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Skip to sub-navigation This page has no sub-navigation. Skip to page content. What's New Top Picks 5/22/2025 Wind and solar combined share of generation 5/22/2025 Daily electric power demand 5/19/2025 Natural gas spot prices $2.96 /million Btu $0.235 /million Btufrom week earlier $0.431 /million Btufrom year earlier 5/16/2025 Brent spot prices $65.20 /barrel $0.94 /barrelfrom week earlier $17.04 /barrelfrom year earlier Exploration and reserves, storage, imports and exports, production, prices, sales. Sales, revenue and prices, power plants, fuel use, stocks, generation, trade, demand & emissions. Uranium fuel, nuclear reactors, generation, spent fuel. Energy use in homes, commercial buildings, manufacturing, and transportation. Monthly and yearly energy forecasts, analysis of energy topics, financial analysis, congressional reports. Crude oil, gasoline, heating oil, diesel, propane, and other liquids including biofuels and natural gas liquids. Reserves, production, prices, employment and productivity, distribution, stocks, imports and exports. Includes hydropower, solar, wind, geothermal, biomass and ethanol. Comprehensive data summaries, comparisons, analysis, and projections integrated across all energy sources. Last updated3 April 2014Cloze sentences and diagram to label about how power stations work and burning fossil fuels. The second sheet is differentiated for lower ability students.Tes classic free licenceSelect overall rating(no rating)Your rating is required to reflect your happiness.Write a reviewUpdate existing reviewIt's good to leave some feedback.Something went wrong, please try again later.Perfect! Neatly summarised to help my children crystallise the key facts. :) Thanks!Empty reply does not make any sense for the end userThanksEmpty reply does not make any sense for the end userThank you - just what I was looking for to introduce my class to Electricity!Empty reply does not make any sense for the end userPerfect! Thank you so much.Empty reply does not make any sense for the end userSimple summary of the electricity generating process. Great diagramEmpty reply does not make any sense for the end userReport this resourceto let us know if it violates our terms and conditions. Our customer service team will review your report and will be in touch. When fossil fuels are burned, their chemical potential energy is primarily converted into heat energy. This heat energy can then be used to generate electricity, power vehicles, or heat buildings. However, the combustion process also releases carbon dioxide and other pollutants into the atmosphere, contributing to environmental issues such as global warming and air pollution. September 14, 2020 Source: U.S. Energy Information Administration, Monthly Energy ReviewNote: Click to enlarge. Fossil fuels, or energy sources formed in the Earth’s crust from decayed organic material, including petroleum, natural gas, and coal, continue to account for the largest share of energy production and consumption in the United States. In 2019, 80% of domestic energy production was from fossil fuels, and 80% of domestic energy consumption originated from fossil fuels. The U.S. Energy Information Administration (EIA) publishes the U.S. total energy flow diagram to visualize U.S. energy from primary energy supply (production and imports) to disposition (consumption, exports, and net stock additions). In this diagram, losses that take place when primary energy sources are converted into electricity are allocated proportionally to the end-use sectors. The result is a visualization that associates the primary energy consumed to generate electricity with the end-use sectors of the retail electricity sales customers, even though the amount of electric energy end users directly consumed was significantly less. Source: U.S. Energy Information Administration, Monthly Energy Review The share of U.S. total energy production from fossil fuels peaked in 1966 at 93%. Total fossil fuel production has continued to rise, but production has also risen for non-fossil fuel sources such as nuclear power and renewables. As a result, fossil fuels have accounted for about 80% of U.S. energy production in the past decade. Since 2008, U.S. production of crude oil, dry natural gas, and natural gas plant liquids (NGPL) has increased by 15 quadrillion British thermal units (quads), 14 quads, and 4 quads, respectively. These increases have more than offset decreasing coal production, which has fallen 10 quads since its peak in 2008. Source: U.S. Energy Information Administration, Monthly Energy Review In 2019, U.S. energy production exceeded energy consumption for the first time since 1957, and U.S. energy exports exceeded energy imports for the first time since 1952. U.S. energy net imports as a share of consumption peaked in 2005 at 30%. Although energy net imports fell below zero in 2019, many regions of the United States still import significant amounts of energy. Most U.S. energy trade is from petroleum (crude oil and petroleum products), which accounted for 69% of energy exports and 86% of energy imports in 2019. Much of the imported crude oil is processed by U.S. refineries and is then exported as petroleum products. Petroleum products accounted for 42% of total U.S. energy exports in 2019. Source: U.S. Energy Information Administration, Monthly Energy Review The share of U.S. total energy consumption that originated from