Disadvantages of Renewable Energy – Drawbacks of Different Alternative Energy Sources

Abhishek Shah wrote on 1 Apr, 2011
Green Investing,Offshore Wind

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The Biggest Disadvantage of Renewable Energy is the relatively higher cost of most forms of alternative energy compared to fossil fuel sources of energy.This has prevented the higher penetration of clean energy as compared to the non-renewable sources of energy.Also the massive old energy lobbies have successfully used their massive influence and power to inhibit the growth of renewable sources of energy.The recent lobbying by oil and gas firms like the Koch Brothers and Valero is quite pertinent.Note the oil and gas lobbies receive almost 10 times the subsidy received by clean energy sources like wind and solar despite their massive established bases.The disadvantages of Renewable Energy are quite a few and have been listed individually for each source of Renewable Energy like solar,wind,biomass,nuclear,tidal,hydro and geothermal.However their biggest advantage is that they do not lead to the growing global warming problem.Despite the current apathy towards climate change mitigation efforts,Global Warming is one of the biggest existential threats to humankind.

Disadvantages of Nuclear Energy

1. **Nuclear and Radiation Accidents** – This is the biggest con for Nuclear Energy and has been repeated 3 times in the last 30 years in Japan,Russia and USA.The fear of a repeat is so great that despite all the safety arrangements touted by the nuclear equipment operators and suppliers,Nuclear Energy faces an uncertain future
2. **Nuclear Waste Disposal** – Again a massive problem as the spent Nuclear Rods of Nuclear Reactors are prohibitively costly and difficult to dispose of.Spent nuclear fuel is initially very highly radioactive and so must be handled with great care and forethought.There is no foolproof way to dispose nuclear waste fuel after it is used in the Nuclear Reactors.The area around Nuclear Waste Sites can be dangerous to humans for hundreds of year as complex nuclear elements have half lives running into many years.the United States had accumulated more than 50,000 metric tons of spent nuclear fuel from nuclear reactors.Permanent storage underground in U.S. had been proposed at the Yucca but that project has now been effectively cancelled.Presently, waste is mainly stored at individual reactor sites and there are over 430 locations around the world where radioactive material continues to accumulate.
3. **Low level of Radioactivity from Normal Operations** – The nuclear industry also produces a large volume of low-level radioactive waste in the form of contaminated items like clothing, hand tools, water purifier resins, and (upon decommissioning) the materials of which the reactor itself is built
4. **Nuclear proliferation** – Many countries have used the ruse of nuclear energy programs to generate fuel for developing nuclear weapons.Currently there is a major international controversy with regards to the Iranian Nuclear Energy Program.Nuclear Reactors are targets for rogue state actors who can steal the fuel for creating radiation weapons
5. **High Capital Investment,Cost Overruns and Long Gestation Time** – The time to construct a large Nuclear power project can take between 5-10 years which leads to time and cost overruns.The Nuclear Plant being built in Finland has been one of the biggest failures in Project Finance.The reactor has been delayed by many year and has led to a massive cost overrun.Areva the

main nuclear equipment supplier has endured huge losses.In fact the safety regulations and the long time of construction has brought the Nuclear Energy in the Developed World to almost a halt.

6. **Regulations** – The Regulations for Nuclear Energy Power Plants are many and cumbersome due to the massive risks of a failure of a nuclear reactor.This greatly increases the costs of generating nuclear power.It also leads to a long time in the actual start to the completion of a Nuclear Plant .
7. **Fuel Danger** – Uranium which is the main fuel used in Nuclear Fission Power Plants is limited to a few countries and suppliers.Its use and transport is regulated by international treaties and groups.India which came under sanctions because of testing of nuclear weapons had to shut many of its nuclear plants because of embargoes.

Disadvantages of Solar Energy

1) **Higher Costs that Fossil Energy Forms** – This is the biggest disadvantage cited by anti-Solar Power activists despite the massive decline in costs that Solar Power has seen over the last decades.It has been estimated that solar power costs fall by 20% for every 100% increase in supply.The Solar Cost Curve has declined massively in the last 2 years as cheap Chinese solar production has made solar panel costs come down by 50% .Note in the next 4-5 years expect an average decline of around 10% per year which would make solar energy competitive with fossil fuel energy in most parts of the world.Current solar power costs between 15-30c/Kwh depending on the solar radiation of the particular location,type of technology used etc.

2) **Intermittent Nature** – One of the biggest problems of Solar Power (Solar PV that is) is that it is intermittent in nature as it generates energy only when the sun shines.This problem can be solved with energy storage however this leads to additional costs.This argument also does not make sense for a US DOE study indicated that solar and wind intermittent power won't be a problem till 30-40% of the electricity in the US is from these 2 forms of renewable energy.Smart Grids and Cheaper Energy Storage in the future should allow even higher penetrations of Wind and Solar Power possible.

3) **High Capital Investment** – A Solar Plant can cost around $3.5-6 million to be spent in building 1 Megawatt.This is said to be too high,however this again is one of the silliest arguments.The costs of energy can only be compared by Levelized Cost of Energy (LCOE) which calculates the cost of energy over the lifetime calculating the capex,fuel costs,maintenance,security and insurance costs.While it is true that the initial capital investment for solar power is quite high,the lifecycle cost of solar energy is not that high.

4) **Cannot be Built Anywhere –** This disadvantage of Solar Energy is present with other forms of Energy as well.Some forms of Energy are just better suited to some places.For example you can't build a nuclear plant on top of an earthquake prone region,you can't build a wind farm near the Dead Sea etc

Disadvantages of Hydro Energy

1) **Environmental, Dislocation and Tribal Rights** – Large Dam construction especially in populated areas leads to massive Tribal Displacement,Loss of Livelihood and Religious Infringement as potentially sacred Land is occupied by the Government.

2) **Wildlife and Fishes get Affected** – The Fishes are the most affected species from Dam Construction as the normal flow of the river is completely changed form its river character to a lake one.Submergence of land also leads to ecological destruction of the habitat of land based wildlife.

