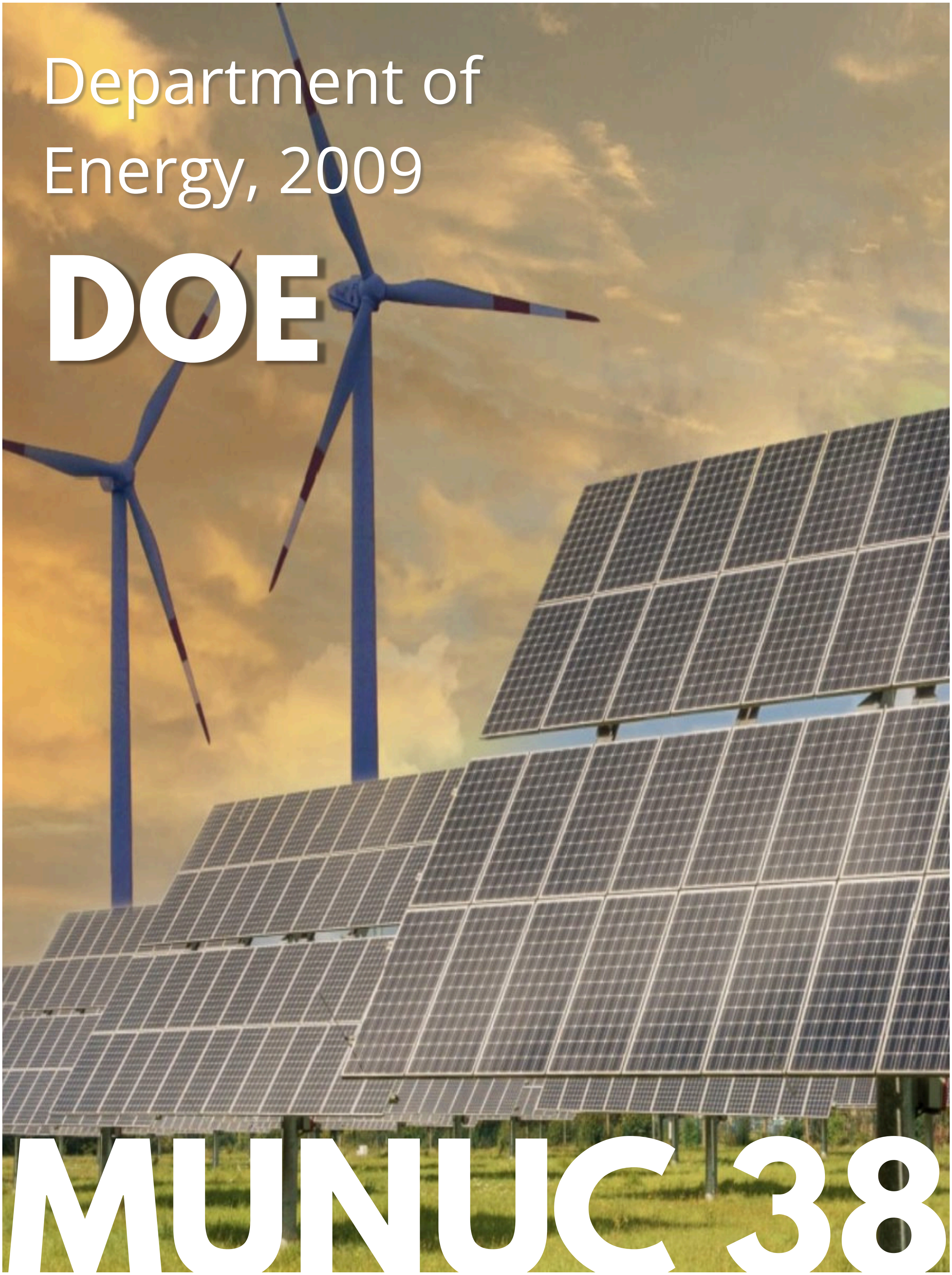
Department of Energy, 2009

DOE



MUNUC 38

Model United Nations of the University of Chicago

Chair Letters

Dear Delegates,

Hello, and welcome to MUNUC 38! My name is Riley Sisk, and I will be serving as one of your Chairs in the United States Department of Energy Committee, 2009. I am a second-year student at the University of Chicago, and I plan to major in Philosophy and Public Policy. I began participating in Model United Nations back in high school and have continued this course into college. Last year, I participated as an Assistant Chair in MUNUC 37 and ChoMUN XVIII. Outside of MUN, I am an avid reader and a member of the UChicago Quiz Bowl team.

2009 was a pivotal year in the DoE's history, with the American Recovery and Reinvestment Act allocating tens of billions of dollars to the agency to fund clean energy initiatives. This committee will consider two topics pertaining to these circumstances. Topic A is Energy Efficiency, which involves optimizing and minimizing waste by using energy more efficiently. Topic B examines the implementation of solar energy, including potential tax breaks and grants for manufacturers, as well as the advancement of solar technology. Whichever topic you select, I am confident that this committee will work towards holistic solutions that both recognize the national economic effects of green energy and consider the global impact of carbon emissions.

Essential topics such as these deserve careful consideration and sensitivity. If you are concerned that something you say or do may constitute a sensitivity violation, please reach out to one of your chairs; we are more than happy to answer any questions you may have.

Our goal in writing this background guide is to provide information that will serve as a valuable resource in its own right, while also serving as a starting point for further research. We hope that you find this committee to be fun and educational. MUN is always a daunting experience, but the skills you develop here are unique and invaluable. If you find yourself getting discouraged or overwhelmed at any point during the committee, take a deep breath and remember we are all here to learn! If you have any questions about the background guide or the committee in general, feel free to contact me or Maxi. Good luck, and we look forward to seeing you all in February!

Sincerely,

Riley Sisk

Chair

rileysisk@uchicago.edu

Dear Delegates,

I hope all is well! My name is Maxi, and I am very excited to be one of your chairs for MUNUC 38 on the 2009 US Department of Energy Committee.

I am a third-year student studying business economics and history, with interests in investment banking and the late 20th and early 21st centuries. Outside of Model UN, I'm involved in the UChicago Credit Group, where I lead the financials pitch team, and am also a skier and runner. I'm a New Yorker through and through, but have enjoyed adjusting to Chicago.

The Department of Energy underwent major changes in 2009 as the nation embraced Obama's message of change. The American Recovery and Reinvestment Act, passed by Obama as a stimulus to help fight the effects of the Great Recession, allocated a great amount of money toward clean and renewable energy. This committee will focus on two specific facets of that development: energy efficiency and the implementation of solar energy. Although I understand that many of you may have a good understanding of climate-related topics and the technology surrounding them, I urge you to read this background guide so that our committee can be as productive as possible. Not only our committee, but also your experience, will be enriched should you spend more time before the meeting of the committee doing your due diligence on the topic.

I hope that this committee will be enjoyable for all members as we grapple with these topics, which are arguably more salient than ever as time progresses. To ensure this, if you have any questions or issues, especially sensitivity violations, please reach out to me or Riley so that we can handle it properly. I look forward to meeting you all in February!

Your co-chair,

Maxi

Chair

mglanz@uchicago.edu

History of the Committee

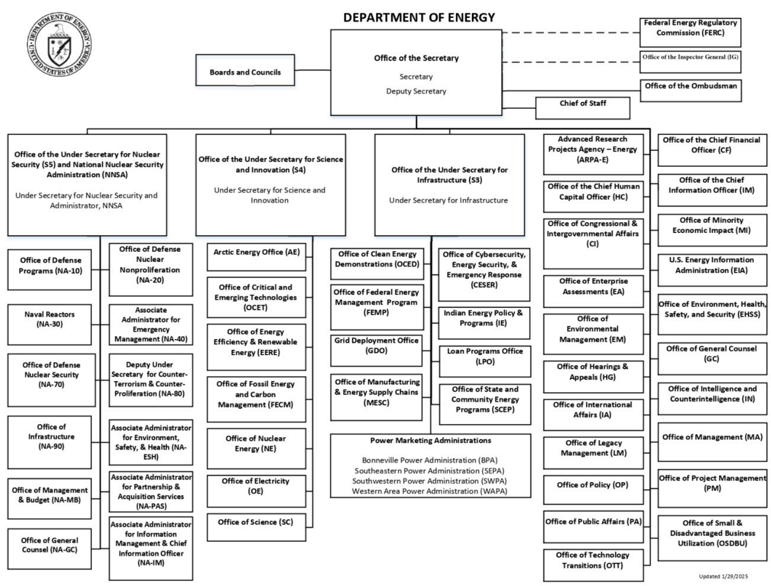
The **Manhattan Project** planted the seeds for the establishment of the Department of Energy (DOE). During World War II, the United States Army Corps of Engineers oversaw the development of nuclear technology. However, with the arrival of peace, Congress created the Atomic Energy Commission (AEC) in 1946, a civilian agency. Although primarily focused on weapons development during its early history, the AEC would later expand its endeavors to promote the peaceful uses of the atom. Nevertheless, before the 1970s, the United States federal government lacked a cohesive energy strategy.[1]

The chief catalyst for the DOE was the **1973-74 Organization of Arab Petroleum Exporting Countries (OAPEC) Embargo** in the aftermath of the 1973 **Yom Kippur War**. The resulting energy crisis led to calls for the creation of a coordinated national energy plan. One such advocate, President Jimmy Carter, signed the Department of Energy Organization Act in 1977, and the DOE became officially active on October 1 of that year.[2] The legislation effectively merged more than 30 responsibilities previously discharged by separate organizations into a single agency.[3]

Consistent with its lineage, the DOE is responsible for research and development for both nuclear power and nuclear weaponry. Additionally, the DOE operates a system of 17 laboratories, known as the National Laboratories, to conduct research in a variety of subjects. Along with energy R&D, the agency performs inquiries into diverse topics, ranging from

[1] "A Brief History of the Department of Energy," Department of Energy, accessed August 10, 2025, https://www.energy.gov/lm/brief-history-department-energy.
[2] "Timeline of Events: 1971 to 1980," Department of Energy, accessed August 10, 2025, https://www.energy.gov/lm/timeline-events-1971-1980.
[3] "History," U.S. DOE Office of Science (SC), last modified April 21, 2022, https://science.osti.gov/About/History.

atmospheric and Earth systems to artificial intelligence and bioengineering.[4,5] An overarching goal of the DOE is to promote American energy security, exemplified by the Strategic Petroleum Reserve (SPR), which stores crude oil underground for emergency use. One instance of this occurred during the Gulf War, when President George H.W. Bush authorized an emergency release from the SPR to stabilize global markets.[6] Ultimately, while this background guide focuses on two topics that this committee will consider, the plethora of challenges and mandates of the DOE serve as a powerful reminder of the agency's capabilities and commitments.



Organizational Structure of the DOE.[7]

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[4] "Department of Energy," U.S. Global Change Research Program, last modified July 30, 2025, https://web.archive.org/web/20250630043605/https://www.globalchange.gov/agencies/department-energy.
[5] "Department of Energy (DOE)," Emerging Technology Policy Careers, last modified January 16, 2025, https://emergingtechpolicy.org/institutions/executive-branch/department-of-energy/.
[6] "History of SPR Releases," Department of Energy, accessed August 10, 2025, https://www.energy.gov/ceser/history-spr-releases.
[7] Department of Energy, *DOE Org Chart Feb 2022*, 2022, https://commons.wikimedia.org/wiki/File:DOE_Org_Chart_Feb_2022.png

TOPIC A: ENERGY EFFICIENCY

Statement of the Problem

What is Energy Efficiency?

According to the law of the conservation of energy, energy can not be created or destroyed, but can only be transformed from one form to another.[8] For example, when a car burns fuel, this process converts some of the energy sourced from the fuel into motion, while the remaining energy is emitted as heat. Though strictly speaking, no energy is lost in the exchange, only some of the converted energy is 'useful', i.e., contributing to the car's movement; the heat is merely a side effect of the process. This distinction is at the heart of what defines energy efficiency. In an inefficient scenario, a significant portion of energy is merely a byproduct of the conversion process. In contrast, in an efficient situation, more energy is converted into useful outputs than wasted as a byproduct.

While seemingly simple at first glance, energy efficiency can be a complex and nuanced concept. Broadly, energy efficiency is defined as the ratio of useful energy output to energy input.[9] However, definitions used by authors and policymakers are frequently not rigorous.[10] In a scientific context, energy efficiency may be expressed using physical and **thermodynamic** measures,[11] while on the scale of an economy, energy efficiency may be defined as the ratio between energy usage and **Gross Domestic Product** (GDP).[12] Defining energy efficiency in

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[8] J.M.K.C. Donev et al. (2024). Energy Education. Available: https://energyeducation.ca. [Accessed: 2024].
[9] Murray G. Patterson, "96/04578 What is energy efficiency? Concepts, indicators and methodological issues," *Fuel and Energy Abstracts* 37, no. 4 (1996): 377, doi:10.1016/0140-6701(96)82844-x.
[10] Patterson, "What is energy efficiency?," 377.
[11] Patterson, "What is energy efficiency"," 378.
[12] "7th Annual Global Conference on Energy Efficiency The value of urgent action on energy efficiency," International Atomic Energy Agency, last modified June 2022,

terms of a single quantity may have some drawbacks. For example, compact fluorescent (CFL) and incandescent bulbs, both types of lightbulbs, have the same light output. With this in mind, one may prioritize CFLs, as they are more energy efficient. However, CFLs offer relatively low light quality, which may dissatisfy users.[13] In light of such considerations, policymakers should adopt a holistic approach to addressing energy efficiency issues that does not unduly compromise the quality of service. Modern energy efficiency measures have also tended to move away from context-specific energy labels such as horsepower to **joules** and **kilowatts** (kWh), which are more standardized units and applicable to a variety of situations.[14]

Transmission lines are designed to transfer energy across long distances with minimal losses.[15]

Importance

One of the most immediate positive impacts of increased energy efficiency is the resulting monetary savings. While the average American spends $2,000 on energy annually,

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https://iea.blob.core.windows.net/assets/6ed712b4-32a3-4934-9050-d97a83a45a80/Thevalueofurgentaction-7thAnnualGlobalConferenceonEnergyEfficiency.pdf.

[13] Elizabeth Shove, "What is wrong with energy efficiency?," *Building Research & Information* 46, no. 7 (2017): 781, doi:10.1080/09613218.2017.1361746.

