

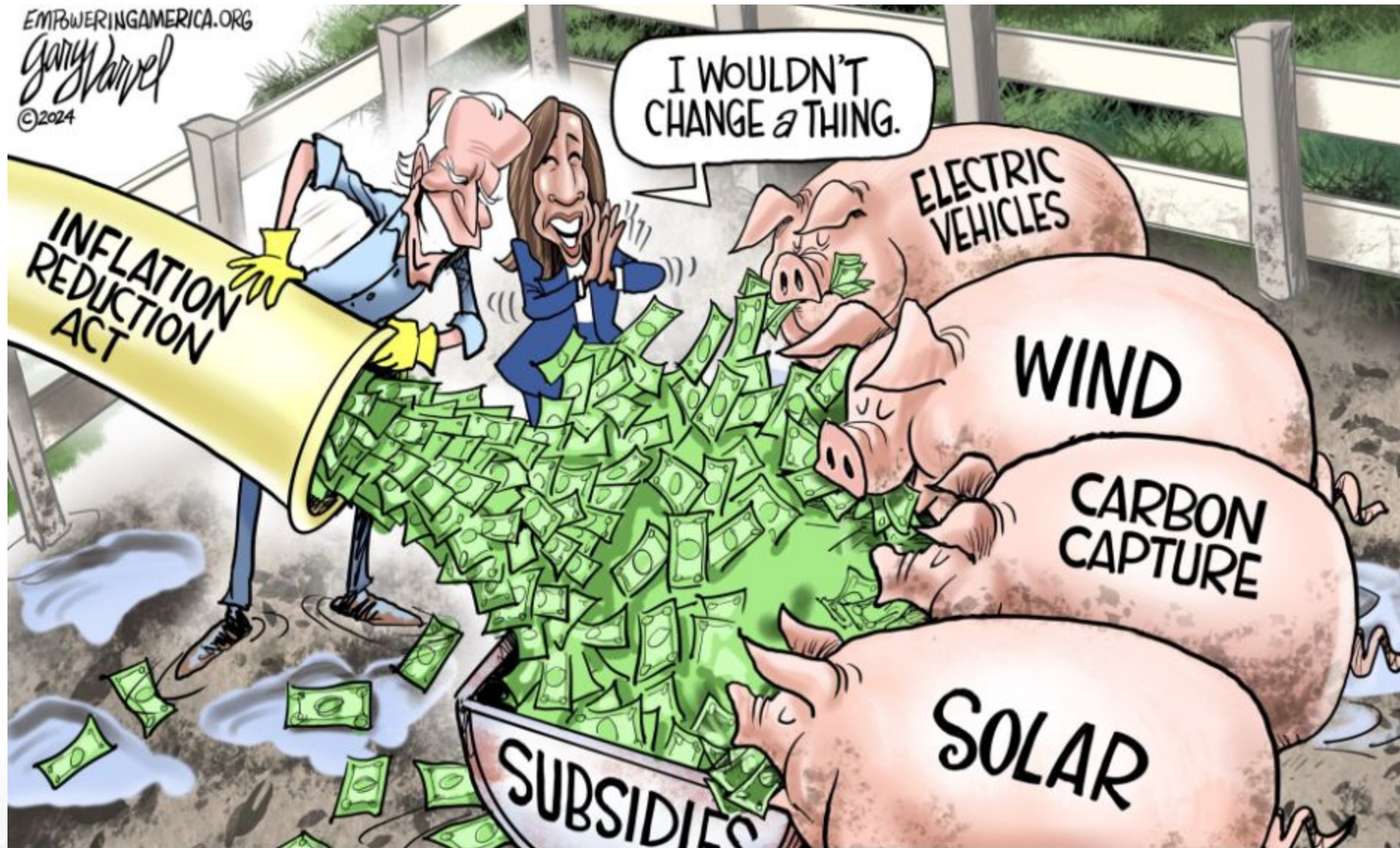


ARC vs CAR CONTRAST

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Gary Shaver

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ARC vs CAR - KEY POINTS

- Clean energy sources are an important goal, but not at the expense of affordable and reliable energy. Our goal should be Affordable, Reliable AND Clean energy.
- Renewable energy sources like wind and solar are propped up by government subsidies, making them costly and unreliable. While traditional energy sources like natural gas, nuclear and coal still provide most of the world's energy.
- Wind and solar energy are not as “clean” as most people think. Their production contributes to emissions, and they also come with many of their own environmental issues.



