Examination of Alternative Energy as a U.S. National Security Priority: 1987 – 2017

Examination of Alternative Energy as a U.S. National Security Priority: 1987 – 2017

Nancy O'Nita Smalley

A Thesis in the Field of International Relations

for the Degree of Master of Liberal Arts in Extension Studies

Harvard University

May 2023

Abstract

Alternative energy development has been a consistent priority of U.S. National Security Strategies since 1987. Despite the prioritization, alternative energy is still in early emergence and diffusion stages. An examination of the national security prioritization of alternative energy against global oil prices and budget allocations for alternative research and development is examined to determine if there are any correlations. No correlation between the examined data is found. The U.S. Government should work towards policy integration to ensure consistent prioritization and subsequent budget allocations to make a transition towards greater energy independence using alternative energy sources, while ensuring sustained focus.

Author's Biographical Sketch

Nancy Smalley is a military veteran and analyst who is passionate about blending environmental policy and sustainability with national security. Nancy was born in Mississippi and knew by the early age of five she wanted to attend either Harvard or Yale University. Her initial career goal was to work in international business, but after discovering Foreign Affairs magazine as a teen, she quickly became interested in international relations.

After serving seven years active duty in the U.S. Army with one combat tour in Afghanistan, Nancy continued her career as a defense contract analyst in Washington D.C. After completing a bachelor's degree in international relations, she embarked on a master's degree from Harvard Extension School because of the ability to blend international relations coursework with sustainability studies, and the flexibility to complete her degree without taking an absence from her career. Through her studies, she knew she wanted to focus on the intersection of the environment and national security. While researching a thesis topic, she realized a strong interest in the energy sector as an underpinning of security and defense as well as its strong impact on the environment.

Dedication

This thesis is dedicated to all of those who have believed in me and supported me throughout my education – from the earliest days to present. There are far more people here than I could possibly mention, but you all know who you are.

My husband – thank you for your never-ending love and support.

My mother and grandmothers – thank you for raising me to be a strong woman with perseverance, tenacity, and an enduring curiosity. Mavis, Bobbie, Betty, and Flora Mae, I couldn't have asked for more.

To the rest of my family – thank you for believing in me and supporting me through some of the most difficult times of continuous academic pursuits.

To my friends – thank you for the emotional support and shoulder to lean on.

To my former teachers – thank you for the motivation and inspiration.

Acknowledgments

Thank you to everyone who had a hand in developing this thesis. First to my husband, Nick Smalley, who has been a sounding board through the development of this research. Next, to the amazing teaching staff and librarians at Harvard, who have set the standard for educators. A particular thanks to Dr. Doug Bond, who goes above and beyond as an educator to help his students. To my colleagues, thank you for the support, flexibility, and outstanding editing skills – specifically Sarah Halye and Paula Marlowe. My dear friend, Whitney Collums, thank you for the emotional support and listening ear needed to overcome the hurdles for this research effort. And last, but certainly not least, to my Father-in-Law, Steve Smalley, for the final proofread.

Table of Contents

List of Tables

List of Figures

Chapter I.

Introduction

The past is an inheritance, a gift and a burden.
It can't be shirked. You carry it everywhere.
There's nothing for it but to get to know it.
-Jill Lepore

National security is a cornerstone priority for all governments. Moreover, energy is a foundational piece of critical infrastructure for economic power and defense of countries. It is widely recognized that energy sources directly impact the environment. The environment is also a high priority for most governments, though its prominence has waxed and waned across American presidential administrations. The intersectionality of these interests is perhaps more important than either topic independently because environmental drivers are what brought the possibility of non-petroleum energy sources to the forefront. This thesis recognizes the environment as an impetus to alternative energy development and as a secondary driver to implement alternative energy infrastructure. To that end, the focus of this thesis research lies at this junction of national security and the development of alternative energy. However, the focus of this research is on the role establishing alternative energy as a national security priority played in moving the United States toward energy independence by decreasing reliance on energy imports and increasing domestic alternative energy sources.

In the 1970s, the concept of national security was expanded to include economics because it was recognized that globalization would mean that foreign economic policies could impact those of the United States.[1] To that end, energy became a key focus of U.S. national security strategies, initially as part of Economic Policy, though over the years, Energy Security evolved to be an independent concern. In 1988, the need for alternative energy development was prioritized as part of a vision for the U.S. to gain greater energy independence.[2] In the last 20 years, the discourse changed to focus on the need for alternative energy development in order to move away from finite fossil fuel energy sources that also pollute the environment instead of prominently featuring the need to gain energy independence. Regardless, both justifications for alternative energy are still valid today. Since the second codified National Security Strategy (NSS) in 1988, all presidential administrations in the U.S. have explicitly recognized the need to develop alternative energy as a necessity of national security, and yet, the United States still relies on petroleum and other fossil fuel energy sources (natural gas, coal) to supply more than 70% of energy.[3]

For 35 years, NSS's have explicitly invoked the need for alternative energy development.[4] Though there was widespread interest in energy sources and the environment in the 1960s and 1970s and was a topic in government legislature[5], there

[1]Jessica Tuchman Mathews, "Redefining Security," *Foreign Affairs*, Spring 1989.
[2] The White House, "National Security Strategy of The United States," January 1988, https://history.defense.gov/Historical-Sources/National-Security-Strategy/.
[3] U.S. Energy Information Administration, "U.S. Energy Facts Explained," Accessed February 1, 2023, https://www.eia.gov/energyexplained/us-energy-facts/.
[4] See Analysis section for full account of alternative energy prioritization in national security strategies from 1987-2017.
[5] Jill Lepore, "For the Birds," *The Last Archive,* Pushkin Industries, podcast audio, July 9, 2020.

was no formalized NSS.[6] Prior to 1987, the NSS was crafted verbally, thus harder to assess. Early formalization of environmental concerns in the first NSS indicates high prioritization, maintained by successive administrations. The lack of proportional alternative energy development progress therefore warrants assessment of subsequent budgeting of federal government alternative energy research and development.

The second published NSS in 1988 by President Reagan contained two significant mentions of environmental issues. The first mention regarded the depletion of natural environmental endowments such as forests, soil, water, and air in other countries and how that would impact the global community.[7] The second mention was of energy sources in the United States and that ensuring adequate energy supplies was vital to American economic, industrial, and military strength.[8] Both concerns remain relevant and interrelated today. President Reagan encouraged the development of alternative energy sources, yet more than 30 years later, the U.S. is still heavily reliant on oil and gas. The objective of this thesis therefore is to develop a better understanding of the impact of NSS on alternative energy development prioritization to the U.S. energy sector since 1988.

Since 1988, alternative energy development continued to be prioritized as a national security concern, but in 2022, the U.S. faced new foreign import energy challenges and rising oil and gas prices impacting the economy and general public. This research recognizes the importance of maintaining current energy sources to power the current infrastructure while planning for the future of energy independence using

[6] Richard B. Doyle, "The U.S. National Security Strategy: Policy, Process, Problems," ed. Nancy Roberts, Naval Postgraduate School, 2007.
[7] The White House, "National Security Strategy," 1988.
[8] The White House, "National Security Strategy," 1988.

domestic alternative energy sources. Insofar as planning, it was recognized in the early national security strategies, yet the U.S. is still heavily reliant on the same petroleum-based energy and infrastructure as it was in 1988. Therefore, the aim of this research is thus to examine shortcomings in alternative energy prioritization as a national security concern from 1987 to 2017.

In 2022, the U.S. government passed two of the most significant pieces of federal legislation to support the environment and alternative energy production. President Biden invoked the Defense Production Act to accelerate clean energy production,[9] and both Senate and Congress passed the Inflation Reduction Act that included $369 billion for renewable energy infrastructure and climate change remediation.[10] These appropriations provide incentives for the U.S. public and private sector to invest in alternative energy infrastructure, including solar energy technology for the power grid and transportation sector. This represents a major milestone in alternative energy development and a step toward greater alternative energy independence for the United States. Nevertheless, consistent NSS prioritization of alternative energy development suggests the need for taking similar action at an earlier stage.

At first glance, it could be believed that prioritizing alternative energy development in the NSS made it a top priority of the U.S. federal government; however, subsequent budgeting and resource allocation is required to make NSS priorities a success.[11] Stating something as a priority does not mean it will be achieved. Resources

[9] The White House, "Defense Production Act," June 6, 2022, https://www.whitehouse.gov/briefing-room/statements-releases/2022/06/06/fact-sheet-president-biden-takes-bold-executive-action-to-spur-domestic-clean-energy-manufacturing/.
[10] The White House, "The Inflation Reduction Act," August 15, 2022, https://www.whitehouse.gov/briefing-room/speeches-remarks/2022/07/28/remarks-by-president-biden-on-the-inflation-reduction-act-of-2022/.
[11] Doyle, "National Security Strategy".

and follow through are required. In order to examine alternative energy prioritization, this research will address the following questions: To what extent are NSS statements reflective of the prioritization of alternative energy development in the United States? How does the National Security Strategy prioritization of alternative energy development contrast with average U.S. oil prices in corresponding years? Is there a relationship between national security alternative energy prioritization and government appropriations for alternative energy research and development?

The primary hypothesis herein is that even though alternative energy development was recognized as a national security priority starting in 1988, policy and legislation was focused on the near-term energy access status quo and unsustained resource allocation to maximize alternative energy development. To test this hypothesis and answer the identified research questions, data will be synthesized from 30 years of National Security Strategies for mentions of alternative energy prioritization and contrasted against average U.S. oil import prices and budget allocations for Department of Energy alternative energy research and development.

Until this point, studies have argued whether the environment is a national security issue, and have examined failings in energy policy, particularly in the 1970s and 1980s, to assess why the U.S. did not prioritize renewable energy when there was an environmental movement and strong public and political support following energy crises. What is missing from these studies is an examination of energy policy as an environmental national security priority, and whether the inclusion of energy in the environmental context as a national security priority impacted appropriations for renewable energy. An assessment of NSS prioritization of alternative energy

development, including potential external influences such as oil prices, and subsequent appropriations for research and development, is critical to understanding the progress of U.S. energy development and may provide insight for future policy.

Chapter II.

Background

The history of how alternative energy gained political prominence is important to contextualize the importance of developing domestic alternative energy for national security reasons. This section will review a short history of U.S. energy sources by type and some of the events to brought alternative energy options into focus. After that, it will cover some of the background of putting the onus of energy research and development on the free market, as well as policy issues related to stimulating development. Next, this section reviews some of the function of the NSS for context on how it functions and serves as the framework for more specific doctrine and policy. Finally, it will review some of the impediments to replacing fossil fuels with alternative energy.

Much of the background and analysis will focus 1987 to 2017, but some background and contextual information will start earlier. Presidential administrations are mentioned to mark policies and concerns of the time. This chart is intended as a reference to sync presidential administrations with time periods discussed.

Figure 1. Presidential Administrations from Nixon to Trump

Description of Figure 1, graphical depiction of presidential administrations and years in office to reference for the proceeding text.

Source: Library of Congress

Sources of energy vary through history and include wood, hydro, coal, nuclear, petroleum, and wind. Until the Industrial Revolution, wood and wind were two prominent sources of energy in the United States.[12] The Industrial Revolution developed new technology that allowed for energy to be distributed on a wide scale, and soon, cities became electrified. During this time, rural areas still relied heavily on other wood and wind sources, and it wasn't until the 1930s and the passage of The New Deal that rural areas were able to plug into the larger energy grid. The Rural Electrification Act was passed in 1936 as part of The New Deal and allowed the U.S. Government to offer low-cost loans to rural farmers who created co-ops to install power lines that private power companies refused to install due to the cost.[13] Coal continued to be the dominant energy source for the U.S. until the mid-20th Century, when petroleum became the primary energy source. Petroleum overtook coal due to its abundance, ease of transport, energy density, and liquid nature permitting development of the internal combustion engine.[14]

[12] Janet Laughlin Sawin, "The Role of Government in the Development and Diffusion of Renewable Energy Technologies: Wind Power in the United States, California, Denmark, and Germany, 1970-2000," ProQuest Information and Learning, September 2001.
[13] Lisa Thompson, "The Rural Electrification Administration (REA) (1935)," November 18, 2016, https://livingnewdeal.org/glossary/rural-electrification-administration-rea-1935/.
[14] Samantha Gross, "Why are Fossil Fuels so Hard to Quit," *Brookings Institute,* June 2020, https://www.brookings.edu/essay/why-are-fossil-fuels-so-hard-to-quit/.