fossil fuels has fallen from its peak of 94% in 1966 to 80% in 2019. The total amount of fossil fuels consumed in the United States has also fallen from its peak of 86 quads in 2007. Since then, coal consumption has decreased by 11 quads. In 2019, renewable energy consumption in the United States surpassed coal consumption for the first time. The decrease in coal consumption, along with a 3-quad decrease in petroleum consumption, more than offset an 8-quad increase in natural gas consumption. EIA previously published articles explaining the energy flows of petroleum, natural gas, coal, and electricity. More information about total energy consumption, production, trade, and emissions is available in EIA’s Monthly Energy Review. Principal contributor: Bill Sanchez Last updated8 June 2022This TWO HOUR resource investigates the difference between renewable and non-renewable energy. This pack contains a fun kinaesthetic activity, where pupils are required to engage with their fellow peers to match their card to its definition, picture and classification. The lesson teaches pupils how fossil fuels are formed over millions of years, as well as how they are used. The independent writing task requires half the pupils to create an argument for renewables, while the other half argue against them. This is then presented in a debate style presentation, where the class votes for the most convincing argument. A marking grid and writing fame for less able pupils is provided, along with an information sheet to help pupils construct their arguments. Tes paid licenceHow can I reuse this?Select overall rating(no rating)Your rating is required to reflect your happiness.Write a reviewUpdate existing reviewIt's good to leave some feedback.Something went wrong, please try again later.This resource hasn't been reviewed yetTo ensure quality for our reviews, only customers who have purchased this resource can review itReport this resourceto let us know if it violates our terms and conditions. Our customer service team will review your report and will be in touch. Share — copy and redistribute the material in any medium or format for any purpose, even commercially. Adapt — remix, transform, and build upon the material for any purpose, even commercially. The licensor cannot revoke these freedoms as long as you follow the license terms. Attribution — You must give appropriate credit , provide a link to the license, and indicate if changes were made . You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use. ShareAlike — If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original. No additional restrictions — You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits. You do not have to comply with the license for elements of the material in the public domain or where your use is permitted by an applicable exception or limitation . No warranties are given. The license may not give you all of the permissions necessary for your intended use. For example, other rights such as publicity, privacy, or moral rights may limit how you use the material. The term "fossil fuels" has evolved from a cheeky moniker into a something of villain in the public consciousness. Formerly a benign enough name to the substances that perhaps single-handedly propelled global civilization into a truly modern age, many people now associate "fossil fuels" with pollution – not merely ugly smoke and noxious vehicle exhaust, but the sort of materials with the capacity to veritably ruin or end civilization, depending on whom one listens to. As of 2018, the U.S. derived 81 percent of its energy from fossil fuels. These are not renewable, and as the world's population increases and the supply of fossil fuels dwindles, it becomes more expensive to extract what fossil fuels remain from their subterranean sources. Moreover, the burning of fossil fuels, more than just a blight on skylines, creates products that contribute to global warming, which scientists around the planet agree is an extremely urgent issue political entities would be reckless to ignore. Fossils fuels include oil (i.e., petroleum), coal and natural gas. One of these is a thick liquid, another a solid and the third a less dense liquid, but they all share a common origin. As the name implies, these fuels arise from material that was once a part of living things, both animals and plants, in the very distant past. These prehistoric organisms were compressed over a period of millions of years by rocks, but only when temperature and pressure conditions favored the process; that is, only a small fraction of ancient life was converted to fossil fuels today, just as only a small number of prehistoric animals and plants resulted in the formation of fossils that gave today's human paleontologists specific clues about what these organisms, from dinosaurs to giant ferns, looked like and how they lived. **Oil:** This fossil fuel is used mainly for heating and transportation, and it is the source of gasoline in its various forms. It is arguably the single most valuable commodity the world over, and has transformed civilization in a number of obvious and crucial ways. The U.S. relies heavily on other countries to meet is massive oil demands, and some of these nations are subject to ongoing political upheaval. The U.S. Department of Energy's Office of Petroleum Reserves (OPR) maintains an emergency stash of oil in the event foreign supply is suddenly cut off. This supply, divided into three