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- \$9 trillion has been spent globally over the last decade on wind, solar, electric vehicles, energy storage, electrified heat and power grids, but the renewable share of final energy consumption is advancing at only 0.3%–0.6% per year. (Mark Mills, “We’ll Never Have an Energy Transition,” [City Journal](#), 3/19/25)
- Despite all that investment in renewable energy sources, fossil fuels still supply over 80 percent of all global needs today. (Mark Mills, “We’ll Never Have an Energy Transition,” [City Journal](#), 3/19/25)
- The shale revolution collapsed the prices of natural gas & coal, the two fuels that produce 70% of U.S. electricity. But electric rates haven’t gone down, rising instead 20% since 2008. Direct and indirect subsidies for solar and wind consumed those savings. (Mark Mills, “We’ll Never Have an Energy Transition,” [City Journal](#), 3/19/25)
- The amount burned for energy today is greater than at any time in history. Overall, burning wood supplies the world with twice as much energy as do all the world’s solar and wind machines combined. (Mark Mills, “We’ll Never Have an Energy Transition,” [City Journal](#), 3/19/25)

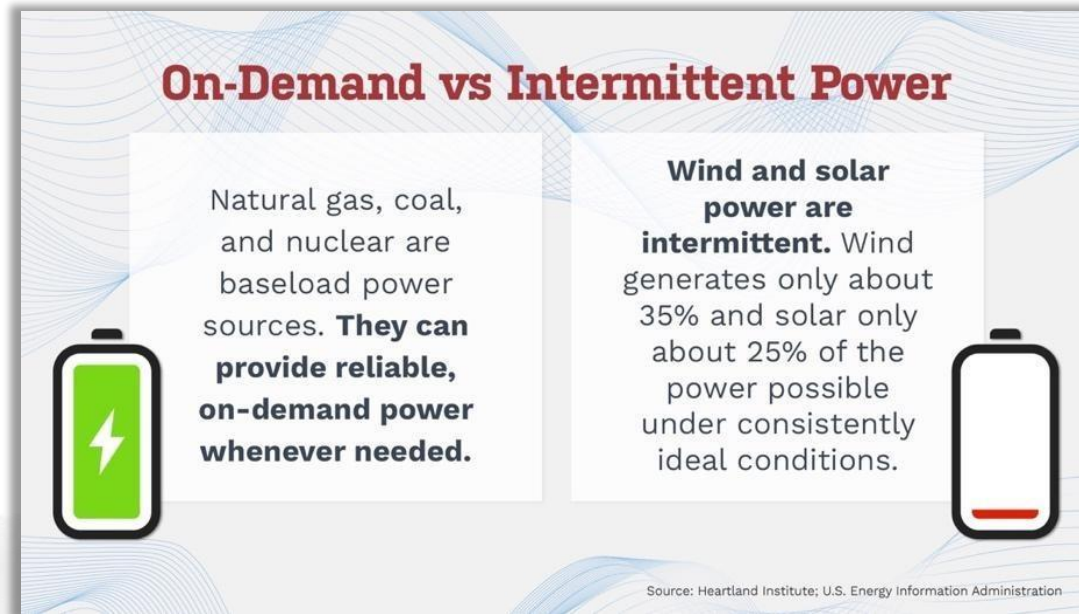


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- Natural gas, coal and nuclear are called “baseload power sources,” meaning they can provide on-demand power anytime it is needed. Wind and solar energy on the other hand are “intermittent.” They are only around when the wind blows or the sun shines. For this reason, they provide only 25-35% of the power they could if they were a consistent baseload power source. (“Affordable, Reliable, And Clean: An Objective Scorecard To Assess Competing Energy Sources,” The Heartland Institute, 4/25)