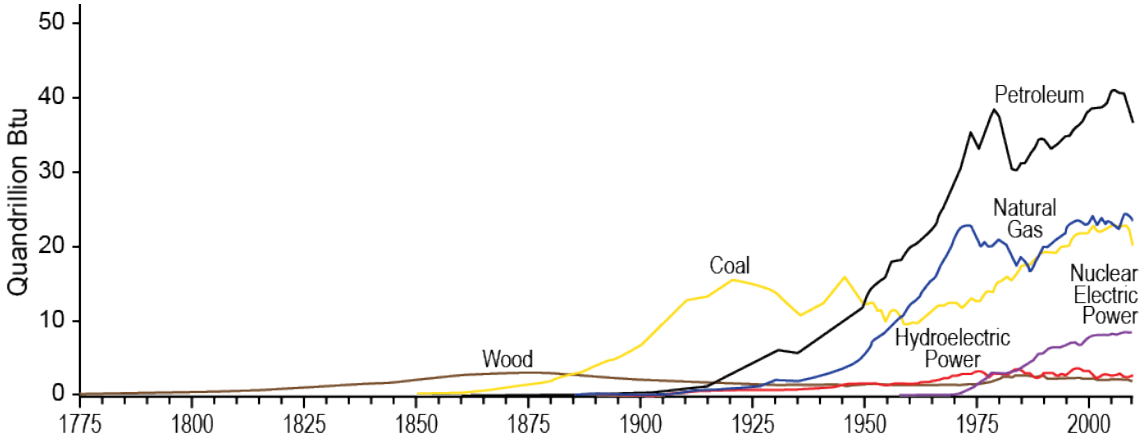


Figure 2. Primary Energy Consumption by Source, 1775-2009

Description of Figure 2, line chart showing energy sources consumption and transitions through different sources from 1775 to 2009.

Source: Annual Energy Review 2009

Through the Industrial Revolution and rise of contemporary industry, energy became central to both the economy and defense. Energy powers the everyday world and allows for production of goods and services, underpinning Gross Domestic Production (GDP), and powering the state and military. In every published U.S. NSS, the importance of energy is recognized, and uninterrupted access to energy, both foreign and domestic, is a national security priority. As environmental concerns and limits to finite resources were

recognized in the U.S.[15], legislation focused on alternative energy sources.[16] [17] The federal government identified the basic alternative energy sources in 1988 as:

- Photovoltaics
- Wind
- Solar Thermal
- Biofuels
- Solar Building and Energy Systems
- Ocean Energy Systems
- Geothermal Energy[18]

With the evolving transitions of energy sources over time, and the consistent focus on development of alternative energy sources in the U.S., questions remain on the progress of a new energy transition. The U.S., and much of the world, maintains an energy grid geared toward petroleum-based power. In the post industrialized world, it is a complex and immense task to transition infrastructure at that scale. Regardless, fossil fuels and petroleum based products are limited resources, and so a change must eventually happen. Making the change involves government prioritization, support, and incentives. Since the second published NSS in 1988 recognized the importance of expanding alternative

---

[15] Sarah Mittlefehldt, "From Appropriate technology to the clean energy economy: renewable energy and environmental politics since the 1970s," *Journal of Environmental Studies and Sciences,* 2018, Vol.8, p.212-219, https://link-springer-com.ezp-prod1.hul.harvard.edu/content/pdf/10.1007/s13412-018-0471-z.pdf.

[16] "Senate OKs omnibus tax measure," *Facts on File World News Digest,* August 14, 1976, https://advance-lexis-com.ezp-prod1.hul.harvard.edu/api/document?collection=news&id=urn:contentItem:3SJ4-DHD0-000Y-N2K2-00000-00&context=1516831.

[17] "House votes energy tax bill," *Facts on File World News Digest,* June 21, 1975, https://advance-lexis-com.ezp-prod1.hul.harvard.edu/api/document?collection=news&id=urn:contentItem:3SJ4-DDF0-000Y-N2BJ-00000-00&context=1516831.

[18] U.S. Congress, House, *Renewable Energy and Energy Conservation Commercialization and Development Act,* HR 4226, 100th Congress, 2nd Session, Introduced in the House September, 22, 1988, https://www.congress.gov/bill/100th-congress/house-bill/4226/text.

energy sources in the U.S. to reduce dependence on foreign energy imports in the interests of national security, an examination of how the NSS drove prioritization of alternative energy can help illuminate the steps in this transition.

Politics and the Environment

Preceded by the discovery of the dangers associated with synthetic chemical pesticide DDT to birds in the 1950s, the 1960s marked the emergence of environmental concerns into civil society. *Silent Spring* by Rachel Carson, published in 1962, was pivotal in spurring the environmental movement.[19] The environmental movement became a concern of the Kennedy administration, elevating the priority of environmental considerations in policy.[20] In the decade after *Silent Spring,* DDT use in agriculture was banned, Earth Day was founded, and the Environmental Protection Agency (EPA) was created. Carson's book was influential in these actions because she clearly articulated the dangers of synthetic chemicals sprayed on food and contaminating the earth and ground water, highlighting how dangerous human actions can be to the environment and catching the public's attention about health concerns to humans and animals alike.[21] These developments in the decade after initial publication were significant for crafting the United States' earliest environmental policies.

In 1973, an oil crisis hit the United States. The U.S. has been a top oil producer since the discover of oil in the 1800s and both supplied much of its own domestic needs

[19] Lepore, "Birds".
[20] Lepore, "Birds".
[21] Rachel Carson, *Silent Spring*, Houghton Mifflin Company publisher, and Riverside Press printer, 1962, Boston: Houghton Mifflin.

and exported to foreign countries.[22] As large oil reserves were found and developed in Middle East in the mid-1900s, the U.S. created an early partnership with Saudi Arabia.[23] As trade globalized, and more oil became available, U.S. presidential administrations implemented different import and export policies and to ensure price stability.[24] In 1960, Saudi Arabia and other Middle Eastern countries created the Organization of Petroleum Exporting Countries (OPEC) with the purpose to defend their oil prices and ensure stability of their oil.[25] In the early 1970s, U.S. political actions in the Middle East caused OPEC to take action against the U.S. by increasing oil prices, which greatly impacted the U.S., who at the time was relying heavily on foreign oil imports.[26] Prices sharply rose from less than $2 a barrel in 1972 to over $11 per barrel in 1974. This deeply affected the U.S. energy sector who had not planned for a sudden increase in oil costs.

Prior to the oil crisis, the U.S. Government did not have centralized energy management because the private sector fulfilled energy needs without significant disruption.[27] After the oil crisis, the Government recognized the need for government oversight on energy, and in 1977, the Department of Energy (DOE) was established.[28] The DOE's mission was to focus on energy development and regulation, eventually expanding to include nuclear weapons research and oversight.

In 1979, oil prices were still climbing, and another world event emerged, decreasing oil production – the Iranian Revolution. Iran was one of the major suppliers

---

[22] "Oil Dependence and U.S. Foreign Policy, 1850-2022," Council on Foreign Relations, Accessed on February 1, 2023, https://www.cfr.org/timeline/oil-dependence-and-us-foreign-policy.
[23] "Oil Dependence".
[24] "Oil Dependence".
[25] "Oil Dependence".
[26] "Oil Dependence".
[27] "A Brief History of The Department of Energy," Office of Legacy Management, Accessed February 1, 2023, https://www.energy.gov/lm/doe-history/brief-history-department-energy.
[28] "A Brief History".

for U.S. oil, and with increased inflation and continued climbing energy prices, American citizens were concerned.[29] Oil production from Iran declined by approximately seven percent.[30] Some suppliers capped purchase amounts of gasoline, while some refineries would withhold gasoline so they could fetch a larger price in the following month since prices were based on the previous month's barrel prices. [31]The newly established DOE attempted to alleviate problems by enacting policies that ordered large refineries to sell to small refineries who could not afford market price oil in order to speed up production.[32] This backfired because the smaller refineries were not sophisticated enough to keep production pace.

Disruptions to energy supply can impact defense mechanisms and GDP due to affordability and availability. The U.S. GDP declined by 4.7% due to the 1973 energy crisis[33] which coincided with popular public and political support for seeking alternative energy sources. The Nixon administration sought to increase nuclear power and directed the U.S. Atomic Energy Commission to conduct further research and development (R&D).[34] These priorities continued through the Nixon, Ford, and Carter administrations, each of them contributing to a National Energy Plan presented to Congress, and Carter ultimately consolidated energy plans, R&D, and policy under the new Department of Energy.[35] Sarah Mittlefehldt found that politicians from all sides of the spectrum at least

[29] Samantha Gross, "What Iran's 1979 Revolution Meant for US and Global Oil Markets," Brookings Institute, March 5, 2019, https://www.brookings.edu/blog/order-from-chaos/2019/03/05/what-irans-1979-revolution-meant-for-us-and-global-oil-markets/.
[30] Gross, "Iran's 1979 Revolution".
[31] Gross, "Iran's 1979 Revolution".
[32] Gross, "Iran's 1979 Revolution".
[33] "The 1973 Energy Crisis Sparked the Idea for Establishing the IEA. What Have we Learned," World Economic Forum, March 29, 2022, weforum.org/agenda/2022/03/iea-1970s-energy-crisis/.
[34] "Timeline of Events: 1971-1980," Office of Legacy Management, Accessed February 1, 2023, https://www.energy.gov/lm/doe-history/doe-history-timeline/timeline-events-1971-1980.
[35] "Timeline of Events".

paid lip service to considering alternative energy and sought to make the U.S. independent from foreign energy sources.[36] Though her findings indicate an intention to develop domestic energy, these sources could not be categorized as alternative (renewable) energy in the contemporary sense. She notes the Nixon, Ford, and Carter administrations prioritized other domestic energy sources, such as coal, oil, and nuclear power, over solar and wind. Considering coal and oil comprised the energy status quo, increased domestic production of these resources presents an alternative only in respect of origin. Mittlefehldt also saw the failure of administrations through the 1970s to achieve energy independence as the driving force behind the deregulation strategy that came with Reagan in the 1980s.[37]

During Reagan's campaign, he commissioned an energy task force report to help shape his energy policy. The report was led by a petroleum engineer and favored government deregulation.[38] Reagan's policy during his first three years in office, relied on the free market and private sector to drive energy production, instead of the federal government.[39] Though there was a National Energy Plan during this time, the NSS had not yet been conceived. Even without an NSS, the discussion of energy in the context of national security gained momentum, with members of the executive branch who disagreed with Reagan's deregulation of energy calling his 1981 National Energy Plan irresponsible and a risk to national security.[40] In 1986, Congress passed a law that required the president to submit an annual NSS for review. Prior to this requirement, the

[36] Mittlefehldt, "Appropriate Technology".
[37] Mittlefehldt, "Appropriate Technology".
[38] James Everett Katz, "US Energy Policy Impact of the Reagan Administration," Butterworth & Co, 1984.
[39] Katz, "US Energy Policy Impact".
[40] Katz, "US Energy Policy Impact".

NSS was not a written, codified document. Reagan submitted the first one in January 1987, and thus also codified the importance of energy to national security.

Energy Policy and the Free Market

Under the Nixon, Ford, and Carter administrations, there was movement towards establishing and centralizing energy governance in the federal government as evident by the creation of government energy offices and agencies after the 1973 oil crisis. Reagan campaigned on the platform of government deregulation – reducing government management and oversight of items that could be handled by the free market and thus reducing reliance on the U.S. Government. His platform was popular, and he won the election by a landslide, taking the popular vote and winning 489 electoral votes to Carter's 49.[41] With the 1970s economy suffering, Americans were looking for new leadership to implement new policy, and deregulation polled well. Large groups of business owners, from small business to the large oil industries, supported Reagan's philosophy of deregulation and reliance on the free market.[42] [43] After election, Reagan pushed deregulation heavily, reducing government funding for many programs, including alternative energy development. Reagan's Presidential Budget Request each year in office steadily requested cuts to energy development, and often stated claims such as, "The Nation needs adequate supplies of energy at reasonable prices. The best way to

[41] "The American Presidency Project," UC Santa Barbara, Accessed February 1, 2023, https://www.presidency.ucsb.edu/statistics/elections/1980.
[42] James W. Singer, "Small Support for the President," *National Journal,* June 23, 1979, https://advance-lexis-com.ezp-prod1.hul.harvard.edu/api/document?collection=news&id=urn:contentItem:3SJB-04F0-000X-74RB-00000-00&context=1516831.
[43] "Independent Oilmen Cheer Reagan Promise," *The Associated Press,* October 21, 1980, https://advance-lexis-com.ezp-prod1.hul.harvard.edu/api/document?collection=news&id=urn:contentItem:3SJ4-DX40-0011-40XX-00000-00&context=1516831.

meet this need is to let market forces work."[44] It is difficult to determine how well Reagan's deregulation worked, and it remains a controversial topic, with some saying aspects of deregulation work, while others say it did not, especially regarding the energy market.[45] [46] [47]

The attempt to use the free market to solve energy problems was not completely misguided. To achieve alternative energy, alternative sources, such as solar and wind, must be developed sufficiently enough to support the entire United States. Natural resources were energy sources that needed relatively simple, albeit revolutionary, technology to expend. Wind was extensively used as a source of small-scale energy production on individual properties in the 1800s,[48] but with the advent of power plants and lines that could carry electricity long distances, it was easier and more cost efficient for the Government to support regional cooperatives to switch to centralized coal powered energy. The dominance of fossil fuel energy sources in the market resulted in competitive repression of alternative energy developments, rendering them largely cost inefficient. Moreover, in the early 1900s, coal was not known to be a detriment to the environment.