sources, includes almost three-quarters of a billion barrels of oil. **Coal:** This fossil fuel is the largest domestically produced energy source in the U.S. and provides a significant fraction of the electricity supply. In 2015, the U.S. produced over 900 million tons of coal, and about 25 percent of all of the coal reserves in the world are believed to lie within America's borders. Coal is also a very cheap source of energy, pound for pound. Unfortunately, coal is extremely problematic from the standpoint of pollution. There is also some question of how accessible the vast reserves of coal in the U.S. really are. With the energy economy moving toward renewable sources, all fossil fuels are likely to be de-emphasized in the decades to come, but the coal industry may be especially vulnerable as a result of public pressure as well as basic economic realities. **Natural Gas:** As of 2018, the U.S. was the world's leading producer of natural gas. Much of this is owed to the natural gas extracted from shale, a type of sedimentary rock. This kind of natural gas, called shale gas and consisting mainly of methane (CH4), has developed into a subject of intense interest and attendant controversy thanks to recently developed ways to extract it from the ground, allowing for the tapping into considerable reserves that have lain dormant within rock until now. One of these, hydraulic fracturing ("fracking"), has become a target of environmental groups thanks to its potential and observed effects on the rock from which it is removed, including the increased possibility of earthquakes when waste water from fracking is re-injected into the ground. 801 million tons of coal were consumed in the U.S. in 2015, almost all of it for the purpose of generating electricity. Based on current projections, this number is expected to gradually decrease to about 557 million tons by 2040, an average decline of about 1.4 percent per year. This is in spite of the fact that the U.S. population is growing (albeit not as quickly as that of developing nations) and the fact that the U.S. is thought to have 257 billion tons of coal in reserve. For reference, a billion is 1,000 million, so the amount of coal remaining underground in America is about 300 times the amount presently being burned annually. While West Virginia and Pennsylvania receive a lot of attention whenever the subject of U.S. coal mining arises, as of 2018, about 57 percent of the coal mined in the U.S. came out of the ground of states in the western half of the country – 42 percent from the state of Wyoming alone. This is owed to the fact that this "brand" of coal is lower in sulfur content. Regardless, coal burning releases greenhouse gases, not only carbon dioxide (CO2) but also methane (CH4), and its extraction disrupts the natural environment no matter what care is taken to minimize damage to local environments. Fossil fuel pollution is at the center of one of the most contentious and important national conversations in the U.S., as well as a driving force of political, economic and technological movements all over the world. All fossil fuels contain large amounts of carbon; if you've followed the energy and climate-change debate at any level, you have likely heard the term "carbon footprint" used to describe the relative amount of fossil fuels being used by a given sector, piece of equipment or community. Fossil fuels also contain substantial amounts of the elements hydrogen, oxygen, nitrogen and sulfur. All of these elements are highly reactive, both with each other and with different elements in the air and on the ground. The primary pollutants released from the burning of fossil fuels are carbon monoxide (CO), carbon dioxide (CO2), sulfur dioxide (SO2), nitrogen oxides of the chemical form NOx (primarily nitrogen dioxide, or NO2), nitric oxide (N2O), various hydrocarbons (methane, CH4, being one such example) and substances collectively termed volatile organic compounds, or VOC. Some of these are hazardous in their native forms; others are especially damaging only after they combine with other otherwise benign reagents in the atmosphere. By far the most concerning and talked-about of these compounds is CO2. Because carbon accounts from between 60 to 90 percent of the mass of the fossil fuels burned, CO2 is the principal product of the combustion of fossil fuels worldwide. China has become the largest emitter of CO2 on the planet, with total mass reaching 8.32 billion metric tons in 2010. (A metric ton is 1,000 kilograms, or about 2,200 pounds, making a metric ton about 10 percent more massive than a standard ton.) The U.S., ranked second in this dubious category in 2010 with an output of 5.61 billion metric tons. (China's population as of 2018 was over four times that of the U.S.) While CO2 receives the bulk of the attention as a greenhouse gas – meaning a substance that can trap unwanted heat in the Earth's atmosphere and contribute to the increasing average surface and sea temperatures now afflicting the planet and expected to continue unchecked without a serious effort to restructure the entire means of energy delivery the world over – CH4 is actually a more potent greenhouse gas, molecule per molecule, than CO2 is. The effects of CO2 predominate over those of methane simply because there is so much more of it in the atmosphere, even though CO2 accounts for less than 1 percent of the gases in the atmosphere. What makes CH4 particularly troubling is that