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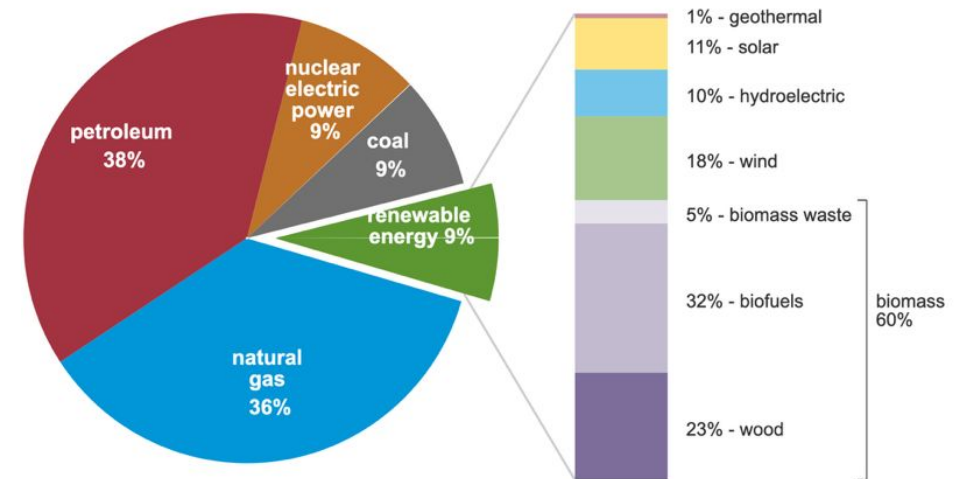
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- Wind and solar machines produce energy an average of 25%–30% of the time, and only when nature permits. Conventional power plants can operate nearly continuously and are available when needed. (Mark Mills, "We'll Never Have an Energy Transition," City Journal, 3/19/25)
- Traditional energy sources like oil, natural gas, coal and nuclear power over 90% of America's total energy needs. Renewable sources like wind and solar only contribute 9%. ("U.S. energy facts explained," U.S. Energy Information Administration, Updated 7/15/24)

U.S. primary energy consumption by energy source, 2023

total = 93.59 quadrillion
British thermal units

total = 8.24 quadrillion British thermal units



Data source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 1.3 and 10.1, April 2024, preliminary data
Note: Sum of components may not equal 100% because of independent rounding.

("U.S. energy facts explained," U.S. Energy Information Administration, Updated 7/15/24)