Once the environmental movement in the 1960s brought environmental concerns to the forefront and the federal government incorporated the environment as a priority,

---

[44] Executive Office of the President, *Budget of the United States Government – Fiscal Year 1987*, February 5, 1987, https://fraser.stlouisfed.org/title/budget-united-states-government-54/fiscal-year-1987-18993.
[45] David Narum, "A Troublesome Legacy: The Reagan Administration's Conservation and Renewable Energy Policy," *Energy Policy*, Volume 20, Issue 1, p.40-53, January 1992.
[46] Frank Swoboda, "The Legacy of Deregulation," *The Washington Post,* October 2, 1988, https://www.washingtonpost.com/archive/business/1988/10/02/the-legacy-of-deregulation/c553674b-8bd2-436e-9be7-7de95f798fbb/.
[47] David Wessel, "What we Learned from Reagan's Tax Cuts," Brookings Institute, December 8, 2017, https://www.brookings.edu/blog/up-front/2017/12/08/what-we-learned-from-reagans-tax-cuts/.
[48] Robert W. Righter, *Wind Energy in America: A History,* University of Oklahoma Press, 1996.

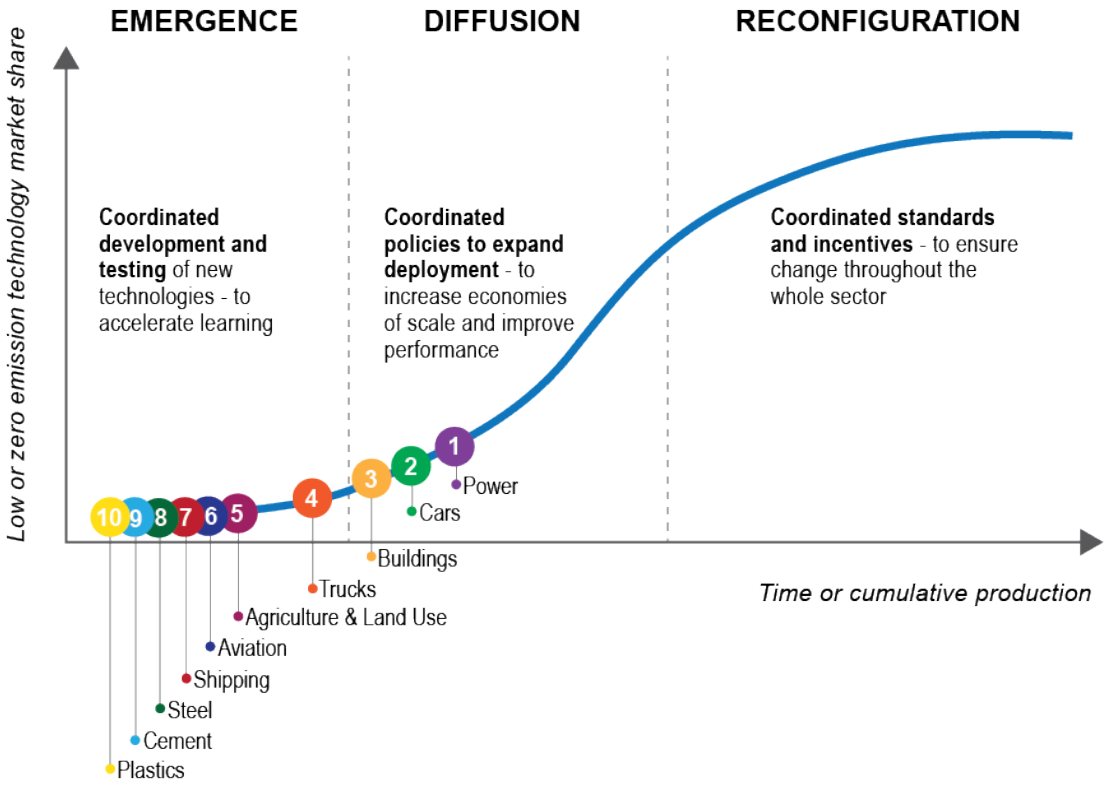
the free market still had a role. In the 1970s and 1980s, there was an attempted comeback of wind energy, deploying commercial scale turbines, but they were not efficient enough to compete with the established coal and oil industry.[49] With coal and oil as the ingrained energy system in the U.S., there would need to be an energy transition to replace it with new sources, and new sources need to be developed and widely deployed.

One attempt to incentive the free market to innovate and adopt cleaner energy technologies is cap-and-trade systems. The basic premise of cap-and-trade is that the government sets limits on how much pollution can be emitted by industry, and if exceeded, they will be taxed.[50] The idea behind this is it will stimulate the market to come up with innovative ideas to reduce pollution caused by production. There are accredited successes to it, as it has been attributed to reducing pollution that caused acid rain and removed lead from gasoline, and cap-and-trade has backing from some prominent economists like Paul Krugman.[51]Whereas others, such as political scientist David G. Victor and economist Danny Cullenward, argue cap-and-trade on its own is not enough to cut pollution levels to what it should be.[52] Victor and Cullenward argue in order to make advances in carbon reduction is to support the advancement of novel technologies.[53] They point to a 2019 study that found the majority of sectors that should be advancing decarbonization efforts are still in the very early stages of technology

[49] Sarah Mittlefehldt, "Appropriate Technology".
[50] Paul Krugman, "The Textbook Economics of Cap-and-Trade," *The New York Times,* September 27, 2009, https://archive.nytimes.com/krugman.blogs.nytimes.com/2009/09/27/the-textbook-economics-of-cap-and-trade/
[51] David Doniger, "The Rest of the Story of Cap and Trade," *The Grist*, December 10, 2009, https://grist.org/article/the-rest-of-the-story-of-cap-and-trade/.
[52] Danny Cullenward and David G. Victor, *Making Climate Policy Work,* Polity Press (Medford, MA), 2020.
[53] Cullenward and Victor, *Making Climate Policy Work*.

development, with power being the furthest along.[54] A study published by the Brookings Institute examines adoption of new environmentally friendly technology highlights key policy roles for the Government.

[54] Cullenward and Victor, *Making Climate Policy Work*.



Sector	Emissions and Stage of Transition
POWER 1	*25% of global GHG emissions* DIFFUSION Renewable technologies diffusing rapidly; others at earlier stages
CARS 2	*7% of global GHG emissions* EARLY DIFFUSION Innovation has stabilized around electric vehicles Alternative technologies (fuel cells) much earlier stage
BUILDINGS 3	*6% of global GHG emissions* ***Construction:*** EMERGENCE ***Heating and Cooling:*** DIFFUSION

**Buildings also account for roughly half of the emissions from the power, steel, and cement sectors*

Sector	Emissions and Stage of Transition
TRUCKS 4 	*3% of global GHG emissions* **EMERGENCE** New technology yet to enter market at scale
AGRICULTURE & LAND USE 5 	*24% of global GHG emissions* ***Agriculture:*** **EARLY EMERGENCE** ***Land Use*** **DIFFUSION**
AVIATION 6 	*1.5% of global GHG emissions* **EARLY EMERGENCE** New technologies yet to stabilize or enter markets
SHIPPING 7 	*1.6% of global GHG emissions* **EARLY EMERGENCE** New technologies yet to stabilize or enter markets
STEEL 8 	*4% of global GHG emissions* **EARLY EMERGENCE** New technologies yet to stabilize or enter markets
CEMENT 9 	*3% of global GHG emissions* **EARLY EMERGENCE** New technologies yet to stabilize or enter markets
PLASTICS 10 	*3% of global GHG emissions* ***Recycling (in some countries):*** **DIFFUSION** ***Production:*** **VERY EARLY EMERGENCE**

Figure 3. Progress of Sectors' Low Carbon Transitions, and Priorities for Coordinated International Action

Description of Figure 3, chart showing different sectors' transitions to low carbon emissions and the status in production.

Source: Accelerating the Low Carbon Transition, Department for Business, Energy & Industrial Strategy

First is the emergence phase where the technologies are developed. Policy is needed in this phase to stimulate R&D, foster partnership and cooperation, and articulate goals.[55] Once the technologies exist, they must be deployed for widespread use (diffusion). In this phase, policy is needed to support resource allocation, which can come in the form of incentives, tax breaks, subsidies, grants, loans, etc…[56] This makes it easier and cost advantageous for people, businesses, and industries to make the switch from the old to the new.[57] Finally, there is the reconfiguration phase in which policy solidifies new regulations and standards and realigns other interrelated policies to support the new system.[58]

This transition from one technology to another greatly involves private businesses and corporations. However, without government policy and monetary resources for support, new businesses are disinclined to invest in alternative energies on principal.[59] Businesses have made developments in some sectors, using what policy and resources were available. As a historic example, when cars were first made available for general public purchase, people did not quickly take to favoring cars over horses.[60] One reason

[55] David G. Victor, Frank W. Geels, and Simon Sharpe, *Accelerating the Low Carbon Transition: The Case for Stronger, More Targeted and Coordinated International Action,* The Brookings Institute, November 2019, https://www.brookings.edu/wp-content/uploads/2019/12/Coordinatedactionreport.pdf.
[56] Victor, Geels, and Sharpe, *Accelerating the Low Carbon Transition.*
[57] Victor, Geels, and Sharpe, *Accelerating the Low Carbon Transition.*
[58] Victor, Geels, and Sharpe, *Accelerating the Low Carbon Transition.*
[59] Victor, Geels, and Sharpe, *Accelerating the Low Carbon Transition.*
[60] Victor, Geels, and Sharpe, *Accelerating the Low Carbon Transition.*

was due to the cobbled roads making an uneasy driving experience.[61] Government policies provided resource allocation and funding to repave roads and make them smoother.[62] Looking to a similar but newer example, as electric car technology developed in recent years, government policy provided incentives in the form of tax breaks, grants, and subsidies to make electric cars competitive with gas powered cars. The incentives alleviated costs on companies, and incentivized buyers to purchase by making the total price comparable with gas powered cars largely as a result of tax rebates. Even so, this technology is still in the early phases of diffusion because gas powered cars remain in the majority, and the energy grid needs to be reconfigured to support electric cars with charging stations.

Currently, the U.S. has approximately 50,000 charging stations with approximately 140,000 public chargers, of which, not all are fast chargers and require a substantial amount of time for cars to recharge.[63] About eight months prior to the passage of the Inflation Reduction Act, another law, the Bipartisan Infrastructure Law (BIL) was passed in late 2021, and it included funding to add another 500,000 chargers by 2030. McKinsey and Company estimate to meet transportation-based carbon targets by 2030, the fleet of electric vehicles would need to grow from the approximately three million now to around 44 million.[64] McKinsey additionally estimates that to power that many electric vehicles, there would need to be around 30 million chargers, of which 1.2 million

---

[61] Victor, Geels, and Sharpe, *Accelerating the Low Carbon Transition.*
[62] Victor, Geels, and Sharpe, *Accelerating the Low Carbon Transition.*
[63] Steve Loveday, "A Comprehensive Guide to U.S. EV Charging Networks," ed. Cody Trotter, *U.S. News,* January 4, 2023, https://cars.usnews.com/cars-trucks/advice/ev-charging-stations#:~:text=According%20to%20the%20U.S.%20Department,individual%20(EVSE)%20charging%20ports.
[64] Philipp Kampshoff et al., "Building the Electric-Vehicle Charging Infrastructure America Needs," McKinsey & Company, April 18, 2022, https://www.mckinsey.com/industries/public-and-social-sector/our-insights/building-the-electric-vehicle-charging-infrastructure-america-needs.

would need to be public chargers.[65] In sum, McKinsey highlights the need for policy to support installation of chargers, ensuring proper mix of charging speed, installation in the right areas (e.g. not only in high income areas), and ensuring charging prices are affordable.

The National Security Strategy

It is important to juxtapose these energy policy requirements to the purpose of the NSS. The NSS is intended to be the "nation's plan for the coordinated use of all the instruments of state power — nonmilitary as well as military — to pursue objectives that defend and advance its national interest".[66] The NSS is not policy itself, but rather it provides a framework of priorities for individual agencies to craft policies that will achieve progress in support of national security objectives. As explained by Reagan in the first published NSS:

> "This National Security Strategy Report builds on the efforts of the Administration, Congress, and the American people over the past six years. But any strategy document is only a guide. To be effective, it must be firmly rooted in broad national interests and objectives, supported by an adequate commitment of resources, and integrate all relevant facets of national power to achieve our national objectives. It must provide a framework within which more specific and detailed objectives can be identified by those executive branch agencies charged with stewardship over various elements of the nation's power. And it must guide the creation of specific plans for attainment of those more detailed objectives.
>
> For this reason, the annual presentations to the Congress by the Secretary of State and Secretary of Defense play a key role in supporting the objectives outlined in this report. In their respective areas of Foreign and Defense Policy, they develop detailed plans of action to sustain our

[65] Philipp Kampshoff et al., "Building the Electric-Vehicle Charging Infrastructure".
[66] Katz, "US Energy Policy Impact".

> National Strategy, advance U.S. interests and most importantly, reduce the risk to our nation and our allies."[67]

The NSS is intended to be submitted annually and soon followed with a presidential budget request.[68] This schedule has not been kept over the years, but it was in the early years. Naval Postgraduate School professor Richard B. Doyle observes the NSS and budget request should be read concurrently because without resources, the strategy will not be realized.[69] The significance of the budget to follow the NSS is for the President's budget to align with the strategy. As Reagan stated, other agencies must craft policy to advance U.S. national security. In order to achieve agency goals, agencies must have a sufficient budget to implement plans and policy.

