are 42 gallons in every barrel, the recordsetting 14.7 billion gallons of ethanol produced in 2015 amounts to only 350 million barrels of ethanol (Urbanchuk 2016). This is the equivalent of about 18 days' worth, or approximately 5 percent, of oil-based fuel consumption in the United States, or 1 percent of annual world oil consumption.

In theory, biofuels may eventually be able to extend the life of domestic energy reserves, but we are at little risk of running out of fossil fuels, globally or in the United States, for centuries (Carroll 2006; Huber and Mills 2005). Fear of running out of cheap oil hundreds of years into the future is no reason to subsidize or mandate the use of expensive biofuels now.

Policy Agenda

In 2016, The Heritage Foundation's Nicolas Loris wrote: "Congress should not tinker around the edges with attempts to reform the RFS. Policymakers should recognize the mandate is a failure and the government has no legitimate place propping up one energy source or technology over another. Congress should eliminate the RFS entirely and empower free enterprise to drive fuel competition and choice" (Loris 2016). We can hardly improve on that recommendation.

Recommended Readings: Nicolas Loris, "Examining the Renewable Fuel Standard," The Heritage Foundation, March 17, 2016; Michael Grunwald, "The Clean Energy Scam," *Time*, March 27, 2008; David Kreutzer, "Renewable Fuel Standard, Ethanol Use, and Corn Prices," The Heritage Foundation, 2012.

9. Corporate Average Fuel Economy standards sacrifice lives for oil.

CAFE standards increase highway fatalities and are not an effective way to lower transportation fuel consumption.

Environmental activist groups call for ever-stricter Corporate Average Fuel Economy (CAFE) standards to force Americans to purchase and drive cars and trucks with better fuel economy. But there are more costeffective ways to save fuel, and CAFE standards have a terrible unintended consequence: needless highway deaths.

Understanding CAFE

CAFE standards, created by the 1975 Energy Policy Conservation Act, require car and truck manufacturers to achieve minimum targets for the average fuel economy of their fleets, expressed in miles per gallon (mpg), based on a vehicle's size. CAFE standards currently mandate an average fuel economy of 35.5 mpg for passenger cars and 28.4 mpg for light trucks.

The Obama administration set mileage requirements at 54.5 mpg by 2025, nearly double the 27.5 mpg required in 2011. However, in early 2017 Trump announced EPA would reconsider that target with an eye to reducing it. There are currently no known technologies to meet the 2025 requirement, other than forcing American consumers to purchase more expensive electric or hybrid vehicles.

What CAFE Doesn't Achieve

The idea that consumers can be made better off by restricting their freedom of choice—the presumption that lies at the bottom of CAFE standards—is false. Consumers are better positioned than regulators to choose the size, fuel economy, and other features of the cars and trucks they buy to meet their safety and pocketbook needs. Fuel economy information is plainly posted on the price stickers of new cars, and the price of gasoline is advertised at gas stations.

Even EPA admitted in 2009 that CAFE standards don't benefit consumers, estimating their cost equals whatever benefits they could produce (Hennessy 2009). The National Auto Dealers Association calculated the new CAFE standards would increase the cost of the Chevy Aveo, the least-expensive car studied, by 24 percent, from \$12,700 to \$15,700. The average price for a new car would increase by \$3,000, pricing an estimated 6.8 million would-be car owners out of the market for new vehicles. Under the new mandate, the Energy Information Administration warns, new cars under \$15,000 may simply be no longer available in the United States (Wagner *et al.* 2012).

Estimates of lifetime fuel savings, which are used to justify higher sticker prices, are based on strikingly pessimistic projections of future gasoline prices and the unrealistic assumption that most vehicle owners will keep their vehicle for 30 years (for cars) and 37 years (for light-duty trucks). The claims of consumer benefits from higher CAFE standards rest on implausible assumptions.

Another thing CAFE standards don't do is reduce reliance on foreign sources of oil. In fact, CAFE standards could do just the opposite. Reduced demand for gasoline caused by higher CAFE standards would cause gasoline prices in the United States to be lower than they would be otherwise. Lower gasoline prices, in turn, increase our reliance on imported oil, measured as a percentage of total oil consumption, because domestically produced oil is more expensive than imported oil.

Although the Obama administration claimed global warming concerns were a significant factor in its adoption of the new CAFE standards, it is unlikely any greenhouse gas reductions realized by morestringent CAFE standards would have a significant impact on the climate. Car and light truck emissions in the United States account for only 1.5 percent of all human-caused greenhouse gas emissions, a fraction that will become even smaller as emissions from developing countries rise.

Higher CAFE standards could actually increase emissions of pollutants and greenhouse gases by encouraging more driving (called the "rebound effect"). CAFE standards discourage ride-sharing and divert investment and innovation from genuine breakthrough technologies into compliance with regulations that have little to do with real-world environmental effects (Kleit 2002).