3) **Earthquake Vulnerability** – Large Dam Construction has been linked to increased propensity of Earthquakes.Massive Earthquakes in China and Uttarakhand in India were linked to the building of Massive Dams in these countries
4) **Siltation** When water flows it has the ability to transport particles heavier than itself downstream. This has a negative effect on dams and subsequently their power stations, particularly those on rivers or within catchment areas with high siltation
5) **Tail Risk,Dam Failure –** Because large conventional dammed-hydro facilities hold back large volumes of water, a failure due to poor construction, terrorism, or other cause can be catastrophic to downriver settlements and infrastructure. Dam failures have been some of the largest man-made disasters in history.The Banqiao Dam failure in Southern China directly resulted in the deaths of 26,000 people, and another 145,000 from epidemics.
6) Cannot be Built Anywhere – This disadvantage of Hdyro Energy is present with other forms of Energy as well.Some forms of Energy are just better suited to some places.For example you can't build a nuclear plant on top of an earthquake prone region,you can't build a wind farm near the Dead Sea etc.Hydro Energy can only be built in particular places though enough of those places exist globally
7) **Long Gestation Time** – The time to construct a large hydro power project can take between 5-10 years which leads to time and cost overruns.

Disadvantages of Biomass Energy

1) Pollution in case of Poor Technology – Biomass Energy can lead to air pollution in the form of char if the biomass is not completely combusted.This happens in the case of biomass energy being produced in rural areas through bad technology
2) **Feedstock Problems** – One of the biggest drawbacks of biomass energy is the problem of feedstock.The plants are forced to run at lower utilization leading to higher costs if feedstock is not available due to some reason like a drought
3) **Good Management Required** – The operations of a biomass plant requires very good management otherwise it may run into losses or even in some cases have to shut down.It requires a skill of high order to run the plant optimally and make use of alternative feedstock in case the regular one is not available
4) **Limited Potential** – Biomass Energy has smaller potential than compared to other forms of energy like solar,hydro etc.
5) **Controversial NIMBY** – Large Biomass Plants like the one in Scotland have run into massive protests as people think it might lead to air pollution and health hazards if constructed near their homes.

Disadvantages of Wind Energy

1) **Low Persistent Noise** – There have been a large number of complaints about the persistent level of low level nosie from the whirring of the blades of a wind turbine.There have been cases reported about animals on farms getting affected by wind turbine noise.
2) **Loss of Scenery –** The sight of giant 200 metres tall towers has drawn objections from neighbours about wind power leading to loss of scenery and beauty.The Cape Wind Energy project off the shore of Massachusetts has been delayed by over 10 years as it has drawn serious objections from the owners of coastal homes about loss in their property values

3) **Land usage** – Wind Turbines can sometimes use large amounts of land if not properly planned and built.The construction of roads to access the wind farms etc also takes up some land.
4) **Intermittent Nature** – Wind Power is intermittent in nature as it generates energy only when the wind blows.This problem can be solved with energy storage however this leads to additional costs.

Disadvantages of Geothermal Energy

1) **Long Gestation Time Leading to Cost Overruns** – The Gestation Time for permitting,financing,drilling etc. can easily take 5-7 years to develop a geothermal energy field.Compare this to 6 months for a small wind farm or 3 months for a Solar PV plant
2) **Slow Technology Improvement** – Geothermal Energy has the potential to generate 100s of gigawatts of electricity through new techniques like EGS.However the technology improvement has been slow with setbacks.
3) **Financing** is the biggest problem in developing projects particularly for small project developers in this industry.There are few big geothermal developers like Chevron and Calpine.
4) **Regulations** – Drilling for new geothermal energy fields,buying of geothermal companies in foreign geographies faces innumerable hurdles.Magma which is one of the biggest geothermal energy companies faced massive local opposition in trying to buy an Icelandic company.This prevents the growth of pureplay geothermal companies in acquiring a critical scale.
5) **Limited Locations** – Geothermal Energy can only be built in places which have the geological characteristics favorable to generation of geothermal power.Note there have been talk that Enhanced Geothermal Energy (EGS) can lead to a massive increase in the number of locations which can generate Geothermal Energy,however EGS is facing environmental issues.

Disadvantages of Tidal Energy

1. **High Initial Capital Investment** – Tidal Barrages require massive investment to construct a Barrage or Dam across a river estuary.This is comparable to construction of a massive dam for Hydro Power.This is perhaps the biggest disadvantage of this technology
2. **Limited Locations** – The US DOE estimates that there are only about 40 locations in the world capable of supporting Tidal Barrages.This is because this Tidal Energy Technology requires sizable Tides for the Power Plant to be built.The limited number of locations is a big hurdle.
3. **Effect on Marine Life** – The operation of commercial Tidal Power Stations has known to moderately affect the marine life around the Power Plant.It leads to disruption in movement and growth of fishes and other marine life.Can also lead to increase in silt.Turbines can also kill fish passing through it.
4. **Immature Technology** – Except for Tidal Barrage,the other forms of Technology generating Tidal or Wave Power are quite immature,costly and unproven
5. **Long Gestation Time** – The cost and time overruns can be huge for Tidal Power Plants leading to their cancellation just like that of the Severn Barrage in the UK.Many of the Tidal Power Stations like the gigantic Plant being planned in Russia will never come to fruition because of the very long gestation time.

6. **Difficulty in Transmission of Tidal Electricity** – Some forms of Tidal Power generate power quite far away from the consumption of electricity.Transportation of Tidal Energy can be quite combersome and expensive.
7. **Weather Effects** – Severe Weather like Storms and Typhoons can be quite devastating on the Tidal Power Equipment especially those place on the Sea Floor.