Thus the U.S. NSS is the key hierarchical strategy, such that subsequent strategies follow goals and guidelines set by the NSS.[70] The process of the NSS is as follows: the president releases the NSS and presidential budget request in close succession; subsequent strategies logically follow the NSS, and agency budget requests are also submitted; congress considers the strategy and budget request, and releases approved appropriations.

Following the NSS, there are several other strategies, which are either related or derived from strategies set in the NSS.[71] The NSS is broad, and agencies need strategies that focus and expand on their specific mission. Based on the NSS, individual agencies can find the intersection of mission and priority to craft longer, specific strategies. For example, after 9/11, Bush signed the Intelligence Reform and Terrorism Prevention Act

[67] The White House, "National Security Strategy," 1988.
[68] Doyle, "National Security Strategy".
[69] Doyle, "National Security Strategy".
[70] Katz, "US Energy Policy Impact".
[71] Doyle, "National Security Strategy".

of 2004, from which the Office of the Director of National Intelligence (ODNI) was formed. ODNI is responsible for crafting intelligence policy for all the intelligence agencies. Modern national security strategies mention the importance of intelligence collection and countering intelligence threats, and ODNI takes that broad goal and crafts more specific strategies to follow – such as the National Intelligence Estimate and the National Counterintelligence and Security Strategy – and these specific strategies drive policy updates for products like Intelligence Community Directives and Intelligence Community Standards. Though seemingly unrelated to the energy sector, even these intelligence doctrines prioritize protection of critical infrastructure, including energy, from exploitation, disruption, and degradation of infrastructure worldwide.[72]

In addition, the Department of Energy maintains its own strategic plan. Similar to the intelligence strategies, DOE also focuses on providing energy security, albeit with a different mission focus. Per the DOE Strategic Plan, the agency is responsible for, "advancing the energy, environmental, and nuclear security of the United States; promoting scientific and technological innovation in support of that mission; sponsoring basic research in the physical sciences; and ensuring the environmental cleanup of the nation's nuclear weapons complex."[73] Highlighting the alignment to the NSS, the Secretary's Message states:

> "We will also continue our work to reduce America's dependence on oil and improve our energy security. Although domestic oil production has increased to the extent that in 2012 net imports of petroleum fell to their lowest level in nearly 20 years, we must continue our efforts to develop

[72] "National Counterintelligence Strategy of the United States of America 2020-2022," Office of the Director of National Security, Accessed February 1, 2023, https://www.dni.gov/files/NCSC/documents/features/20200205-National_CI_Strategy_2020_2022.pdf.
[73] "Strategic Plan 2014-2018," U.S. Department of Energy, Accessed February 1, 2023, https://www.energy.gov/sites/prod/files/2014/04/f14/2014_dept_energy_strategic_plan.pdf.

> alternative fuels and vehicles, as we are far from decoupling our economy from the global oil market."[74]

All of this in totality demonstrates the importance of the NSS as a framework to shaping priorities, strategies, and policies for the United States. Issues, like energy, can cross multiple agencies and mission sets. The significance for the NSS and subsequent budgeting to be aligned cannot be understated.

Obstacles to Adopting Alternative Energy

Having discussed the items that have influenced and shaped the focus on alternative energy development in the U.S. this section focuses on reasons the transition from fossil fuels is difficult. Primary obstacles include a complex global trade system, scale of work needed to transition energy infrastructure, need of new technology, and the financial transition.

Today, the oil trade is increasingly complex. According to the U.S. Energy Information Administration (EIA), the U.S. produces and exports a net positive amount of oil - more than it imports (see Figure 4).[75] One reason for this the globalized trade system, demonstrated through an example provided by EIA the is oil produced in the Southwest U.S. may export to Mexico rather than get sent to the Eastern U.S. because it is cheaper and more advantageous for the U.S. to sell regionally in Mexico and import oil to the east coast from Europe.[76] This intermingled global trade system means countries

[74] "Strategic Plan 2014-2018".
[75] "U.S. Energy Facts Explained".
[76] "U.S. Energy Facts Explained".

are interdependent upon each other to maintain the trade status quo. This graphic demonstrates the complexity of the global oil trade in 2014.

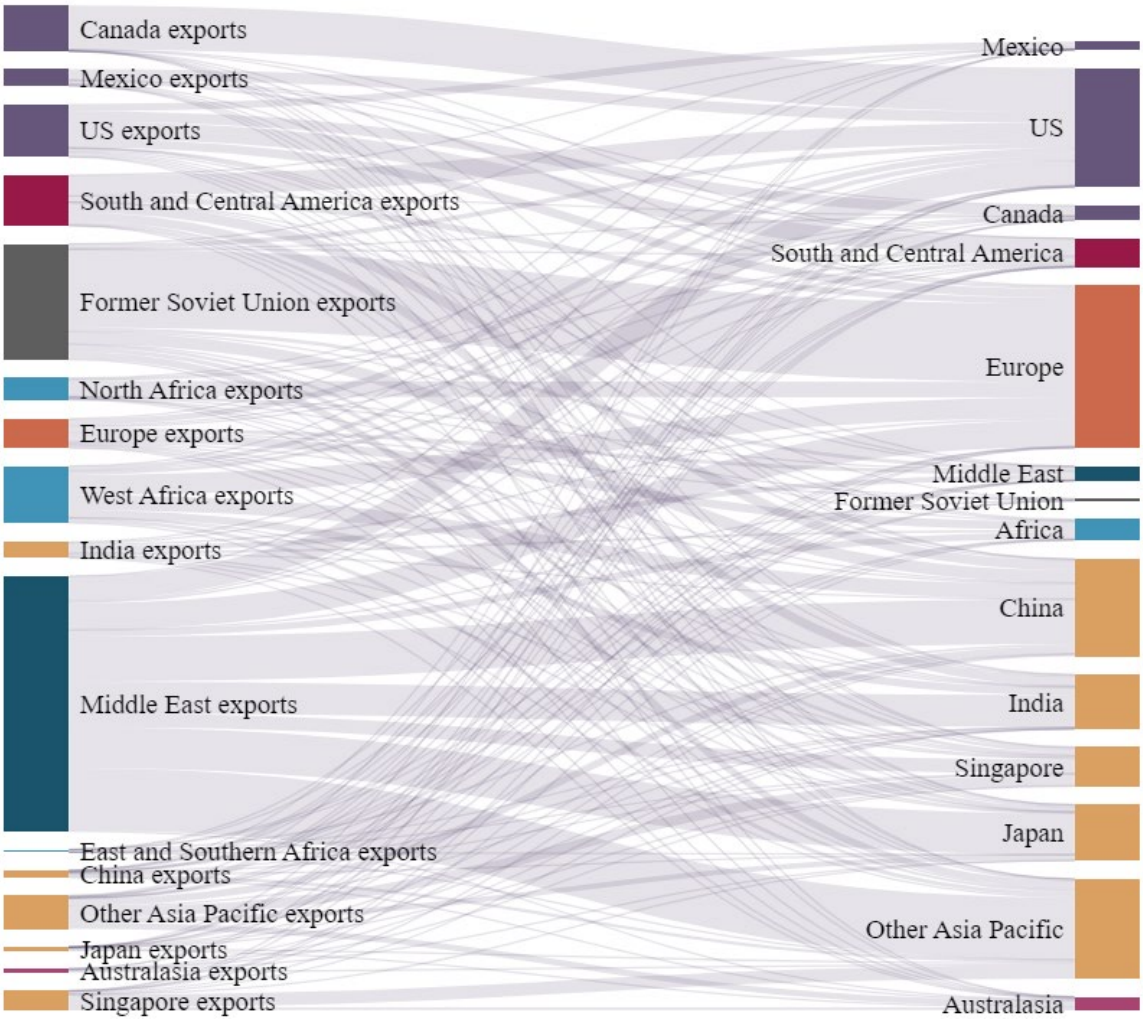


Figure 4. Global Oil Trade, 2014

Description of Figure 4, global oil imports and exports by state.

Source: Carbon Brief.

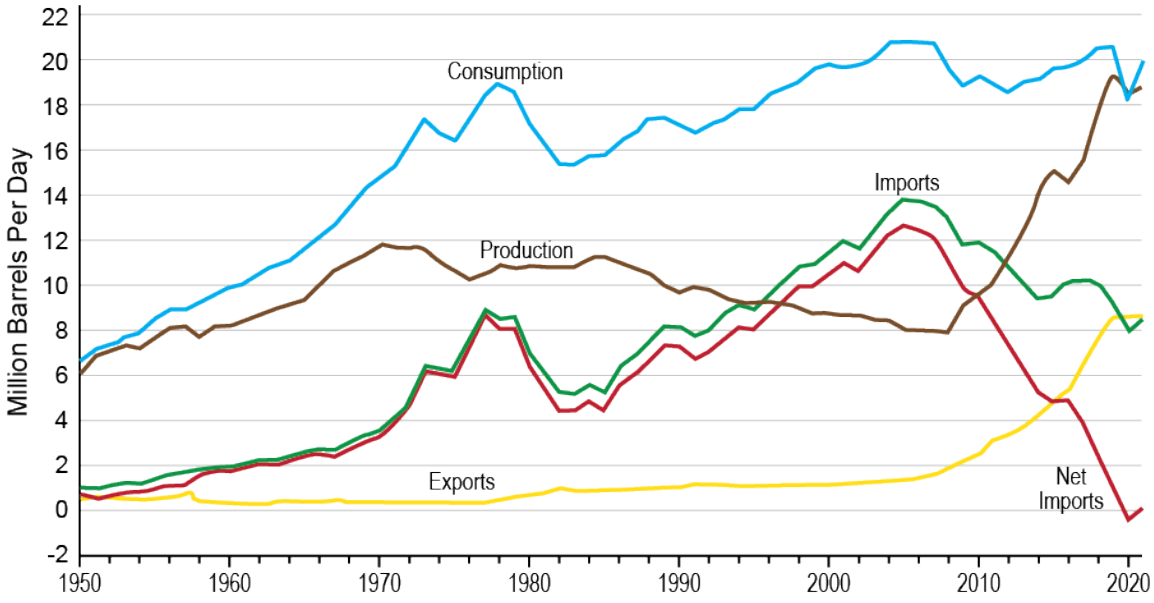


Figure 5. U.S. Petroleum Consumption, Production, Imports, Exports, and Net Imports, 1950-2021

Description of Figure 5, U.S. consumption of petroleum, including imports, exports, and the net imports accounting for exports.

Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 3.1, October 2022

Based on this global trade intricacy, if any one sector of trade decreases, it can create a domino effect on the whole market. A recent example of this is the impact of the Russian invasion of Ukraine in 2022. Russia accounts for nearly 10% of the global oil supply, of which, about half is exported.[77] Europe is the most reliant on Russian petroleum exports[78], as demonstrated in the figure below. When Russia invaded Ukraine, much of the Western world imposed sanctions, divested Russian assets, and stopped trade

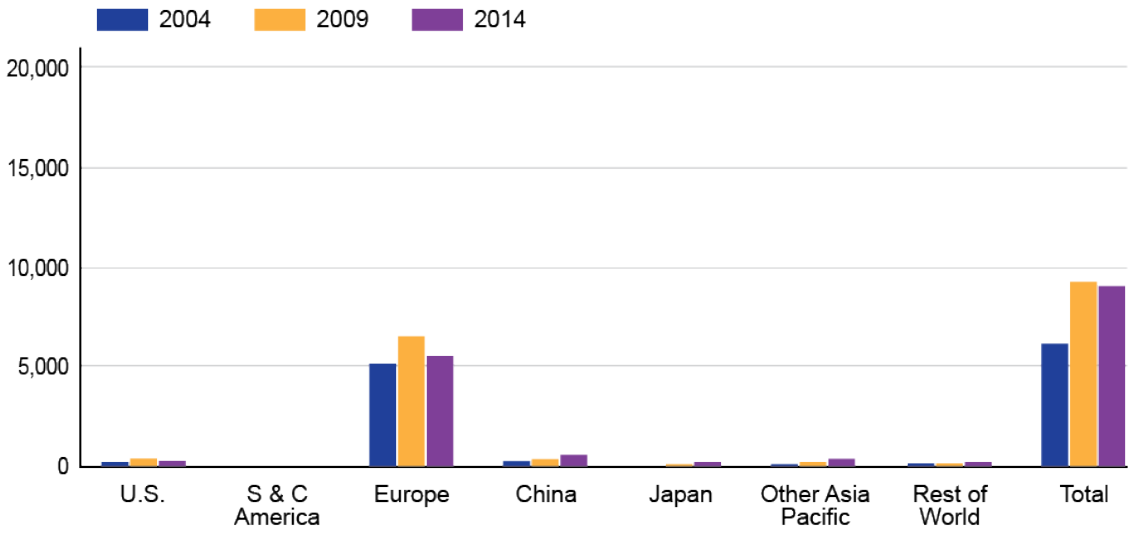
[77] "Impact of Russia's Invasion of Ukraine on Oil and Gas Sector". 2022, *Oil & Energy Trends*, 47 (4): 3–5. https://doi.org/10.1111/oet.12913.
[78] "Impact of Russia's Invasion".

with the Russian oil and gas industry.[79] Due to Europe's heavy reliance on Russian petroleum, they were not able to immediately stop all trade,[80] but the shift in supply caused a global impact to oil prices. This section from a Wiley article demonstrates the immediate movements and decisions by the global market:

> "Initially, prices moved above $100/barrel around the time of the invasion and then hit $129/barrel, before falling back towards $115/barrel, and then up to $120/barrel again late in March. …In response to the initial price rise, the IEA said all 31 member countries had agreed to release 60 million barrels of oil from their strategic reserves … OPEC-plus, on the other hand, appeared unwilling to intervene with spare capacity, with Saudi Arabia saying on March 22nd that it did not want to take on responsibility for the shortfall in Russian supplies, especially given on-going attacks from Iran-backed Houthi rebels in the country."[81]

Real impact of this was also felt for everyday citizens in fuel prices for personal transportation. In late 2021, average automobile gas prices across the U.S. were in the mid-three-dollar range; by mid-2022, those prices peaked close to five dollars per gallon.[82]

[79] "Impact of Russia's Invasion".
[80] "Impact of Russia's Invasion".
[81] "Impact of Russia's Invasion".
[82] Richard Laycock, "US Gas Prices: 2018 to February 2023," Updated February 9, 2023, https://www.finder.com/gas-prices.