its its emissions arise not only from the combustion of natural gas, but during drilling operations and also during the transportation of natural gas in pipelines. Effects on climate represent a small fraction of the harm that burning fossil fuels can produce. In fact, even if there were no effects whatsoever on the planet's temperature of CO2 and CH4 emissions, fossil-fuel combustion would still be problematic. For example, nitrogen oxides can combine with other atmospheric elements to from smog (ground-level ozone) and acid rain. Ammonia (NH4) is also produced during the combustion of fossil fuels. Most nitrogen oxides reach the environment via vehicle emissions. VOC also contribute to the formation of smog. The particulate matter (PM) formed in the atmosphere thanks to fossil-fuel combustion can cause or worsen a variety of chronic lung conditions, such as asthma and bronchitis. In a nutshell, the burning of any kind of fossil fuel is almost certain to cause something to become warmer, hazier or more acidic, or otherwise take on characteristics that are undesirable to the ecosystem as a whole. As noted, the U.S. alone has a great deal of oil stashed away in reserves and billions of tons of coal underground. Whatever you may have heard about the imminent drying up of oil and natural gas wells is most likely an exaggeration. Instead, it is concerns about the hazards of burning fossil fuels that are motivating energy pioneers and environmental leaders to pursue the many known alternatives to fossil fuels, collectively known as "clean energy." These include solar, wind, hydropower, biofuels and nuclear power; of these, all but nuclear are considered renewable as well as "clean" (nuclear power comes from uranium, which is a finite resource). In addition to making greater use of these alternative fuels, people can work to make more efficient use of fossil fuels by being conscientious. Businesses, for example, can manage and reduce emissions, increase energy efficiency in the workplace by stricter monitoring of wasteful use of electricity and also look into buying renewable energy. It is also vital, however, for individuals to take part in active energy conservation. Turning off your lights, computers, televisions, video games and other electrical equipment when they are not in use may sound like an old, tired refrain from a nagging parent, but these measures do add up to a vast number of kilowatt-hours saved per year when people are attentive. Finally, walking or cycling to work whenever possible, or making use of public transportation such as buses and light-rail options (many of which are now using hybrid fuels) is not only beneficial to the environment but also eases the stress of having to drive on congested roads and breathe in others' exhaust. Beck, Kevin. "What Happens When Fossil Fuels Burn?" sciencing.com, . 5 November 2018. APA Beck, Kevin. (2018, November 5). What Happens When Fossil Fuels Burn?. sciencing.com. Retrieved from Chicago Beck, Kevin. What Happens When Fossil Fuels Burn? last modified March 24, 2022. Fuel formed over millions of years from dead plants and animals "Oil and gas" redirects here. For other uses, see Oil and gas (disambiguation). The main fossil fuels (from top to bottom): natural gas, oil, and coal A fossil fuel[a] is a flammable carbon compound- or hydrocarbon-containing material[2] formed naturally in the Earth's crust from the buried remains of prehistoric organisms (animals, plants or microplanktons), a process that occurs within geological formations. Reservoirs of such compound mixtures, such as coal, petroleum and natural gas, can be extracted and burnt as fuel for human consumption to provide energy for direct use (such as for cooking, heating or lighting), to power heat engines (such as steam or internal combustion engines) that can propel vehicles, or to generate electricity via steam turbine generators.[3] Some fossil fuels are further refined into derivatives such as kerosene, gasoline and diesel, or converted into petrochemicals such as polyolefins (plastics), aromatics and synthetic resins. The origin of fossil fuels is the anaerobic decomposition of buried dead organisms. The conversion from these organic materials to high-carbon fossil fuels is typically the result of a geological process of millions of years.[4] Due to the length of time it takes for them to form, fossil fuels are considered non-renewable resources. In 2023, 77% of primary energy consumption in the world[5] and over 60% of its electricity supply were from fossil fuels.[6] The large-scale burning of fossil fuels causes serious environmental damage. Over 70% of the greenhouse gas emissions due to human activity in 2022 was carbon dioxide (CO2) released from burning fossil fuels.[7] Natural carbon cycle processes on Earth, mostly absorption by the ocean, can remove only a small part of this, and terrestrial vegetation loss due to deforestation, land degradation and desertification further compounds this deficiency. Therefore, there is a net increase of many billion tonnes of atmospheric CO2 per year.[8] Although methane leaks are significant,[9]:52 the burning of fossil fuels is the main source of greenhouse gas emissions causing global warming and ocean acidification. Additionally, most air pollution deaths are due to fossil fuel particulates and noxious gases, and it is estimated that this costs over 3% of the global gross domestic product[10] and that fossil fuel phase-out will save millions of lives each year.