Trading Lives for Oil

One thing CAFE standards do achieve is unintended: more highway fatalities. The best way to achieve better fuel economy is to build lighter cars made of aluminum instead of steel. Lighter cars do not protect passengers nearly as well as heavier vehicles during traffic accidents.

An analysis by the Brookings Institution found a 500-pound

reduction in weight of the average car increased highway fatalities by 2,200 to 3,900 and serious injuries by 11,000 to 19,500 per year (Murdock 2012). A USA Today investigation estimated 7,700 deaths occurred for every mile-per-gallon increase in average fuel economy (*Ibid.*).

The National Academy of Sciences reports CAFE standards have caused an average of between 1,300 and 2,600 additional traffic deaths per year since they were established in 1975 (National Academy of Sciences 2001). A study by the National Highway Transportation and Safety Administration (NHTSA) calculated higher CAFE standards resulted in additional traffic deaths of 13,608 people in light cars, 10,884 people in heavier cars, and 14,705 people in light trucks between 1996 and 1999 (Murphy 2011).

Anti-war activists, many of them also environmental activists, sometimes accused the Bush administrations of "trading lives for oil" by deploying troops in the Middle East. CAFE standards, in an attempt to save a little oil, kill far more Americans each year than were dying in Iraq and Afghanistan.

Policy Agenda

The Corporate Average Fuel Economy (CAFE) program, like the Renewable Fuels Standard (RFS) addressed in the previous principle in this chapter, is a poorly designed and executed national program that serves no public purpose. Rather than allow regulators to tell consumers what their next car or truck should look like, Congress and the president should repeal the program entirely.

Recommended Readings: Tim Benson *et al.*, "Heartland Institute Experts React to New EPA Fuel Standards," The Heartland Institute, January 13, 2017; Robert P. Murphy, "Will Fuel Economy Mandates Increase Car Company Profits?" Institute for Energy Research, 2011.

10. Replace the Environmental Protection Agency.

State environmental protection agencies working together in a Committee of the Whole can more effectively address environment concerns than the federal government.

The U.S. Environmental Protection Agency (EPA) was created in December 1970 by an executive order issued by then-President Richard Nixon. Today, EPA regulations imposed on the U.S. economy are estimated to cost more than \$330 billion every year (Crain 2014). A recent analysis from the Mercatus Center at George Mason University estimates there are at least 88,852 environmental regulations on the books, and depending on court interpretations, that figure could go as high as 154,350 (Young 2012).

EPA was originally designed to handle problems associated with major sources of pollution, such as billowing smokestacks, polluted water, and toxic waste sites. Since then, EPA has become less about advancing environmental protections based on sound science and more about promoting increasingly burdensome regulations on job creators and individuals.

Unintended EPA

EPA was originally put in charge of enforcing laws passed by Congress, such as the Clean Air Act and Clean Water Act. But as executive branch power has grown relative to congressional power, presidents have increasingly used EPA to enforce their agendas without congressional approval, in ways that would have shocked even the most vocal environmentalists in the 1970s.

For example, after President Barack Obama was unable to enact capand-trade legislation to combat the alleged global warming problem, despite having filibuster-proof Democratic majorities in both houses of Congress, he famously claimed, "Cap and trade was just one way of skinning the cat; it was not the only way." He then used federal agencies, especially EPA, to impose costly regulations and restrictions on U.S. consumers and businesses.

The Obama administration's Clean Power Plan to reduce carbon dioxide emissions by 30 percent by 2030, now on hold due to legal challenges and the Trump administration's pledge to withdraw it, would have cost between \$8.4 billion and \$50 billion per year, and hundreds of thousands of people would have lost their jobs because of it (Federal

Register 2015). According to EPA's own climate models, the regulations would have provided no significant climate benefits (Michaels 2015).

Bad Explanations for Expensive Regulations

As explained in Principle 6 on air quality, EPA has a long and sordid tradition of misusing science to justify unnecessary regulation. EPA defended the Obama administration's war on fossil fuels even when the science made it clear there were no health benefits. EPA administrators have exaggerated the public health threats of air pollution, pesticides, and "global warming" even as the scientific community has increasingly reached consensus that these are not legitimate threats after all.

EPA relies on the linear no-threshold assumption because it lends legitimacy to regulations that are popular with advocacy groups and politicians. The agency uses flawed epidemiologic studies whenever they can be portrayed as supporting its agenda.

Before it may implement a proposed rule, EPA must show the societal benefits of the rule will outweigh its costs. The process of creating this cost-benefit analysis, formally known as Regulatory Impact Analysis (RIA), is regulated by various statutes, executive orders, and Office of Management and Budget (OMB) guidance requirements designed to ensure the quality of the findings. RIAs are designed to provide affected entities, agencies, Congress, and the public with important information about the potential effects of new regulations (GAO 2014).