ENERGY

Renewable Energy Saves Water and Creates Jobs

Eight graphs tell the story; see for yourself

By Luciano Castillo, Walter Gutierrez, Jay Gore on August 7, 2018

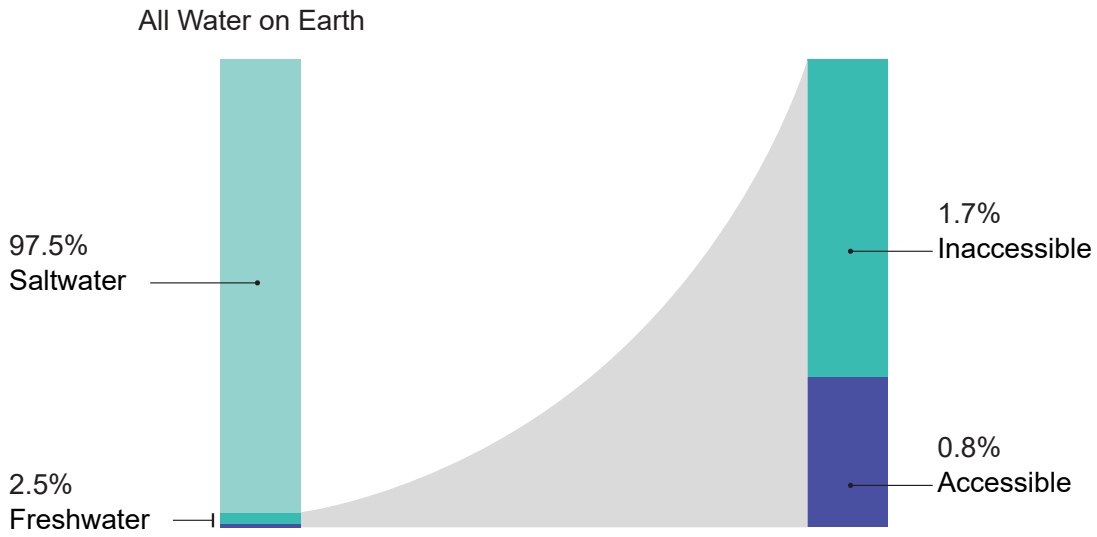
Credit: David Hogan *Getty Images*

A common argument for expanding renewable energy sources is that technologies such as solar panels and wind turbines are responsible for far less carbon dioxide than power plants that burn fossil fuels. But two other powerful benefits should also be getting much more attention: the switch can save vast quantities of freshwater, and can create a large number of new, high-paying jobs. Want proof? Let's look at the data that our detailed research has revealed.

NOTE: Tapping a graphic, or placing a cursor over it, will reveal interactive information.

Only about 3 percent of the Earth's water is freshwater.

Volume of Accessible Freshwater on Earth



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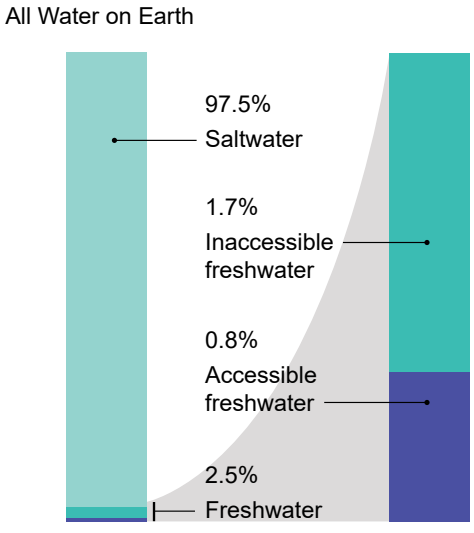
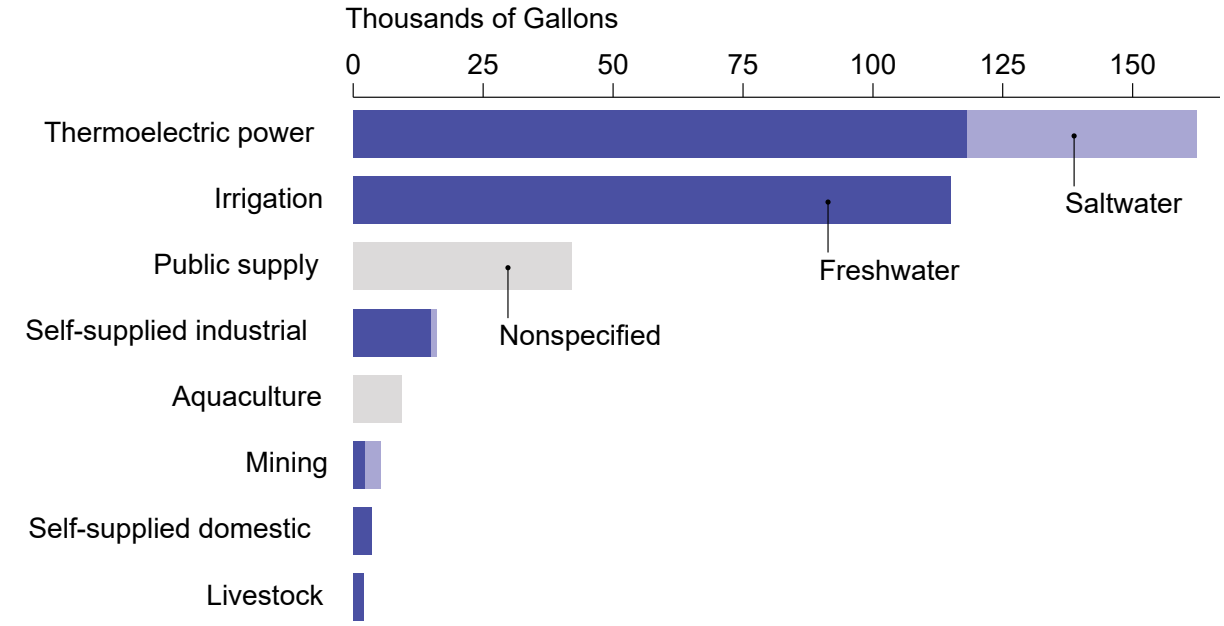


Credit: Anna Hazard; Source: *Water in Crisis: A Guide to the World's Fresh Water Resources*, edited by Peter H. Gleick. New York, New York: Oxford University Press, 1993

Most of that is frozen in glaciers—which means only 0.8 percent of the planet's water reserves can be tapped for human use. Water is a precious, but limited, commodity. And nearly 1 billion people worldwide lack access to clean water.

In the U.S., 45.3 percent of the water withdrawn from lakes, rivers and underground aquifers is used to cool off thermoelectric power plants: nuclear reactors and plants that burn fossil fuels.

Volume of Water Withdrawn per Day by Activity, 2010



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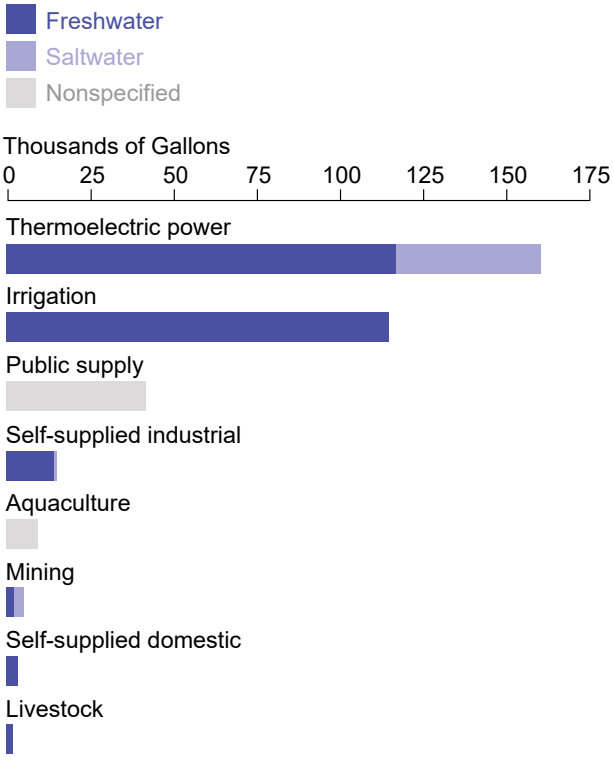