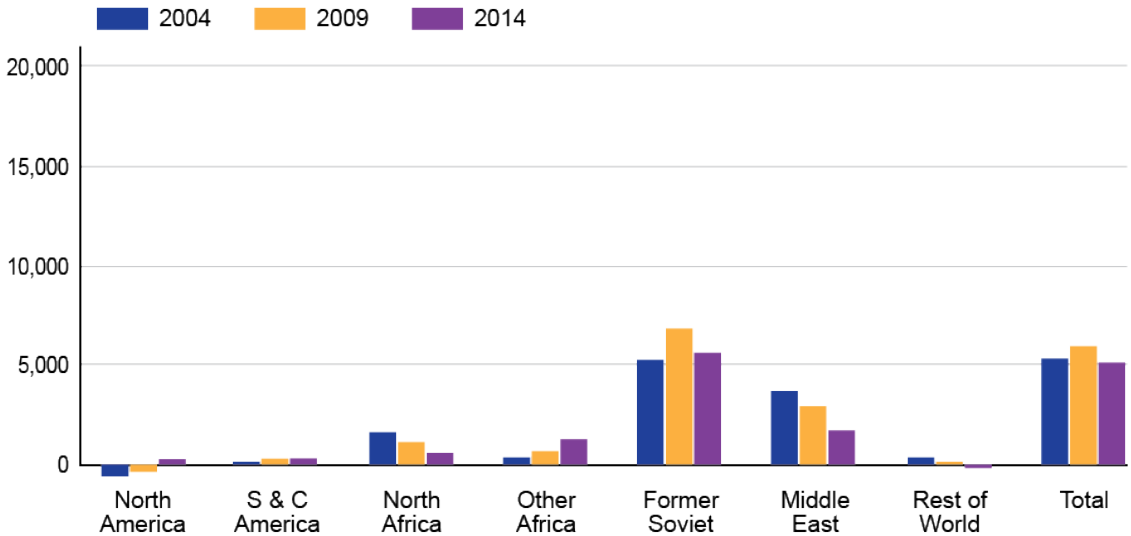


Net oil exports from former Soviet states to their major trading partner countries and regions in 2004, 2009 and 2014 (thousands of barrels per day).

Figure 6. Former Soviet Union Exports, Thousands of Barrels Daily

Description of Figure 6, Petroleum exports of former Soviet Union states.

Source: BP Statistical Review of World Energy 2005, 2010, and 2015. Chart by Carbon Brief.



Net oil imports to Europe from its major trading partner countries and regions in 2004, 2009 and 2014 (thousands of barrels per day).

Figure 7. Europe Net Oil Imports, Thousands of Barrels Daily

Description of Figure 7, Net petroleum imports of Europe.

Source: BP Statistical Review of World Energy 2005, 2010, and 2015. Chart by Carbon Brief.

Because of the heavy reliance on Russia for oil, Europe had to carefully consider whether it could support the trading bans and sanctions with Russia. The German economy minister initially said he could not stop petroleum trade with Russia in order to keep "social peace,"[83] because doing so would have likely caused an energy shortage in the country. The U.S. was able to pledge increased trade with Europe to allow them to reduce their reliance on Russia,[84] but these are not shifts that can happen immediately and require planning, cooperation, and time, during which oil prices saw at least temporary spikes.

As of 2022, the U.S. energy supply was still fossil fuel dominant, with petroleum being the highest percentage of the supply (see Figure 8). Based on 2014 import data, the U.S. received most imports from the Middle East and Canada (see Figure 9).

[83] "Impact of Russia's Invasion".
[84] "Impact of Russia's Invasion".

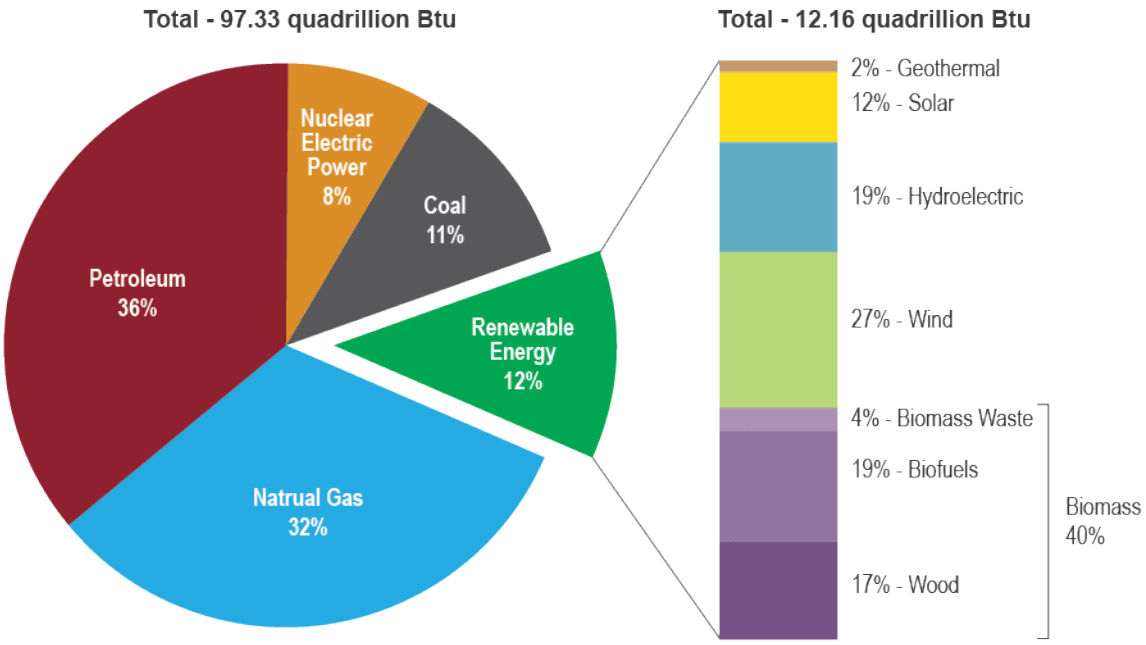


Figure 8. U.S. Primary Energy Consumption by Energy Source, 2021

Description of Figure 8, U.S. energy consumption by source in 2021.

Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 1.3 and 10.1, April 2022, Preliminary Data

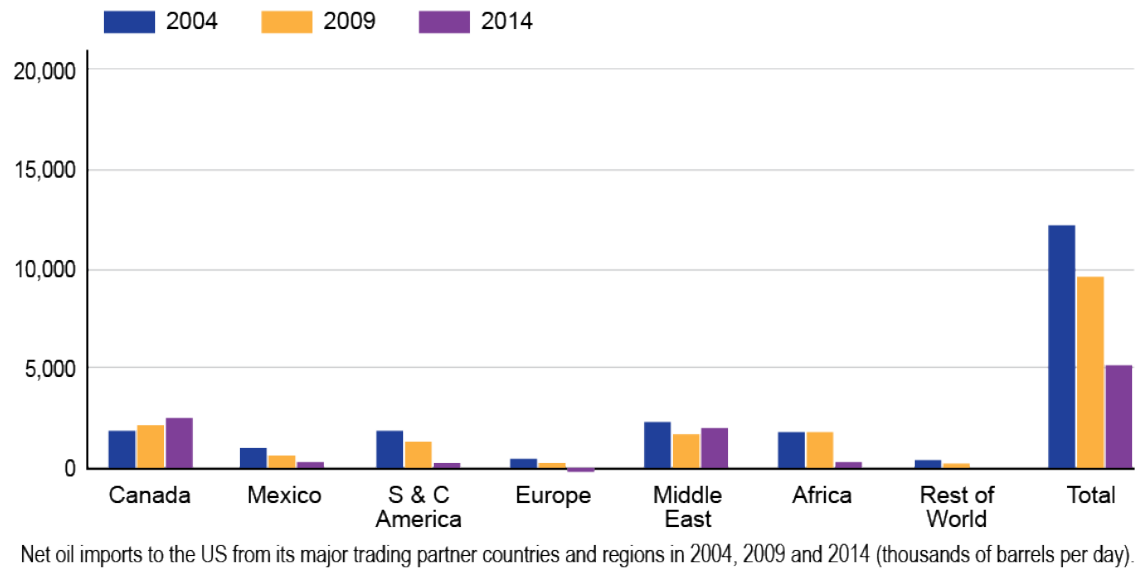


Figure 9. U.S. Net Oil Imports, Thousands of Barrels Daily

Description of Figure 9, U.S. net petroleum imports.

Source: BP Statistical Review of World Energy 2005, 2010, and 2015. Chart by Carbon Brief.

This data shows how reliant the U.S. is on energy imports, and how much more work is to be done on conversion to alternative energy. However, taking into consideration the totality of the global trade, the U.S. alone cannot transition to alternative energy without causing a disruption in the supply and impacting other countries.

An additional challenge is that the world's energy infrastructure is still primarily fossil fuel based. Power grids plug in to a variety of energy sources, including coal, natural gas, solar, and wind, but there is still work and considerations for continuing to move the grid away from fossil fuel sources. One such factor of consideration is land use and space. To increase energy sources from alternative sources like wind and solar, there must be space for the panels and turbines, which poses challenges for cities in particular.[85] While wind and solar farms can be installed further away from cities, there is also the consideration of efficiency in delivering energy across longer distances through the grid.[86] Furthermore, developing countries do not have advanced infrastructure and are still working to power their rural areas.[87] Given the technology and infrastructure for

[85] Christina E Hoicka, Jessica Conroy, and Anna L. Berka, "Reconfiguring Actors and Infrastructure in City Renewable Energy Transitions: A Regional Perspective." Energy Policy 158: 112544, 2021, https://doi.org/10.1016/j.enpol.2021.112544.
[86] Hoika, Conroy, and Burka, "Reconfiguring Actors and Infrastructure".
[87] Rahul Tongia, "It is Unfair to Push Poor Countries to Reach Zero Carbon Emissions Too Early," The Brookings Institute, October 26, 2022, https://www.brookings.edu/blog/planetpolicy/2022/10/26/it-is-unfair-to-push-poor-countries-to-reach-zero-carbon-emissions-too-early/.

fossil fuel energy exists, there is the question as to whether developing countries should implement the existing, or if they should look to installing alternative sources.[88]

Regarding technology, the previous section highlighted how low carbon technologies were in the early stages of emergence and diffusion. This is a big factor of consideration as an obstacle to transition because without the existence of technology, it is not possible to deploy on a large-scale. The Brookings Institute study shows that the power sector is one of the furthest along in diffusion, but there is still work to be done.[89] This is recognized throughout the national security strategies, as the rhetoric calls for research and development of alternative energy technology.[90]

Finally, another obstacle to consider is the financial transition. With the current infrastructure and primary energy source being fossil fuel based, that means there is a considerable amount of money invested in the fossil fuel industry, some of it for long-term development.[91] The fossil fuel industry's global financial investment in 2022 was estimated over $2 trillion dollars (see Figure 10). Global alternative energy investment for 2022 was a bit lower, closer to $1 trillion, but as demonstrated in Figure 11, investments have been steadily increasing.

[88] Tongia, "Unfair to Push".
[89] Tongia "Unfair to Push".
[90] The White House, "National Security Strategy," 1988.
[91] Hoika, Conroy, and Burka, "Reconfiguring Actors and Infrastructure".