[11][12] Recognition of the climate crisis, pollution and other negative impacts caused by fossil fuels has led to a widespread policy transition and activist movement focused on ending their use in favor of renewable and sustainable energy.[13] Because the fossil-fuel industry is so heavily integrated in the global economy and heavily subsidized,[14] this transition is expected to have significant economic impacts.[15] Many stakeholders argue that this change needs to be a just transition[16] and create policy that addresses the societal burdens created by the stranded assets of the fossil fuel industry.[17][18] International policy, in the form of United Nations' sustainable development goals for affordable and clean energy and climate action, as well as the Paris Climate Agreement, is designed to facilitate this transition at a global level. In 2021, the International Energy Agency concluded that no new fossil fuel extraction projects could be opened if the global economy and society wants to avoid the worst impacts of climate change and meet international goals for climate change mitigation.[19] Since oil fields are located only at certain places on Earth,[20] only some countries are oil-independent; the other countries depend on the oil-production capacities of these countries. The theory that fossil fuels formed from the fossilized remains of dead plants by exposure to heat and pressure in Earth's crust over millions of years was first introduced by Andreas Libavius "in his 1597 Alchemia [Alchymia]" and later by Mikhail Lomonosov "as early as 1757 and certainly by 1763".[21] The first recorded use of the term "fossil fuel" occurs in the work of the German chemist Caspar Neumann, in English translation in 1759.[22] The Oxford English Dictionary notes that, in the phrase "fossil fuel," the adjective "fossil" means "[o]btained by digging; found buried in the earth", which dates to at least 1652,[23] before the English noun "fossil" came to refer primarily to long-dead organisms in the early 18th century.[24] Aquatic phytoplankton and zooplankton that died and sedimented in large quantities under anoxic conditions millions of years ago began forming petroleum and natural gas as a result of anaerobic decomposition. Over geological time this organic matter, mixed with mud, became buried under further heavy layers of inorganic sediment. The resulting high temperature and pressure caused the organic matter to chemically alter, first into a waxy material known as kerogen, which is found in oil shales, and then with more heat into liquid and gaseous hydrocarbons in a process known as catagenesis. Despite these heat-driven transformations, the energy released in combustion is still photosynthetic in origin.[25] Terrestrial plants tended to form coal and methane. Many of the coal fields date to the Carboniferous period of Earth's history. Terrestrial plants also form type III kerogen, a source of natural gas. Although fossil fuels are continually formed by natural processes, they are classified as non-renewable resources because they take millions of years to form and known viable reserves are being depleted much faster than new ones are generated.[26][27] See also: Fossil fuel power station Net income of the global oil and gas industry reached a record US$4 trillion in 2022.[28] After recovering from the COVID-19 pandemic, energy company profits increased with greater revenues from higher fuel prices resulting from the Russian invasion of Ukraine, falling debt levels, tax write-downs of projects shut down in Russia, and backing off from earlier plans to reduce greenhouse gas emissions.[29] Record profits sparked public calls for windfall taxes.[29] Fossil fuels have been important to human development because they can be readily burned in the open atmosphere to produce heat. The use of peat as a domestic fuel predates recorded history. Coal was burned in some early furnaces for the smelting of metal ore, while semi-solid hydrocarbons from oil seeps were also burned in ancient times,[30] they were mostly used for waterproofing and embalming.[31] Commercial exploitation of petroleum began in the 19th century.[32] Natural gas, once flared-off as an unneeded byproduct of petroleum production, is now considered a very valuable resource.[33] Natural gas deposits are also the main source of helium. Heavy crude oil, which is much more viscous than conventional crude oil, and oil sands, where bitumen is found mixed with sand and clay, began to become more important as sources of fossil fuel in the early 2000s.[34] Oil shale and similar materials are sedimentary rocks containing kerogen, a complex mixture of high-molecular weight organic compounds, which yield synthetic crude oil when heated (pyrolyzed). With additional processing, they can be employed instead of other established fossil fuels. During the 2010s and 2020s there was disinvestment from exploitation of such resources due to their high carbon cost relative to more easily-processed reserves.