A recent investigation into EPA cost-benefit analyses shows the agency has routinely failed to follow OMB rules. The Government Accountability Office (GAO) reports EPA's cost-benefit analyses are of questionable value for creating policy and EPA did not "adhere to guidance requiring it to communicate information supporting regulatory decisions and enable a third party to understand how the agency arrives at its conclusions" (GAO 2014). Without complete and accurate RIAs, it is impossible to determine whether the cost-benefit conclusions drawn by EPA are valid.

A prime example of EPA data manipulation is the agency's analysis of the so-called "social cost of carbon" (SCC), where regulators used one set of assumptions to calculate the benefits of regulating carbon and a different set of assumptions to calculate the costs, resulting in numbers supporting EPA's intent to regulate carbon dioxide emissions (GAO 2014). GAO's findings support other studies that have concluded SCC estimates are so unstable in response to changes in assumptions as to make the SCC calculation entirely unsuitable for regulatory policy (Dayaratna and Kreutzer 2014). On March 28, 2017, Trump issued an executive order prohibiting the use of Obama's SCC calculations in rulemaking (White House 2017).

EPA ignores regulatory best practices in order to justify its attempts to concentrate more power within the agency and implement economically damaging regulations not supported by sound science. The good news is the nation's environmental problems have largely been solved in the years since EPA's formation. Further, Trump is in the process of addressing the practices that make EPA a greater threat to public health than is the pollution the agency allegedly is fighting.

Policy Agenda

Past efforts to reform EPA have failed because the incentives for the agency to pursue an impossible "zero risk" goal are simply too strong. A huge and permanent bureaucracy is largely ideologically committed to that goal and resists efforts by Congress and even presidents to change.

Rather than reform EPA, we recommend *replacing it* with a "committee of the whole" representing environmental agencies of the 50 states tasked with a limited agenda of fostering cooperation among the states and resolving interstate disputes. A plan to do this was worked out by Jay Lehr, a distinguished scientist who helped write the Clean Air Act and Clean Water Act (Lehr 2014). It's an ambitious plan, to be sure, but we fear nothing less will work to rein in EPA.

Recommended Readings: Jay Lehr, Replacing the Environmental Protection Agency, The Heartland Institute, 2014; Government Accountability Office, Environmental Regulation: EPA Should Improve Adherence to Guidance for Selected Elements of Regulatory Impact Analysis (Washington, DC: U.S. Government Accountability Office, 2014).

References

American Council on Renewable Energy. 2014. "Renewable Energy in Connecticut." *Renewable Energy in the 50 States.* June.

Anderson, Soren T. 2012. "The Demand for Ethanol as a Gasoline Substitute." *Journal Environmental Economics and Management* **63** (2): 151–68. doi:10.1016/j.jeem.2011.08.002.

Anishchuk, Alexei. 2014. "Russia Warns Europe of Gas Supply Cuts Over Ukraine Debt." *Reuters*. April 10.

Arizona Power Authority. 2012. "Hoover Dam (website)." Accessed August 21, 2017.

Bartik, Alexander W. *et al.* 2016. "The Local Economic and Welfare Consequences of Hydraulic Fracturing." National Bureau of Economic Research. December 22.

Bast, Joseph. 2010. "Analysis: New International Survey of Climate Scientists." The Heartland Institute.

——. 2016. "Pro-Environment, Pro-Energy, and Pro-Jobs." *Policy Tip Sheet*. The Heartland Institute. August 10.

Bast, Joseph, and Roy Spencer. 2014. "The Myth of the Climate Change '97%'." *The Wall Street Journal*. May 26.

Behrens, Carl E., Michael Ratner, and Carol Glover. 2011. U.S. Fossil Fuel Resources: Terminology, Reporting, and Summary. Washington, DC: Congressional Research Service.

Benson, Tim. 2017a. "Peer-Reviewed Study Says Hydraulic Fracturing Not Responsible for Groundwater Contamination in West Virginia." *Research & Commentary*. The Heartland Institute. May 15.

______. 2017b. "Thanks to Mitigation Measures, Induced Seismicity Risks Dropping Quickly." *Research & Commentary*. The Heartland Institute. April 5. https://www.heartland.org/publications-resources/publications/research--commentary-thanks-to-mitigation-measures-induced-seismicity-risks-dropping-quickly.

Benson, Tim, *et al.* 2017. "Heartland Institute Experts React to New EPA Fuel Standards." The Heartland Institute. January 13.

Bentsen, Lloyd. 2016. "Available and Off-Limits Offshore U.S. Oil and Natural Gas Resources." National Center for Policy Analysis. March 30.

Bergholt, D., and P. Lujala. 2012. "Climate-Related Natural Disasters, Economic Growth and Armed Conflict." *Journal of Peace Research* **49** (1): 147–62.

Bezdek, Roger. 2016. "Essential Role of Fossil Fuels in Future Economic Growth." *Public Utilities Fortnightly.* September.

Biello, David. 2009. "Navy Green: Military Investigates Biofuels to Power Its Ships and Planes." *Scientific American*. September 14.