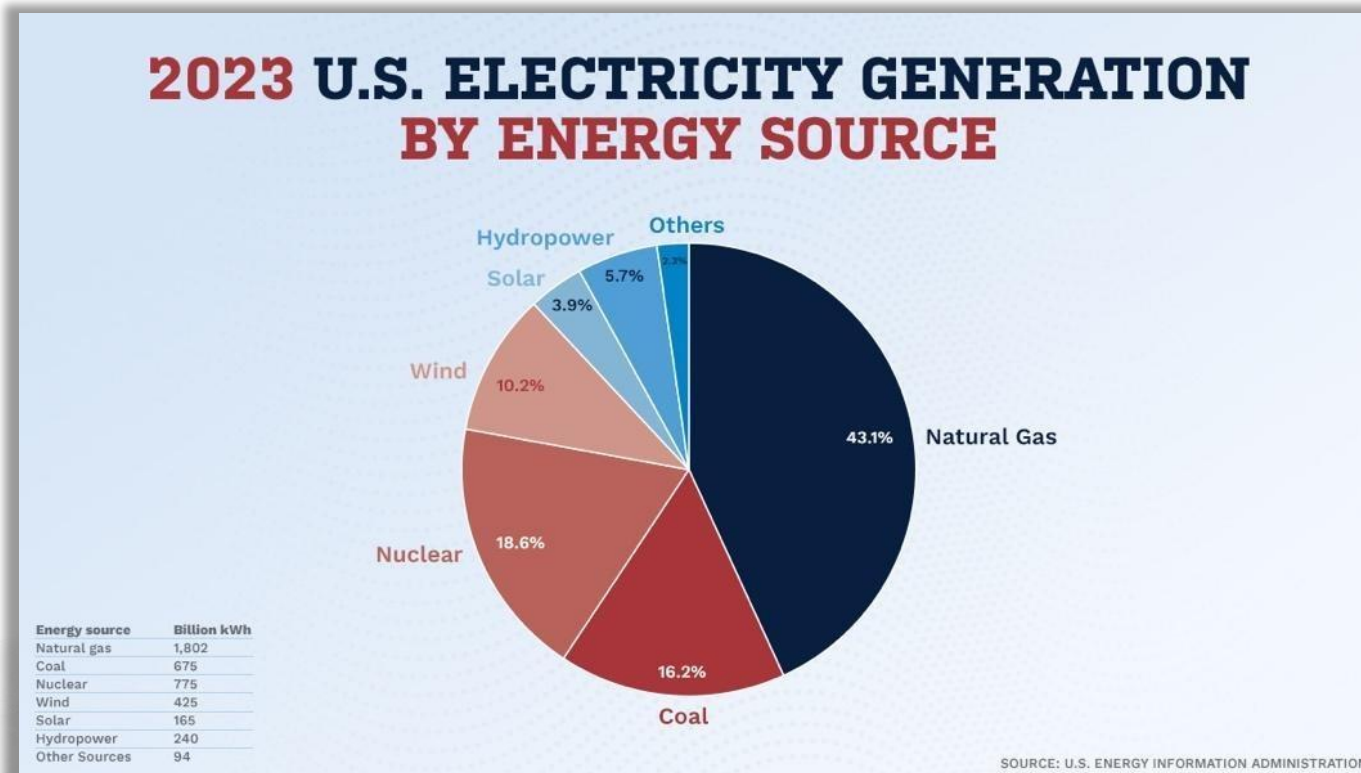


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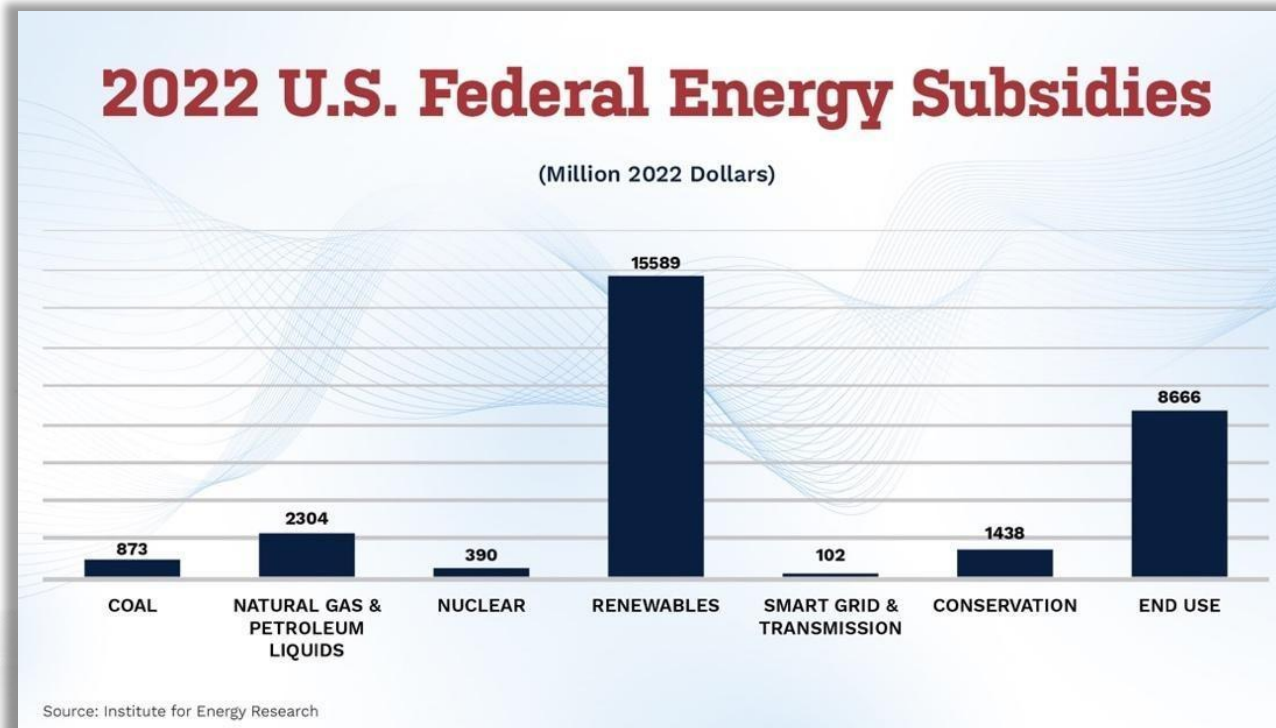
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- Over 78% of U.S. electricity generation comes from traditional energy sources like natural gas, coal and nuclear. Only about 14% comes from wind and solar power. ("What is U.S. electricity generation by energy source?," [U.S. Energy Information Administration](#), Updated 2/29/24)