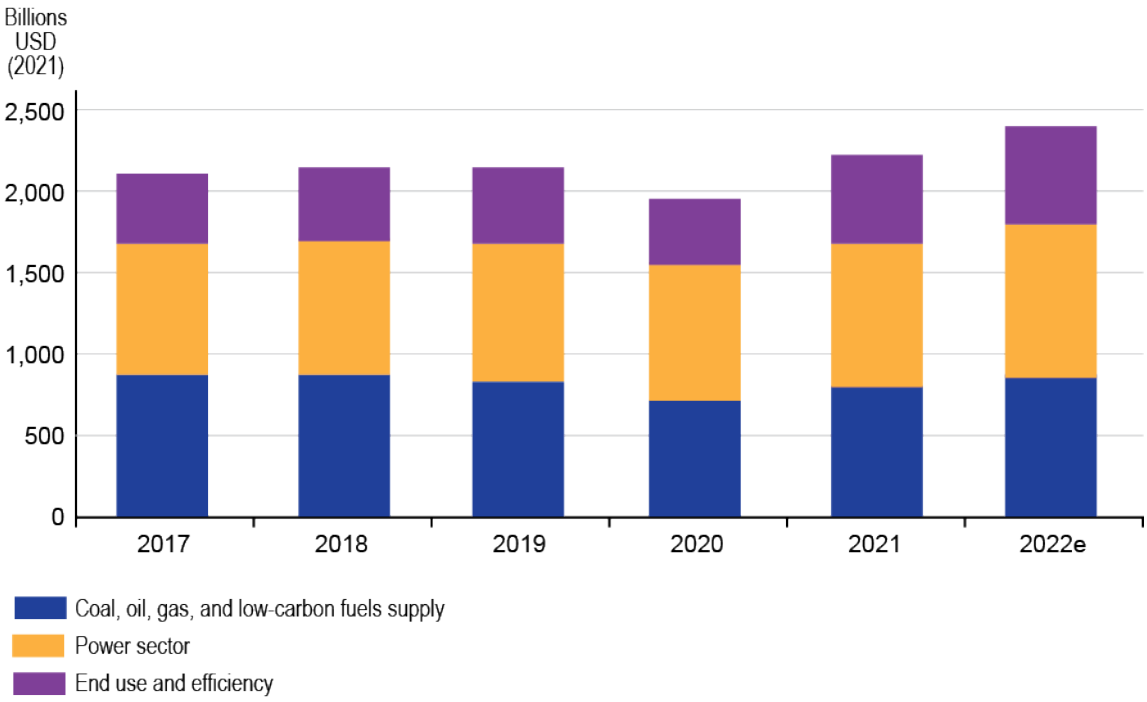


Figure 10. Global Fossil Fuel Investments, 2017-2022

Description of Figure 10, Investments in global fossil fuel infrastructure.

Source: International Energy Agency, World Energy Investment 2022.

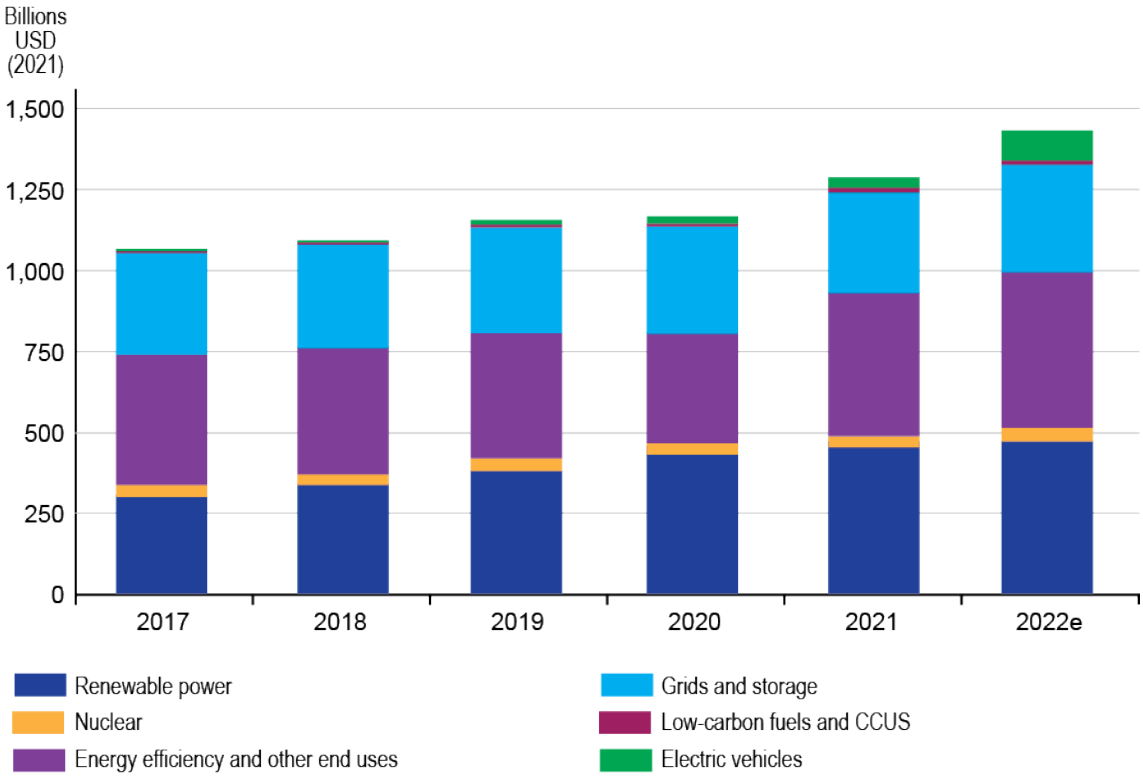


Figure 11. Global Alternative Energy Investments, 2017-2022

Description of Figure 11,Global investments in alternative energy infrastructure.

Source: International Energy Agency, World Energy Investment 2022.

The culmination of energy supply, trade, infrastructure, and financial investments makes it a large undertaking to transition to new, alternative energy sources. The transition has started and been slowly growing, but there is still a lot to consider as the U.S. moves towards greater energy independence.

Chapter III.

Methods

During research, I examined Presidential Budget Requests, Congressional Committee on Appropriations Energy and Water Development Bills, and Public Law Energy and Water Development Acts. My analysis uses the Committee on Appropriations Energy and Water Development Bills to pull recommended budget figures to conduct the analysis. These annual documents were chosen over the other two because of the clear delineation of energy categories – total DoE budget and breakdowns of alternative energy subsector budgets. Based on my observations, these numbers are generally consistently presented over the years, with some variation in later years, whereas the Presidential Budget Request and the Public Law documents did not present the numbers for the categories as clearly and consistently. Though the Committee recommendations do have slight variance from the final approved budget, it is not a significant variance and still allows the analysis to establish trends in the budget.[92]

U.S. National Security Strategy Analysis

To measure priorities of energy from the national security strategies, I conducted a simple search of the word "energy" and used context to categorize the mentions. During my analysis, I did not use any text from the preface. I also did not include anti-

[92] This observation is based on my analysis. The Committee budget recommendations are not the final, approved budget numbers, but the Committee recommendations are late-stage appropriation documentation, so the numbers are close to the final approved numbers, assuming the budget is passed.

proliferation text because the context is regarding weapons proliferation, not energy use for power sources. I did not use adjacent terms to energy, such as "oil", because the focus was on overall energy development and dynamics, and also, because through my search oil mentions were grouped well with the term energy.

Energy categories in the NSS are not measured per word, but instead annotated sections, such as a bullet, single sentence mention within a paragraph, a paragraph, or titled section focused on energy. The sections are categorized based on context. Some sections, particularly paragraphs, may be allocated to more than one category. For example, this paragraph in the 1988 NSS discusses energy in the context of all three identified categories (see below for categories):

> "Energy is an important underpinning to our economic, industrial, and military strength, and thus to our national security. Over the long term, our national energy policy is aimed at ensuring adequate supplies of energy at reasonable prices by strengthening domestic energy industries, diversifying energy sources, and improving energy efficiency. We are working through the International Energy Agency to assist our allies to develop complementary strategies. More immediate objectives are to reduce the nation's vulnerability to disruptions in foreign energy supplies and to lessen the impact on the civil economy if disruptions should occur. This includes plans for increasing the size of the Strategic Petroleum Reserve, promoting international cooperation with allies and partners in the International Energy Agency, and encouraging research into economically viable technologies that increase energy efficiency or that make use of alternative sources of power."[93]

Since this is a single paragraph, we count each context only once, not per sentence or mention.

There are three clear contextual categories in which energy is discussed in the national security strategies (see Table 1). The first regards ensuring continued access to foreign supplies. A second is prioritizing domestic development. The second category

[93] The White House, "National Security Strategy," 1988.

includes both increasing the Strategic Petroleum Reserve and developing alternative energy sources, such as solar and hydro power. In most cases, the two are mentioned together, so the category is kept as singular group. The third category is the about the importance of energy to our national security. Interestingly, there is a fair amount of variance in the explicit mentions of the importance of energy to national security. It seems in many of the strategies, the importance is implicitly implied. However, in the early strategies, energy was clearly articulated as an underpinning of U.S. national security, defense, and economic power.[94]

Access to Supply (foreign) – contextual mentions in the NSS of importance for maintaining access to foreign energy sources.

Energy Development & Alternative Energy (domestic) – contextual mentions in the NSS of importance for developing domestic alternative energy sources.

Strength of / Importance to Security & Defense – contextual mentions in the NSS of importance of energy to U.S. Security & Defense.

While not every annotated section of energy fits neatly into each category, the mentions were allocated as best as possible. The most recent years, starting around 2010, is when there is blending of some of the categories. For example, some of the mentions reference international cooperation to develop and access foreign alternative energies. While the classic context of access refers to oil and petroleum, the decision was made to not create a new category and instead count that as access to foreign supplies.

Appropriations Analysis

[94] The White House, "National Security Strategy," 1987

For analysis of the appropriation documents, the Energy and Water Development Appropriation Bill for each Fiscal Year corresponding to a year a NSS released was pulled from ProQuest Congressional. The data reflects the Committee on Appropriations recommended amount for both Department of Energy Supply, Research, and Development as well as the recommended amount for Solar Energy Research and Development (see Table 2). The reason for picking these sections is best articulated by the committee's explanation of funding:

> "The appropriations recommended for energy supply, research and development activities provide for all of the Department of Energy's renewable energy programs, nuclear fission and fusion, electric energy systems and energy storage, environmental, and basic energy sciences programs. These programs address the development of longer term energy supply options to provide the energy resources needed for sustained national growth and to alleviate our dependence on fossil fuels and foreign oil."[95]

Solar Energy R&D was selected to be a singular point of comparison for alternative energy development because it is the first sub-section of the appropriations bill under Department of Energy Supply, Research, and Development, and because it is well documented in the late-1980s appropriation bills that there were significant decreases in Solar Energy R&D presidential budget requests. Though the presidential budget request is a recommendation and does not reflect the final approved budget, it does establish a start point in budget discussions. The presidential budget request is not included in the data analysis for this paper due to the discrepancy in funding breakdowns between the presidential request and the appropriations bill.

[95] U.S. Congress, House, *Energy and Water Development Appropriation Bill, 1993*, 102nd Congress, 2nd Session, Legislative Day July 23, 1992.

Additional appropriations data outside the years of a published NSS is included to provide a more complete picture of appropriations after a published NSS. Appropriations are passed prior to the start of a fiscal year, meaning the previous calendar year to when a NSS is published. To help determine if there is any effect of NSS priorities on budget, I included two years prior to the first published NSS in 1987 and two years after the last published NSS used in this study, 2017.

Chapter IV.

Analysis

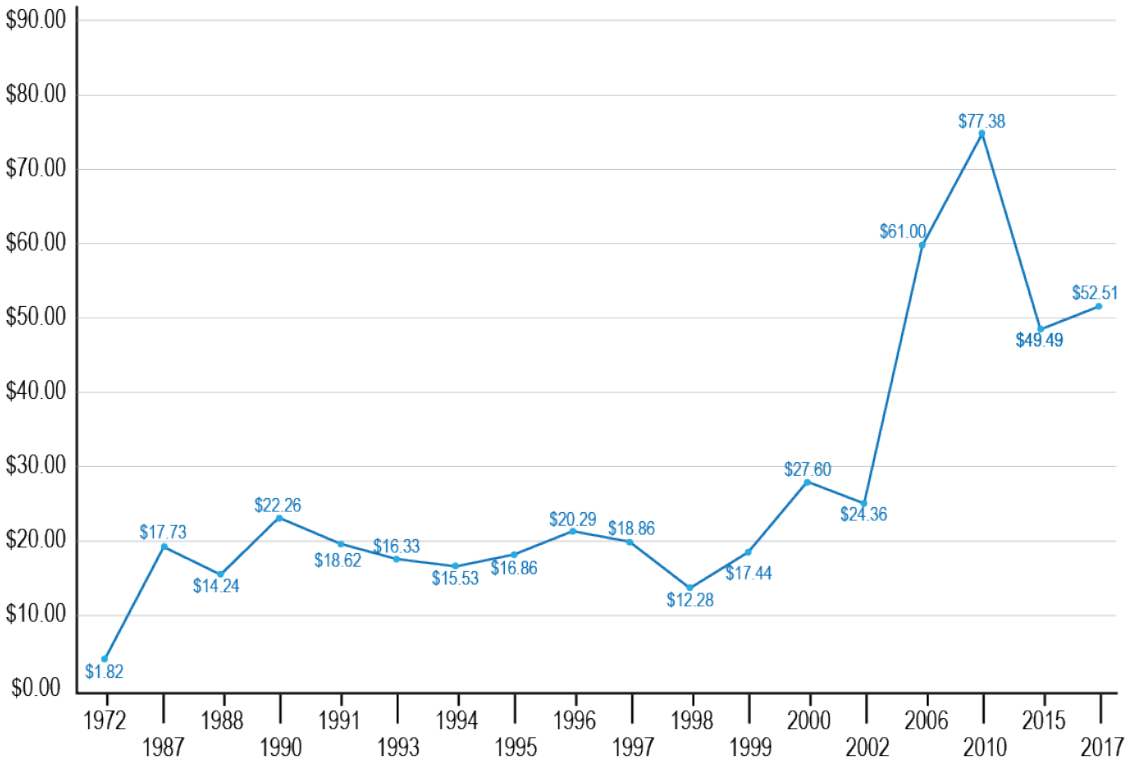
Table 1. Energy Categorization in U.S. National Security Strategies: 1987 – 2017

	Access to Supply (foreign)	Energy Development & Alternative Energy (domestic)	Strength of / Importance to Security & Defense
1987	3		3
1988	2	2	2
1990	3	2	1
1991	3	2	
1993	1	2	
1994	1	2	1
1995	1	2	1
1996	1	2	1
1997	1	1	1
1998	4	1	3
1999	5	1	5
2000	5	2	4
2002	1	2	1
2006	1	2	1
2010	4	8	1
2015	9	7	1
2017	6	3	4

Though Congress mandated U.S. Presidents develop an annual NSS, most presidents only submit every 2-3 years of their tenure. Reagan submitted one for the last

two years of his presidency after the mandate, and Clinton was the only president to submit an NSS each year in office. Clinton's NSS text showed little variance from year to year, and only in the last few were there substantial changes. This is why from 1994 to 1997 the mentions and categorizations of energy are relatively consistent. The 2010 and 2015 strategies increased focus on energy production, both foreign and domestic, showing energy as a high priority for the Obama administration.