Bray, Dennis, and Hans von Storch. 2016. *The Bray and von Storch 5th International Survey of Climate Scientists 2015/2016.*

Bryce, Robert. 2016. "Cheating VW's Are Cleaner Than Ethanol." *Bloomberg.* January 20.

Bureau of Land Management. 2014. "Table 3. Total Number of Acres Under Lease As of the Last Day of the Fiscal Year (website)." Accessed August 21, 2017.

Burnett, H. Sterling. 2015. "Pulling the Plug on Renewable Energy." *Freedom Pub* (blog). April 1.

Calabrese, E.J. 2015. "On The Origins Of The Linear No-Threshold (LNT) Dogma By Means Of Untruths, Artful Dodges And Blind Faith." *Environmental Research* **142** (October): 432–42.

Carpenter, Claudia. 2017. "Russia Overtakes Saudi Arabia as World's Top Crude Oil Producer." February 20.

Carroll, Joe. 2006. "Global Oil Output Won't Peak Until 2030, Yergin Says." Bloomberg.

Cellarius, Doris. 2015. "Sierra Club Guidance on Biofuels." Sierra Club Grassroots Network.

Chase, Alston. 1995. In a Dark Wood: The Fight Over Forests and the Rising Tyranny of Ecology. Boston, MA: Houghton Mifflin Company.

Christy, John. 2016. Testimony to U.S. House Committee on Science, Space & Technology. February.

Clack, Christopher T.M., *et al.* 2017. "Evaluation Of A Proposal For Reliable Low-Cost Grid Power With 100% Wind, Water, And Solar." *PNAS* **114** (26).

Commission on Energy and Geopolitics. 2014. *Oil Security 2025: US National Security Policy in an Era of Domestic Oil Abundance*. Washington, DC: Securing America's Future Energy.

Considine, Timothy J. 2016. "Evaluating the Costs and Benefits of Renewable Portfolio Standards." National Resource Economics, Inc.

COGCC (Colorado Oil and Gas Conservation Commission). n.d. COGCC Gasland Correction Document. Accessed August 21, 2017.

Crain, Mark. 2014. "The Cost of Federal Regulation to the U.S. Economy, Manufacturing and Small Business." National Association of Manufacturers. September 10.

Cravens, Gwyneth. 2007. *Power to Save the World: The Truth about Nuclear Energy*. New York, NY: Alfred A. Knopf.

CSIRO Australia. 2013. "Deserts 'Greening' from Rising Carbon Dioxide: Global Foliage Boosted across the World's Arid Regions." *Science Daily*.

Dayaratna, Kevin D., and David W. Kreutzer. 2014. "Unfounded FUND Yet Another EPA Model Not Ready for the Big Game." The Heritage Foundation.

Dears, Donn. 2015. *Nothing to Fear: A Bright Future for Fossil Fuels*. The Villages, FL: Critical Thinking Press.

——____. 2017. Clexit for a Brighter Future: The Case for Withdrawing from United Nations' Climate Treaties. The Villages, FL: Critical Thinking Press.

DoD (Department of Defense). 2013. *Fiscal Year 2012 Operational Energy Annual Report*. Washington, DC: U.S. Department of Defense.

Driessen, Paul. 2003. *Eco-imperialism: Green Power, Black Death*. Bellevue, WA: Merril Press.

—. 2014. Quadrennial Defense Review. March 4.

EIA (U.S. Energy Information Administration). n.d. "How Much Carbon Dioxide Is Produced Per Kilowatt Hour When Generating Electricity With Fossil Fuels? (website)." Accessed July 12, 2017.

——. 2010. "Levelized Cost of New Generation Resources in the Annual Energy Outlook (website)." Accessed July 12, 2017.

——. 2015a. "U.S. Energy-Related Carbon Dioxide Emissions, 2014 (website)." Accessed July 12, 2017.

. 2015b. "International Energy Statistics (website)." Accessed August 21, 2017.

_____. 2015d. "U.S. Field Production of Crude Oil (website)." Accessed August 21, 2017.

——.2016a. "How Much Oil Is Consumed in the United States? (website)." March 17. Accessed July 12, 2017.

-------.2016c. "How Much Oil Consumed by the United States Comes from Foreign Countries? (website)." October 13. Accessed July 12, 2017.

_____. 2017. "Petroleum & Other Liquids Data (website)." Accessed February 27, 2017.

Enstrom, James. 2017. "Fine Particulate Matter and Total Mortality in Cancer Prevention Study Cohort Reanalysis." *Dose-Response: An International Journal* **15** (1): 1–12. doi: 10.1177/1559325817693345.

Environmental News Network. 2012. "Why Are We Not Drowning in Algae Biofuel?" *Oil Price*.

EPA (Environmental Protection Agency). 2015b. "Fact Sheet: Clean Power Plan Overview, Cutting Carbon Pollution From Power Plants (website)." Accessed October 30, 2015.