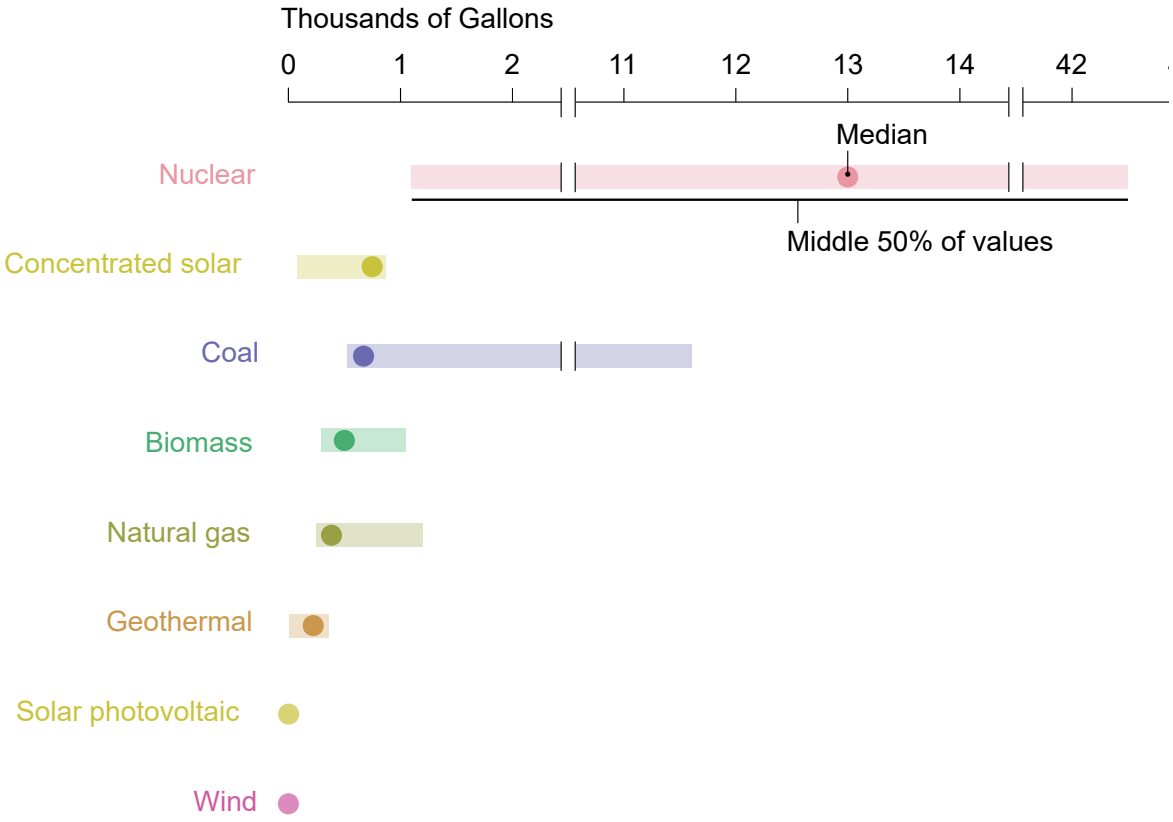
Credit: Anna Hazard; Source: *Estimated Use of Water in the United States in 2010*, by Molly A. Maupin et al. U.S. Geological Survey, 2014

This is more water than used nationwide for irrigation, and it far exceeds any other source of demand, including public consumption.

To provide electricity for an average home, a nuclear power plant requires 615 gallons of cooling water a day, a coal-fired plant requires 199 gallons per day, and a natural gas power plant requires 114 gallons per day. The stunning volume is a quiet thief that threatens the U.S. water supply.

But to make sure we are comparing apples to apples, let's look at how much water each power source withdraws to generate one megawatt-hour of electricity.

Water Withdrawal to Produce 1 Megawatt-Hour of Electricity



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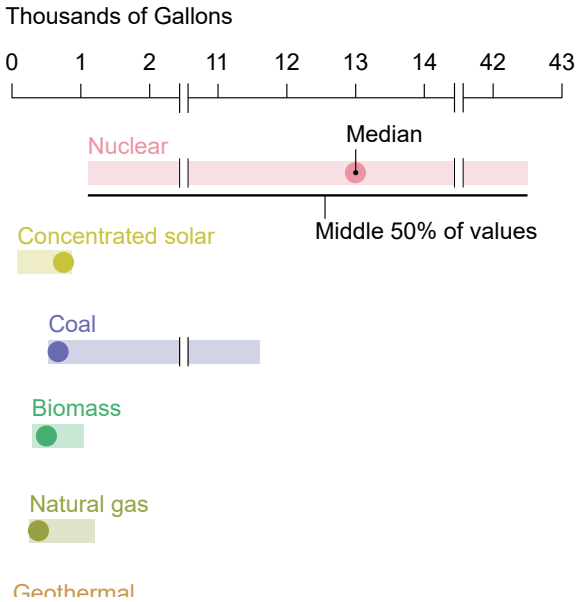