[14] Elizabeth Shove, "What is wrong with energy efficiency?," *Building Research & Information* 46, no. 7 (2017): 781, doi:10.1080/09613218.2017.1361746.

[15] Mr.TinMD, *Patuxent Research Refuge Power Lines*, 2011, https://www.flickr.com/photos/mr_t_in_dc/.

energy efficiency upgrades can substantially reduce 10 to 20% of these expenditures.[16] Globally, increased action on energy efficiency in the coming years has the potential to save 650 billion dollars in household energy costs.[17] Additionally, energy efficiency is cost-effective in itself; saving energy is less expensive than producing it. According to one study, while the price of generating one kWh varies between 3-12 cents per unit, the cost of saving one kWh is consistently less than three cents.[18]

Energy efficiency is crucial for assisting nations with increasing energy demand, such as the United States. In 2022, the United States consumed 4.07 trillion kWh of electricity, or 14 times larger than the 1950 consumption numbers.[19] Though the rate of this increase has slowed over time, consumption is still expected to increase by 1% annually until 2050.[20] Global energy consumption has also increased, in line with economic and population growth in the developing world. Global energy consumption in 2023 stood at 183 trillion kWhs, representing a 2% increase from 2022.[21] Using less energy to achieve the same or greater useful output means that these demand increases can be offset.

Along with reducing the consumption of fossil fuels and energy conservation, energy efficiency is a keystone in the fight against human-caused climate change. If societies can achieve more output without increasing input from non-renewable sources, economic expansion can coexist with planetary concerns. Between 2010 and 2022, nations achieved 82% of global

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[16] "Why Energy Efficiency Matters," Department of Energy, accessed August 4, 2025, https://www.energy.gov/energysaver/why-energy-efficiency-matters.
[17] "The value of urgent action on energy efficiency," International Energy Agency, accessed August 4, 2025, https://iea.blob.core.windows.net/assets/6ed712b4-32a3-4934-9050-d97a83a45a80/Thevalueofurgentaction-7thAnnualGlobalConferenceonEnergyEfficiency.pdf.
[18] "Still the One: New Study Finds Efficiency Remains a Cost-Effective Electricity Resource," Berkeley Lab, accessed August 4, 2025, https://emp.lbl.gov/news/still-one-new-study-finds-efficiency
[19] *Use of Electricity*, (2023), https://www.eia.gov/energyexplained/electricity/use-of-electricity.php.
[20] "*Use of Electricity*"
[21] Hannah Ritchie, Pablo Rosado, and Max Roser, "Energy Production and Consumption," Our World in Data, accessed July 2, 2025, https://ourworldindata.org/energy-production-consumption.

reductions in carbon emissions as a result of complementary improvements in energy efficiency.[22] Despite these gains, current energy efficiency efforts are insufficient to prevent global temperatures from rising 1.5°C above pre-industrial levels, a target set by the **Paris Agreement** in 2016. To reach net-zero emissions by 2050, improvements in the **energy intensity** level must increase from 2% annually to 4%.[23] In the absence of energy efficiency improvements, the transition to a carbon-neutral economy will be significantly more difficult and expensive.[24]

Barriers

Lack of information is a simple yet common issue associated with efforts to improve energy efficiency. In the industrial sector, identifying which areas have the most significant potential for upgrades requires careful monitoring of energy consumption data. Along with improper evaluation, plants may lack knowledge of government incentives and subsidies pertaining to their situation, or fail to calculate savings associated with energy efficiency initiatives.[25] In both commercial and household situations, potential investments in energy efficiency may appear to be risky compared to more familiar options when combined with the high upfront costs of some improvements.[26]

Striving towards energy efficiency may also have unintended consequences. As previously mentioned, incandescent bulbs are more efficient than CFL bulbs but suffer from lower light quality, which represents an unpleasant side effect of an energy efficiency measure.

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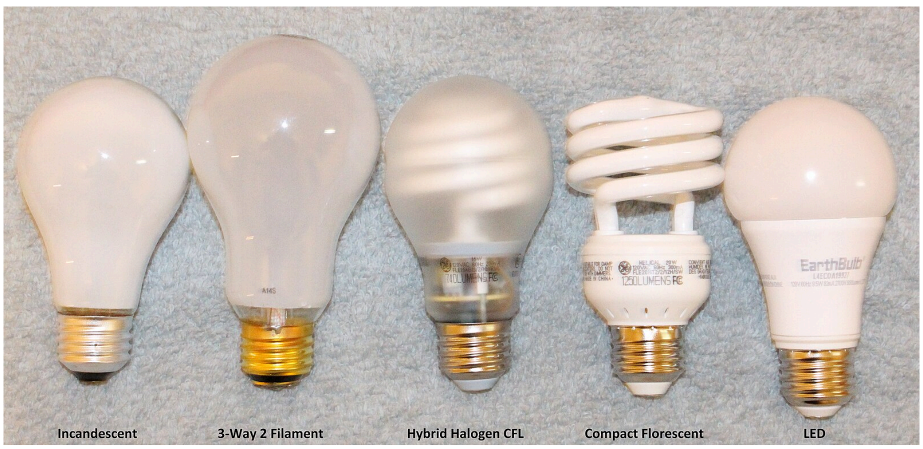
[22] "Energy Efficiency."
[23] "The value of urgent action on energy efficiency."
[24] Ibid.
[25] "Barriers to Industrial Energy Efficiency," Department of Energy, last modified June 2015, https://www.energy.gov/sites/prod/files/2015/06/f23/EXEC-2014-005846_6%20Report_signed_0.pdf.
[26] "Energy Efficiency," Understand Energy Learning Hub, accessed July 10, 2025, https://understand-energy.stanford.edu/energy-resources/renewable-energy/energy-efficiency.

Another concern is the Jevons paradox, which occurs when, as a result of a resource becoming more efficient to use, its consumption increases. For instance, insulating a home to retain heat more effectively will reduce energy consumption, all else being equal. However, there is also a chance that the increased ability to maintain heat will instead drive up heat consumption as heat is now less costly to produce.[27]



Various types of lightbulbs.[28]

In addition to issues associated with energy efficiency technology, institutional barriers pose a challenge. At their best, building codes can ensure that newly constructed buildings are energy-efficient, for example, by mandating insulation; however, inconsistent and lackluster standards have the opposite effect. Along with inadequate requirements, international construction standards can prove to be ineffective if they do not take into account local conditions such as a hotter or drier climate.[29] Governments may also not adjust their fiscal policies in line with the benefits of energy efficiency upgrades. Tax credits and rebates provide

[27] "Three Barriers to Energy Efficiency and How to Overcome Them," SMS, last modified September 6, 2024, https://www.smsenergy.com/insights/three-barriers-to-energy-efficiency-and-how-to-overcome-them/.
[28] Mark Jurrens, *Lightbulbs,* 2014, https://commons.wikimedia.org/wiki/File:Lightbulbs.jpg.
[29] Muhammad Imran Khan et al., "The GCC's path to a sustainable future: Navigating the barriers to the adoption of energy efficiency measures in the built environment," *Energy Conversion and Management: X* 23 (2024): 8, doi:10.1016/j.ecmx.2024.100636.

an additional incentive for individuals to invest in energy efficiency, offsetting higher upfront costs associated with conventional technologies. When governments do not offer such incentives, potential buyers may be spooked or unable to afford short-term costs, causing both themselves and society to miss out on long-term benefits.[30]

Other impediments to energy efficiency include political resistance. While outright opposition to energy efficiency is uncommon, skepticism directed against specific measures is prevalent. One area of contention is building codes, which frequently engender irritation from commercial interests. In North Carolina, Republicans froze any alterations to the building code until 2031 in response to pressure from the homebuilder lobby.[31] Developers argued that proposed energy efficiency requirements would force them to raise prices by more than $20,000.[32] While in reality, the legislation would only raise prices by $6,500 per home,[33] policymakers would benefit from understanding opponents' concerns and incorporating them into educational efforts, perhaps by emphasizing the long-term savings that energy efficiency improvements can bring. Unfortunately, receptiveness to energy efficiency is characterized by a partisan divide. Research has shown that compared to Republicans, Democratic administrations tend to score higher on energy efficiency indices.[34] However, energy efficiency also has the potential to be an area of cooperation. Left-leaning individuals may be drawn to the concept due to their concern for the environment, while right-leaning individuals may see potential in cost reductions.

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[30] Imran Khan, "Navigating the barriers to the adoption of energy efficiency measures," 9.
[31] Anna Phillips, "Why industry is blocking the push for more energy efficient homes," *Washington Post*, February 21, 2024
[32] Phillips, "Energy efficient homes".
[33] Ibid.
[34] Jorge J. Antunes et al., "A new perspective on the U.S. energy efficiency: The political context," *Technological Forecasting and Social Change* 186 (2023): 10, doi:10.1016/j.techfore.2022.122093.

History of the Problem

The Industrial Revolution

Many issues facing the DOE in 2009 are the result of economic shifts hatched by the Industrial Revolution. Roughly situated between 1750 and 1850, this period witnessed the rise of more productive manufacturing technologies and increasing standards of living, alongside growing economic inequality and social unrest. Crucially, the Industrial Revolution had a significant impact on the types of energy harnessed by humanity. Before the Industrial Revolution, most energy was either produced by human and animal labor or by burning biomass such as wood, peat, and charcoal.[35,36]

However, this all began to change with a series of technological advancements starting in 1712 with the introduction of the Newcomen engine. English inventor Thomas Newcomen designed a steam-powered engine to pump water out of coal mines, though the device was merely 0.5% efficient.[37] Decades later, Scottish inventor James Watt improved the efficiency of the Newcomen engine by reducing thermal energy waste, thereby increasing the engine's efficiency to 2-3%.[38] These improvements facilitated new uses for the steam engine in factories and transportation.

Associated with these economic development trends was increased discussion in the scholarly literature. In the 1860s, many observers extrapolated coal availability trends to argue that the reserves would provide enough fuel for centuries.[39] The English economist William

[35] Annie Sun, "The Evolution of Energy in the United States," Sites at Dartmouth, last modified May 29, 2013, https://sites.dartmouth.edu/dujs/2013/05/29/the-evolution-of-energy-in-the-united-states/.
[36] Hannah Ritchie, "How Have the World's Energy Sources Changed over the Last Two Centuries?," Our World in Data, last modified December 2021, https://ourworldindata.org/global-energy-200-years.
[37] Cutler Cleveland and Heather Clifford, "Maximum Efficiencies of Engines and Turbines, 1700-2000," Visualizing Energy, last modified June 26, 2023, https://visualizingenergy.org/maximum-efficiencies-of-engines-and-turbines-1700-2000/.
[38] Cleveland and Clifford, "Efficiencies of Engines and Turbines."
[39] Louis-Gaëtan Giraudet and Antoine Missemer, "The history of energy efficiency in economics: Breakpoints and regularities," *Energy Research & Social Science* 97 (2023): 2, doi:10.1016/j.erss.2023.102973.

Stanley Jevons disagreed; he argued that any coal saved by energy efficiency improvements would be used for other purposes, hence nullifying the initial energy savings.[40] Therefore, fuel use would only increase as time progressed. In any case, the role of technology in energy savings was a topic of discussion throughout the 19th century.[41]

The Rise of Cheap Energy

In the early 20th century, the coal industry dominated energy production, accounting for 74% of the world's energy supply. Oil, by contrast, contributed less than 5% globally.[42] With the conclusion of World War I, this trend began to reverse, as oil became an increasingly attractive source of energy. For example, in 1945, oil accounted for 10% of Europe's primary energy consumption mix (this term refers to the varying proportions of raw energy sources before they are converted to electricity). The end of World War II would cause this emerging trend to explode, with this exact figure rising rapidly to 21% in 1955 and 45% by 1964.[43] In 1973, oil's share of worldwide energy consumption reached a peak of 46.2%, surpassing all other competing energy sources before falling in the decades since.[44] Another shift during this period was the increasing efficiency of steam engines to 25%.[45]

This increase in oil usage coincided with the post-World War II economic expansion, often referred to as "the Golden Age of Capitalism." During this period, crude oil prices were consistently low, at under $3 a gallon during the 1950s and 1960s.[46] The economic boom brought

[40] Giraudet and Missemer, "Energy efficiency in economics," 2.
[41] Ibid.
[42] Phil Johnstone and Caitriona McLeish, "World wars and the age of oil: Exploring directionality in deep energy transitions," *Energy Research & Social Science* 69 (2020): 6, doi:10.1016/j.erss.2020.101732.
[43] Johnstone and McLeish, "World wars and the age of oil," 9.
[44] "Worldwide Primary Energy Supply by Source| Statista," Statista, last modified September 1, 2021, https://www.statista.com/statistics/270528/global-energy-supply-by-source/.
[45] Cleveland and Clifford, "Efficiencies of Engines and Turbines."
[46] "Crude Oil Prices - 70 Year Historical Chart." Macrotrends | The Long Term Perspective on Markets. Accessed July 10, 2025. https://www.macrotrends.net/1369/crude-oil-price-history-chart.

about numerous social and economic changes in the United States — one notable effect was the rise of suburbia, accompanied by a subsequent increase in automobile ownership. The growing dependence of suburbanites on cars meant that developers no longer needed to locate amenities within walking distance from residential areas, leading to sprawl.[47] Since residents living in single-family homes became dispersed over long distances, maintaining public transportation became more difficult and expensive.[48] Car ownership rates predictably rose in the face of suburban life. In 1945, the car ownership rate was under 250 per 1,000, but grew rapidly to more than 750 per 1,000 in 2000.[49]

Suburban sprawl as seen in Houston, TX.[50]

[47] *Encyclopedia of Greater Philadelphia* "Automobile Suburbs," (2024), accessed July 10, 2025, https://philadelphiaencyclopedia.org/essays/automobile-suburbs/.
[48] Joseph Stromberg, "The Real Reason American Public Transportation is Such a Disaster," Vox, last modified August 10, 2015, https://www.vox.com/2015/8/10/9118199/public-transportation-subway-buses.
[49] Donald Shoup, *The High Cost of Free Parking* (Washington D.C.: Planners Press, 2005), 5 https://www.researchgate.net/publication/264967305_The_high_cost_of_free_parking.
[50] Wayne S. Grazio, *Suburbia Texas Style*, 2015, https://www.flickr.com/photos/fotograzio/23189165344.