. 2015a. "Air Quality Trends (website)." Accessed November 23, 2016.

———. 2016a. "Hydraulic Fracturing for Oil and Gas: Impacts from the Hydraulic Fracturing Water Cycle on Drinking Water Resources in the United States (Final Report)."

_____. 2016b. "National Air Quality: Status and Trends of Key Air Pollutants (website)." Accessed July 12, 2017.

Epstein, Alex. 2014. *The Moral Case for Fossil Fuels*. New York, NY: Penguin Publishing Group.

Fargione, Joseph, Jason Hill, David Tilman, Stephen Polasky, and Peter Hawthorne. 2008. "Land Clearing and the Biofuel Carbon Debt." *Science* **319** (5867): 1235–8. doi:10.1126/science.1152747.

FJC (Federal Judicial Center. 2011. *Reference Manual on Scientific Evidence. Third Edition.* Federal Judicial Center and National Research Council of the National Academies. Washington, DC: National Academies Press.

Federal Register. 2015. "Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units." October 23.

Frank, Charles. 2014. "Why the Best Path to a Low-Carbon Future is Not Wind or Solar Power." Brookings Institution. May 20.

GAO (Government Accountability Office). 2014. Environmental Regulation: EPA Should Improve Adherence to Guidance for Selected Elements of Regulatory Impact Analysis. Washington, DC: U.S. Government Accountability Office.

Gilje, Erik, Robert Ready, and Nikolai Roussanov. 2016. "Fracking, Drilling, And Asset Pricing: Estimating The Economic Benefits Of The Shale Revolution." *Working Paper* 22914. National Bureau of Economic Research. December.

Glennon, Robert. 2009. "The Unintended Consequences of Solar Power." *Washington Post.* June 7.

Global Warming Petition Project. n.d. Website accessed July 17, 2017.

Goklany, Indur M. 2012. "Humanity Unbound: How Fossil Fuels Saved Humanity From Nature And Nature From Humanity." *Cato Policy Analysis* #715. Cato Institute.

Goklany, Indur M. 2007. *The Improving State of the World: Why We're Living Longer, Healthier, More Comfortable Lives on a Cleaner Planet.* Washington, DC: Cato Institute.

Green, Kesten and J. Scott Armstrong. 2007. "Global Warming: Forecasts By Scientists Versus Scientific Forecasts." *Energy and Environment* **18**: 997–1021.

Green, Mark. 2013. "Unlock US Energy Potential: Offshore Oil and Gas." *The Energy Collective* (website). Accessed August 21, 2017.

Grunwald, Michael. 2008. "The Clean Energy Scam." Time. March 27.

Hao, Z., *et al.* 2014. "Global Integrated Drought Monitoring And Prediction System." *Scientific Data* **1**:140001. doi: 10.1038/sdata.2014.1.

Harkness, Jennifer S., *et al.* 2017. "The Geochemistry Of Naturally Occurring Methane And Saline Groundwater In An Area Of Unconventional Shale Gas Development." *Geochimica et Cosmochimica Acta* 208 (1): 302–34.

Harris, Andy, and Paul Broun. 2011. "Letter to The Honorable Cass R. Sunstein." U.S. House of Representatives Committee on Science, Space, and Technology. November 15.

Harrison Jr., David, Albert L. Nichols, James Johndrow, Mark LeBel, and Bernard Reddy. 2008. *Evaluation of NHTSA's Benefit-Cost Analysis of 2011-2015 CAFE Standards*. New York, NY: NERA Economic Consulting.

Hartnett White, Kathleen, and Stephen Moore. 2016. Fueling Freedom: Exposing the Mad War on Energy. New York, NY: Regnery Publishing.

Hayden, Howard. 2000. "Wind Turbines & Power Density." *The Energy Advocate* (website). Accessed August 21, 2017.

Hayward, S. 2011. *Almanac of Environmental Trends*. San Francisco, CA: Pacific Institute for Public Policy Research.

Hayward, Thomas B., Edward S. Briggs, and Donald K. Forbes. 2014. *Climate Change, Energy Policy, and National Power*. Chicago, IL: The Heartland Institute.

Hennessy, Keith. 2009. "Understanding the President's CAFE Announcement." May 19.

Henry, Devin. 2017. "Maryland Governor Signs Fracking Ban into Law." *The Hill*. April 4.

Hill, A.B. 1965. "The Environment and Disease: Association or Causation?" *Proceedings* of the Royal Society of Medicine **58** (5): 295–300.

Hinderaker, John. 2015. "Global Warming: A \$1.5 Trillion Industry." *Powerline* (website). August 9.

Hubbell, Bryan J., Aaron Hallberg, Donald R. McCubbin, and Ellen Post. 2005. "Health-Related Benefits of Attaining the 8-Hr Ozone Standard." *Environmental Health Perspectives* **113** (1): 73–82. doi:10.1289/ehp.7186.

Huber, Peter W., and Mark P. Mills. 2005. *The Bottomless Well*. New York, NY: Basic Books.