While there are no clear patterns in any three of the energy categories examined in the strategies, it does clearly demonstrate access to energy remained a priority through the years. Only in two strategies, 1991 and 1994, was it not explicitly able to be drawn from context that energy was a priority for national defense and security, but the prioritization of maintaining access to energy could infer the priority for defense and security since it was included in a U.S. National Security Strategy.



**1972 added as a baseline to show prices prior to the oil crisis of 1973.*[96]

Figure 12. Average Price of Imported Oil Barrel

Description of Figure 12, Average price of imported oil per barrel, 1972-2017.

Source: Annual Energy Review 2009

Oil prices fluctuated from 1987 to 2002 but did not see any massive fluctuations – at least not to the scale of the 1973 and 2003. Interestingly in 1987, on the tail end of the 1970s oil crisis and 1980s recession, and in 2006 in the post-Iraq war price fluctuations, the NSS did not have an increased focus on alternative energy development prioritization. This suggests the prioritization of alternative energy as a national security priority is not related to oil prices.

There are years in which oil prices increase and the NSS mentions of access to foreign supply correlate – such as 1999 and 2000 – but there are other years where the inverse is true – such as 1991 and 2015. This seems to support there is no correlation between oil prices fluctuations and prioritization of energy focus in the NSS.

Table 2. U.S. Appropriations for Solar Energy Research and Development: 1985 – 2019

	Total Congressional Approved U.S. Government Budget[97]	Total Committee Recommended Department of Energy Budget	Percentage of Total Budget	Committee Solar Energy Research and Development Budget	Annual Change to Solar Energy Research and Development
1985	$743.0 Billion	$1,926,149,000	.25%	$174,485,000	n/a
1986	$769.2 Billion	$1,656,620,000	.21%	$161,732,000	-7.3%

[96] "Change in OPEC Crude Oil Prices Since 1960," Statista, Accessed February 1, 2023, https://www.statista.com/statistics/262858/change-in-opec-crude-oil-prices-since-1960/.
[97] The American Presidency Project, "Federal Budget Receipts and Outlays: Coolidge-Biden," UC Santa Barbara, Accessed February 1, 2023, https://www.presidency.ucsb.edu/statistics/data/federal-budget-receipts-and-outlays.

	Total Congressional Approved U.S. Government Budget[97]	Total Committee Recommended Department of Energy Budget	Percentage of Total Budget	Committee Solar Energy Research and Development Budget	Annual Change to Solar Energy Research and Development
1987	$854.3 Billion	$1,318,798,000	.15%	$125,792,000	-22.22%
1988	$909.2 Billion	$2,056,207,000	.22%	$105,102,000	-16.44%
1990	$1.032 Trillion	$2,215,466,000	.21%	$94,606,000	-9.98%
1991	$1.055 Trillion	$2,745,615,000	.26%	$129,673,000	37.06%
1993	$1.154 Trillion	$2,969,583,000	.25%	$186,425,000	43.76%
1994	$1.258 Trillion	$3,271,286,000	.26%	$252,349,000	35.36%
1995	$1.351 Trillion	$3,329,728,000	.24%	$271,914,000	7.75%
1996	$1.453 Trillion	$2,798,324,000	.19%	$283,560,000	4.28%
1997	$1.579 Trillion	$2,749,043,000	.17%	$246,641,000	-13.01%
1998	$1.721 Trillion	$880,730,000	.05%	$329,304,000	33.51%
1999	$1.827 Trillion	$880,834,000	.04%	$351,405,000	6.71%
2000	$2,025 Trillion	$715,412,000	.03%	$353,900,000	.71%
2002	$1.853 Trillion	$741,139,000	.03%	$435,600,000	23.08%
2006	$2.406 Trillion	$24,574,857,000	1%	$83,953,000[98]	-80.72%
2010	$2.162 Trillion	$26,878,850,000	1.2%	$258,655,000[99]	208.09%
2015	$3.249 Trillion	$27,305,845,000	.84%	$178,000,000[100]	-31.18%
2017	$3.316 Trillion	$31,503,000,000[101]	.95%	Unavailable	n/a
2018	$3.329 Trillion	$31,967,986,000	.96%	$167,500,000[102]	-5.89%
2019	$3.463 Trillion	$30,146,071,000	.87%	Unavailable[103]	n/a

[98] From 2006-2015, the Energy Appropriations categorization changed from previous years and included a section for "Renewable Energy". This new categorization and focus on diversification of alternative energy research and development increased the budget for other energy sources and explains the decrease in solar energy budgeting. The total recommended budget for Renewable energy was $1,762,888,000.
[99] The 2010 total recommended budget for Renewable Energy was $1,787,440,000.
[100] The 2015 total recommended budget for Renewable Energy was $1,789,000,000.
[101] This is the recommended number, not final approved, because the budget failed to pass Congress.
[102] The 2018 total recommended budget for Renewable Energy was $1,936,988,000.
[103] The 2019 total recommended budget for Renewable Energy was $2,078,640,000.

Calculations were completed to the nearest 1/100. In the years where a solar energy budget amount was unavailable, the calculation was made using the previously available year (e.g., 2018 is the percent change from 2015).

In the late 1980s, the budget for solar research and development within the Department of Energy budget continually decreased. Reagan was very clear about his reasons for this, primarily being he believed the free market should lead the effort in energy development, and thus the government should not be relied upon to provide the bulk of the funding. To that end, Reagan stated in the Fiscal Year 1987 Presidential Budget Request:

> "The Nation needs adequate supplies of energy at reasonable costs. The best way to meet this need is to let market forces work. The role of the Federal Government in this process should be limited. Consistent with this philosophy, the administration proposes a number of reductions in energy programs and major initiatives which both provide new revenues and curtail the Federal Government's involvement in energy markets. Total outlays for energy are estimated to be $4.0 billion in 1987, compared to $4.4 billion in 1986."[104]

To which, the Committee responded in the 1987 Energy and Water Appropriations:

> "The administration proposes major reductions from the fiscal year 1986 level of funding for solar and renewable energy activities. The budget request would accelerate the downward trend in these programs which have been substantially curtailed over the last 5 years. As in the past, the technology development would be focused on long-term re- search and development.
>
> The Committee agrees that the marketplace must ultimately decide the future role of the solar technologies. Most solar and renewables re- search, however, has not been developed to the point where the private sector alone can be expected to carry forward with its development.

[104] Executive Office of the President, *Budget of the United States Government – Fiscal Year 1987*, February 5, 1987, https://fraser.stlouisfed.org/title/budget-brief-332/fiscal-year-1987-6337.

> The Committee considers it essential that a viable solar and renewable energy research and development program be maintained in the Department of Energy and that the staff expertise be maintained to properly manage this type of effort. Continued basic research and development of solar and renewable energy is essential to maintain a balanced energy research program."[105]

This rhetoric showed opposition from Congress on Reagan's philosophy for energy development, yet the budget continued to decrease throughout Reagan's presidency.

After Reagan left office, funding for the DOE and Solar R&D continued to increase until the mid-1990s. The funding decrease in 1997 was cited to be due to inefficient management, processes, and output from DOE. There was a decrease in DOE energy research and development in 1998 due to concerns over contracting procedures, but there was an increase for solar energy research and development due to "commitment of Congress to develop clean and renewable energy sources of energy".[106] The mid-1990s marked the lowest amount of DOE budget in comparison to the total U.S. federal government budget measured in this research, but DOE funding then sharply increased in 2002. The 2002 increase is attributed to increased funding for security after 9/11.[107]

The 2002 budget documents marked another year in which the Presidential and Congressional Committee disagreed on budget allocation based on alternative energy prioritization. The Committee states, "While the Administration's Report of the National Energy Policy Development Group recognized the importance of a clean and diverse

---

[105] U.S. Congress, House, *Energy and Water Development Appropriation Bill, 1987*, 99th Congress, 2nd Session, Legislative Day September 15, 1986.
[106] U.S. Congress, House, *Energy and Water Development Appropriation Bill, 1988*, 100th Congress, 1st Session, Legislative Day September 16, 1987.
[107] U.S. Congress, House, *Energy and Water Development Appropriation Bill, 2003*, 107th Congress, 2nd Session, Legislative Day September 24, 2002.

portfolio of renewable domestic energy supplies, the Administration's budget, even as amended, provides inadequate resources to accomplish these goals."[108]

While it appears there was a decrease in solar R&D funding from 2006-2018, it is difficult to measure these years because the categorization of the budget changed, including a larger, encompassing budget for renewable energy, that included broadened categories and reduced focus on solar energy.

.

[108] U.S. Congress, House, *Energy and Water Development Appropriation Bill, 2002,* 107th, Congress, 1st, Session, Legislative Day July 13, 2001.

Chapter V.

Conclusion

The most consistent energy priority in the NSS is ensuring continued access to foreign energy supplies, primarily petroleum-based supplies. The reason for this is simple. The U.S. energy infrastructure is established for petroleum products and has been for approximately the last century. Even though in the last few decades, the U.S. emerged as a top oil producer, the country's production and trade is not set up to meet its energy needs, so it must rely on foreign supply. Any disruption to the foreign supply, as seen in the 1973 oil crisis and 2022 impact from Russia's invasion in Ukraine, will sharply increase prices and reshuffle the global trade. Further, with supply chain routes and surrounding costs associated, even changes to shipping routes could impact prices.

Overall, the budget for solar R&D struggled to remain consistent. It started strong in the 1970s and decreased under Reagan in an effort to rely on the private market. Since the 1980s, the budget has fluctuated based on various obstacles, administration priorities, and changes in alternative energy technologies. The NSS prioritization, oil prices, and solar R&D budget do not show clear correlations. What can be drawn from this is there is a disconnect between focusing priorities based on real time, world events and sustained focus across presidential administrations. What is clear though, is each presidential administration recognizes the importance of energy to national security and defense. The missing piece is having sustained focus and resource allocation to make progress.

Without sufficient energy, our defense, security, economic, and personal wellbeing are at risk. It makes sense that even in the years where developing alternative energy sources was a clear NSS priority, the focus would still be on maintaining foreign access because that is the immediate priority while alternative energy development is a long-term priority to eventually gain greater energy independence.

Future studies can expand on this research by conducting a comparative analysis of NSS prioritization of energy and subsequent budget allocations to another sector. For example, examining the percentages of alternative energy appropriations against a Department of Defense budget could illuminate if there is a perception amongst federal government leadership that defense budget drives national security protection more than energy. Given energy is not in the Department of Defense sector, it could struggle to justify an energy budget since energy is governed by the Department of Energy. Yet, the significant increase to the energy budget to account for security post 9/11 provides a stand-alone demonstration of the importance of energy to defense and security. The integration of energy in intelligence strategies demonstrates the importance of cross-sector energy protection. Thus energy should be treated as a whole of government effort.

Chapter VI.

Policy Recommendations

In the words of political scientists, Danny Cullenward and David G. Victor, "Climate change presents an extremely difficult political problem that pits the diffuse public interests of the future – where everyone, to varying degrees, benefits from protecting the planet – against the private concerns of the present. Relying on markets to redirect those political forces takes a hard problem and makes it even harder to solve."[109] The same can be said for the energy problem. Since 1988, multiple presidential administrations have noted the importance of developing alternative energy for national security reasons and recognized the pivotal role the private market plays. Some, like Reagan, believed deregulation would allow the free market to develop new alternative energy sources and invested little in government research and development. The problem is much deeper and complex than the free market could expect to solve without policy, guidance, and incentives from governments.