Additionally, Congress failed to legislate **fuel economy standards** during this time.[51] As a result, manufacturers frequently produced cars with low **miles per gallon (MPG)** rates. These factors led to decreased energy efficiency, but the sheer abundance of oil on the market alleviated any pressing concerns.

Early in the economic boom, American domestic oil production met the country's energy needs, but as time passed, it became increasingly reliant on imports. In 1973, 36% of the American oil supply came from imports, a fact that oil-rich countries in the Middle East, such as Saudi Arabia, began to take notice of.[52] This foreign leverage would lay the seeds for the 1973 Oil Crisis. Overall, myriad energy inefficiencies entered the American economy during the energy shift to oil. Regardless, continued prosperity seemed inevitable, and economic growth continued to chug along. However, this would all change with the economic downturn of the 1970s.

Energy Efficiency in the 1970s & the Oil Crisis

In October 1973, the Yom Kippur War broke out in the Middle East with Israel on one side and Egypt and Syria on the other. That same month, enraged by extensive material and diplomatic support for Israel from the United States and other Western countries, the Organization of Arab Petroleum Exporting Countries (OAPEC) announced a total oil embargo against Israel's allies. The effect on oil prices was swift and devastating, with crude oil prices more than doubling from $4.31 to $10.11 per barrel by the end of the year.[53] Faced with shortages, the United States resorted to oil rationing measures. One famous example of this

[51] *Maps and Data - Vehicle Fuel Efficiency (CAFE) Requirements by Year*, (2025), https://afdc.energy.gov/data/10562.
[52] "The 1973/74 Oil Crisis: How the Golden Age of Capitalism Ended," StreetFins, last modified 11, 2021, https://streetfins.com/the-1973-74-oil-crisis-how-the-golden-age-of-capitalism-ended/.
[53] "Crude Oil Prices."

policy was the odd-even scheme, where cars with license plates ending in odd numbers were allowed to access pumps only on certain days, while those with even numbers were permitted to fill up on others. While this was not the first time Arab countries had restricted oil supplies to the West, having done so in 1956 and 1967,[54] none of these instances had such a dramatic effect on the market.

Long lines of cars at gas stations were a common sight during the Crisis.[55]

Although the embargo ended in March, its effects continue to cast a shadow on energy policy, particularly in the United States. The crisis did not spare the economy either. The 1973-75 Recession was the worst the country experienced in decades, with gross national product declining by almost 7%.[56] Ultimately, the ordeal exposed the untenability of the post-World War

[54] "How the Golden Age of Capitalism Ended."
[55] David Falconer, *Solid Lines of Cars Such as This Scene in Portland, Resulted in a First-Come, First-Served Limit of Five Gallons Per Customer Shortly Thereafter Oregon Went to a System of Dispensing Gas According to License Numbers*, 1973, https://www.flickr.com/photos/usnationalarchives/4272497906/.
[56] Robert J. Gordon and Saul H. Hymans, "What Depressed the Consumer? The Household Balance Sheet and the 1973-75 Recession," Brookings, last modified August 9, 2016,

II economic expansion, and public attention turned to the concept of energy efficiency as a means to build resilience against future crises. One of the most significant reforms to address the energy efficiency issue was the creation of the Department of Energy in 1977, a cause championed by President Jimmy Carter. Another change was the establishment of public advocacy organizations such as the Alliance to Save Energy, which provided education to ordinary citizens on the importance of energy efficiency and conservation efforts.[57]

The 1973 shock was not the only oil-related crisis of the decade. In 1979, oil prices once again began to rise rapidly, as the **Islamic Revolution** in Iran spooked global investors. Though global oil production only declined by 4%, the Islamic Revolution fueled oil hoarding as insurance against future oil fluctuations, driving up demand and consequently prices.[58] It was not until the mid-1980s that oil prices began to decline to pre-crisis levels, signaling the start of a long-term downward trend; however, oil prices would never return to the inexpensive levels of the post-World War II years.

The 1980s and 1990s

In the early 1980s, energy efficiency remained at the forefront as the nation still reeled from the effects of the 1979 Oil Shock. Falling oil prices later in the 1980s led to a decrease in focus on existing energy efficiency initiatives. For example, programs to produce synthetic fuel from **shale oil** and coal, enacted by the Carter administration, were abandoned in favor of traditional energy.[59] Carter's landslide defeat to Ronald Reagan in 1980 also brought changes to

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https://www.brookings.edu/articles/what-depressed-the-consumer-the-household-balance-sheet-and-the-1973-75-recession/.

[57] *The History of Energy Efficiency*, (Washington D.C.: Alliance to Save Energy, 2013), 3, https://www.ase.org/sites/ase.org/files/resources/Media%20browser/ee_commission_history_report_2-1-13.pdf.

[58] Laurel Graefe, "Oil Shock of 1978–79," Federal Reserve History, last modified November 22, 2013, https://www.federalreservehistory.org/essays/oil-shock-of-1978-79.

[59] Paul Joskow, "U.S. Energy Policy During the 1990s," 2001, 9 doi:10.3386/w8454.

the energy landscape. As the Governor of California, Reagan championed some of the earliest energy efficiency initiatives.[60] Still, as president, he disagreed with some actions taken in the 1970s, particularly increased federal intervention in the economy as a means of resolving the Oil Crisis. Reagan removed oil price controls and opened federal land for drilling operations.[61] Reagan implemented few new programs for energy efficiency during his presidency,[62] instead cutting funding for energy efficiency research and development at the DOE.[63] When Congress proposed the National Appliance Energy Conservation Act of 1986, Reagan initially opposed the legislation, arguing that the bill would unduly raise prices for consumers and excessively impede the free market's operation.[64] However, he would go on to sign it into law the following year.

The Gulf War dominated the start of the 1990s and the administration of George H.W. Bush. In 1990, Iraq, under the leadership of Saddam Hussein, invaded its oil-rich neighbor, Kuwait. The international community widely condemned this action, and in response, assembled a coalition of the United States and 41 other countries to initiate a military response against Iraq. The war led to a short-term increase in oil prices that the coalition's swift military success nevertheless mitigated.[65] Nonetheless, the deregulation of the 1980s meant that federal policy could have little potential impact on the effects of the oil shock.[66] Though technology continued to develop during this decade, this doesn't mean there weren't any missed opportunities. In 1991, researchers discovered that the introduction of a thin sheet of glass in the middle of a window

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[60] Andrew Delaski, "Build on Reagan's bipartisan energy efficiency legacy," *The Hill*, December 2, 2015, https://thehill.com/blogs/congress-blog/energy-environment/261729-build-on-reagans-bipartisan-energy-efficiency-legacy/.
[61] James E. Katz, "US energy policy Impact of the Reagan Administration," *Energy Policy* 12, no. 2 (1984): 137-1, doi:10.1016/0301-4215(84)90164-2.
[62] Joskow, "U.S. Energy Policy During the 1990s," 10.
[63] David Narum, "A troublesome legacy: The Reagan Administration's conservation and renewable energy policy," *Energy Policy* 20, no. 1 (1992): 40, doi:10.1016/0301-4215(92)90146-s.
[64] *Memorandum of Disapproval of the Appliance Energy Conservation Bill*, (1986), https://www.reaganlibrary.gov/archives/speech/memorandum-disapproval-appliance-energy-conservation-bill.
[65] "Crude Oil Prices."
[66] Joskow, "U.S. Energy Policy During the 1990s," 3.

could lead to significant insulation gains and, consequently, lower energy costs for heating and cooling.[67] However, manufacturers determined that the design was too expensive and never produced triple-pane windows on a large scale.[68] After 1992, the Clinton administration did not oversee any meaningful changes to energy policy by Congress.[69] Regardless, Clinton provided tax credits to energy-efficient technologies and mandated reduced energy consumption in federal buildings.[70,71] The American energy consumption patterns also held steady during this decade, with energy efficiency and demand both increasing gradually.[72]

Early 2000s to Present Day

As the nation entered the new millennium, energy efficiency continued to prove its relevance. From 2000 to 2001, the California Electricity Crisis rocked the Golden State. Following California's implementation of deregulatory reforms to energy regulation in the mid-1990s, a series of blackouts and energy shortages affected the state's electricity utilities.[73] In response to this emergency, California redoubled its energy conservation and efficiency efforts.[74] On the positive side, energy efficiency plays a crucial role in keeping pace with the increasing demand for energy. Since 1950, in the United States, 67% of the total energy demand has been

[67] John Fialka and E&E News, "Discarded 1990s Energy Invention Makes a Comeback," *Scientific American*, January 21, 2022, https://www.scientificamerican.com/article/discarded-1990s-energy-invention-makes-a-comeback/.
[68] Fialka and E&E, "Discarded 1990s Energy Invention Makes a Comeback."
[69] Joskow, "U.S. Energy Policy During the 1990s," 2.
[70] "Meeting the Challenge of Global Warming," Clinton White House, last modified November 12, 1998, https://clintonwhitehouse4.archives.gov/CEQ/earthday/ch3.html.
[71] "The President's New Federal Energy Efficiency Executive Order," Clinton White House, accessed August 6, 2025, https://clintonwhitehouse5.archives.gov/Initiatives/Climate/fedenergy.html.
[72] Joskow, "U.S. Energy Policy During the 1990s," 2.
[73] "California - Timeline | Blackout | FRONTLINE | PBS," PBS: Public Broadcasting Service, accessed August 7, 2025, https://www.pbs.org/wgbh/pages/frontline/shows/blackout/california/timeline.
[74] Martin Kushler and Edward Vine, "Examining California's Energy Efficiency Policy Response to the 2000/2001 Electricity Crisis: Practical Lessons Learned Regarding Policies, Administration, and Implementation," *American Council for an Energy-Efficient Economy*, March 2003, https://www.aceee.org/sites/default/files/pdfs/u033.pdf.

met by increases in energy efficiency.[75] While economic output tripled from 1970 to 2012, the corresponding increase in energy demand stood at 50%.[76] Despite the growing economy, per capita energy consumption has decreased accordingly. The average American in 1970 consumed the equivalent of 2,700 gallons of gasoline, whereas today they consume only 2,500 gallons.[77]

In 2009, the **Great Recession** dominated the headlines as the global economy slumps. To mitigate the worst effects, the 111th Congress passed the American Recovery and Reinvestment Act (ARRA). President Barack Obama has signed the economic stimulus package into law, with energy efficiency playing a prominent role in the bill.[78] While the current situation is suboptimal, there also exists the opportunity for growth and for the DOE to step in. Due to the recession, many homes are struggling with limited income and credit, and many families would benefit from reduced energy expenditures as a result of home efficiency upgrades. Furthermore, energy investments promoted by the ARRA will create jobs that have the potential to reduce the high unemployment rate caused by the recession.[79] In the modern era, it is clear that the economy and energy efficiency have become further intertwined.

[75] "The History of Energy Efficiency."
[76] Ibid.
[77] Ibid.
[78] "Recovery Act," Department of Energy, accessed August 7, 2025, https://www.energy.gov/recovery-act.
[79] "FACT SHEET: The Recovery Act Made The Largest Single Investment In Clean Energy In History, Driving The Deployment Of Clean Energy, Promoting Energy Efficiency, And Supporting Manufacturing," Whitehouse, last modified February 25, 2016, https://obamawhitehouse.archives.gov/the-press-office/2016/02/25/fact-sheet-recovery-act-made-largest-single-investment-clean-energy.

Examples of Energy Efficiency in Action

A standard method for achieving energy efficiency in a household setting is the use of heat pumps. Heat pumps function by drawing heat from the environment and transferring it throughout a building. Conversely, boilers and electric heaters work by converting energy into heat.[80] Because heat pumps merely transfer heat, they use less energy to accomplish the same task. Additionally, while heat pumps are more expensive upfront, they are cheaper to maintain.[81] Modern heat pumps can reduce heating and cooling electricity needs by 75% along with being three times more efficient than conventional electric heating systems.[82,83] Behavioral changes are an additional opportunity for households and businesses to lower their energy consumption. These include actions such as turning off unused lights and shutting down idle computers.

A heat pump installed outside a home.[84]

[80] "How a Heat Pump Works – The Future of Heat Pumps – Analysis," IEA, accessed August 8, 2025, https://www.iea.org/reports/the-future-of-heat-pumps/how-a-heat-pump-works.
[81] "How a Heat Pump Works."
[82] "Heat Pump Systems," Energy.gov, accessed August 8, 2025, https://www.energy.gov/energysaver/heat-pump-systems.
[83] "Energy Efficiency"
[84] Wikideas, *Heat pump unit*, 2023,https://commons.wikimedia.org/wiki/File:Heat_pump_unit.webp.