Humphries, Marc. 2014. U.S. Crude Oil and Natural Gas Production in Federal and Non-Federal Areas. Washington, DC: Congressional Research Service. April 10.

IAC (InterAcademy Council). 2010. *Climate Change Assessments: Review of the Processes & Procedures of IPCC.* Committee to Review the Intergovernmental Panel on Climate Change. October.

Idso, Craig D., Robert M. Carter, and S. Fred Singer. 2009. *Climate Change Reconsidered: Report of the Nongovernmental International Panel on Climate Change NIPCC)*. Chicago, IL: The Heartland Institute.

——. 2011. *Climate Change Reconsidered: 2011 Interim Report*. Chicago, IL: The Heartland Institute.

——. 2013. Climate Change Reconsidered II: Physical Science. Chicago, IL: The Heartland Institute.

-------. 2016. Why Scientists Disagree About Global Warming: The NIPCC Report on Scientific Consensus second edition. Arlington Heights, IL: The Heartland Institute.

Idso, Craig D., Sherwood B. Idso, Robert M. Carter, and S. Fred Singer. 2014. *Climate Change Reconsidered II: Biological Impacts*. Chicago, IL: The Heartland Institute.

IPCC (Intergovernmental Panel on Climate Change). 1990. "Observed Climate Variations and Change." In *Climate Change: The IPCC Scientific Assessment*. Cambridge, United Kingdom: Cambridge University Press.

——. 2007. "Projections of Future Changes in Climate." In *Working Group I Report The Physical Science Basis.* Cambridge, United Kingdom: Cambridge University Press..

Kabat, Geoffrey C. 2016. *Getting Risk Right: Understanding the Science of Elusive Health Risks.* New York, NY: Columbia University Press.

King, Jeffrey C., Jamie Lavergne Bryan, and Meredith Clark. 2012. "Factual Causation: The Missing Link in Hydraulic Fracture—Groundwater Contamination Litigation." *Duke Environmental Law & Policy Forum* **22** (Spring): 341–60.

Kleit, Andrew N. 2002. "CAFE Changes, by the Numbers." Regulation. Fall.

Knickmeyer, Ellen, and John Locher. 2014. "Emerging Solar Plants Scorch Birds in Mid-Air." Associated Press.

Knoema. 2016. "World GDP Ranking 2016 | Data and Charts | Forecast (website)." Accessed July 12, 2017.

Koubi, V., T. Bernauer, A. Kalbhenn, and G. Spilker. 2012. "Climate Variability, Economic Growth, and Civil Conflict." *Journal of Peace Research* **49** (1): 113–27.

Kreutzer, David. 2012. "Renewable Fuel Standard, Ethanol Use, and Corn Prices." *Backgrounder*. The Heritage Foundation. September 17.

Kreutzer, David, Nicolas D. Loris, Katie Tubb, and Kevin Dayaratna. 2016. "The State of Climate Science: No Justification for Extreme Policies." *Backgrounder*. The Heritage Foundation. April 26.

Kueter, Jeff. 2012. *Climate and National Security: Exploring the Connection*. George C. Marshall Institute.

Lehr, Jay. 2014. *Replacing the Environmental Protection Agency*. Chicago, IL: The Heartland Institute.

Liska, Adam J., Haishun Yang, Maribeth Milner, Steve Goddard, Humberto Blanco-Canqui, Matthew P. Pelton, Xiao X. Fang, Haitao Zhu, and Andrew E. Suyker. 2014. "Biofuels from Crop Residue Can Reduce Soil Carbon and Increase CO₂ Emissions." *Nature Climate Change* **4**: 398–401. doi:10.1038/nclimate2187.

Loris, Nicolas. 2013. "The Ethanol Mandate: Don't Mend It, End It." The Heritage Foundation.

——. 2016. "Examining the Renewable Fuel Standard." The Heritage Foundation. March 17.

Michaels, Patrick. 2013. "Reduce U.S. Carbon Dioxide Emissions To Zero, And the Temperature Decrease By 2100 Will Be Undetectable." *Forbes* (website).

Michaels, Patrick, and Chip Knappenberger. 2013. "We Calculate, You Decide: A Handy-Dandy Carbon Tax Temperature Savings Calculator." *Cato at Liberty* (blog). July 23.

Milloy, Steve. 2016. *Scare Pollution: Why and How to Fix the EPA*. Washington, DC: Bench Press.

Monckton, C., W. W.-H Soon, D.R. Legates, and W.M. Briggs. 2015. "Keeping It Simple: The Value Of An Irreducibly Simple Climate Model." *Science Bulletin* **60** (15): 1378–90.

Moore, S. and J. Simon. 2000. It's Getting Better All the Time: 100 Greatest Trends of the Last 100 Years. Washington, DC: Cato Institute.

Murdock, Deroy. 2012. "CAFE Standards Kill." National Review Online. April 26.