[35] Prior to the latter half of the 18th century, windmills and watermills provided the energy needed for work such as milling flour, sawing wood or pumping water, while burning wood or peat provided domestic heat. The wide-scale use of fossil fuels, coal at first and petroleum later, in steam engines enabled the Industrial Revolution. At the same time, gas lights using natural gas or coal gas were coming into wide use. The invention of the internal combustion engine and its use in automobiles and trucks greatly increased the demand for gasoline and diesel oil, both made from fossil fuels. Other forms of transportation, railways and aircraft, also require fossil fuels. The other major use for fossil fuels is in generating electricity and as feedstock for the petrochemical industry. Tar, a leftover of petroleum extraction, is used in the construction of roads. The energy for the Green Revolution was provided by fossil fuels in the form of fertilizers (natural gas), pesticides (oil), and hydrocarbon-fueled irrigation.[36][37] The development of synthetic nitrogen fertilizer has significantly supported global population growth; it has been estimated that almost half of the Earth's population are currently fed as a result of synthetic nitrogen fertilizer use.[38] According to head of a fertilizers commodity price agency, "50% of the world's food relies on fertilisers."[39] Main articles: Effects of climate change and Health and environmental impact of the coal industrySee also: Extinction risk from climate change The Global Carbon Project shows how additions to CO2 since 1880 have been caused by different sources ramping up one after another. The burning of fossil fuels has a number of negative externalities – harmful environmental impacts where the effects extend beyond the people using the fuel. These effects vary between different fuels. All fossil fuels release CO2 when they burn, thus accelerating climate change. Burning coal, and to a lesser extent oil and its derivatives, contributes to atmospheric particulate matter, smog and acid rain.[40][41][42] Air pollution from fossil fuels in 2018 has been estimated to cost US$2.9 trillion, or 3.3% of the global gross domestic product (GDP).[10] Global surface temperature reconstruction over the last 2000 years using proxy data from tree rings, corals, and ice cores in blue.[43] Directly observational data is in red, with all data showing a 5 year moving average.[44] Climate change is largely driven by the release of greenhouse gases like CO2, and the burning of fossil fuels is the main source of these emissions. In most parts of the world climate change is negatively impacting ecosystems.[45] This includes contributing to the extinction of species and reducing people's ability to produce food, thus adding to the problem of world hunger. Continued rises in global temperatures will lead to further adverse effects on both ecosystems and people; the World Health Organization has said that climate change is the greatest threat to human health in the 21st century.[46][47] Combustion of fossil fuels generates sulfuric and nitric acids, which fall to Earth as acid rain, impacting both natural areas and the built environment. Monuments and sculptures made from marble and limestone are particularly vulnerable, as the acids dissolve calcium carbonate. Fossil fuels also contain radioactive materials, mainly uranium and thorium, which are released into the atmosphere. In 2000, about 12,000 tonnes of thorium and 5,000 tonnes of uranium were released worldwide from burning coal.[48] It is estimated that during 1982, US coal burning released 155 times as much radioactivity into the atmosphere as the Three Mile Island accident.[49] Burning coal also generates large amounts of bottom ash and fly ash. These materials are used in a wide variety of applications (see Fly ash reuse), utilizing, for example,[clarification needed] about 40% of the United States production.[50] In addition to the effects that result from burning, the harvesting, processing, and distribution of fossil fuels also have environmental effects. Coal mining methods, particularly mountaintop removal and strip mining, have negative environmental impacts, and offshore oil drilling poses a hazard to aquatic organisms. Fossil fuel wells can contribute to methane release via fugitive gas emissions. Oil refineries also have negative environmental impacts, including air and water pollution. Coal is sometimes transported by diesel-powered locomotives, while crude oil is typically transported by tanker ships, requiring the combustion of additional fossil fuels. Annual CO2 emissions by region. This measures fossil fuel and industry emissions. Land use change is not included.[51] A variety of mitigating efforts have arisen to counter the negative effects of fossil fuels. This includes a movement to use alternative energy sources, such as renewable energy. Environmental regulation uses a variety of approaches to limit these emissions; for example, rules against releasing waste products like fly ash into the atmosphere.[42] In December 2020, the United Nations released a report saying that despite the need to reduce greenhouse emissions, various governments are "doubling down" on fossil fuels, in some cases diverting over 50% of their COVID-19 recovery stimulus funding to fossil fuel production rather than to alternative energy. The UN secretary general António Guterres declared that "Humanity is waging war on nature. This is suicidal. Nature always strikes back – and it is already doing so with growing force and fury." He also claimed there is still cause for hope, anticipating the US plan to join other large emitters like China and the EU in adopting targets to reach net zero emissions by 2050.[52][53][54] Fossilflation is a term that describes the impact of fossil fuels on inflation.