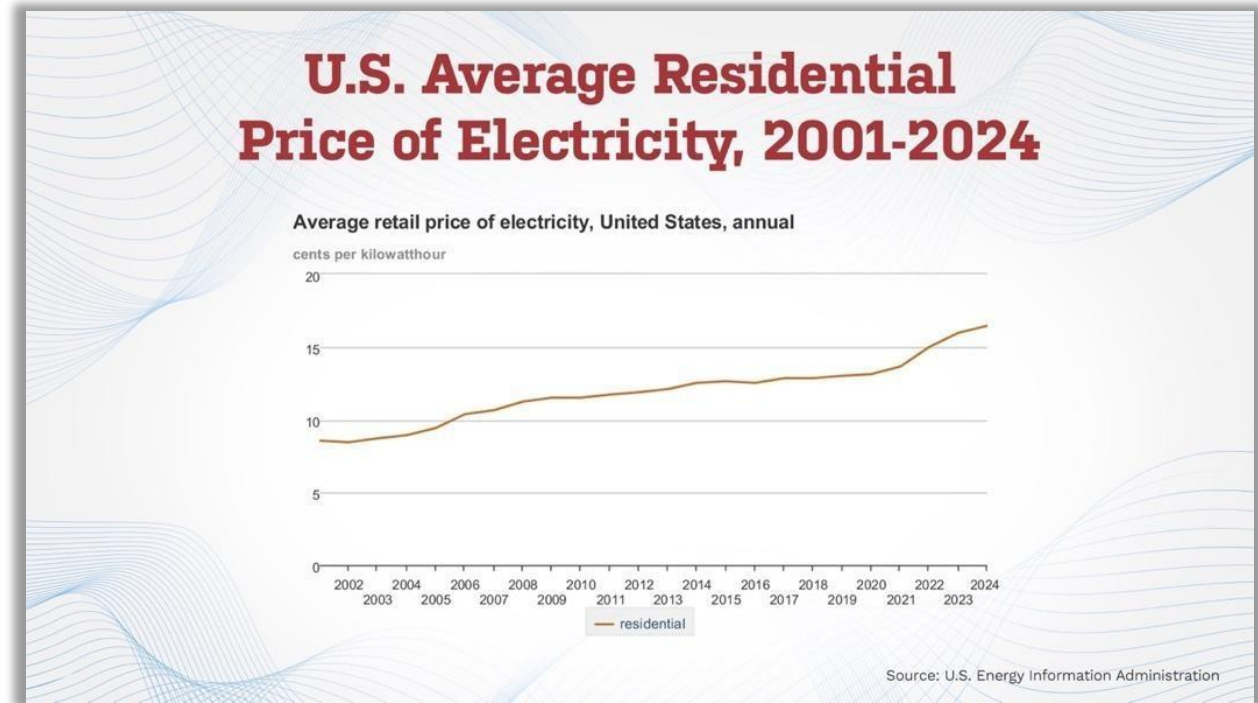
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- “Federal subsidies to support renewable energy formed nearly half of all federal energy-related support between fiscal years 2016 and 2022. Traditional fuels (coal, natural gas, oil and nuclear) received just 15 percent of all subsidies between FY 2016 and FY 2022, while renewables, conservation and end use received a whopping 85 percent. Renewable subsidies more than doubled between FY 2016 and FY 2022, increasing to \$15.6 billion in fiscal year 2022 from \$7.4 billion in fiscal year 2016 (both in 2022 dollars). Federal subsidies and incentives to support renewable energy in fiscal year 2022 were almost 5 times higher than those for fossil energy, which totaled \$3.2 billion in subsidies.” (“Renewable Energy Still Dominates Energy Subsidies in FY 2022,” [Institute for Energy Research](#), 8/9/22)



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- The retail price of electricity in the United States has risen at a consistent pace over the last two decades. In 2001, Americans were paying an average 8.58 cents per kilowatt hour for residential electricity. In 2024, that price was 16.48 cents per kilowatt hour, nearly doubling in just over 20 years. And, the biggest uptick on the graph can be seen starting in 2021. From 2021 to 2024, there was a 21% percent increase in the average price American families paid for electricity. ("Electricity Data Browser," [U.S. Energy Information Administration](#), Updated 2/29/24)



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- On the coldest day of the year, the natural gas system delivers 3X more energy than the electric system delivers on the hottest day of the year. ("AGA Playbook," [American Gas Association](#), 2026)
- Carbon dioxide emissions from residences using natural gas for space heating, water heating, cooking and clothes drying are about 22% lower than those attributable to an all-electric home. ("AGA Playbook," [American Gas Association](#), 2026)
- A "zero-emission" power grid would cost the U.S. \$4.5 trillion. (Dan Shreve, "Deep decarbonisation: the multi-trillion-dollar question," [Wood Mackenzie](#), 6/27/19)
- That cost would equate to \$35,000 per U.S. household, or nearly \$2,000 a year over the course of a 20-year plan. (Dan Shreve, "Deep decarbonisation: the multi-trillion-dollar question," [Wood Mackenzie](#), 6/27/19)
- A zero-emissions transportation system could cost an average American household from \$9,000 to \$20,000 through 2029. (Douglas Holtz-Eakin, Dan Bosch, Ben Gitis, Dan Goldbeck, and Philip Rossetti, "The Green New Deal: Scope, Scale, And Implications," [American Action Forum](#), 2/25/19)



