Rahway High School

Teacher _____Noah Walsh_____

Emergency School Closure Pacing Guide

These assignments will be counted towards your child's grade in each subject area.
Please make sure that they are completed ONE DAY AT A TIME.

Course Title	Day 1	Day 2	Day 3	Day 4	Day 5
Intro to CAD	Read through the Technology Analysis Document Pick a piece of technology from around your house to focus your assignment on.	Fill out the design features chart based on your chosen technology	Complete a basic sketch of your technology with labels and annotations to describe it.	Begin writing a response about your technology, its use, and effect on the world.	Complete your technology response.
Course Title	Day 6	Day 7	Day 8	Day 9	Day 10
Intro to CAD	Read the Smartphone prompt and read one of the provided articles	Read the remaining two articles on smartphone technology	Fill out the provided outline on the pros/cons of smartphones	Begin to write a one page response either claiming smartphones are beneficial or harmful to society.	Complete your smartphone argument paper/
Course Title	Day 11	Day 12	Day 13	Day 14	Day 15
Intro to CAD	Read through 2 of the provided articles on renewable energy	Read through 1 of the provided articles on renewable energy	Read through 1 of the provided articles on renewable energy Begin to fill out your outline on renewable energy.	Begin to write your 1 page paper on renewable energy and its effects on the world.	Complete your paper on renewable energy.

Technology Analysis

Technology is defined as any man made object created to alleviate and reduce the problems of the world. Technology can be anything from a computer made up of complex electronics to a pencil that was created to make sharing messages easier.

Your task is to pick a piece of technology from around your house and critique the way it was designed and how it helps humans in the modern world. After picking a piece of technology fill out the chart below:

What technology did you choose?
What is this technology used for?
What problems does this technology solve?
What is the technology made out of? Describe its general form.

What problems does this technology create?
How has this technology changed over time?

Sketch

Sketch your chosen technology below. Be sure to include labels for key parts and features.

After completing the chart and sketch write a one page response on the technology, its purpose and design, and how you think the technology will change going forward.

Smartphone Technology

Since the development of the Blackberry and Iphone the smartphone industry has exploded. Devices that at one point in time could only be used to make calls are now used to do everything from accessing the internet to functioning as a digital wallet.

Your task is to read the provided articles on smartphones and create an argument either in support or against smartphone technology. You must include references to both the provided articles as well as your observations of the modern world. Before beginning your article use the space below to make a list of the benefits and problems created by smartphone technology.

SMART PHONE ASSIGNMENT RESOURCES

ARTICLE 1

https://www.psychologytoday.com/us/blog/the-athletes-way/201706/are-smartphones-making-us-stupid

Are Smartphones Making Us Stupid?

The mere presence of your smartphone can reduce cognitive capacity, study finds.

Posted Jun 25, 2017

Cognitive capacity and overall brain power are significantly reduced when your smartphone is within glancing distance—even if it's turned off and face down—according to a recent study. This new report from the University of Texas at Austin, "Brain Drain: The Mere Presence of One's Own Smartphone Reduces Available Cognitive Capacity," was published in the *Journal of the Association for Consumer Research.*

During this study, the UT Austin researchers found that someone's ability to hold and process data significantly improved if his or her smartphone was in another room while taking a test to gauge attentional control and cognitive processes. Participants who kept their phones in a pocket or bag also outperformed those who kept their phones on the desk while taking the same test. Again, even if the phone was turned off and face down on the desk, the mere sight of one's own smartphone seemed to induce "brain drain" by depleting finite cognitive resources.

In June 2016, another study reported that the typical smartphone owner interacts with his or her phone an average of 85 times per day. This includes immediately upon waking up, just before going to sleep, and oftentimes in the middle of the night. (*For the record: Although I hate to admit it, I am a heavy smartphone user and these statistics accurately describe my waking and sleeping phone habits*.)

Have you ever experienced a lack of focused attention and distractibility caused by the "itch that needs to be scratched" temptation to constantly keep checking your smartphone? I have. If left to my own devices, I would check my phone incessantly. Therefore, I make a conscious daily effort to physically distance myself from my smartphone whenever possible. As a real-time example, I purposely left my smartphone locked in the glove compartment of my car while I'm writing this blog post at a local coffee shop.

It's nice to have some empirical evidence to remind us all to keep our smartphones out of sight whenever we need to be fully present and in the moment. This new clinical research from the McCombs School of Business

at The University of Texas at Austin also serves to reinforce the validity and importance of "smartphone-distancing behaviors" in other aspects of life, such as while driving or socializing face-to-face with friends and family.

> We all understand the joys of our always-wired world—the connections, the validations, the laughs…the information. But we are only beginning to get our minds around the costs. —Andrew Sullivan (2016)

For their latest research on the reduction of cognitive capacity caused by the mere sight of one's own smartphone, Adrian Ward and co-authors from McCombs conducted two different experiments with nearly 800 smartphone users.

In the first experiment, the researchers asked study participants to take a series of tests that required full concentration and gauged cognitive capacity while sitting at a desk. Before the test began, all participants were instructed to put their phones in “silent” airplane mode. Then, participants were randomly assigned to place their smartphones either on the desk face down, in their pocket or personal bag, or in another room. As mentioned earlier, the researchers found that participants who left their phones in another room significantly outperformed those with their phones anywhere physically close to them while taking the test.