[55][56] According to Vox in August 2022, "Economists have pointed to energy prices as the main reason for high inflation", noting that "energy prices indirectly affect virtually every part of the economy".[55] Sectors that raise prices significantly as a result of higher fossil fuel prices include transportation, food, and shipping.[55] Mark Zandi of Moody's says that fossil fuel prices have driven every big episode of inflation since WWII.[55] The economic impact of the Russian Invasion of Ukraine in 2022 was a major recent example of fossil fuels causing inflation.[56] Some economists, including Isabel Schnabel, believe that dependence on fossil fuels is the main driver of the 2021-2022 inflation spike.[55][56] Gernot Wagner argues that commodities are undesirable energy sources because they are susceptible to volatile price swings that technologies like renewable energy are not. He also argues that technologies improve and get relatively cheaper over time.[55][57] Coming out of the COVID-19 pandemic, some argued for the possibility of a base effect phenomenon due to cheaper than normal prices, such as for oil, at the onset of the pandemic, followed by above-average prices which exacerbated the perceived inflation.[58][59] While not expected to provide much short-term relief, the Inflation Reduction Act seeks to make the United States less dependent on fossil fuels and their ability to cause inflation in the economy.[55][60][57] Moody's estimates that by 2030, the bill could reduce the typical American household's spending on energy by more than $300 each year, in 2022 dollars.[55] Deaths caused as a result of fossil fuel use (areas of rectangles in chart) greatly exceed those resulting from production of renewable energy (rectangles barely visible in chart).[61] Environmental pollution from fossil fuels impacts humans because particulates and other air pollution from fossil fuel combustion may cause illness and death when inhaled. These health effects include premature death, acute respiratory illness, aggravated asthma, chronic bronchitis and decreased lung function. The poor, undernourished, very young and very old, and people with preexisting respiratory disease and other ill health are more at risk.[62] Global air pollution deaths due to fossil fuels have been estimated at over 8 million people (2018, nearly 1 in 5 deaths worldwide)[63] at 10.2 million (2019),[64] and 5.13 million excess deaths from ambient air pollution from fossil fuel use (2023).[65] While all energy sources inherently have adverse effects, the data show that fossil fuels cause the highest levels of greenhouse gas emissions and are the most dangerous for human health. In contrast, modern renewable energy sources appear to be safer for human health and cleaner. The death rates from accidents and air pollution in the EU are as follows per terawatt-hour (TWh): Energy source Nos. of deathsper TWh Greenhouse gasemissions(thousand tonnes/TWh) Coal 24.6 820 Oil 18.4 720 Natural gas 2.8 490 Biomass 4.6 78–230 Hydropower 0.02 34 Nuclear energy 0.07 3 Wind 0.04 4 Solar 0.02 5 [66] As the data shows, coal, oil, natural gas, and biomass cause higher death rates and higher levels of greenhouse gas emissions than hydropower, nuclear energy, wind, and solar power. Scientists propose that 1.8 million lives have been saved by replacing fossil fuel sources with nuclear power.[67] Bloomberg NEF reported that in 2022, global energy transition investment equaled fossil fuels investment for the first time.[68] This paragraph is an excerpt from Fossil fuel phase-out.[edit] Fossil fuel phase-out is the proposed gradual global reduction of the use and production of fossil fuels to zero, to reduce air pollution, limit climate change, and strengthen energy independence. It is part of the ongoing renewable energy transition. This section is an excerpt from Just transition.[edit] This article needs to be updated. The reason given is: Needs to incorporate developments in international law and climate law which now recognise just transition. Please help update this article to reflect recent events or newly available information. (September 2024) Just transition is a concept that emerged in the 1980s through efforts by U.S. trade unions to protect workers' rights and livelihoods as economies shift to sustainable production, primarily protecting workers affected by environmental regulations.[69] Since then, it has evolved and gained global recognition, including having a place in the Paris Agreement in 2015. A just transition focuses on the connection between energy transition and equitable approaches to decarbonization that support broader development goals.[70][71] A growing number of countries are incorporating just transition strategies to achieve ambitious climate goals, with 38% of 170 countries referring to just transition in their short-term climate plans as of 2022.[70] This section is an excerpt from Fossil fuel divestment.[edit] As of 2021, 1,300 institutions possessing US$14.6 trillion have divested from the fossil fuel industry.[72] Fossil fuel divestment or fossil fuel divestment and investment in climate solutions is an attempt to reduce climate change by exerting social, political, and economic pressure for the institutional divestment of assets including stocks, bonds, and other financial instruments connected to companies involved in extracting fossil fuels.