Electrification can be a source of increased energy efficiency compared to processes powered by fossil fuels. For example, electric cars are more efficient than gasoline cars because when fossil fuels are burnt, most of the energy is emitted as heat. This inefficiency usually translates to 80% of energy being lost in gasoline cars before it can be converted into motion, while electric vehicles only lose 10% of their energy in the same process.[85] Electrical appliances in household settings include induction and electric cooktops.[86] Additionally, the agricultural sector benefits from electrification. Electrified tractors and field sprayers are both inexpensive and less energy-intensive than traditional means.[87]

City planning is an essential element in promoting energy efficiency on a large scale. Promoting public transportation is part of the equation, as buses are generally more fuel-efficient than automobiles. Residents living in communities that incorporate **mixed land use** will consume fewer resources to reach the same destinations they would otherwise;[88] designing communities to be compact has a similar effect.[89] Less energy usage also means less reliance on occasionally unstable external transport mechanisms.[90]

Energy Standards

Since the 1970s, lawmakers have frequently enacted policies aimed at imposing minimum efficiency requirements for energy-intensive products. One example of these standards

[85] Karin Kirk, "Electric Vehicles Use Half the Energy of Gas-powered Vehicles » Yale Climate Connections," Yale Climate Connections, last modified February 13, 2024, https://yaleclimateconnections.org/2024/01/electric-vehicles-use-half-the-energy-of-gas-powered-vehicles/.
[86] "What is Electrification?," Energy.gov, accessed August 8, 2025, https://www.energy.gov/electricity-insights/what-electrification.
[87] "What is Electrification?"
[88] Environmental and Energy Study Institute (EESI), "Cities," accessed August 8, 2025, https://www.eesi.org/topics/cities/description.
[89] "Greenvolve » Efficiency in Urban Planning," Greenvolve, accessed August 8, 2025, https://greenvolve-project.eu/efficiency-in-urban-planing/.
[90] "Efficiency in Urban Planning."

is Corporate Average Fuel Economy (CAFE), which operates at the federal level. As previously mentioned, before the 1973 Oil Crisis, fuel inefficiency was rampant in automobiles, with an average fuel efficiency of 12 miles per gallon (MPG) in 1972.[91] With the enactment of CAFE in 1975, Congress took bold action to combat this issue, mandating that manufacturers double the fuel economy of both passenger vehicles and trucks by 1985.[92] Today, the National Highway Traffic Safety Administration sets CAFE standards, while automakers must submit results from fuel economy tests to the Environmental Protection Agency (EPA).[93] Specialists conduct these tests with a device called a dynamometer in a laboratory setting to measure the amount of fuel burned by the car's engine.[94] Standards have continued to evolve. In 2007, provisions in the Energy Independence and Security Act ordained an increase to 35 MPG in fleet-wide mileage standards.[95]

Another example of policymakers implementing similar policies is the adoption of appliance energy standards. Similar to CAFE, the government only drafted energy standards for household appliances following the Oil Crisis. Unlike CAFE, though, state governments were the first entities to enact energy standards for household appliances.[96] The first federal legislation in this regard was the National Appliance Energy Conservation Act (NAECA) of 1987.[97] The NAECA covered a wide variety of appliances; for example, the NAECA set the thermal efficiency of pool heaters at a minimum of 78% by 1990.[98] Today, standards apply to more than

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[91] Michael Sivak, "Actual fuel economy of cars and light trucks: 1966-2017," Green Car Congress, last modified September 20, 2019, https://www.greencarcongress.com/2019/09/20190930-sivak.html.
[92] "History of Energy Efficiency," 8.
[93] "Corporate Average Fuel Economy (CAFE) Standard," Cadence, accessed August 8, 2025, https://www.cadence.com/en_US/home/explore/cafe.html.
[94] "CAFE Standard."
[95] "History of Energy Efficiency," 8.
[96] Ibid.
[97] Ibid.
[98] Ibid.

70 household products and save tens of billions of dollars annually.[99] One of the most successful case studies of appliance efficiency is the refrigerator. While refrigerators in 1972 consumed an average of 1,800 kWh, in 2013, they consumed less than 500 kWh, despite their average size increasing during the period.[100]

In addition to mandatory requirements, the ENERGY STAR program is a voluntary initiative first implemented in 1992. Cooperatively administered by both the EPA and the Department of Energy,[101] nearly 40% of Fortune 500 companies partner with ENERGY STAR.[102] The program works by manufacturers meeting energy efficiency benchmarks set by the EPA. If a product is up to the standard, then the manufacturer may label it with the ENERGY STAR logo.[103] The purpose of this program is to inform consumers about which products will best enable them to reduce their carbon footprint and save money. Despite the success of ENERGY STAR in saving $18 billion a year in utility payments,[104] the program has come under some criticism for not providing consumers with a complete picture of the savings. For example, investing in a more energy-efficient refrigerator not only means the appliance is drawing less power, but also wasting less food.[105,106]

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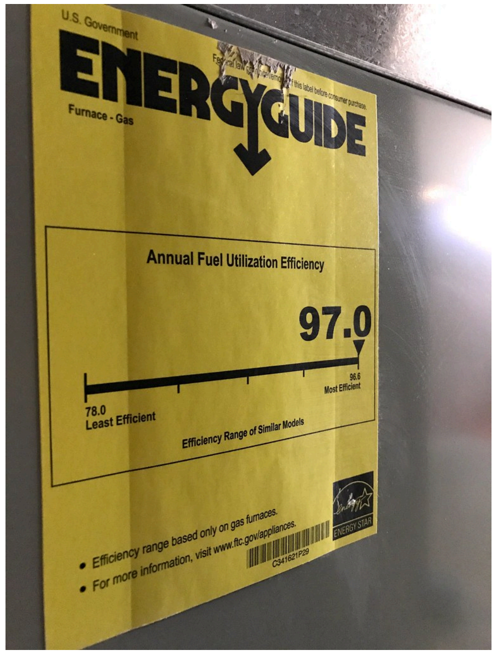
[99] Ibid.
[100] Ibid.
[101] "ENERGY STAR®," Department of Energy, accessed August 8, 2025, https://www.energy.gov/eere/buildings/energy-starr.
[102] Ibid.
[103] Ibid.
[104] Ibid.
[105] David Kender, "Energy Star appliance ratings losing their shine," *USA Today*, October 4, 2013, https://www.usatoday.com/story/tech/2013/10/04/reviewed-energy-star-stalemate/2897277/.
[106] "Benefits of Energy Efficient Refrigerators | Howard's," Howard's Appliances & Mattresses, last modified August 1, 2025, https://www.howards.com/blog/benefits-of-energy-efficient-refrigerators.



A furnace with an ENERGY STAR label.[107]

Energy standards need not be limited to a single appliance, but may also consider a building or structure. Unlike other energy policies outlined in this section, energy efficiency in building codes predates the Oil Crisis. The Housing and Home Finance Agency first established residential efficiency standards in the 1950s.[108] During this period, cold regions began to develop insulation requirements in buildings.[109] However, as is the case with most energy efficiency initiatives, building codes became much more widespread post-1973.[110] Empirical evidence suggests that building codes can be a source of increased energy efficiency. One study,

[107] Green Energy Future, *EnerGuide label for the furnace*, 2017, https://www.flickr.com/photos/greenenergyfutures/
[108] "History of Energy Efficiency," 9.
[109] International Energy Agency and J. Lausten, *Energy Efficiency Requirements in Building Codes, Energy Efficiency Policies for New Buildings*, (2008), 14, https://www.osti.gov/etdeweb/servlets/purl/971038.
[110] International Energy Agency and Lausten, "Energy Efficiency Requirements in Building Codes," 14.

examining Florida's shift to a more stringent code in 2002, found that the change was associated with a 4% and 6% reduction in electricity and natural gas consumption, respectively.[111]

Weatherization Assistance Program

The Energy Policy and Conservation Act of 1975 directed the creation of the Weatherization Assistance Program (WAP) to provide weatherization services to low-income households.[112] Weatherization refers to home improvements that seek to reduce energy use.[113] Weatherization thus plays a crucial role in energy efficiency, as homes may exert temperature control with less energy consumption. Given the intention of WAP is to assist economically disadvantaged people, the program operates with maximum income requirements. Households are eligible if their income is 200% or below the poverty line. Alternatively, states may elect to set eligibility to 60% or less of the state's median income.[114] This emphasis on low-income households is significant, given that these residents spend a significantly higher portion of their income on energy expenditures than wealthier households.[115]

The legislation initially authorized no more than $55 million for the program in the 1977 fiscal year, equivalent to approximately $303 million in today's dollars. The American Recovery and Reinvestment Act of 2009 granted $5 billion to WAP.[116] Aside from increased funding, increased technological improvements and more advanced methods have been a boon to weatherization efforts. One technique used in the early years of WAP was **caulking** to reduce air

[111] Grant Jacobsen and Matthew Kotchen, "Are Building Codes Effective at Saving Energy? Evidence from Residential Billing Data in Florida," *The Review of Economics and Statistics*, 2010, 34, doi:10.3386/w16194.
[112] "The History of Energy Efficiency," 10.
[113] "What is Weatherization?," The Climate Reality Project, last modified June 12, 2023, https://www.climaterealityproject.org/blog/what-weatherization.
[114] "How to Apply for Weatherization Assistance," Department of Energy, accessed August 8, 2025, https://www.energy.gov/scep/wap/how-apply-weatherization-assistance.
[115] "About the Weatherization Assistance Program," Energy.gov, accessed August 8, 2025, https://www.energy.gov/scep/wap/about-weatherization-assistance-program.
[116] "The History of Energy Efficiency," 10.

leakage. More recently, the program has utilized energy audits and air conditioner replacements to improve energy efficiency.[117] Surveys on residents aided by weatherization find that the overwhelming majority are satisfied with the services provided by WAP.[118] At the same time, empirical evidence regarding savings is more mixed. While one study found that monetary savings exceeded cost fourfold,[119] another examining homes weatherized in Michigan found that the initial cost of investment was twice that of savings.[120]

Case Study: California

While gains from energy efficiency reverberated throughout the United States during the 1970s, improvements in efficiency in California were especially significant. Between 1973 and 2006, California's per capita electricity consumption remained constant, while the exact figure increased by 50% in the rest of the United States.[121] In fact, between 1974 and 1998, no applications to build large power plants were submitted in California,[122] in large part due to increased energy efficiency. Several factors contribute to California's success. Environmental influence certainly played a part, with some authors even suggesting that the vast majority of the divergence is due to factors unrelated to energy efficiency policies such as California's milder

[117] Ibid.
[118] Bruce Tonn et al., *Weatherization Works - Summary of Findings from the Retrospective Evaluation of the U.S. Department of Energy's Weatherization Assistance Program*, (Oak Ridge National Laboratory, 2015), https://www.energy.gov/sites/prod/files/2015/09/f26/weatherization-works-retrospective-evaluation.pdf.
[119] B. Tonn, E. Rose, and B. Hawkins, "Evaluation of the U.S. department of energy's weatherization assistance program: Impact results," *Energy Policy* 118 (2018): 279, doi:10.1016/j.enpol.2018.03.051.
[120] Meredith Fowlie, Michael Greenstone, and Catherine Wolfram, "Do Energy Efficiency Investments Deliver? Evidence from the Weatherization Assistance Program," 2015, 1,597, doi:10.3386/w21331.
[121] "The Rosenfeld Effect in California," California Energy Commission, accessed August 8, 2025, https://web.archive.org/web/20091007211617/https://www.energy.ca.gov/co
[122] Arthur H. Rosenfeld and Deborah Poskanzer, "A Graph Is Worth a Thousand Gigawatt-Hours: How California Came to Lead the United States in Energy Efficiency (*Innovations Case Narrative*: The California Effect)," *Innovations: Technology, Governance, Globalization* 4, no. 4 (2009): 67, doi:10.1162/itgg.2009.4.4.57.

climate and decreasing household sizes.[123] Still, research has found that energy policies account for at least 25% of the difference between California and other states.[124]

Aside from benefiting from environmental factors, California also took swift action to promote energy efficiency in the aftermath of the Oil Crisis. The most critical institution in facilitating these efforts was the California Energy Commission (CEC), created in 1974 by the Warren-Alquist Act.[125] The legislation initially empowered the CEC to fund R&D, issue decisions on site applications for power plants, and fund efficiency programs. Later, the agency would oversee appliance standards.[126] One of the most prominent members of the Commission was a scientist by the name of Arthur Rosenfeld, or the "godfather of energy efficiency". Formerly a theoretical physicist working at the Lawrence Berkeley National Laboratory, Rosenfeld switched to energy efficiency research in 1973, essentially founding the field.[127] In response to the Oil Crisis, California Governor Jerry Brown proposed a plan to create a network of power plants to buttress falling energy production. Rosenfeld approached Brown with an energy efficiency plan instead.[128]

[123] Arik Levinson, "California Energy Efficiency: Lessons for the Rest of the World, or Not?," *Journal of Economic Behavior & Organization* 107 (November 2014): 271, doi:10.3386/w19123.
[124] Rosenfeld and Poskanzer, "A Graph Is Worth a Thousand Gigawatt-Hours," 75.
[125] "About," California Energy Commission, accessed August 8, 2025, https://www.energy.ca.gov/about.
[126] Rosenfeld and Poskanzer, "A Graph Is Worth a Thousand Gigawatt-Hours," 64.
[127] Julie Chao, "Art Rosenfeld, California's Godfather of Energy Efficiency, Dies at 90," University of California, last modified November 8, 2021,
https://www.universityofcalifornia.edu/news/art-rosenfeld-californias-godfather-energy-efficiency-dies-90.
[128] Isaac Gendler, "The Rosenfeld Effect," *Isaac's Science Blog*, April 29, 2018,
https://isaacscienceblog.com/2018/04/29/the-rosenfeld-effect/.

Arthur Rosenfeld.[129]

California quickly became an early adopter of energy efficiency policies, becoming the first state to enact appliance standards in 1974.[130] California also led the charge in Demand Side Management (DSM) programs, becoming one of the first states to implement such policies in 1975.[131] The idea behind DSM is that the state can encourage consumers to change the pattern of their electricity consumption, resulting in either reduced total consumption or shifting peak demand periods.[132] A challenge facing DSM programs is the ordinary incentive structure that utility companies operate in. Under a traditional business model, the more of a product an enterprise can sell, the greater revenue it will receive. Hence, utilities are disincentivized from promoting energy efficiency since this would entail the companies selling less energy.[133]

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[129] California Energy Commission, *Portrait of Physicist Arthur Rosenfeld*, 2017, https://commons.wikimedia.org/wiki/File:Art_Rosenfeld_Portrait.jpg
[130] "The History of Energy Efficiency," 8.
[131] "The History of Energy Efficiency," 10.
[132] "Electric Utility Demand-Side Management," U.S. Energy Information Administration, accessed August 8, 2025, https://www.eia.gov/electricity/data/eia861/dsm/.
[133] Souvik Datta, "Decoupling and demand-side management: Evidence from the US electric industry," *Energy Policy* 132 (2019): 175, doi:10.1016/j.enpol.2019.05.005.