Murphy, Robert P. 2011. "Will Fuel Economy Mandates Increase Car Company Profits?" Institute for Energy Research.

National Academy of Sciences. 2001. Report of the National Academy of Sciences on the Effectiveness and Impact of Corporate Average Fuel Economy (CAFE) Standards. August 2.

National Research Council. 2012. Sustainable Development of Algal Biofuels in the United States. Washington, DC: The National Academies Press. doi:10.17226/13437.

Nuclear Energy Institute. 2014. "On-Site Storage of Nuclear Waste (website)." Accessed August 21, 2017.

_____. 2015. "Top 10 Facts About Yucca Mountain (website)." Accessed August 21, 2017.

Obama, Barack. 2008. Interview with the Editorial Board of the *San Francisco Chronicle* (video). January 17. Accessed August 21, 2017.

Orr, Isaac. 2013. "Hydraulic Fracturing a Game-Changer for U.S. Energy and Economies." *Policy Study*. The Heartland Institute. November.

——. 2016. "Bill McKibben's Terrifying Disregard for Fracking Facts." *Policy Brief.* The Heartland Institute. August 19.

Pielke Jr., Roger. 2014. *The Rightful Place of Science: Disasters and Climate Change*. Tempe, AZ: Arizona State University Consortium for Science Policy and Outcomes.

Raleigh, C., and D. Kniveton. 2012. "Come Rain or Shine: An Analysis of Conflict and Climate Variability in East Africa." *Journal of Peace Research* **49** (1): 51–64.

Roadmap. 2017. "National Defense." *Roadmap for the 21st Century*. National Tax-Limitation Committee and The Heartland Institute. February.

Remote Sensing Systems. 2015. "Global and Regional Time Series (website)." Accessed August 21, 2017.

Schwartz, Joel. 2006. "Health Risks of Ozone Are Exaggerated." *Environment & Climate News*. April.

Searchinger, Timothy, Ralph Heimlich, R.A. Houghton, Fengxia Dong, Amani Elobeid, Jacinto Fabiosa, Simla Tokgoz, Dermot Hayes, and Tun-Hsiang Yu. 2008. "Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land-Use Change." *Science* **319** (5867): 1238–40. doi:10.1126/science.1151861.

Slettebak, R. 2012. "Don't Blame the Weather! Climate-Related Natural Disasters and Civil Conflict." *Journal of Peace Research* **49** (1): 163–76.

Smallwood, K. Shawn. 2013. "Comparing Bird and Bat Fatality-Rate Estimates among North American Wind-Energy Projects." *Wildlife Society Bulletin* **37** (1): 19–33. doi:10.1002/wsb.260.

Smith, Taylor. 2014a. "The Limitations on Solar Power." *Research & Commentary*. The Heartland Institute.

Spencer, Roy W. 2010. The Great Global Warming Blunder: How Mother Nature Fooled the World's Top Climate Scientists. New York, NY: Encounter Books.

Spiegel. 2013. "How Electricity Became a Luxury Good." September 7.

Stevens, Landon. 2016. *Ethanol and Renewable Fuel Standard*. Institute of Political Economy at Utah State University. February.

Taylor, James. 2012. "Shock Poll: Meteorologists Are Global Warming Skeptics." *Forbes* (website).

——. 2013a. "Fortified By Global Warming, Crop Production Keeps Breaking Records." *Forbes* (website).

——. 2013b. "Thank Global Warming for Softening the Blow of Hurricane Sandy." *Forbes* (website).

-------. 2014a. "Kansas Renewable Power Mandates Causing Skyrocketing Electricity Prices." *Environment & Climate News*. January 24.

——. 2014b. "Wind Industry Study: Electricity Prices Skyrocketing In Largest Wind Power States." *Forbes* (website)..

——. 2014c. "Ethanol from Corn Residue Increases CO2 Emissions." *Environment & Climate News*. May.

Theisen, O.M., N.P. Gleditsch, and H. Buhaug. 2013. "Is Climate Change a Driver of Armed Conflict?" *Climatic Change* **117**: 613–25.

Tol, R., and S. Wagner. 2010. "Climate Change and Violent Conflict in Europe Over the Last Millennium." *Climatic Change* **99** (1–2): 65–79.

Trump, Donald. 2017. "An America First Energy Plan (website)." Accessed August 21, 2017.

Tubiana, Maurice, *et al.* 2009. "The Linear No-Threshold Relationship Is Inconsistent with Radiation Biologic and Experimental Data." *Radiology* **251** (1): 13–22.

Urbanchuk, John. 2016. "Contribution of the Ethanol Industry to the Economy of the United States in 2015." Renewable Fuels Association. February 5.

United States Chamber of Commerce. 2016. "What If Hydraulic Fracturing Was Banned?" Institute for 21st Century Energy. November 4.