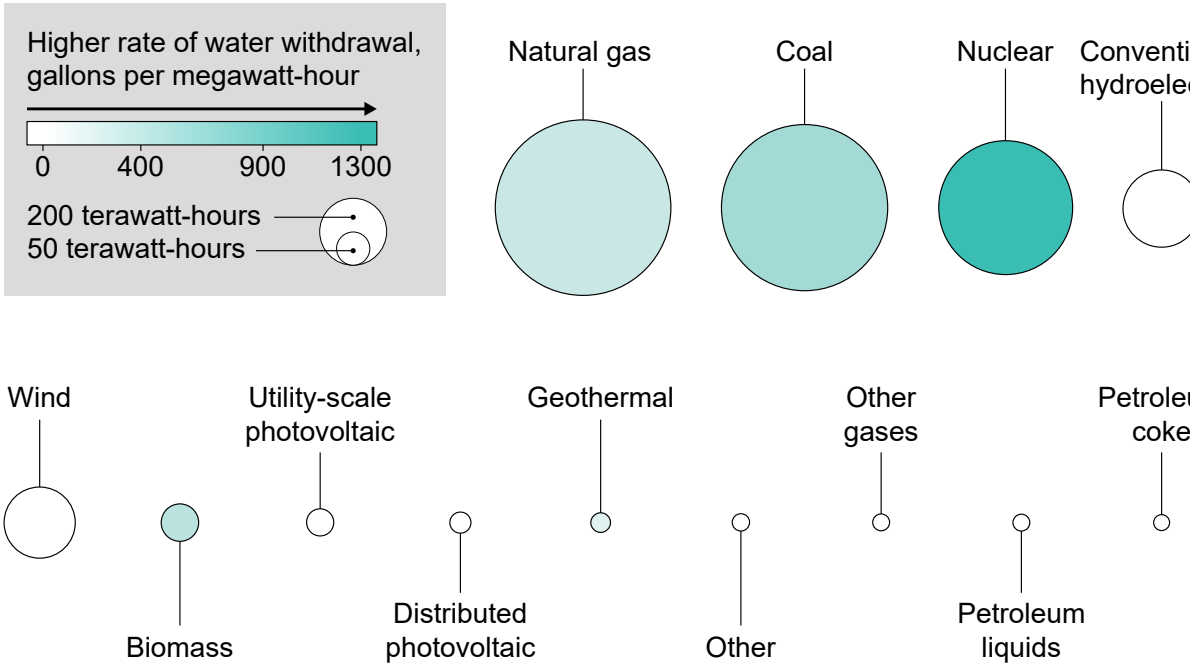
Credit: Anna Hazard; Source: "Operational Water Consumption and Withdrawal Factors for Electricity Generating Technologies: A Review of Existing Literature," by Jordan Macknick et al., in *Environmental Research Letters*, Vol. 7, No. 4; December 20, 2012

Nuclear reactors are the highest, at 13,000 gallons. Then comes concentrated solar (heating a fluid with the sun), coal, natural gas and biomass such as wood. The water needed by solar panels and wind turbines is orders of magnitude lower. Note that these data only reflect operations to generate electricity; they do not include water used to obtain the fuel or generate the power, which can be substantial. For example, fracking can use hundreds of thousands of gallons each time a rock deposit is cracked to release natural gas.

A portion of the water extracted is lost to evaporation. The rest is sent back to the environment, but some of that is contaminated with chemicals, and most of it is hot, which can kill fish and plankton and stress the ecosystem.

Making matters worse, the power sources that have high water withdrawal per MWh are also the largest suppliers of electricity.

Water Withdrawal and Energy Produced by U.S. Energy Sources, 2016



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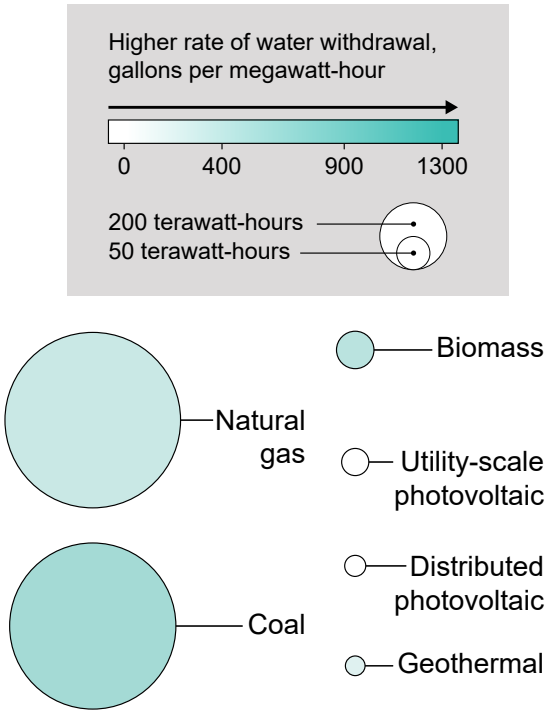
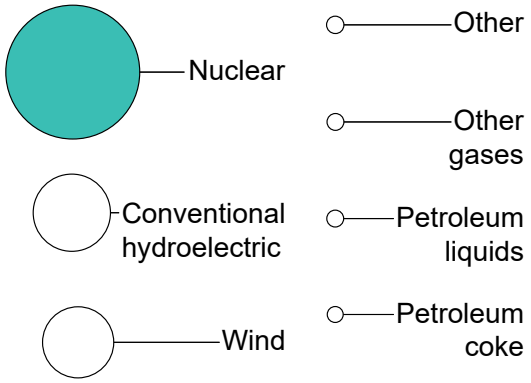