In response to this conflict, the concept of decoupling arose, which aims to sever the link between revenue and supply among utility providers.[134] California sought to accomplish this goal by providing monetary incentives to shareholders. Between the late 1980s and 2002, the California Public Utilities Commission (CPUC) allowed utility companies to pass the financial burden of incentives on to consumers.[135] Cooperating with the CEC, the CPUC integrated energy efficiency programs into the Biennial Resource Planning Update.[136] Ultimately, what set California apart from other states in energy planning was its robust infrastructure and incorporation of diverse stakeholders.[137] Environmental factors also played a role in contributing to a shift in this thinking; the onset of the Oil Crisis meant that suppliers were discouraged from purchasing expensive new energy supplies.[138]

More recently, in 2008, California began to implement the Long-term Energy Efficiency Strategic Plan.[139] This holistic program, adopted by the California Public Utilities Commission, seeks to invest billions of dollars in energy efficiency programs.[140] The lion's share of the funding will go towards **retrofits** of existing structures, with $2 billion allocated to the most extensive residential retrofit program in the United States, CalSPREE.[141,142] The inclusion of a wide variety of stakeholders in the project and the estimated 1,500 megawatt savings further underscores California's commitment to investing in energy efficiency for the future.[143]

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[134] "Aligning Utility Business Models with Energy Efficiency," ACEEE | American Council for an Energy-Efficient Economy, accessed August 8, 2025, https://www.aceee.org/toolkit/2017/11/aligning-utility-business-models-energy-efficiency.
[135] E. Vine, C. Rhee, and K, Lee, "Measurement and evaluation of energy efficiency programs: California and South Korea," *Energy* 31, no. 6-7 (2006): 1,102, doi:10.1016/j.energy.2005.03.003.
[136] Vine, Rhee, and Lee, "Measurement and evaluation of energy efficiency programs," 1,102.
[137] Vine, Rhee, and Lee, "Measurement and evaluation of energy efficiency programs," 1,103.
[138] Rosenfeld and Poskanzer, "A Graph Is Worth a Thousand Gigawatt-Hours," 62.
[139] "The History of Energy Efficiency," 20.
[140] Ibid.
[141] Ibid.
[142] Rosenfeld and Poskanzer, "A Graph Is Worth a Thousand Gigawatt-Hours," 77.
[143] Ibid.

Possible Solutions

These examples, along with the California case study, highlight several important themes that this committee may want to consider when crafting solutions to this issue. One takeaway from previous advances in energy efficiency is the importance of technology. Just as innovations during the Industrial Revolution propelled the efficiency of the rudimentary engines of the early 18th century to new heights, advancements in technology today contribute to increasing energy efficiency levels. One example that the public sector can play in promoting energy efficiency in this regard is the DOE National Laboratories, a network of 17 labs across the country.[144] One of the most important labs for developing energy-efficient devices is the previously mentioned Lawrence Berkley Lab, which has conducted research for decades on technologies such as high-performance windows.[145] Some advancements have been methodological. Scientists working at the lab in the 1970s developed a method to quantitatively measure aggregate gains from energy efficiency, making the cost-effectiveness of the concept evident.[146] In any case, delegates should consider solutions that promote such advances.

While this committee is based in the United States, the DOE still has the opportunity to consider the lessons learned from international energy efficiency actions that have yet to be implemented by the DOE. The EU, for instance, has mandated that all new buildings produce zero emissions by 2030,[147] an action that has yet to be taken by the United States. Sweden and Denmark have also historically been ahead of the curve; these countries were developing the

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[144] "National Laboratories," Energy.gov, accessed August 8, 2025, https://www.energy.gov/national-laboratories.
[145] "High Performance Windows," Windows & Daylighting, accessed August 8, 2025, https://windows.lbl.gov/high-performance-windows.
[146] Rosenfeld and Poskanzer, "A Graph Is Worth a Thousand Gigawatt-Hours," 71.
[147] "What is Required to Scale Up Energy Efficiency Investments by 2030? – Energy Efficiency 2024 – Analysis," IEA, accessed August 8, 2025, https://www.iea.org/reports/energy-efficiency-2024/what-is-required-to-scale-up-energy-efficiency-investments-by-2030?.

previously mentioned triple-pane windows in the early 1900s.[148] Of course, delegates may also consider the fact that solutions are often sensitive to local contexts. What may work effectively in one country or region may fail for other reasons when applied to a different situation or area.

148 Fialka and E&E News, "Discarded 1990s Energy Invention Makes a Comeback"

The Office of Energy Efficiency and Renewable Energy (EERE) & the Energy Information Administration

EERE is the subdivision of the DOE most directly involved in addressing the energy efficiency issue. EERE's mandate includes the transition to a green energy and carbon-neutral economy, funding research and development, and weatherizing buildings.[149] Assistant Secretary Cathy Zoi, who brings decades of experience from both the private and public sectors, currently heads the EERE. While Zoi served as CEO for EVgo, an electric vehicle charging company, her greatest accomplishment was spearheading the creation of the Energy Star program.[150] In general, this bloc will emphasize the importance of regulatory frameworks in promoting energy efficiency. While they do not discount the potential of technological advancement, they are more likely to advocate for government intervention that can make an impact in the short term. The EIA is an agency of the DOE that collects and disseminates statistics and analytics related to energy.[151] Headed by Richard G. Newell, the EIA is a crucial asset to this bloc through the evaluations it provides of government policies.

The Office of Science & ARPA-E

The foremost champion of energy efficiency research in the federal government is the DOE Office of Science, led by physicist William F. Brinkman. The Office of Science funds and

[149] "Office of Energy Efficiency and Renewable Energy," Department of Energy, accessed August 9, 2025, https://www.energy.gov/eere/office-energy-efficiency-and-renewable-energy.
[150] "Cathy Zoi," Precourt Institute for Energy, last modified July 27, 2014, https://web.archive.org/web/20140727233420/https://energy.stanford.edu/people/speaker/cathy-zoi.
[151] "Mission Overview," Energy Information Administration, accessed August 10, 2025, https://www.eia.gov/about/mission_overview.php.

directs 10 of the 17 DOE National Laboratories and supports energy research nationwide.[152] ARPA-E, headed by Director Arun Majumdar, has a similar but distinct mission to Science, more focused on cutting-edge breakthroughs and short-term project funding.[153] The Under Secretary for Science, Steven E. Koonin, ultimately oversees all scientific endeavors of the DOE.[154] Given the research and development focus of this bloc, the scientific backgrounds of most of its members are not surprising, with physicists in particular being heavily involved. Overall, this bloc prioritizes alleviating energy efficiency challenges through innovation, and consequently may be more open to partnering with the private sector.

Opposition to Energy Efficiency

As outlined in an earlier section, various interest groups frequently oppose energy efficiency policies. Whether driven by concern for the economy or potential revenue losses, these voices actively lobby on both the state and national levels against proposed legislation. While not directly involved in the implementation of energy efficiency measures, these groups have an impact on the DOE through their influence on the government.

Government subsidies to heat pump manufacturers are a frequent point of contention. Home builder associations opposing energy-efficient building codes have found common cause with cooling appliance manufacturers, whose products face competition from heat pumps.[155] The oil industry has also taken issue with the proliferation of heat pumps because they consume less energy and, consequently, result in the burning of fewer fossil fuels compared to conventional

[152] "About the Office of Science," Department of Energy, accessed August 10, 2025, https://www.energy.gov/science/about-office-science.
[153] "ARPA-E at a Glance," ARPA-E, accessed August 10, 2025, https://arpa-e.energy.gov/about/arpa-e-at-a-glance.
[154] "Office of the Under Secretary for Science and Innovation," Department of Energy, accessed August 10, 2025, https://www.energy.gov/office-under-secretary-science-and-innovation.
[155] Phillips, "Energy efficient homes".

heating and cooling technologies. The American Petroleum Institute, a business association, has historically lobbied against income tax credits for homeowners with heat pumps, suggesting that the government should invest in further developing the fossil fuel base instead.[156] Electric vehicles, which tend to be more energy efficient, have not been spared either. Both the API and automakers have attacked attempts to promote EV development.[157,158]

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[156] Ajit Niranjan, "Oil industry has sought to block state backing for green tech since 1960s," *The Guardian*, March 8, 2024, https://www.theguardian.com/environment/2024/mar/08/oil-industry-has-sought-to-block-state-backing-for-green-tech-since-1960s.

[157] Ibid.

[158] InfluenceMap, "Automaker Lobbying Against Climate Policy Threatens the Electric Vehicle Transition," InfluenceMap Home, last modified May 14, 2024, https://influencemap.org/pressrelease/Automaker-Lobbying-Against-Climate-Policy-Threatens-the-Electric-Vehicle-Transition-28103.

Glossary

1973-74 Oil Embargo - A total oil embargo enforced by OAPEC against countries that backed Israel during the Yom Kippur War.

Caulking - Using a material called caulk to seal gaps in a building.

Energy intensity - An economy-wide unit of energy efficiency. It measures the ratio between energy output and GDP.

Fuel Economy Standards - Regulations that require manufacturers to ensure a set minimum fuel efficiency standard in their fleet of vehicles.

Great Recession - A global economic downturn that began in 2007 and lasted until 2009. The most severe economic recession since the Great Depression, the causes include the bursting of the U.S. housing bubble and the subprime mortgage crisis.

Gross Domestic Product - The total monetary value of the goods and services produced in a country, generally measured yearly.

Islamic Revolution - The series of events in Iran that culminated in the 1979 overthrow of Mohammad Reza Pahlavi and the establishment of the Islamic Republic of Iran.

Joules - An international unit of energy.

Manhattan Project - A WW2-era research effort by the American government that yielded the world's first atomic bomb.

Miles per gallon - The distance traveled by a vehicle in miles per gallon of gasoline consumed.

Mixed land use - Incorporating different land uses, such as residential and commercial, in the same geographic area.

Organization of Arab Petroleum Exporting Countries - A multinational organization tasked with coordinating energy policy between Arab states.

Paris Agreement - An international climate agreement, signed in 2016 and negotiated by 196 parties.

Retrofit - The addition of new features to an existing system of structure.

Shale oil - A rock containing kerogen, which can be converted into conventional oil.

Thermodynamics - A branch of physics that studies the relationship between energy, heat, and work.

Watt - An international unit of energy. A kilowatt is equivalent to a thousand watts.

Yom Kippur War - Began in response to a surprise attack by Egypt and Syria, who sought to reclaim the Sinai Peninsula and the Golan Heights from Israel.

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Topic B: Implementation of Solar Energy

Statement of the Problem

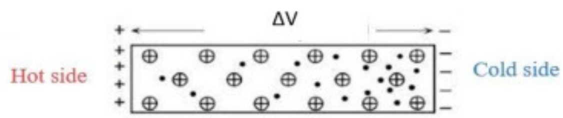
What is Solar Energy?

Since the outset of history, man has tamed energy one way or another; during the second industrial revolution, he finally developed a way to store this energy outside of its natural sources, using generators to store energy in batteries. From this came the power grid, and with it the plethora of inventions we have come to cherish which make our daily lives easier. While the predominant source of electricity came from the expropriation of natural resources, some scientists looked towards biology and our past in a venture to generate electricity.

The power of the sun wasn't unknown to humans; during the Roman and Byzantine Empires, the sun was used to heat the public bathhouses, while in the Americas the ancestors of the Pueblo people designed their homes such that they could capture sunlight during the winter to warm their homes.[159] By the 18th century, inventors like Horace de Saussure were able to harness the sun more powerfully through the development of solar collectors, which he used as an oven. These more primitive forms of modern solar energy used glass to trap heat inside the boxes, utilizing a force similar to the greenhouse effect. Later refinements used mirrors to focus the sunlight onto one focal point — a method still used today in solar collectors, which use that method to harness the thermal energy of solar power by boiling water to turn turbines.[160] The solar panels we see atop homes and other buildings only came about in 1883, when Charles Fritts

[159] U.S. Department of Energy, "The History of Solar," The History of Solar (U.S. Department of Energy, 2001), https://www1.eere.energy.gov/solar/pdfs/solar_timeline.pdf.
[160] Beth Halacy and D S Halacy, Cooking with the Sun : [How to Build and Use Solar Cookers] (Lafayette: Morning Sun Press, 1992).

created the first modern solar cells which converted solar energy into electricity.[161] These solar panels did not use the heat like the solar collectors, and instead used devices known as **thermopiles** to convert the thermal energy into electric energy.[162] Inside the thermopiles are two dissimilar conductors (different metals), with one metal being heated by exposure to the sun and the other kept cool. This leads to electrons going from the hotter metal to the colder metal, and in the process generates energy.[163]



Graph of how solar panels work on the atomic level.[164]

The two types of solar energy described above are known as **photovoltaic** and solar-thermal power, and are not only the two dominant forms of solar energy but also the ones this committee shall focus on.[165]

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[161] U.S. Department of Energy, "The History of Solar," The History of Solar (U.S. Department of Energy, 2001), https://www1.eere.energy.gov/solar/pdfs/solar_timeline.pdf.
[162] Elizabeth Chu and Lawrence Tarazano, "A Brief History of Solar Panels," Smithsonian (Smithsonian.com, April 22, 2019), https://www.smithsonianmag.com/sponsored/brief-history-solar-panels-180972006/.
[163] Xingyi Zhu, Yue Yu, and Feng Li, "A Review on Thermoelectric Energy Harvesting from Asphalt Pavement: Configuration, Performance and Future," Construction and Building Materials 228 (December 2019): 116818, https://doi.org/10.1016/j.conbuildmat.2019.116818.
[164] Xingyi Zhu, Yue Yu, and Feng Li, "A Review on Thermoelectric Energy Harvesting from Asphalt Pavement: Configuration, Performance and Future," Construction and Building Materials 228 (December 2019): 116818, https://doi.org/10.1016/j.conbuildmat.2019.116818
[165] U.S. Department of Energy, "How Does Solar Work?," Energy.gov (U.S. Department of Energy, 2025), https://www.energy.gov/eere/solar/how-does-solar-work.

Solar panels.[166,167]

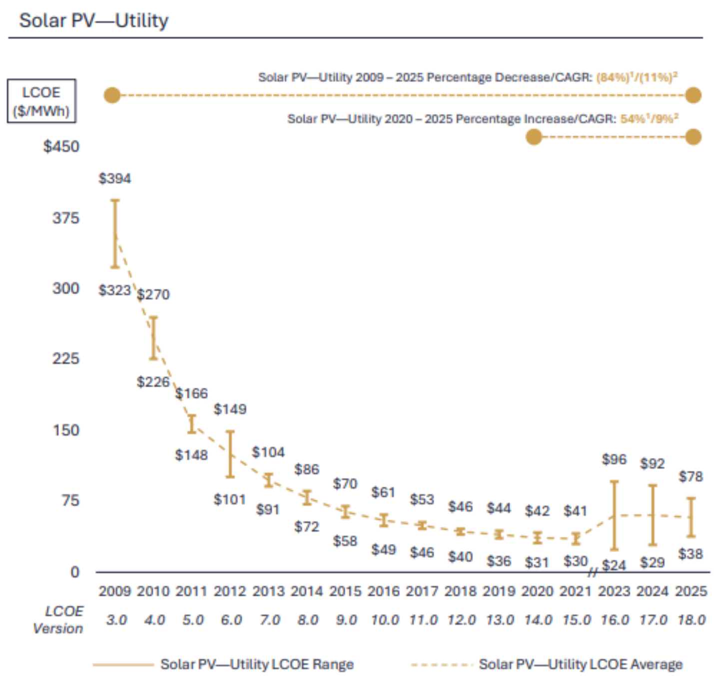
Why Solar Energy?

