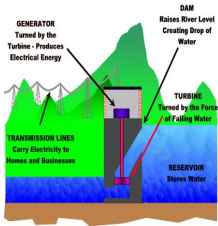
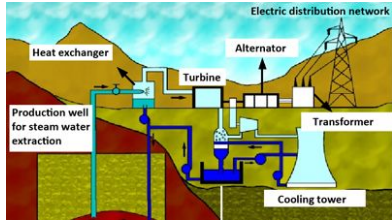
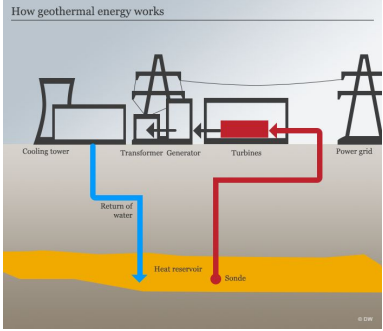




Energy Justification Document - 3rd/4th period, 2018

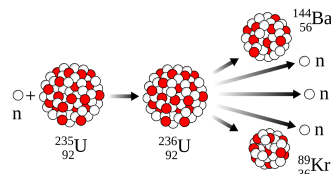
| Energy Source | How does it work? | Pros | Cons |
|--------------------|---|--|---|
| Solar Power | <p>Sunlight comes in from the sun as photons. these photons knock electrons away from their atoms to form a direct current. This happens in the Photovoltaic cells, or PV cells for short. This direct current is turned into ac which is more commonly used. Solar panels are useful because they can be installed in small spaces do to the lack of a spinning turbine which is not common in the energy world. This increases the efficiency of the machines greatly despite their diurnal patterns of production. Also, despite the large upfront cost of installing a high functioning solar system, it costs much less to maintain do to its passive production and lack of moving parts.</p> | <ul style="list-style-type: none"> - Renewable Energy - Noiseless - Can be used anywhere with sunlight - Once installed can make power for 50+ years | <ul style="list-style-type: none"> - Does not work at night or the dark - Initial costs can be Large up front cost |
| Wind Power | <p>As the sun hits the earth, the ground and water start to heat which then heats up the air. As the air is heated it starts to rise which then causes cold air to rush in taking its place. This makes wind. As wind is blowing, turbines with 2-3 blades spin around an axle. This axle turns a</p> | <ul style="list-style-type: none"> - Renewable - Can make energy at day and night. - More desirable in flat windy areas than solar | <ul style="list-style-type: none"> - Super expensive - Only works with wind. - Does not work in high winds. - Bird deaths |

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| | generator which then makes electricity. | | |
| <p>Hydro Power</p>  | <p>The kinetic energy of falling water in a dam is converted by a turbine into mechanical energy. A generator then takes this energy and turns it into electrical energy.</p> | <ul style="list-style-type: none"> - Renewable - Most used renewable energy source - Green source - Most affordable energy source - Safer than fossil fuels - Recreation | <ul style="list-style-type: none"> - Limited areas where we can build power plants for hydro power - Droughts can limit where we can get the energy - Environmental Consequences - Disrupt fish migration - Recreation - Displacing people/land |
| <p>Biomass/ Biofuel</p> | <p>A biomass fired power plant produces electricity and heat by burning biomass in a boiler. In the boiler, the water is heated to a high temperature. Steam from the water powers a turbine which goes to a generator. Commonly used biomass includes wood chips.</p> | <ul style="list-style-type: none"> - Renewable - Dependency on fossil fuels reduced - Carbon neutral - Widely available | <ul style="list-style-type: none"> - Not totally clean when burned - Can lead to deforestation (Due to use of wood) - Inefficient - Expensive |
| <p>Geothermal Energy</p> | <p>Water or working fluid is heated and then sent through a steam turbine where the thermal energy is converted to electricity with a generator through a phenomenon called electromagnetic induction Source Also it can be used to heat up a house by sending cold air through the underground warmed vents to come out as</p> | <ul style="list-style-type: none"> • Mostly environmentally friendly • doesn't cause significant amounts of pollution • massive potential • great for heating and cooling • Less fluctuations and stable energy prices | <ul style="list-style-type: none"> - Extreme cases cause earthquakes. - Very expensive and pricey. - Very location specific. - Requires a lot of management.  |

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| | <p>heated warm air.</p>  <p>Source</p> | <p>Source</p> | |
| <p>Oil/Petroleum (fossil fuel)</p> | <p>Petroleum is a fossil fuel that was formed from the remains of ancient marine organisms, their oil is obtained with large drilling machines. Petroleum is extracted from the Earth as a thick, black liquid, in its original form.</p> <p>Source</p> | <ul style="list-style-type: none"> • Higher energy density • technologies for petroleum have been well developed • the cost of extractions is low • easily transported and stored • abundant and easy to use <p>Source</p> | <ul style="list-style-type: none"> -Contributes to global warming -Non-Renewable Energy -Unsustainable -Incentivised -Releases Carbon Dioxide - pipeline issues/spills -Oil spills - international conflict/acquisition |
| <p>Natural Gas (fossil fuel)</p>  | <p>A naturally occurring hydrogen gas mixture consisting of primarily methane. It can be heated to release energy. Often it is used in a turbine design to generate electricity. Gas is heated and put under pressure to turn a turbine. Other times it is used to heat water in a boiler for steam power. This is how it is often used in homes.</p> | <ul style="list-style-type: none"> • Can be found in clusters with coal, • Easy to find. • Found in US • Less impact than oil/petroleum and coal. • Cleanest of all fossil fuels | <ul style="list-style-type: none"> • Harmful to environment • Fracking (hydraulic fracturing) • Difficult to deliver to facilities • Hard to use, • Non sustainable • Flammable • Expensive pipelines <p>Source</p> |