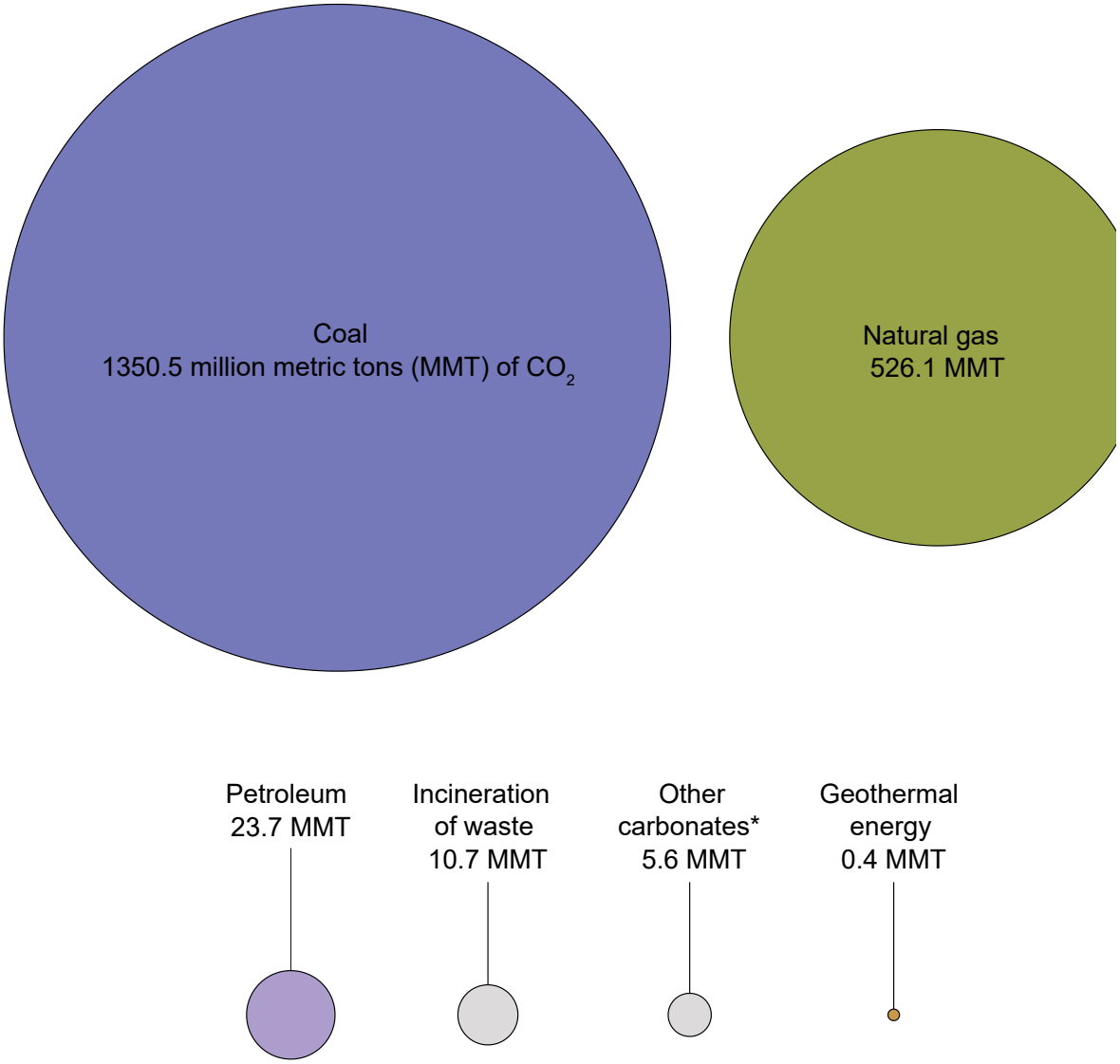


Credit: Anna Hazard; Source: *Electric Power Monthly with Data for December 2016*, U.S. Energy Information Administration. February 2017 (*energy data*); "Operational Water Consumption and Withdrawal Factors for Electricity Generating Technologies: A Review of Existing Literature," by Jordan Macknick et al., in *Environmental Research Letters*, Vol. 7, No. 4; December 20, 2012 (*water withdrawal data*)

Natural gas, coal and nuclear power plants ranked one, two and three in 2016, in terms of the total amount of U.S. electricity generated in a year. And natural gas is projected to become even more important through 2050.

From the point of view of conserving freshwater, it seems clear that the country should shift toward renewables. This move would make more freshwater available for food production and human consumption, particularly as population grows. It would also significantly reduce greenhouse gas emissions.

Carbon Dioxide Emissions by Source, 2015



*Other equipment involved in electricity generation

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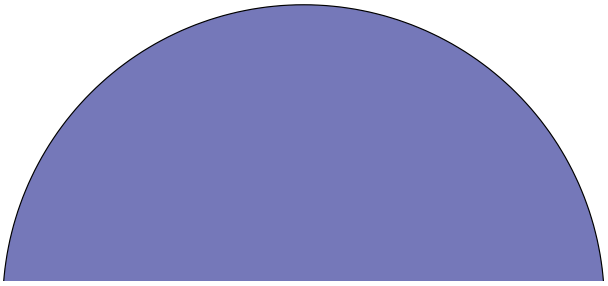
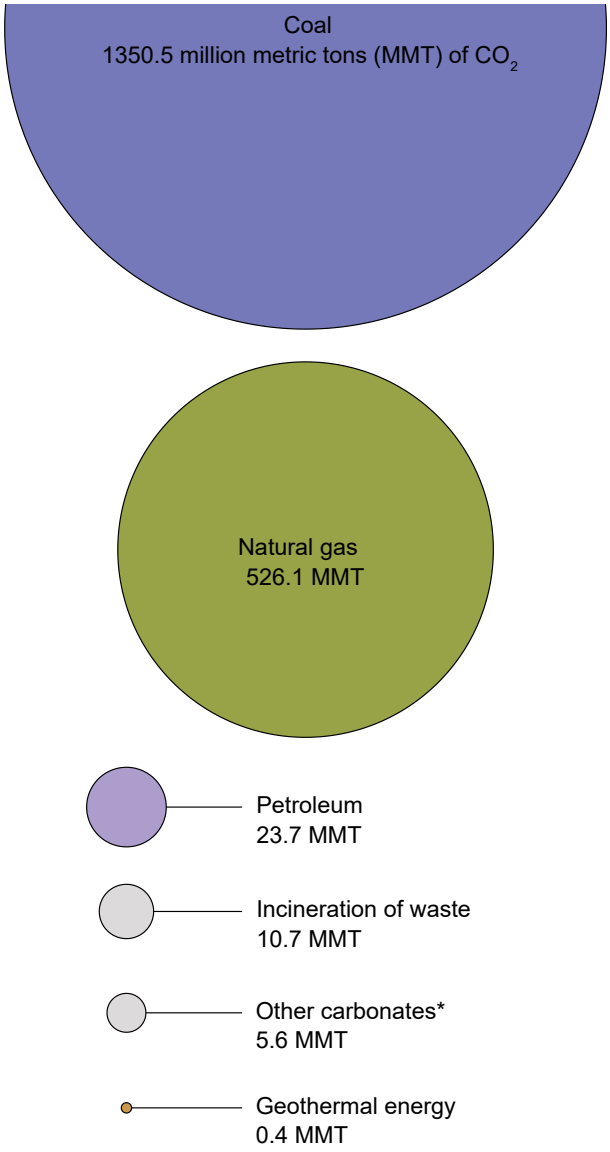
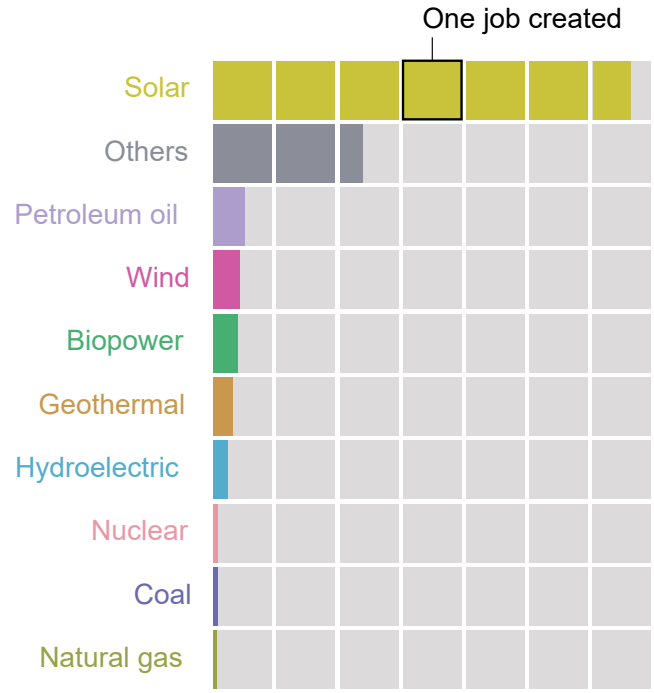




Credit: Anna Hazard; Source: *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015*, U.S. Environmental Protection Agency. https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2015

But what might a switch to solar and wind do to jobs growth?