Solar energy has many advantages over other sources of renewable energy which make it appealing for adoption. Unlike other renewable energy sources which require certain natural phenomena to function, such as strong wind, a river, or closeness to **tectonic activity**, solar power can be adopted nearly anywhere. In the continental US, wind power for example faces trouble outside of the coasts and the **Great Plains**.[168] In comparison, solar power provides relatively high energy production across the continental US, and particularly good production in the southwest deserts.[169]

Furthermore, solar energy has become increasingly affordable, and is projected to become even more affordable. In the past 50 years since 1975, the price of photovoltaic solar panels has dropped 99.8%.[170] In accordance with **Swanson's law**, the price of solar panels halves

[166] Oliver Wainwright, "How Solar Farms Took over the California Desert: 'an Oasis Has Become a Dead Sea,'" The Guardian, May 21, 2023, sec. US news, https://www.theguardian.com/us-news/2023/may/21/solar-farms-energy-power-california-mojave-desert.
[167] George Heynes, "Genesis, FRV Australia Open New Zealand's 'Largest' Solar PV Power Plant," PV Tech, April 30, 2025, https://www.pv-tech.org/genesis-frv-australia-open-new-zealands-largest-solar-pv-power-plant/.
[168] Solargis, "Global Solar Atlas," Globalsolaratlas.info, 2025, https://globalsolaratlas.info/map?c=31.16581.
[169] Ibid.
[170] Hyae Kim et al., "Scaling Solar" (Columbia Business School, July 10, 2025), https://business.columbia.edu/sites/default/files-efs/imce-uploads/CKI/CKI%20Solar-250710.pdf.

each time there is a 10x increase in the amount of solar panels installed.[171] As more solar panels are installed, solar energy will undoubtedly become more affordable as efficiencies are discovered.



Graph showing the increasing affordability of solar power.[172]

Solar energy is also available for a wide range of clientele, including residential units, commercial and industrial companies, and utilities companies. Unlike other energy sources which require large installations, anyone can install solar panels on their rooftop.[173] This makes solar panels more attractive when considering resistance from NIMBYs ("not in my backyard" — a term used to describe people opposed to developments in their neighborhoods), although it isn't infallible in this regard. It provides consumers the opportunity to personally adopt solar

[171] Hansen, "What Is Swanson's Law & Why Should You Care?," AGU Fall Meeting Abstracts 2015 (December 2015): GC33A1269, https://ui.adsabs.harvard.edu/abs/2015AGUFMGC33A1269H/abstract.
[172] "Lazard Levelized Cost of Energy," Lazard, June 2025, https://www.lazard.com/media/uounhon4/lazards-lcoeplus-june-2025.pdf.
[173] Hyae Kim et al., "Scaling Solar" (Columbia Business School, July 10, 2025), https://business.columbia.edu/sites/default/files-efs/imce-uploads/CKI/CKI%20Solar-250710.pdf.

panels should they personally be concerned about **energy independence** or shortages, and is also more easily added to existing infrastructure.

Finally, traditional solar panels in particular have a lower operating expense than other forms of renewable energy. While there is a high capital expense and upfront investment cost to install solar panels, once they are in, they don't require much uptake compared to wind, geothermal, and hydroelectric.[174] This aids its scalability, and makes it more attractive to the average customer who may not have the resources to deal with uptake as a utility company or larger corporation could.

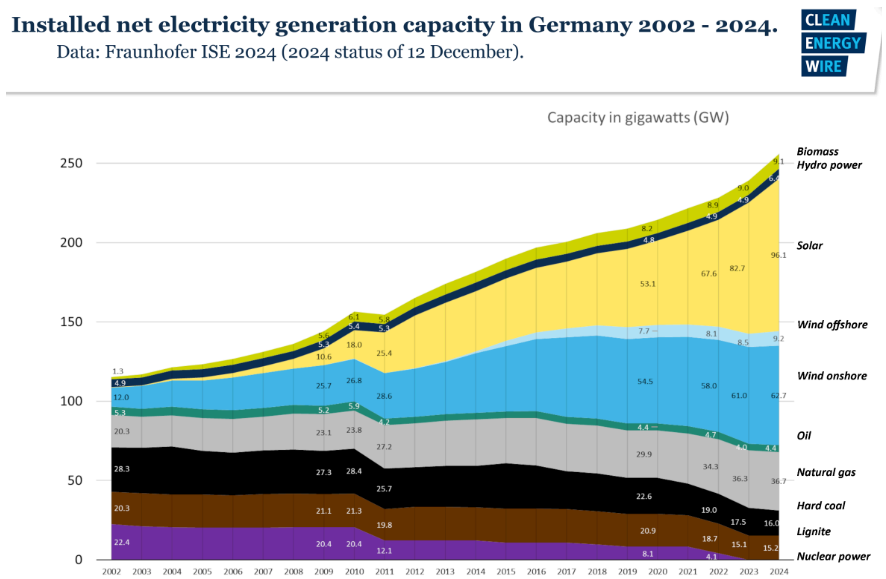
What is Solar Energy's Role in Energy Policy?

Solar energy is important in energy policy as the U.S. and other nations aim to shift away from fossil fuel energy sources, such as oil in the developed world and coal in the developing world. As touched upon in the history of the committee section, renewable energy is the cornerstone of the United States's plan in becoming less dependent on fossil fuels, whether for geopolitical or climate change-related issues.

In Germany, the Energiewende provides a model for what an energy policy based on solar power and other renewables could look like, what it could achieve, and the dangers that accompany it. The Energiewende, translated to "energy turnaround" in English, is Germany's bold plan to become climate neutral by the mid-century through the adoption of solar, wind, hydroelectric, and geothermal energy to abide by the Paris Climate Agreement goals.[175] Since 2002, more solar energy has been installed than any other source of power, as it proves to be one

[174] Hyae Kim et al., "Scaling Solar" (Columbia Business School, July 10, 2025), https://business.columbia.edu/sites/default/files-efs/imce-uploads/CKI/CKI%20Solar-250710.pdf.
[175] Clean Energy Wire, "Germany's Energiewende in Brief," Clean Energy Wire, November 29, 2018, https://www.cleanenergywire.org/germanys-energiewende-brief.

of the most scalable and palatable renewable options. Thus, solar power is key to a renewable and independent energy policy. Yet Germany's pioneering role has exposed many tangible issues with solar energy which this committee will have to address when considering solar energy's role.



Graph showing the installed net electricity generation capacity in Germany between 2002 and 2024.[176]

Dangers of Overly Aggressive Renewables-Based Energy Policy

The Energiewende has revealed new vulnerabilities that come with focusing more dominantly on solar energy. In particular, Germany's aggressive approach against nuclear energy in favor of other renewable energy, paired with the Russia/Ukraine conflict made for a deadly combination. While energy dependence on Russia acted as a catalyst, it also shows the challenges of making dramatic changes in the role of renewable energy in energy policy. In

[176] Kerstine Appunn, Yannick Haas, and Julian Wettengel, "Germany's Energy Consumption and Power Mix in Charts," Clean Energy Wire, December 18, 2024, https://www.cleanenergywire.org/factsheets/germanys-energy-consumption-and-power-mix-charts.

particular, renewable energy sources like solar and wind perform poorly during the winter, when there is less wind and critically the days are shorter.[177] This, combined with the increased demand for energy for heating and other demands can lead to rationing and even blackouts. Thus, when Germany aimed to cut off Russian oil for their power, they had to import large amounts of liquefied natural gas to support their economy at high costs.[178] Any energy policy must adopt solar in a paced manner such that energy shortages do not appear. Beyond this, there are many challenges with adopting solar energy which relate to solar itself, rather than the broader energy policy.

Barriers Against Solar Energy

The most significant barrier against solar energy is the high price point associated with it. While significant improvements have been made, renewable energy is still slightly more expensive today. A great measure of this is the levelized cost of energy, which considers how much per watt each source of energy costs when considering all costs.

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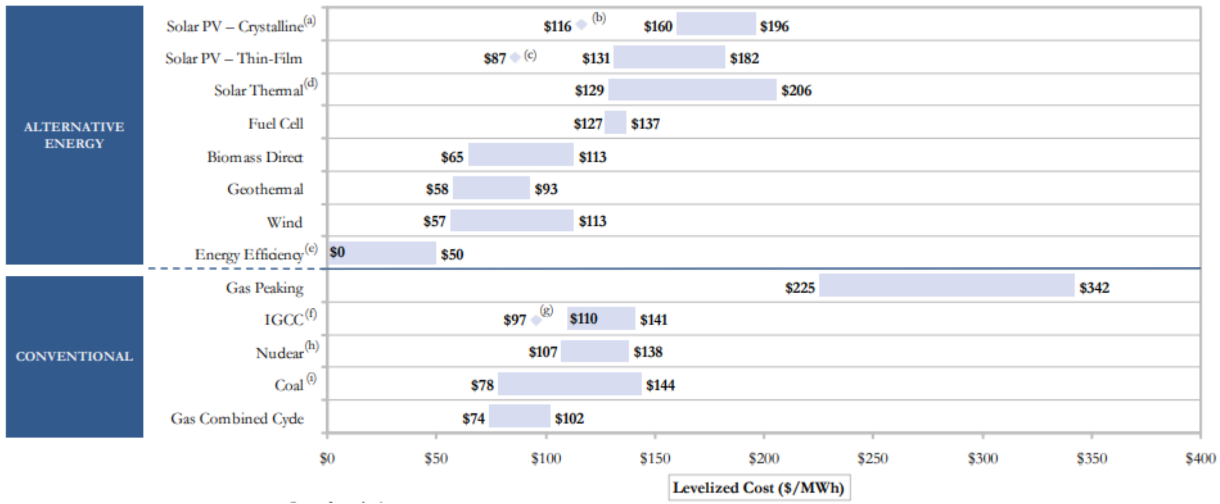
[177] David McHugh, "EXPLAINER: Europe Struggles to Cope with Russia Gas Shutoffs," AP News (AP News, September 6, 2022), https://apnews.com/article/russia-ukraine-france-germany-prices-da1d935fa8bcba4c283f7c5b559a5c9a.

[178] Sören Amelang et al., "Ukraine War: Tracking the Impacts on German Energy and Climate Policy," Clean Energy Wire, February 28, 2022, https://www.cleanenergywire.org/news/ukraine-war-tracking-impacts-german-energy-and-climate-policy.



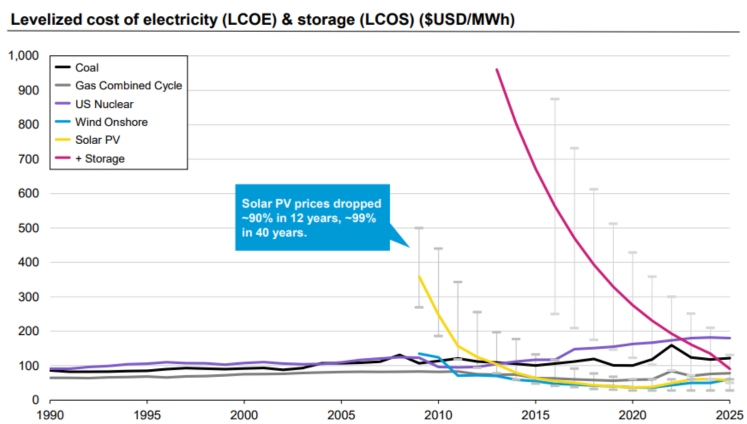
Lazard's 2009 levelized cost of energy report.[179]

As shown in the graph, in February of 2009, using gas combined cycle (traditional fossil fuel generation as opposed to gas peaking, which is for irregular energy usage peaks) remains much more affordable than solar energy, although it is notably more expensive than other renewables even when taking into account ideal market conditions for fossil fuels.[180] While the price per watt has decreased significantly since the times of Jimmy Carter, by the time of the committee it was still nearly double the price of traditional fossil fuels in some cases.

Furthermore, solar energy struggles from a lack of infrastructure which could make it feasible for larger power generation. Perhaps the most important and obvious issue arises when considering that the sun is out at most for around 15 hours during the summer solstice in Chicago, and as little as 9 hours during the winter solstice.[181] If solar energy is to be used as a primary source of energy, especially during the short, yet energy intensive days of winter, there

[179] "Lazard Levelized Cost of Energy," Lazard, June 2025, https://www.lazard.com/media/uounhon4/lazards-lcoeplus-june-2025.pdf.
[180] "Lazard Levelized Cost of Energy," Lazard, June 2025, https://www.lazard.com/media/uounhon4/lazards-lcoeplus-june-2025.pdf.
[181] "Sunrise and Sunset Times in Chicago, June 2025," Timeanddate.com, 2025, https://www.timeanddate.com/sun/usa/chicago?month=6.

must be a robust development of batteries to store the electricity. When factoring in the price of batteries to the levelized cost of energy, solar energy becomes less appealing than gas even today.[182] This is key to making solar energy more adapted, as the duck curve shows that the peak times when solar energy is generated are not the peak times when energy is used, meaning that often energy goes to waste during this production time.



Graph showing the levelized cost of electricity and storage.[181]

Solar energy, while much less invasive than other forms of renewable energy, still faces concerns from NIMBYs as well as naturalists who worry about its interference with nature. Often, renewable energy developers are not from the communities where they plan to install the solar energy plants.[183] Many people may have misconceptions about solar energy and its impacts on the community and environment. Furthermore, there has been a particular concern over solar-thermal energy and how it affects nature. The world's largest solar planet in the Mojave Desert has a major issue of lighting birds on fire mid-air.[184] The mirrors can cook the birds at 900

[182] Hyae Kim et al., "Scaling Solar" (Columbia Business School, July 10, 2025), https://business.columbia.edu/sites/default/files-efs/imce-uploads/CKI/CKI%20Solar-250710.pdf.
[183] Solar Power World and Steffanie Dohn, "Overcoming NIMBY Challenges in Solar," Solar Power World, January 2, 2025, https://www.solarpowerworldonline.com/2025/01/overcoming-nimby-challenges-in-solar/.
[184] CBS Mornings, "California Solar Power Plants Ignite Birds Mid-Flight," YouTube, August 20, 2014, https://www.youtube.com/watch?v=emBY6phmn9E.