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- A 2020 study by the Consumer Energy Alliance found that more than 66,000 jobs, \$13.6 billion in investments, and more than \$280 million per year in state and local tax revenue have been canceled or are at risk of being lost as a result of delayed pipeline projects. ("How Pipelines Can Spur Immediate Post-Covid Economic Recovery," [Consumer Energy Alliance](#), 9/10/20)
- The cost of mandated electrification for the healthcare sector would total \$16.3 billion through 2050. ("AGA Playbook," [American Gas Association](#), 2026)
- Mandated electrification in the hospitality sector would result in increased energy spending of \$23.2 billion through 2050. ("AGA Playbook," [American Gas Association](#), 2026)
- A July 2020 survey of "both union and non-union" tradespeople reported that oil and gas jobs "have better wages, benefits and opportunities than renewables projects." (Editorial, "About Joe's Energy Jobs," [The Wall Street Journal](#), 8/24/20)
- According to the Tax Policy Center, "A [carbon] tax of \$40 per ton would add about 36 cents to the price of a gallon of gasoline, for example, or about 2 cents to the average price of a kilowatt-hour of electricity." ("What is a carbon tax?," [The Tax Policy Center](#), Updated 1/24)



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- “Solar energy technologies require use of materials, such as metals and glass, that are energy intensive to make” and it can take 1-4 years for a solar system to produce an equivalent amount of energy required for that material production. (“Solar explained: Solar energy and the environment,” [U.S. Energy Information Administration](#), Updated 1/19/24)
- Wind turbine blades, as most are currently constructed, cannot be recycled. (“Wind explained: Wind energy and the environment,” [U.S. Energy Information Administration](#), Updated 12/27/22)
- “Production of electric cars emits between 1.3 and 2 times the amount of greenhouse gases than that of internal-combustion vehicles.” (Andrew Sheldon, “Are Electric Car Batteries Bad for the Environment?,” [Your AAA Today](#), 4/20/22)
- “As little as 5% of the world’s lithium batteries are recycled, according to Chemical and Engineering News, a stark contrast to the 99% of lead car batteries recycled here in the U.S.” (Andrew Sheldon, “Are Electric Car Batteries Bad for the Environment?,” [Your AAA Today](#), 4/20/22)



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- An American Gas Association study found that “if 60 percent of residences in the regions studied were converted to electricity by 2035, the average affected household could see an increase of up to \$1,420 per year in increased heating costs alone. Renters and homeowners alike would have to bear these increased costs directly or through increased rent.” And, all that “policy-driven electrification” would only reduce emissions by one percent at the most. (Adam Kay, “How Natural Gas Bans Hurt Communities and Customers,” [American Gas Association](#), 12/7/22)
- The North American Electric Reliability Corporation (NERC) cited the rush to so-called green energy as one of the reasons for increasing electrical grid instability. (“2025 Summer Reliability Assessment,” [North American Electric Reliability Corporation](#), 5/25)
- A 100x growth in the number of electric vehicles to 400 million on the roads by 2040 would displace 5% of global oil demand. (Mark Mills, “Inconvenient Energy Realities,” [Manhattan Institute](#), 7/1/19)
- Renewable energy would have to expand 90-fold to replace global hydrocarbons in two decades. It took a half-century for global petroleum production to expand “only” 10-fold. (Mark Mills, “Inconvenient Energy Realities,” [Manhattan Institute](#), 7/1/19)