Jobs Created per Gigawatt-Hour of Energy Generated, 2016



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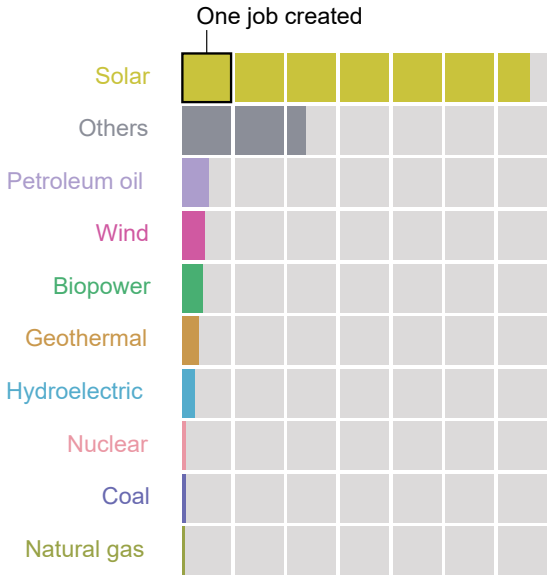
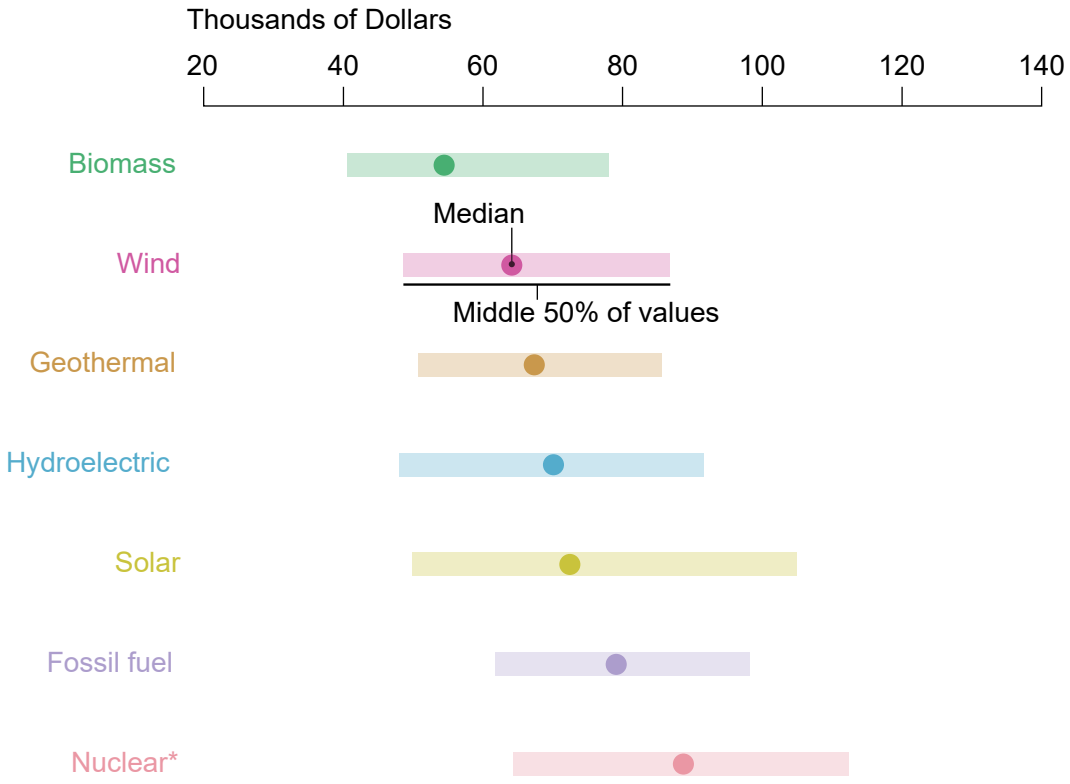


Credit: Anna Hazard; Source: *U.S. Energy and Employment Report*, U.S. Department of Energy. January 2017

It turns out that expanding renewables creates far more jobs than expanding fossil-fuel and nuclear power plants combined. Some of the benefit is from construction jobs to build out solar infrastructure. U.S. coal and oil jobs have been disappearing, and the delivery and burning of more natural gas adds few jobs because the operations are highly automated, requiring few people. ("Other" represents jobs that cannot be assigned to a single category because they cut across multiple energy sectors.)

Jobs are enticing if they pay well.

Energy Salaries by Source, 2017



*Higher paid jobs in nuclear energy generally correspond to higher risk

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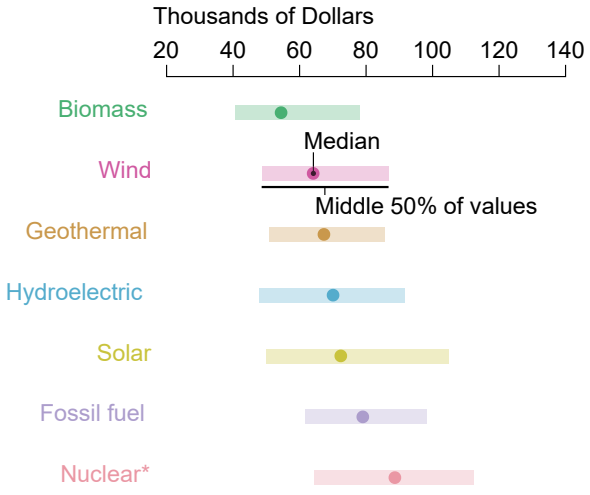