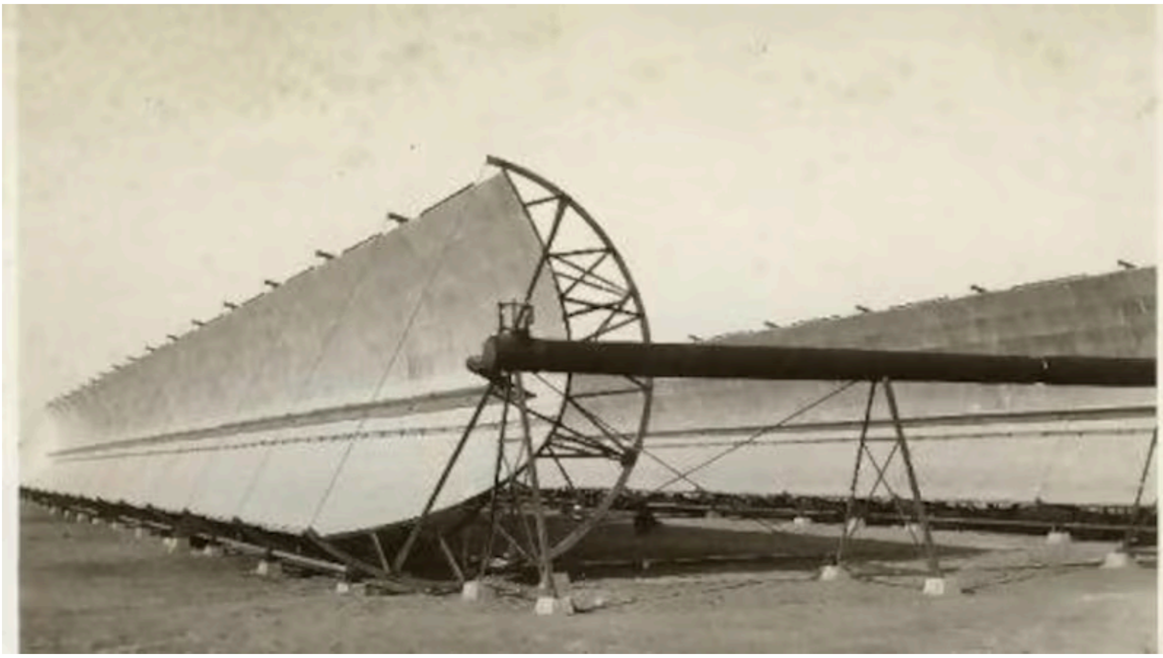
degrees and cause them to crash, which has caused debate to erupt over the environmental impacts of such large plants.

History of the Problem

Development and Use of Solar Power in the Early 20th Century

While modern solar energy as we know it may have been developed in the 19th century, they only truly reached their peak in the 20th century. Even in the early 20th century, when smog from coal dominated the air of cities, solar engines were emerging as an alternative to power water pumping. In Los Angeles in 1901, an inventor by the name of Aubrey Eneas installed a solar-thermal engine to boil water and power a 15-horsepower water pump.[185] By 1913, the inventor Frank Schuman found a practical use for this concept, and installed a solar-thermal engine to pump water from the Nile in order to irrigate fields.[186] At this time, coal was still the primary source of power in Egypt, making his solar field worthwhile. Ultimately, the discovery of oil in the Middle East made his solar engine obsolete, but it still provided strong proof of concept which would be developed as the century progressed.

[185] Alison Bell, "Nothing New under the Sun, Whether Solar Power or Ostrich Farms," Los Angeles Times, April 24, 2011, https://www.latimes.com/local/la-xpm-2011-apr-24-la-me-0424-then-20110424-story.html.
[186] Stephen Dowling, "The Forgotten 20th Century 'Sun Engine,'" www.bbc.com (BBC, April 21, 2023), https://www.bbc.com/future/article/20230420-the-forgotten-20th-century-sun-engine.



Early parabolic trough solar collector system.[187]

Development of Solar Power Post-World War II

By 1946, the modern versions of solar panels emerged as Russel Ohl invented the first silicon solar cell, which became the basis for modern solar panels today, which still use the same metals.[188] By 1954, Daryl Chapin, Calvin Fuller, and Gerald Pearson had improved Ohl's design enough that they could be used for everyday applications, in essence creating the first practical photovoltaic solar panels.[189] These solar panels operated with 6% efficiency, compared to modern day equivalents which produce 25% efficiency.[190] While solar panels were still prohibitively expensive for regular use, they found use in a new frontier — in space.

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187 Jonathan Gornall, "The Promise of Solar Power, Made a Century Ago," The National, January 22, 2011, https://www.thenationalnews.com/business/technology/the-promise-of-solar-power-made-a-century-ago-1.389398.
188 "Russell S. Ohl, Inventor of the Silicon Solar Cell," Monmouth Timeline, n.d., https://monmouthtimeline.org/timeline/russell-s-ohl/.
189 Alan Chodos, "First Practical Silicon Solar Cell," www.aps.org, April 1, 2009, https://www.aps.org/apsnews/2009/04/bell-labs-silicon-solar-cell.
190 "How Efficient Are Modern Solar Energy Systems Compared to Older Models - News," BR Solar Group (Yangzhou Bright Solar Solutions Co., Ltd, December 6, 2024), https://www.brsolarsystem.com/news/how-efficient-are-modern-solar-energy-systems-83012889.html.

By the late 1950s and early 1960s as the space race intensified and the US competed against the USSR to make milestones, NASA recognized the need to generate electricity for their spacecraft continuously. While early satellites operated solely on battery power, by 1958, NASA had begun attaching solar panels to their spacecraft, and continue to do so today.[191] Soon, the U.S. military caught on and wanted solar panels for their own satellites, which ultimately created a large demand for their development.[192] Without this demand, it is likely that solar panels would never have developed to be affordable, or perhaps they would have fizzled out in competition with other forms of renewable energy, such as nuclear forms of energy. This impetus pushed the price of solar panels down consistently, and allowed for their serious consideration as an alternative to powering the homes of everyday Americans by the 1970s.

In 1973, the oil crisis in particular made it obvious to Americans that being reliant on fossil fuels from other countries was a national security threat on par with few others, and sparked interest in renewable energy. As developments came in energy efficiency in homes and cars, so too did an impetus for innovation. In 1974, Ford signed the Energy Reorganization Act, which helped fund solar research.[193] The most significant advances, however, would come under the presidency of Jimmy Carter.

Solar Power During the Carter Presidency

Jimmy Carter proved to be one of the fiercest advocates for solar power and other forms of renewable energy during his presidency. He approached energy policy in a more liberal way than most presidents before and after as he advocated for less energy usage (still controversially

[191] NASA, "How NASA Uses and Improves Solar Power - NASA Science," Nasa.gov, September 26, 2024, https://science.nasa.gov/sun/how-nasa-uses-and-improves-solar-power/.
[192] John Perlin, "Saved by the Space Race | American Solar Energy Society," American Solar Energy Society, April 10, 2014, https://ases.org/saved-by-the-space-race/.
[193] Alice Buck, "A History of the Energy Research and Development Administration" (Department of Energy, 1982),https://www.energy.gov/management/articles/history-energy-research-and-development-administration [3].

donning a cardigan as he delivered the message), and critically for that energy to originate from more renewable sources.[194] In line with his speech, Jimmy Carter founded the Solar Energy Research Institute (SERI) early into his presidency, as well as creating our very own Department of Energy, bringing together other formerly divided parts of energy regulation under one umbrella.[195] The SERI, now the National Renewable Energy Laboratory (NREL), helped conduct research on solar energy and its feasibility, and overall raised awareness of solar energy, which was previously ignored in favor of nuclear energy.[196]

Perhaps the most visible action by Jimmy Carter was his decision to install solar panels on the roof of the white house. While these panels did not provide enough energy to power the whole White House, and only provided enough energy to heat water, they symbolized a change in the attitude towards solar energy, at least for a brief period.[197]

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[194] Chuck Thompson, "The Night We Lost the War on Climate Change," Columbia Insight, June 2, 2022, https://columbiainsight.org/the-night-we-lost-the-war-on-climate-change/.
[195] "A Brief History of the Department of Energy," US Department of Energy, n.d., https://www.energy.gov/lm/brief-history-department-energy.
[196] Alice Buck, "A History of the Energy Research and Development Administration" (Department of Energy, 1982), https://www.energy.gov/management/articles/history-energy-research-and-development-administration.
[197] John Wihbey, "The Forgotten Story of Jimmy Carter's White House Solar Panels» Yale Climate Connections," Yale Climate Connections, February 21, 2023, https://yaleclimateconnections.org/2023/02/the-forgotten-story-of-jimmy-carters-white-house-solar-panels/

Solar panels installed on the roof of the West Wing of the White House during the late 1970s.[198]

Along with this, Jimmy Carter introduced some reforms akin to those which we have today. Through the Energy Tax Act of 1978, Jimmy Carter gave tax rebates for up to 30% of the expenditure of installing solar panels and other renewable energy solutions.[199] Ultimately, the goal of these solutions was to have 20% of energy generated in the U.S. to be solar by 2000, which ultimately never came to fruition as the political paradigm permanently shifted with the election of Ronald Reagan and the shift from New Deal Democrats to New Democrats.[200]

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[198] "The White House Gets Solar Panels, 1979," White House Historical Association (White House Historical Association, n.d.), https://www.whitehousehistory.org/the-white-house-gets-solar-panels.
[199] Dan Rostenkowski, "H.R.5263 - 95th Congress (1977-1978): Energy Tax Act," Congress, November 9, 1978, https://www.congress.gov/bill/95th-congress/house-bill/5263.
[200] John Wihbey, "The Forgotten Story of Jimmy Carter's White House Solar Panels» Yale Climate Connections," Yale Climate Connections, February 21, 2023, https://yaleclimateconnections.org/2023/02/the-forgotten-story-of-jimmy-carters-white-house-solar-panels/

The Period of Indifference Towards Solar Energy

During the Reagan presidency, solar energy suffered as Reagan emphasized small government and deregulation. Reagan's administration promptly rolled back the tax credits passed by Carter which would catalyze the development of solar panels.[201] Similarly, he passed reforms that slashed the SERI budget in half and staff by ⅓, as well as moving projects which would give the agency more importance to other ones.[202] Reagan pushed for the disbanding of the DOE as well, and under his presidency the budget for the agency went down from 889 million dollars to a meager 189 million dollars.[203] For the **nascent** solar industry, this made growth anemic. Simultaneously, Reagan supported the US domestic natural gas industry in a push toward energy independence.[204] Rather than Carter's approach of renewable energy to prevent crises like 1973 to occur again, Reagan instead opted to try to extract more oil in the US in places like Alaska. Near the end of his presidency, the symbolic solar panels were taken down from the White House for roof maintenance, and never returned.[205] This trend continued under George H.W. Bush, as little encouragement from the government was given for solar.

While Bill Clinton reversed the trend of completely shunning solar energy, his policies were not nearly as ambitious as Jimmy Carter's. Most of Bill Clinton's solar policy can be described as merely lip service. He spoke about renewable energy in his inaugural speech, but did little else. The one measure which passed was an increase in NREL's funding (formerly

[201] John Wihbey, "The Forgotten Story of Jimmy Carter's White House Solar Panels» Yale Climate Connections," Yale Climate Connections, February 21, 2023, https://yaleclimateconnections.org/2023/02/the-forgotten-story-of-jimmy-carters-white-house-solar-panels/
[202] Adam Nemett and Kimberly Adams, "National Renewable Energy Laboratory History: 1977-2016," Nrel.gov (NREL History Project, October 2022), https://docs.nrel.gov/docs/fy23osti/84180.pdf.
[203] James Everett Katz, "US Energy Policy Impact of the Reagan Administration," Energy Policy 12, no. 2 (June 1984): 135–45, https://doi.org/10.1016/0301-4215(84)90164-2.
[204] Ibid.
[205] John Wihbey, "The Forgotten Story of Jimmy Carter's White House Solar Panels» Yale Climate Connections," Yale Climate Connections, February 21, 2023, https://yaleclimateconnections.org/2023/02/the-forgotten-story-of-jimmy-carters-white-house-solar-panels/

SERI).[206] This lack of concrete policy was due to a focus on rebounding the economy rather than passing specific social policy programs.[207] Furthermore, he had to deal with a Republican congress who held similar beliefs to the previous presidency, who rejected proposals like energy taxes except on renewable energy. By Clinton's second term, both houses of Congress were controlled by Republicans, and thus little could be accomplished. He created the Million Solar Panel Initiative, which as the name suggests, aimed to install a million solar panels over ten years, but gave this program no teeth.[208] Change mostly came at the regional, rather than national level.

State Support in Solar Energy

While Bill Clinton and the Republican administration before him may have done little to advance solar energy, California and other liberal states made great advances in solar policy. The first advance came with net metering laws. Net metering laws essentially allowed solar panel owners to sell electricity back to the grid, making solar panels financially attractive.[209] This was a break from the otherwise centrally controlled energy grids. While Minnesota passed the first net metering law in 1983, it wasn't used too frequently.[210] By the end of the 1980s, 8 states had enacted net metering laws, and by the end of the 1990s, 21 had done so.[211] Clinton's administration encouraged states to adopt these policies, and notably California and Nevada,

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[206] "Environment Topic Guide," William J. Clinton Presidential Library & Museum, 2017, https://www.clintonlibrary.gov/research/environment-topic-guide.
[207] Alan S Miller, "ENERGY POLICY from NIXON to CLINTON: FROM GRAND PROVIDER to MARKET FACILITATOR," Environmental Law 25, no. 3 (1995): 715–31, https://doi.org/10.2307/43266448.
[208] "U.S. Domestic Climate Change Program," U.S. Department of State Archive (Department of State, November 2, 1998), https://1997-2001.state.gov/global/global_issues/climate/fs-us_climate_prog_981102.html.
[209] SEIA, "Net Metering," SEIA, September 5, 2024, https://seia.org/net-metering/.
[210] SEIA Comms Team, "The Solar Century: Landmark Moments in the History of Solar Energy," Solar Energy Industries Association, August 28, 2024, https://seia.org/blog/solar-century-landmark-moments-history-solar-energy/.
[211] The Role of Net Metering in the Evolving Electricity System (Washington DC: The National Academies Press, 2023), Chapter 3.

states with large deserts, both did.[212] Furthermore, California offered energy rebates which provided tax incentives for companies to adopt solar energy.[213] When the carrot did not work, states did not veer away from the stick; California adopted a policy in 2002 which forced 20% of electricity retail sales to be renewable by 2020.[214] These state-level policies encouraged the federal government to begin adopting energy reform policy, which surprisingly occurred during George W. Bush's second term.