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- Replacing U.S. hydrocarbon-based electric generation over the next 30 years would require a construction program building out the grid at a rate 14-fold greater than any time in history. (Mark Mills, "Inconvenient Energy Realities," [Manhattan Institute](#), 7/1/19)
- Batteries produced annually by the Tesla Gigafactory (world's biggest battery factory) can store three minutes worth of annual U.S. electric demand. (Mark Mills, "Inconvenient Energy Realities," [Manhattan Institute](#), 7/1/19)
- Over a 30-year period, \$1 million worth of utility-scale solar or wind produces 40 million and 55 million kWh respectively: \$1 million worth of shale well produces enough natural gas to generate 300 million kWh over 30 years. (Mark Mills, "Inconvenient Energy Realities," [Manhattan Institute](#), 7/1/19)
- It costs less than \$0.50 to store a barrel of oil, or its equivalent in natural gas, but it costs \$200 to store the equivalent energy of a barrel of oil in batteries. (Mark Mills, "Inconvenient Energy Realities," [Manhattan Institute](#), 7/1/19)
- About 60 pounds of batteries are needed to store the energy equivalent of one pound of hydrocarbons. (Mark Mills, "Inconvenient Energy Realities," [Manhattan Institute](#), 7/1/19)



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- At least 100 pounds of materials are mined, moved and processed for every pound of battery fabricated. (Mark Mills, "Inconvenient Energy Realities," [Manhattan Institute](#), 7/1/19)
- It takes the energy-equivalent of 100 barrels of oil to fabricate a quantity of batteries that can store the energy equivalent of a single barrel of oil. (Mark Mills, "Inconvenient Energy Realities," [Manhattan Institute](#), 7/1/19)
- Building wind turbines and solar panels to generate electricity, as well as batteries to fuel electric vehicles, requires, on average, more than 10 times the quantity of materials, compared with building machines using hydrocarbons to deliver the same amount of energy to society. (Mark Mills, "Mines, Minerals, and "Green" Energy: A Reality Check," [Manhattan Institute](#), 7/9/20)
- A single electric car contains more cobalt than 1,000 smartphone batteries; the blades on a single wind turbine have more plastic than 5 million smartphones; and a solar array that can power one data center uses more glass than 50 million phones. (Mark Mills, "Mines, Minerals, and "Green" Energy: A Reality Check," [Manhattan Institute](#), 7/9/20)