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|--|---|---|--|
| | http://naturalgas.org/ | | |
| Coal (fossil fuel) | <p>A combustible fossil fuel formed by pressurized dead plants and animals. Fossil fuel power plants burn carbon fuels such as coal, oil or gas to boil water and generate steam that drives large turbines that produce electricity. These plants can generate electricity reliably over long periods of time. However, by burning carbon fuels they produce large amounts of carbon dioxide, which causes climate change.</p> <p>eachcoal.org/converting-coal-into-electricity</p> | <ol style="list-style-type: none"> 1. Cheap 2. Abundant 3. Easily accessible 4. Widely known how to produce 5. Already have infrastructure | <ol style="list-style-type: none"> 1. Non Renewable 2. Largest contributor to global warming 3. Coal mining affects health of workers 4. Coal mining devastates surrounding environment 5. Transportation is expensive <p>m</p> |
| <p>Nuclear Power Sources:</p>  <p>-</p> <p>-https://www.britannica.com/science/nuclear-fission</p> <p>-Conversation with Dr. Anatoly Fonarev</p> <p>Presentation</p> | <p>A clean energy resource. Nuclear energy originates from the splitting of uranium atoms – a process called fission. Splitting a nucleus into smaller pieces is not perfect. Some parts of the original nucleus are converted to energy. This generates heat to produce steam, which is used by a turbine generator to generate electricity. Because nuclear power plants do not burn fuel, they do not produce greenhouse gas emissions.</p> | <p>Reliable Low Cost Operation Pollution Free</p> | <p>Disposal of nuclear waste Mass destruction/loss of land if there is a meltdown Not renewable Expensive to build</p> |

Detailed Process: Heavy nuclei such as uranium-235 and plutonium-239 are split apart after absorbing a neutron. The split turns the nuclei into two lighter nuclei. The excess pieces are converted into energy and radiation, in turn creating heat.



Why build a house without electricity?

1. How much energy do humans use? In what forms?

Humans used 23,816 TWh in 2014

Coal/Peat (40.8%)

Natural Gas (21.6%)

Hydro (16.4%)

Nuclear (10.6%)

Oil (4.3%)

Others (Renew.) (6.3%)

https://en.wikipedia.org/wiki/World_energy_consumption

In China, the average electricity used per person per month is around 112 kilowatt hours.

In the US the average electricity used per person per month is around 955 kilowatt hours.

The reason China is so much lower is because there are some people living in poverty who don't have access to electricity.

Cost/Economics of electricity: How much money is spent on electricity generation? In different parts of these country? In other countries?

The average monthly electric bill in the US is \$110.55. The [average electric bill](#) in China is around \$53.92. The average electric bill in California is the lowest compared to states across the country because it is warmer in California then in most states and heating uses the most energy so most other state's bills are higher because they use more [heating](#).

1. Climate change - how does it happen?(greenhouse effect, carbon cycle, use of sun's energy): Several sources on Earth Release Greenhouse gases that affect our atmosphere in many ways. The [carbon cycle](#) naturally releases and takes in the same amount of Carbon from the atmosphere. However, our Carbon production greatly affects our atmosphere and changes these balance of gases in these air. Some of the main Greenhouse gases affecting our atmosphere are Carbon Dioxide (CO₂), Nitrous Oxide (N₂O), Water Vapor (H₂O), and Methane (CH₄) . Others include flatulence from animals and humans, the burning of various fossil fuels, and Chlorofluorocarbons (CFCs). Humankind is increasing Carbon production more than ever by burning fossil fuels to power our vehicles and power our homes. The sun plays a huge part in this too, the sun's rays travel down on earth and heat the ground, but when the heat tries to escape, the Carbon in our atmosphere traps in the heat forcing it to return to the ground and further heat the earth and affecting our planet's natural climate, warming the planet. For example; here in California we are experiencing a drought along with rising temperatures and on a more extreme scale the ice caps in Antarctica and The Arctic Ocean are melting and causing sea levels to rise.

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|---|-----|
| Energy Scattered and Reflected by Clouds | 20% |
| Energy Absorbed by Earth | 51% |
| Energy Reflected off the Surface of the Earth | 4% |
| Energy Absorbed by Clouds and the Atmosphere | 19% |
| Energy Scattered from the Atmosphere | 6% |

<https://sanmarinsscience.weebly.com/why-passive-solar.html>

<https://climate.nasa.gov/causes/>

2. Climate Change - Consequences - what could happen as a result of these changing climate?

If climate changes, the overall temperature of the Earth will rise and cause many devastating changes to our ecosystem. One thing that will happen is that ice caps around these world, such as Antarctica and the Arctic, will melt. As a result, sea levels will rise which will cause cities, towns, and ecosystems to be threatened by submersion underwater. According to NASA, it is predicted that sea level will rise by 1-4 feet by 2100. Another effect will be an increase in acidity in ocean causing many species of fish and coral to die out due to the carbon dioxide, a greenhouse gas, mixing with seawater.

These increasing temperature will affect global weather patterns as well. For instance, hurricanes will become more common, as ocean temperatures will rise, creating a environment for more volatile and common hurricanes. Heatwaves and droughts will also become more common, due to increased heat and reduced rain rates. This could impact hydropower due to reduced water availability. The droughts can reduce crop growth rates, causing crops to die out and blights to become more common causing an overall food shortage to our already overpopulated areas. It will also create a more unsafe environment for rural and impoverished areas because the increasing temperature around will reduce water availability and worsen heat in hot areas. The consequences of climate change will greatly impact our planet's ecosystem and civilization.

Sources

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