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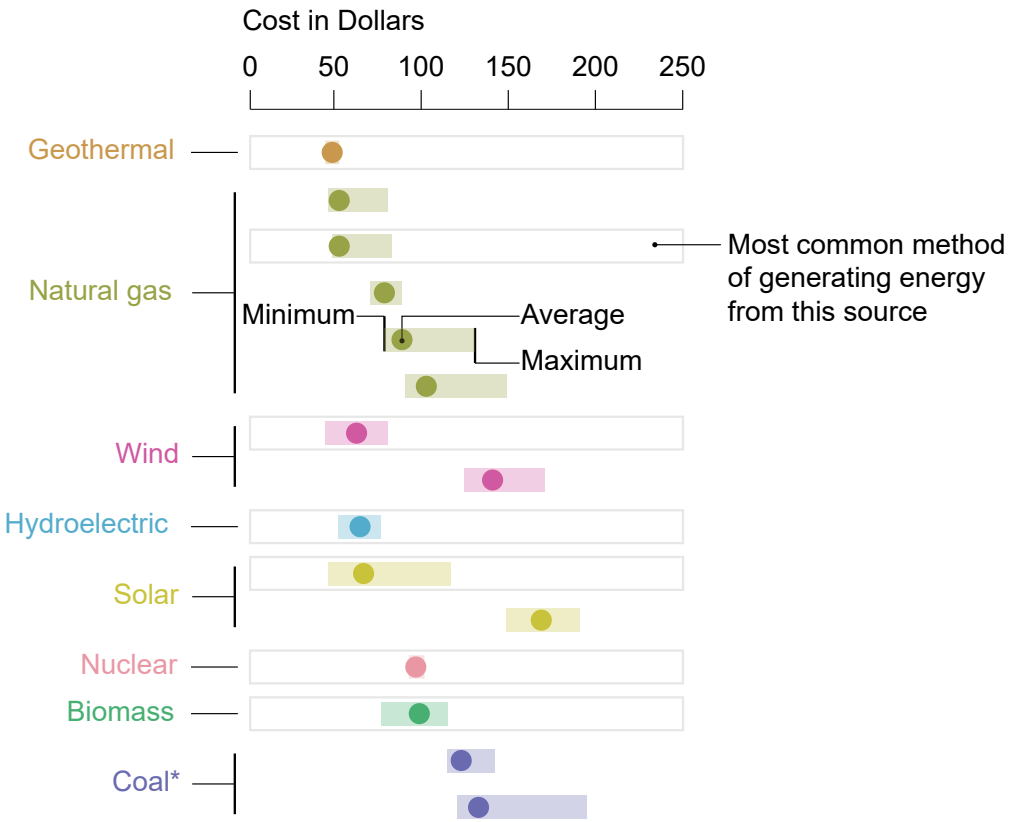
Credit: Anna Hazard; Source: *May 2017 National Industry-Specific Occupational Employment and Wage Estimates*, U.S. Department of Labor Statistics. https://www.bls.gov/oes/current/oessrci.htm

Solar jobs pay roughly the same median salaries as fossil fuel jobs. Nuclear power jobs still pay the highest, because they are very technical and involve large risk. Wind jobs pay less, on average.

More good jobs sounds promising. But how would a shift toward renewables affect the other big money question: the price of electricity consumers must pay?

Cost of One Megawatt-Hour of Energy, Projected for 2022



*Most common current method of generating energy from coal does not use carbon capture and sequestration (CCS). However, this practice is projected to be more common in 2022, so both metl shown here use CCS.

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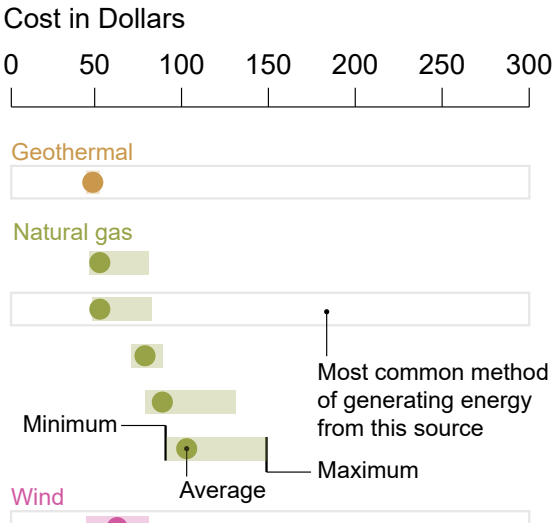

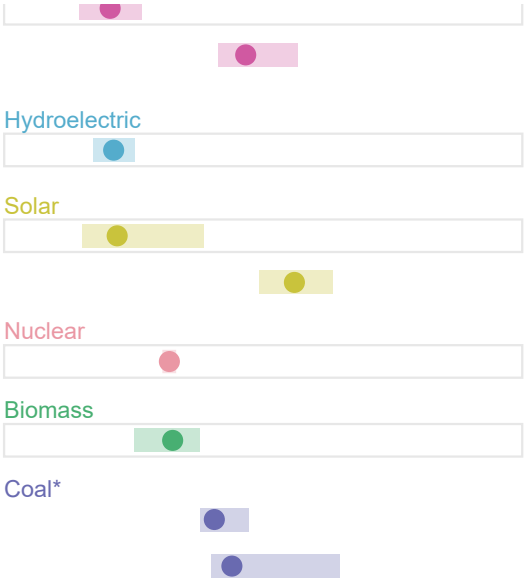

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Credit: Anna Hazard; Source: "Levelized Cost and Levelized Avoided Cost of New Generation Resources in the Annual Energy Outlook 2018," U.S. Energy Information Administration. March 2018

The answer is called the levelized cost of energy: the total expense required —capital investment, operations, fuel and so on for a power plant's lifetime —divided by the total energy that plant could produce in that time.

Fuel and operating expenses are very high for fossil and nuclear plants, and are very low for solar and wind. The bottom line is that the levelized cost of electricity from solar panels and wind (on land) is very similar to that of natural gas. And electricity cost from those technologies is less than that from nuclear and especially clean coal. (Oil is not included because it is disappearing as a fuel for electricity generation in the U.S.)

These data and calculations make it apparent that a big shift to renewable energy in the U.S. can greatly reduce water use, lower carbon dioxide emissions, create new high-paying jobs and keep electricity costs low.

The same transition could benefit other countries as well. Electricity already costs much more in Germany and Ireland. Unemployment is high in many countries. Today many people worldwide do not have access to safe, clean water. And hundreds of thousands of people die each year because of poor sanitation, which in many places could be greatly improved using water for sewage systems.

Switching to renewable energy can help the world conserve water for personal use, sanitation and food production, and help improve living standards with good jobs. The move could help solve these interdependent issues together.

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