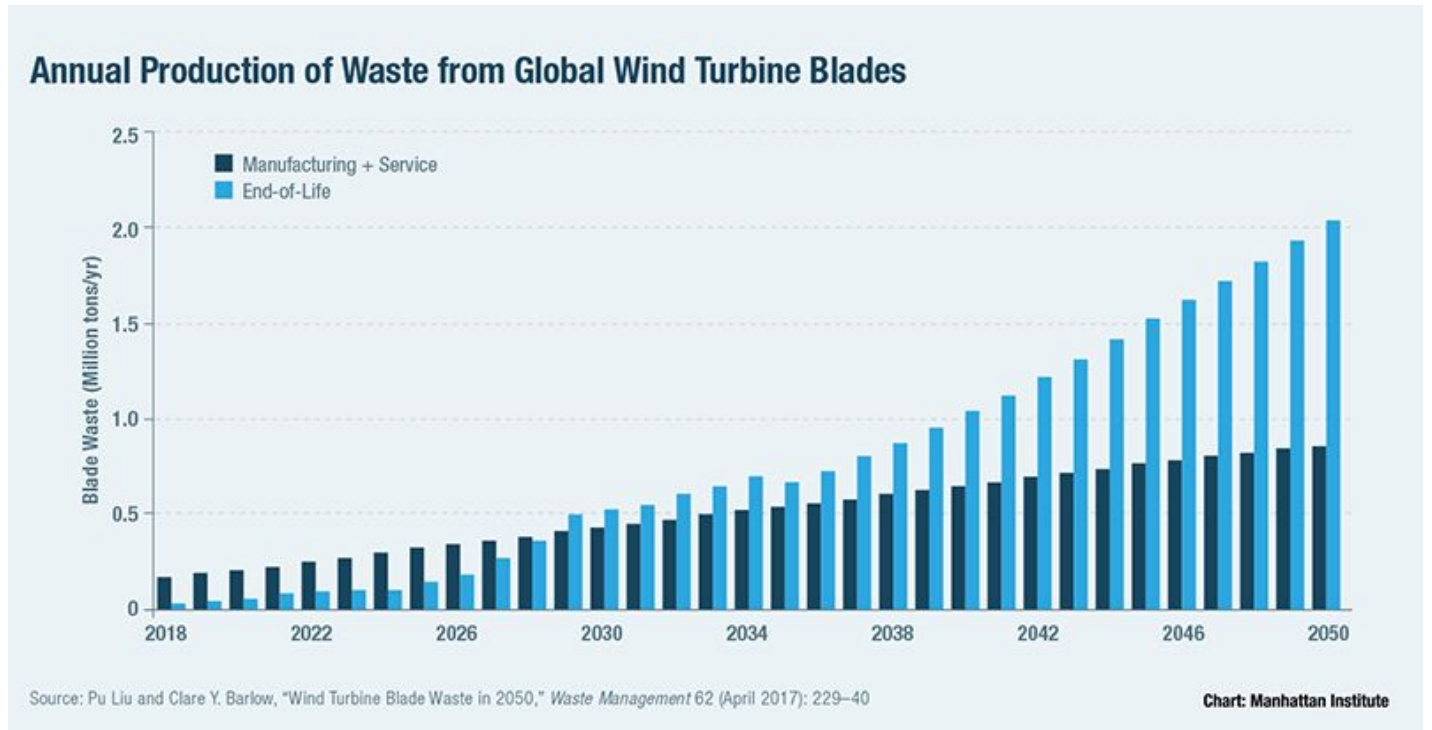


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- By 2050, with current plans, the quantity of worn-out solar panels—much of it nonrecyclable—will constitute double the tonnage of all today's global plastic waste, along with over 3 million tons per year of unrecyclable plastics from worn-out wind turbine blades. By 2030, more than 10 million tons per year of batteries will become garbage. (Mark Mills, "Mines, Minerals, and "Green" Energy: A Reality Check," [Manhattan Institute](#), 7/9/20)



(Mark Mills, "Mines, Minerals, and "Green" Energy: A Reality Check," [Manhattan Institute](#), 7/9/20)

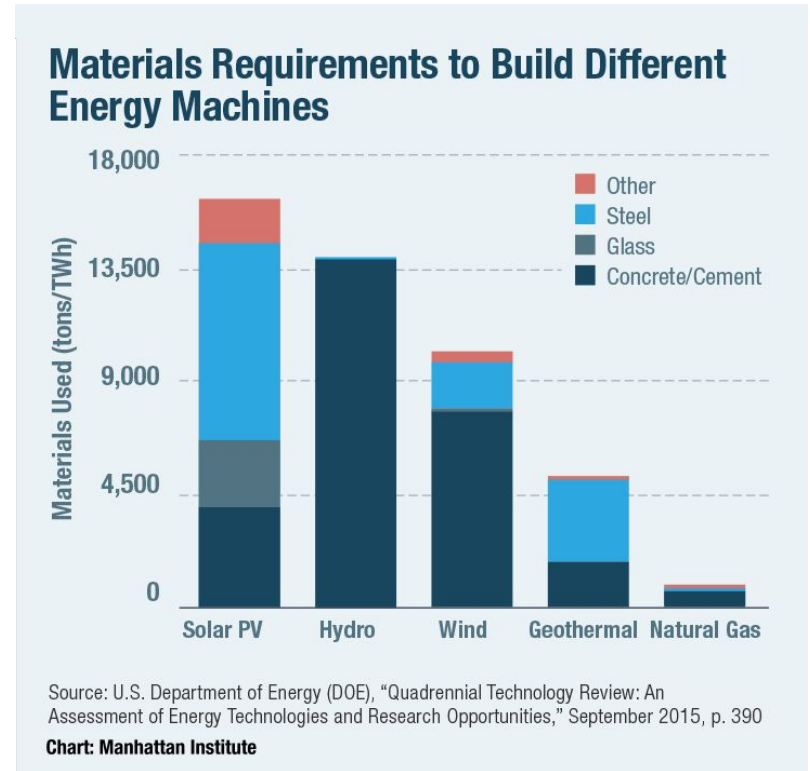


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- Replacing the energy output from a single 100-MW natural gas-fired turbine, itself about the size of a residential house (producing enough electricity for 75,000 homes), requires at least 20 wind turbines, each one about the size of the Washington Monument, occupying some 10 square miles of land. (Mark Mills, "Mines, Minerals, and "Green" Energy: A Reality Check," [Manhattan Institute](#), 7/9/20)
- Building a single 100-MW wind farm— never mind thousands of them—requires some 30,000 tons of iron ore and 50,000 tons of concrete, as well as 900 tons of nonrecyclable plastics for the huge blades. With solar hardware, the tonnage in cement, steel, and glass is 150% greater than for wind, for the same energy output. (Mark Mills, "Mines, Minerals, and "Green" Energy: A Reality Check," [Manhattan Institute](#), 7/9/20)



(Mark Mills, "Mines, Minerals, and "Green" Energy: A Reality Check," [Manhattan Institute](#), 7/9/20)



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Thank You