Wagner, David, Paulina Nusinovich, and Esteban Plaza-Jennings. 2012. *The Effect of Proposed MY 2017–2025 Corporate Average Fuel Economy (CAFE) Standards on the New Vehicle Market Population*. Tysons, VA: National Automobile Dealers Association.

Ware, Doug. 2016. "Obama Bans Offshore Drilling in 115M More Acres in Atlantic, Arctic." United Press International. December 21.

White House. 2017. "Presidential Executive Order on Promoting Energy Independence and Economic Growth." March 28.

World Nuclear News. 2014. "UN Reports on Fukushima Radiation." April 2.

Young, Ryan. 2012. "Regulatory Report Card: Environmental Protection Agency." Competitive Enterprise Institute. December 19.

Young, S., R. Smith, and K. Lopiano. 2017. "Air Quality and Acute Deaths in California, 2000–2012." *Regulatory Toxicology and Pharmacology* **88**: 173–84.

Zhang, D., P. Brecke, H. Lee, Y.-Q. He, and J. Zhang. 2007. "Global Climate Change, War, and Population Decline in Recent Human History." *PNAS* **104** (49): 19214–19.

Zycher, Benjamin, 2014. "Five questions for Mr. Tom Steyer." *National Review* (website). April 22. Accessed August 21, 2017.

Additional Resources

Additional information about energy and environment issues is available from The Heartland Institute:

- PolicyBot, The Heartland Institute's free online clearinghouse for the work of other free-market think tanks, contains thousands of documents on environment and climate issues. It is on Heartland's website at https://www.heartland.org/policybot/.
- https://www.heartland.org/Center-Climate-Environment is the website of the Arthur B. Robinson Center on Climate and Environmental Policy, devoted to the latest research, news, and commentary about environment and climate issues. Read headlines, watch videos, or browse the thousands of documents on energy and environment issues available from *PolicyBot*.
- Environment & Climate News is The Heartland Institute's monthly newspaper devoted to this topic. Subscriptions with digital delivery are free, print subscriptions are \$36/year for 10 issues.

- http://climateconferences.heartland.org/ is the home page for The Heartland Institute's International Conferences on Climate Change, 12 of which have been held since March 2008. Video of hundreds of presentations on the causes, consequences, and economics of climate change are available here.
- http://climatechangereconsidered.org/ is the home page for the series of *Climate Change Reconsidered* books published by the Nongovernmental International Panel on Climate Change (NIPCC). The entire text of all volumes is available here for free download.

Directory

The following organizations produce reliable information on energy and environment topics.

- 1000Frolley, https://www.youtube.com/user/1000frolly
- Bishop Hill, http://www.bishop-hill.net/
- Biweekly Updates from the Cooler Heads Coalition, http://www.globalwarming.org/category/blog/
- C3 Headlines, http://www.c3headlines.com/
- Center for Energy and Environment, Competitive Enterprise Institute, http://cei.org/issues/energy-and-environment
- Climate Audit, https://climateaudit.org/
- Climate Policy, The Heritage Foundation, http://www.heritage.org/issues/energy-and-environment
- Climate Depot by Marc Morano, http://www.climatedepot.com/
- Climate Etc., https://judithcurry.com/
- Climate in Review, by C. Jeffery Small, http://gogalt.org/climategate.html
- Climate Exam, http://www.climatexam.com/
- CO2 Coalition, co2coalition.org
- CO2 Science, http://www.co2science.org/
- Committee for a Constructive Tomorrow, http://www.cfact.org

- Cooler Heads Digest, http://www.globalwarming.org/2012/01/22/coolerheads-digest
- Cornwall Alliance for the Stewardship of Creation, http://www.cornwallalliance.org/
- Dr. Roy Spencer, http://www.drroyspencer.com/
- Gelbspan Files, http://www.gelbspanfiles.com
- Global Science Report, http://www.cato.org/blog/tags/global-sciencereport
- Global Warming, Cato Institute, http://www.cato.org/global-warming
- GlobalWarming.org, http://www.Globalwarming.Org
- Heartland Institute, https://www.heartland.org/
- ICECAP by Joseph D'Aleo, http://www.icecap.us
- International Conferences on Climate Change, http://climateconference.heartland.org
- International Climate Science Coalition, http://climatescienceinternational.org/
- JoNova, hosted by Joanne Nova, http://joannenova.com.au/
- Junk Science by Steve Milloy, http://junkscience.com/
- Master Resource, http://www.masterresource.org/
- No Tricks Zone, http://notrickszone.com/
- Power for USA, http://dddusmma.wordpress.com/
- Real Science, https://realclimatescience.com
- Science and Public Policy Institute, http://scienceandpublicpolicy.org/
- Science and Environmental Policy Project (SEPP), http://sepp.org/
- The Climate Bet, http://www.theclimatebet.com/
- Watts Up With That? by Anthony Watts, http://wattsupwiththat.com
- WiseEnergy, http://wiseenergy.org/
- World Climate Report by Dr. Patrick Michaels, http://www.worldclimatereport.com/