[73] Fossil fuel divestment campaigns emerged on college and university campuses in the United States in 2011 with students urging their administrations to turn endowment investments in the fossil fuel industry into investments in clean energy and communities most impacted by climate change.[74] In 2012, Unity College in Maine became the first institution of higher learning to divest[75] its endowment from fossil fuels. By 2015, fossil fuel divestment was reportedly the fastest growing divestment movement in history.[76] As of July 2023, more than 1593 institutions with assets totalling more than $40.5 trillion in assets worldwide had begun or committed some form of divestment of fossil fuels.[77] Divesters cite several reasons for their decisions. To some, it is a means of aligning investments with core values; to others, it is a tactic for combatting the fossil fuel industry; to others, it is a way to protect portfolios from climate-related financial risk.[78] Financial research suggests that, in the longer term, fossil fuel divestment has positively impacted investors' returns.[79][80] Main articles: Coal industry and Petroleum industry Further information: Fossil fuel exporters and Fossil fuels lobby In 2019, Saudi Aramco was listed and it reached a US$2 trillion valuation on its second day of trading,[81] after the world's largest initial public offering.[82] This section is an excerpt from Fossil fuel subsidies.[edit] Fossil-fuel subsidies per capita, 2019. Fossil-fuel pre-tax subsidies per capita are measured in constant US dollars. Fossil fuel subsidies are energy subsidies on fossil fuels. Under a narrow definition, fossil fuel subsidies totalled around $1.5 trillion in 2022.[83] Under more expansive definition, they totalled around $7 trillion.[83] They may be tax breaks on consumption, such as a lower sales tax on natural gas for residential heating; or subsidies on production, such as tax breaks on exploration for oil. Or they may be free or cheap negative externalities; such as air pollution or climate change due to burning gasoline, diesel and jet fuel. Some fossil fuel subsidies are via electricity generation, such as subsidies for coal-fired power stations. Eliminating fossil fuel subsidies would reduce the health risks of air pollution,[84] and would greatly reduce global carbon emissions thus helping to limit climate change.[85] As of 2021[update], policy researchers estimate that substantially more money is spent on fossil fuel subsidies than on environmentally harmful agricultural subsidies or environmentally harmful water subsidies.[86] The International Energy Agency says: "High fossil fuel prices hit the poor hardest, but subsidies are rarely well-targeted to protect vulnerable groups and tend to benefit better-off segments of the population."[87] Despite the G20 countries having pledged to phase-out inefficient fossil fuel subsidies,[88] as of 2023[update] they continue because of voter demand,[89][90] or for energy security.[91] These paragraphs are an excerpt from Fossil fuels lobby.[edit] The fossil fuels lobby includes paid representatives of corporations involved in the fossil fuel industry (oil, gas, coal), as well as related industries like chemicals, plastics, aviation and other transportation.[92] Because of their wealth and the importance of energy, transport and chemical industries to local, national and international economies, these lobbies have the capacity and money to attempt to have outsized influence on governmental policy. In particular, the lobbies have been known to obstruct policy related to environmental protection, environmental health and climate action.[93] Lobbies are active in most fossil-fuel intensive economies with democratic governance, with reporting on the lobbies most prominent in Canada, Australia, the United States and Europe; however, the lobbies are present in many parts of the world. Big Oil companies such as ExxonMobil, Shell, BP, TotalEnergies, Chevron Corporation, and ConocoPhillips are among the largest corporations associated with the fossil fuels lobby.[94] The American Petroleum Institute is a powerful industry lobbyist for Big Oil with significant influence in Washington, D.C.[95][96][97] In Australia, Australian Energy Producers, formerly known as the Australian Petroleum Production and Exploration Association (APPEA), has significant influence in Canberra and helps to maintain favorable policy settings for Oil and Gas.[98] The presence of major fossil fuel companies and national oil companies at global forums for decision making, like the Intergovernmental Panel on Climate Change,[99] Paris Climate Agreement negotiations,[99] and United Nations Climate Change conferences has been criticised.[100] The lobby is known for exploiting international crises, such as the COVID-19 pandemic,[101] or the 2022 Russian invasion of Ukraine,[102][103] to try to roll back existing regulations or justify new fossil fuel development.[101][102] Lobbyists try to retain fossil fuel subsidies.[104] Abiogenic petroleum origin – a proposal that petroleum is not a fossil fuel Bioremediation Carbon bubble Eco-economic decoupling Environmental impact of the energy industry Fossil Fools Day Fossil Fuel Beta Hydraulic fracturing Liquefied petroleum gas Low-carbon power Peak coal Peak gas Phase-out of fossil fuel vehicles Shale gas ^ The term has been considered a misnomer because it does not actually originate from fossils, but from preserved organic matters.[1] ^ Fleckenstein, Joseph E. 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