As demonstrated in the background section, the energy sector is a concern of multiple U.S. government agencies, from intelligence to energy. Because energy impacts so many sectors, and multiple sectors are involved in energy policy, policy and political science researchers look toward policy integration as the method for ensuring consistent policy across agencies and sectors.[110] The concept is not new. In 1987, the World

[109] Cullenward and Victor, *Making Climate Policy Work,* 9.
[110] Mans Nilsson and Katarina Eckerberg, *Environmental Policy Integration in Practice,* Earthscan (Sterling, VA), 2007.

Commission on Environment and Development noted the fragmented policy process related to environmental issues:

> "The integrated and interdependent nature of the new challenges and issues today contrasts sharply with the nature of the institutions that exist today. These institutions tend to be independent, fragmented, and working to relatively narrow mandates with closed decision processes. Those responsible for managing natural resources and protecting the environment are institutionally separated from those responsible for managing the economy. The real world of interlocked economic and ecological systems will not change; the policies and institutions must."[111]

This concept could also be considered for energy policy. The first step to achieving U.S. energy independence using alternative energy is to state it as a priority, which has consistently happened since the 1988 NSS. The next step is to allocate policy and resources to support emergence and diffusion. As shown in this thesis, there is a disconnect between priorities and sustaining resource allocation. Drawing from the Brookings study and the example of automobile transitions through the decades, coordinated policies to support diffusion and adoption is necessary. Since energy crosses multiple government and private sectors, policy integration is thus necessary.

Having a unified energy working group to consider intra-agency challenges with respect to energy would be beneficial for working through the obstacles impeding alternative energy development – both for domestic agencies and international coalitions. Fossil fuel energy is so ingrained in the U.S. and without foreign partners, there is no way to move the U.S. in a silo, it must be done as a whole and as an integrated approach across sectors in order to avoid disrupting the global economy in which energy is also ingrained.

[111] Nilson and Eckerberg, *Environmental Practice,* 1-2.

Global oil infrastructure investments continue to compete with global alternative energy investments. It is important policies take this into account as the U.S. and its foreign partners move toward alternative energy to avoid sunk cost and impacts to the economy. Policies that move petroleum companies toward alternative energy R&D could assist the transition, but policies should also be careful to not cut out innovation from new companies as well.

As the U.S. government continues funding alternative energy R&D, leaders and policymakers must consider cross-sector policy integration. Working with domestic government agencies to coordinate policies and resources should be a top priority. As a close second, the U.S. should work closely with foreign partners to develop a plan for a global transition away from oil to ensure a well-planned economic transition for the energy sector as well.

References

"A Brief History of The Department of Energy." Office of Legacy Management. Accessed February 1, 2023. https://www.energy.gov/lm/doe-history/brief-history-department-energy.

Carson, Rachel. *Silent Spring*. Houghton Mifflin Company publisher and Riverside Press printer. 1962. Boston: Houghton Mifflin.

"Change in OPEC Crude Oil Prices Since 1960". Statista. Accessed February 1, 2023. https://www.statista.com/statistics/262858/change-in-opec-crude-oil-prices-since-1960/.

Cullenward, Danny and David G. Victor. *Making Climate Policy Work.* Polity Press (Medford, MA). 2020.

Doniger, David. "The Rest of the Story of Cap and Trade". *The Grist*. December 10, 2009. https://grist.org/article/the-rest-of-the-story-of-cap-and-trade/.

Doyle, Richard B. "The U.S. National Security Strategy: Policy, Process, Problems". ed. Nancy Roberts. Naval Postgraduate School. 2007.

Executive Office of the President. *Budget of the United States Government – Fiscal Year 1987*. February 5, 1987. https://fraser.stlouisfed.org/title/budget-united-states-government-54/fiscal-year-1987-18993.

Gross, Samantha. "What Iran's 1979 Revolution Meant for US and Global Oil Markets". The Brookings Institute. March 5, 2019. https://www.brookings.edu/blog/order-from-chaos/2019/03/05/what-irans-1979-revolution-meant-for-us-and-global-oil-markets/.

Gross, Samantha. "Why are Fossil Fuels so Hard to Quit". The Brookings Institute. June 2020, https://www.brookings.edu/essay/why-are-fossil-fuels-so-hard-to-quit/.

Hoicka, Christina E., Jessica Conroy, and Anna L. Berka. 2021. "Reconfiguring Actors and Infrastructure in City Renewable Energy Transitions: A Regional Perspective." Energy Policy 158: 112544. https://doi.org/10.1016/j.enpol.2021.112544.

"House votes energy tax bill". *Facts on File World News Digest.* June 21, 1975. https://advance-lexis-com.ezp-prod1.hul.harvard.edu/api/document?collection=news&id=urn:contentItem:3SJ4-DDF0-000Y-N2BJ-00000-00&context=1516831.

"Impact of Russia's Invasion of Ukraine on Oil and Gas Sector". *Oil & Energy Trends*. 47 (4): 3–5. https://doi.org/10.1111/oet.12913.

"Independent Oilmen Cheer Reagan Promise". *The Associated Press.* October 21, 1980. https://advance-lexis-com.ezp-prod1.hul.harvard.edu/api/document?collection=news&id=urn:contentItem:3SJ4-DX40-0011-40XX-00000-00&context=1516831.

Kampshoff, Philipp, et al. "Building the Electric-Vehicle Charging Infrastructure America Needs". McKinsey & Company. April 18, 2022. https://www.mckinsey.com/industries/public-and-social-sector/our-insights/building-the-electric-vehicle-charging-infrastructure-america-needs.

Katz, James Everett. "US Energy Policy Impact of the Reagan Administration". Butterworth & Co. 1984.

Krugman, Paul. "The Textbook Economics of Cap-and-Trade". *The New York Times.* September 27, 2009. https://archive.nytimes.com/krugman.blogs.nytimes.com/2009/09/27/the-textbook-economics-of-cap-and-trade/.

Laycock, Richard. "US Gas Prices: 2018 to February 2023". Updated February 9, 2023. https://www.finder.com/gas-prices.

Lepore, Jill. "For the Birds". *The Last Archive.* Pushkin Industries. Podcast Audio. July 9, 2020.

Loveday, Steve. "A Comprehensive Guide to U.S. EV Charging Networks". ed. Cody Trotter. *U.S. News.* January 4, 2023. https://cars.usnews.com/cars-trucks/advice/ev-charging-stations#:~:text=According%20to%20the%20U.S.%20Department,individual%20(EVSE)%20charging%20ports.

Matthews, Jessica Tuchman. "Redefining Security". *Foreign Affairs*. Spring 1989.

Mittlefehldt, Sarah. "From Appropriate technology to the clean energy economy: renewable energy and environmental politics since the 1970s". *Journal of Environmental Studies and Sciences.* 2018. Volume 8. p.212-219. https://link-springer-com.ezp-prod1.hul.harvard.edu/content/pdf/10.1007/s13412-018-0471-z.pdf.

Narum, David. "A Troublesome Legacy: The Reagan Administration's Conservation and Renewable Energy Policy". *Energy Policy*. Volume 20. Issue 1. p.40-53. January 1992.

"National Counterintelligence Strategy of the United States of America 2020-2022". Office of the Director of National Security. Accessed February 1, 2023.

https://www.dni.gov/files/NCSC/documents/features/20200205-National_CI_Strategy_2020_2022.pdf.

Nilsson, Mans and Katarina Eckerberg. *Environmental Policy Integration in Practice.* Earthscan (Sterling, VA), 2007.

"Oil Dependence and U.S. Foreign Policy, 1850-2022". Council on Foreign Relations. Accessed on February 1, 2023. https://www.cfr.org/timeline/oil-dependence-and-us-foreign-policy.

Righter, Robert W. *Wind Energy in America: A History.* University of Oklahoma Press (Oklahoma). 1996.

Sawin, Janet Laughlin. "The Role of Government in the Development and Diffusion of Renewable Energy Technologies: Wind Power in the United States, California, Denmark, and Germany, 1970-2000". ProQuest Information and Learning. September 2001.

"Senate OKs omnibus tax measure". *Facts on File World News Digest.* August 14, 1976. https://advance-lexis-com.ezp-prod1.hul.harvard.edu/api/document?collection=news&id=urn:contentItem:3SJ4-DHD0-000Y-N2K2-00000-00&context=1516831.

Singer, James W. "Small Support for the President". *National Journal.* June 23, 1979. https://advance-lexis-com.ezp-prod1.hul.harvard.edu/api/document?collection=news&id=urn:contentItem:3SJB-04F0-000X-74RB-00000-00&context=1516831.

"Strategic Plan 2014-2018". U.S. Department of Energy. Accessed February 1, 2023. https://www.energy.gov/sites/prod/files/2014/04/f14/2014_dept_energy_strategic_plan.pdf.

Swoboda, Frank. "The Legacy of Deregulation". *The Washington Post.* October 2, 1988. https://www.washingtonpost.com/archive/business/1988/10/02/the-legacy-of-deregulation/c553674b-8bd2-436e-9be7-7de95f798fbb/.

"The 1973 Energy Crisis Sparked the Idea for Establishing the IEA. What Have we Learned". World Economic Forum. March 29, 2022. weforum.org/agenda/2022/03/iea-1970s-energy-crisis/.

"The American Presidency Project". UC Santa Barbara. Accessed February 1, 2023. https://www.presidency.ucsb.edu/statistics/elections/1980.

The American Presidency Project. "Federal Budget Receipts and Outlays: Coolidge-Biden". UC Santa Barbara. Accessed February 1, 2023. https://www.presidency.ucsb.edu/statistics/data/federal-budget-receipts-and-outlays.

The White House. “Defense Production Act”. June 6, 2022. https://www.whitehouse.gov/briefing-room/statements-releases/2022/06/06/fact-sheet-president-biden-takes-bold-executive-action-to-spur-domestic-clean-energy-manufacturing/.

The White House. “The Inflation Reduction Act”. August 15, 2022. https://www.whitehouse.gov/briefing-room/speeches-remarks/2022/07/28/remarks-by-president-biden-on-the-inflation-reduction-act-of-2022/.

The White House. “National Security Strategy of the United States.” January 1987.

The White House. “National Security Strategy of the United States.” January 1988.

The White House. “National Security Strategy of the United States.” March 1990.

The White House. “National Security Strategy of the United States.” August 1991.

The White House. “National Security Strategy of the United States.” January 1993.

The White House. “National Security Strategy of the United States.” July 1994.

The White House. “National Security Strategy of the United States.” February 1995.

The White House. “National Security Strategy of the United States.” February 1996.

The White House. “National Security Strategy of the United States.” May 1997.

The White House. “National Security Strategy of the United States.” October 1998.

The White House. “National Security Strategy of the United States.” December 1999.

The White House. “National Security Strategy of the United States.” December 2000.

The White House. “National Security Strategy of the United States.” September 2002.

The White House. “National Security Strategy of the United States.” March 2006.

The White House. “National Security Strategy of the United States.” May 2010.

The White House. “National Security Strategy of the United States.” February 2015.

The White House. “National Security Strategy of the United States.” December 2017.

Thompson, Lisa. “The Rural Electrification Administration (REA) (1935)”. November 18, 2016. https://livingnewdeal.org/glossary/rural-electrification-administration-rea-1935/.

"Timeline of Events: 1971-1980". Office of Legacy Management. Accessed February 1, 2023. https://www.energy.gov/lm/doe-history/doe-history-timeline/timeline-events-1971-1980.

Tongia, Rahul. "It is Unfair to Push Poor Countries to Reach Zero Carbon Emissions Too Early". The Brookings Institute. October 26, 2022. https://www.brookings.edu/blog/planetpolicy/2022/10/26/it-is-unfair-to-push-poor-countries-to-reach-zero-carbon-emissions-too-early/.

U.S. Congress. House. *Energy and Water Development Appropriation Bill, 1987*. 99th Congress. 2nd Session. Legislative Day September 15, 1986.

U.S. Congress. House. *Energy and Water Development Appropriation Bill, 1988*. 100th Congress. 1st Session. Legislative Day September 16, 1987.

U.S. Congress. House. *Energy and Water Development Appropriation Bill. 1993*. 102nd Congress. 2nd Session. Legislative Day July 23, 1992.

U.S. Congress. House. *Energy and Water Development Appropriation Bill, 2003*. 107th Congress. 2nd Session. Legislative Day September 24, 2002.

U.S. Congress, House, *Energy and Water Development Appropriation Bill, 2002,* 107th, Congress, 1st, Session, Legislative Day July 13, 2001.

U.S. Congress. House. *Renewable Energy and Energy Conservation Commercialization and Development Act.* HR 4226. 100th Congress. 2nd Session. Introduced in the House September, 22, 1988. https://www.congress.gov/bill/100th-congress/house-bill/4226/text.

U.S. Energy Information Administration, "U.S. Energy Facts Explained," Accessed February 1, 2023, https://www.eia.gov/energyexplained/us-energy-facts/.

Victor, David G., Frank W. Geels, and Simon Sharpe. *Accelerating the Low Carbon Transition: The Case for Stronger, More Targeted and Coordinated International Action.* The Brookings Institute. November 2019. https://www.brookings.edu/wp-content/uploads/2019/12/Coordinatedactionreport.pdf.

Wessel, David. "What we Learned from Reagan's Tax Cuts." The Brookings Institute. December 8, 2017. https://www.brookings.edu/blog/up-front/2017/12/08/what-we-learned-from-reagans-tax-cuts/.