The Turn in Federal Policy Under Bush Junior

By 2005, pressure had mounted on the Bush administration to adopt more pro-renewable policies, and this came in the form of the Energy Policy Act of 2005. This act was the most sweeping pro-solar action from the federal government in nearly 30 years, with tax incentives similar to those Carter had implemented coming back.[215] Furthermore, loan guarantees were given for renewable energy research which otherwise would be considered too risky.[216] Finally, it aimed to increase renewable energy adoption among federal agencies. While this was by no means comprehensive, it provided the first major support from the federal government for renewables in a long time. These policies set the stage for our committee as it opened in 2009, with the inauguration of Barack Obama, and new energy goals.

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212 Ibid.

213 "State Clean Energy Practices: Renewable Energy Rebates," OSTI OAI (U.S. Department of Energy Office of Scientific and Technical Information), March 1, 2009, https://doi.org/10.2172/950149.

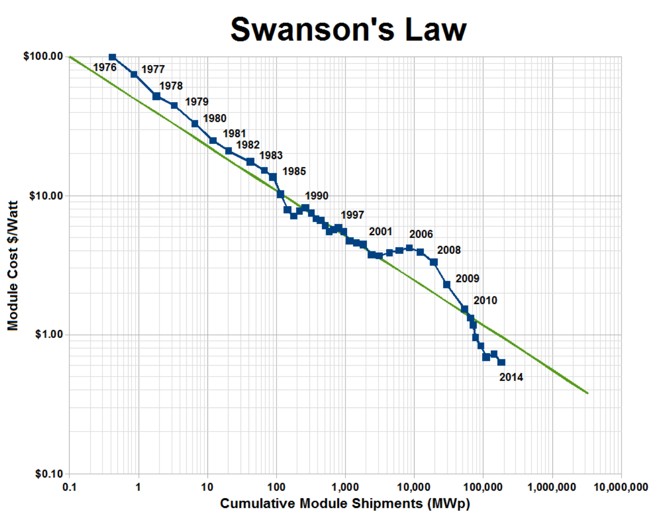
214 "Renewable Portfolio Standard (RPS) Program," www.cpuc.ca.gov (Public Utilities Commission of the State of California, n.d.), https://www.cpuc.ca.gov/rps/.

215 "Energy Policy Act 2005 (Energy Bill) - Climate Change Laws of the World," climate-laws.org (Climate Change Laws of the World, n.d.), https://climate-laws.org/document/energy-policy-act-2005-energy-bill_c45d.

216 Ibid.

American Federal Support for Tax Incentives

As covered earlier, the most ubiquitous and arguably reliable forms of support for solar energy comes from tax credits for solar installations. These policies allow flexibility in installation, unlike other forms of development which require more heavy-handed action from the government. Even during the Carter and then Reagan years, tax incentives increased the installation of solar equipment by 700% between 1978 to 1982, and helped spur the founding of solar companies.[217] Beyond just reducing environmental impact immediately, Swanson's law shows that the price for solar panels drops by 20% each time there's a doubling in cumulative module shipments of solar panels, which essentially means the production and deployment of solar panels.



Visualization of Swanson's Law, which shows the historical decline in the cost of solar photovoltaic (PV) modules as cumulative production increases.[218]

[217] Mike Nicklas, "Will History Repeat Itself? Like Reagan's Repeal of Carter's Achievements in Advancing Solar Energy, Will Trump Kill Biden's?," Ases.org (American Solar Energy Society, April 10, 2025), https://ases.org/will-history-repeat-itself-like-reagans-repeal-of-carters-achievements-in-advancing-solarenergy-willtrump-kill-bidens/.
[218] "Swanson's Law," Wikimedia.org, July 13, 2014, https://commons.wikimedia.org/wiki/File:Swansons-law.png.

EU Policies

The EU has taken aggressive action to ensure their carbon footprint is reduced. Between 2014-2020, the EU spent 20% of the nearly trillion-dollar budget on climate change and its mitigation.[219] Some of these funds went to subsidizing research and clean energy sources through programs like the European Strategic Energy Technology Plan (SET-Plan), which was created in 2008. The SET-Plan had a budget of up to 72 billion dollars and worked to "accelerate the development and deployment of low carbon technologies" by "coordinating research and helping to finance projects".[220] These policies help allow for the underlying technology to be cheaper not only for EU citizens but for everyone.

The largest policy which has undoubtedly benefitted solar in the EU has been the European Emissions Trading System, also known as the EU ETS. It is many things: the first major **carbon market**, the largest one, and one of the only international ones in the world. To emit greenhouse gasses in those industries, companies either receive or buy, through an auction system, tradable emission allowances. Should a company go over its allowance, its failure to contain its emissions is publicized and there is a penalty of 100 Euros per ton emitted above the allowance.[221] The EU ETS has a turnover of nearly 1 trillion dollars and record transactions of 12.5 billion tons of carbon.[222] Combined with subsidies, it makes solar power a much more appealing option than it would be otherwise.[223] Recently, a new policy known as the Carbon Border Adjustment Mechanism (CBAM) has been proposed, which prevents "carbon leakage,"

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[219] Sophia Kalantzakos, The EU, US and China Tackling Climate Change (Routledge, 2018).
[220] Ibid.
[221] "Monitoring, Reporting and Verification," EU Emissions Trading System (ETS) (European Union, n.d.), https://climate.ec.europa.eu/eu-action/carbon-markets/eu-emissions-trading-system-eu-ets/monitoring-reporting-and-verification_en.
[222] Hongqiao Liu et al., "The Carbon Brief Profile: China," Carbon Brief, November 30, 2023, https://interactive.carbonbrief.org/the-carbon-brief-profile-china/index.html.
[223] "Making Europe's Businesses Future-Ready: A New Industrial Strategy for a Globally Competitive, Green and Digital Europe," European Commission Press Corner (European Union, n.d.), https://ec.europa.eu/commission/presscorner/detail/en/ip_20_416.

which is where companies move their "carbon-intensive production abroad to countries" with less climate legislation.[224] This new policy would essentially protect EU made goods by implementing a tariff that considers the "embedded carbon emissions" on imported goods and make sure the carbon price of those imports is the same as it is for domestic made goods.[225]

Another policy used by EU countries is feed-in tariffs. A feed-in tariff essentially mandates the country or utility companies to purchase electricity generated from a source (in this case solar energy) at a higher rate, and to buy all of it. This makes solar energy, which may struggle deeply with profitability, much more of a reasonable choice to the average consumer.[226] Germany has used feed-in tariffs since 2000, and has allowed for the amount of electricity generated from renewable sources to go from 6.2% in 2000 to 28% in 2014.[227] This policy runs into issues when wholesale electricity prices go below zero, as they aren't flexible to the rules of supply and demand.[228] Essentially, while oil and gas producers are encouraged by negative prices (them literally paying customers to use electricity) to slow production, feed-in tariffs incentivize the solar companies to continue producing electricity even if it's completely unnecessary.

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[224] European Commission, "Carbon Border Adjustment Mechanism," European Commission (European Union, n.d.), https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en.
[225] Ibid.
[226] Will Kenton, "Feed-in Tariff (FIT)," Investopedia, February 5, 2025, https://www.investopedia.com/terms/f/feed-in-tariff.asp.
[227] "The German Feed-in Tariff," Future Policy, September 15, 2016, https://www.futurepolicy.org/climate-stability/renewable-energies/the-german-feed-in-tariff/.
[228] Carolina Kyllmann, "Q&A: How Will Germany Support the Expansion of Renewables in Future?," Clean Energy Wire, November 8, 2024, https://www.cleanenergywire.org/factsheets/qa-how-will-germany-support-expansion-renewables-future.

Possible Solutions

The solutions you as a committee will look at will likely be similar to the ones which have been implemented in the past and in other countries. When approaching any solutions, try to remember Swanson's Law: more solar panel production and deployment will lower the price in the future. This provides an opportunity to propel development without heavy-handed government intervention, which is often politically very unpopular, especially in a place like the United States. Review the actions of the past and try your best to iron out any flaws and adapt them to US politics.

The Office of Energy Efficiency and Renewable Energy (EERE) & the Energy Information Administration

As mentioned prior, the Office of Energy Efficiency and Renewable Energy (EERE) is the office leading the United States's charge toward a more renewable future. The EERE is the agency responsible for funding renewable energy businesses, conducting basic research on solar energy, and providing assistance to said companies.[229] This bloc will focus on creating programs and initiatives which Congress can codify into law, focusing on creating targeted (or blanket) tax credits, funding short-term impactful research, or other financial incentives for solar energy. Once again, this office is more focused on achieving more short-term tangible results, rather than long-term riskier goals such as large amounts of spending on research and development into solar energy.[230] The funding is typically done through **grants** rather than direct research.[231] In application, this may mean providing investment to a solar startup working on rolling out more efficient panels, rather than researching the panel technology themselves.

The Office of Science & ARPA-E

The Office of Science & ARPA-E is more focused on long-term research with fewer immediate payouts. Furthermore, the research is more directly conducted, rather than being in the form of grants as it is for EERE.[232] These are described explicitly as "high-risk, high-reward"

[229] "Office of Energy Efficiency and Renewable Energy," Energy.gov (Department of Energy, 2024), https://www.energy.gov/eere/office-energy-efficiency-and-renewable-energy.
[230] "What Types of EERE Funding Exist?," Energy.gov (Department of Energy, n.d.), https://www.energy.gov/eere/funding/what-types-eere-funding-exist.
[231] Ibid.
[232] "Program Overview | ARPA-E," Energy.gov (Department of Energy, n.d.), https://arpa-e.energy.gov/programs-and-initiatives/program-overview.

projects rather than ones which may be commercialized within a short period of time.[233] In practice, this may mean doing research on alternative materials for solar panels. While this likely yields some of the most results in the long-term, it may face some unpopularity, especially during times of increased austerity.

Opposition to Solar Energy

The opposition bloc is wide, encompassing a variety of different interests for different reasons. As covered earlier, those who advocate for less government intervention may attack solar energy for being a superfluous expenditure placed on the American people. Other anti-solar energy proponents may be those who do not believe in human caused climate change, who at this time make up 64% of the American population.[234] Others against it are oil companies who stand to lose from cheaper solar energy and a long-term shift away from natural gas, as well as those employed by these firms. This means that states like North Dakota, which benefit greatly from oil booms, will harshly oppose legislation that pushes solar energy into the limelight.[235]

[233] Ibid.
[234] Guardian staff reporter, "Apocalypse Fatigue: Losing the Public on Climate Change," the Guardian (The Guardian, November 17, 2009), https://www.theguardian.com/environment/2009/nov/17/apocalypse-public-climate-change.
[235] "Bakken Oil Boom, North Dakota, USA | EROS," Usgs.gov, n.d., https://eros.usgs.gov/earthshots/bakken-oil-boom-north-dakota-usa.

Glossary

Carbon market - A market set up by a governing body to facilitate the exchange of permits, which allow for emissions of a certain amount of carbon dioxide per permit.

Energy independence - The ability for a country to completely support its energy needs without imports from other countries.

Grant - Money given by an institution without expectation of repayment.

Great Plains - Region of America encompassing central North America.

Nascent - New or emerging.

North Dakota Oil Boom - Oil boom in the early 21st century in North Dakota, spurred on by fracking in the Bakken shale formation.

Photovoltaic panels - Solar panels which directly convert sunlight into electricity, unlike solar thermal panels which heat water.

Swanson's Law - For every increase of sales by 10 times, the price of solar panels halves.

Tectonic activity areas - Areas near fault lines (cracks in Earth's crust), which are prone to high amounts of geothermal activity.

Thermopiles - A device which can convert thermal energy collected from the sun into electricity.

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Delegate Positions

A Note on Researching Your Positions

Please note that there may be limited information available online about your assigned position. Do your best to explore any available resources, and spend time researching the issues presented in this background guide thoroughly and thinking about what solutions you believe would be best at addressing them! Also, please understand that though delegates will be representing individuals, not countries, this committee will still operate as a standard two-topic **traditional** committee. Please don't hesitate to reach out to Riley or Maxi with any questions.

Roster

1. Secretary of Energy: **Steven Chu**
2. Deputy Secretary of Energy: **Daniel Poneman**
3. Under Secretary of Energy: **Kristina Johnson**
4. Under Secretary for Science: **Steven Koonin**
5. Under Secretary for Nuclear Security: **Thomas P. D'Agostino**
6. Administrator, Energy Information Administration: **Richard Newell**
7. Assistant Secretary for Energy Efficiency and Renewable Energy: **Cathy Zoi**
8. Assistant Secretary for Nuclear Energy: **Warren F. Miller, Jr.**
9. Assistant Secretary for Environmental Management: **Ines R. Triay**
10. Assistant Secretary for Fossil Energy: **James J. Markowsky**
11. Assistant Secretary for Electricity Delivery and Energy Reliability: **Patricia Hoffman**
12. Director of Science: **William Brinkman**

13. Director of Civilian Radioactive Waste Management: **Christopher A. Kouts**

14. Chief of Staff: **Rodd O'Connor**

15. Chief Financial Officer: **Steven J. Isakowitz**

16. General Counsel: **Scott Blake Harris**

17. Inspector General: **Gregory H. Friedman**

18. Assistant Secretary, Policy & International Affairs: **David Sandalow**

19. Chief Human Capital Officer: **Rita Franklin**

20. Chief Information Officer: **Thomas N. Pyke**

21. Director of Public Affairs: **Dan Leistikow**

22. Director of Economic Impact & Diversity: **Annie Whatley**

23. Director of Management: **Ingrid Kolb**

24. Director of Intelligence & Counterintelligence: **Stanley Borgia**

25. Director of Hearings and Appeals: **Poli A. Marmolejos**