In the second experiment, the researchers found that participants who had been identified as extremely dependent on their smartphones performed much worse on cognitive tests than their less-dependent peers if they kept their smartphones on the desk, in their pocket, or in a bag. The good news is that when the smartphone was placed in another room, all study participants—regardless of someone’s pre-existing degree of smartphone dependence—performed equally well on cognitive capacity tests.

Adrian Ward summed up his team's research findings in a statement to UT Austin: "We see a linear trend that suggests that as the smartphone becomes more noticeable, participants' available cognitive capacity decreases. Your conscious mind isn't thinking about your smartphone, but that process—the process of requiring yourself to not think about something—uses up some of your limited cognitive resources. It's a brain drain."

One of the most valuable takeaways from this study is that it doesn’t seem to matter whether your smartphone is turned on or off—or whether it's face up or face down on a desk close to you...Just having your smartphone within sight can reduce your proficiency on cognitive tasks that require your undivided attention. Luckily for all

of us, putting your smartphone in another room, a pocket, or the bottom of a bag seems to be an easy remedy for this problem.

Remember: Anytime you (or your children) need to optimize attentional control and cognitive function, keeping smartphones out of sight helps to boost brain power and minimize brain drain.

ARTICLE 2

https://www.keyideasinfotech.com/blog/impact-of-smartphone-on-society/

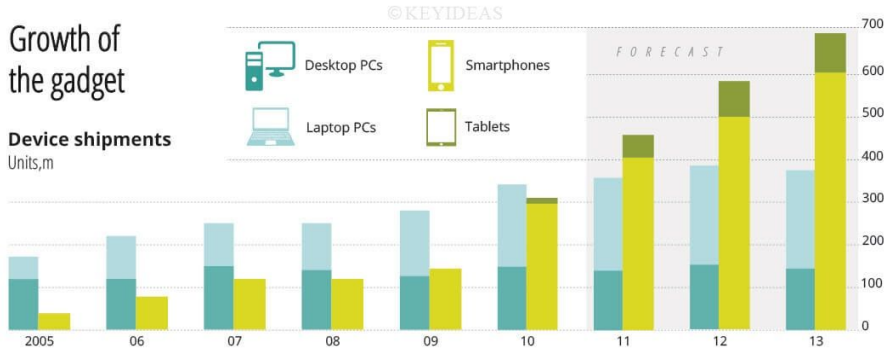
The emergence of communication and computing for mobile consumer devices is on the evolutionary course to bring interoperability and leverage the services and functions of every industry. As a marketing strategy, Smartphone term was introduced, referring to a new class of mobile phones with integrated services like communication, mobile sectors including voice communication, messaging, personal information management and wireless communication capability. Initially, Smartphone's were only perceived for business use due to higher cost, but not today, today we are in a frenetic impact of Smart phone on the society. The latest surveys show that the popularity of Smartphone is increasing in general public with a much higher pace than it is increasing in any corporate sector. Earlier Smartphones were used as enterprise devices and were predominantly meant for corporate users. Smartphones have been around since 1993, but in reality, it reached the general public when Apple introduced this in the mass consumer market.

Smartphones Revolutionized Society in Less Than a Decade

With more than 1 billion users worldwide and 2.5 million apps – available across Google and Apple's digital marketplaces, smartphones are impacting day-to-day life in some surprising ways. The adoption of Smartphone has been tremendous all over the world. Surveys show that 80% of the world population use mobile devices and 42% of mobile subscribers in the US use Smartphone. According to a survey by Compete, a web analytics firm, a large number of people almost up to 65% is using their Smartphones to read news feeds, post status updates, read & reply to messages and post photos. This shows that now people are leaving PCs and moving towards Smartphones. According to analysts, the long dominated giants are experiencing bad times due to the rise of Smartphone and tablets, and the pressure to gain market share in the mobile device market is causing fractures in long partnerships. It is true that still millions of PCs will continue to sell, but the Smartphones and tablets will see more considerable growth in the future.

Smartphone Growth /Usage

Below figure shows the growth of Smartphones compared to PCs.



In another survey, it is estimated that Apple will sell 250 MILLION iPhone Smartphone units at an average expected price $575, generating nearly $144 BILLION in revenue, $77 BILLION as gross profit, and $47 BILLION as net income.

80% OF THE WORLD'S POPULATION HAS A **MOBILE DEVICE**

1.8 BILLION OF THEM ARE SMARTPHONES

1.5 MILLION NEW SMARTPHONES ARE ACTIVATED EVERY SINGLE DAY

1 IN 4 HOUSEHOLDS IN THE **UNITED STATES** HAVE **CUT** THEIR **LANDLINE**, MAKING THEIR **MOBILE DEVICE** THEIR **ONLY MEANS** FOR TELECOMMUNICATION

50 MILLION PEOPLE **WORLDWIDE** OWN A **MOBILE DEVICE** BUT **DO NOT** HAVE **ELECTRICITY** AT HOME

= 5 MILLION

MORE **KIDS** BETWEEN **2-5 YEARS OLD** **CAN WORK SMARTPHONES** THAN CAN TIE THEIR OWN SHOES

TEENAGERS BETWEEN THE AGES OF **13-17 YEAR OLDS** SEND/RECEIVE **3,705 TEXT MESSAGES** MONTHLY. THAT'S **123 TEXTS A DAY!**

94 MINS

PHONE AND TABLET USERS NOW SPEND AN AVERAGE OF **94 MINUTES** PER DAY USING APPS

51% OF MOMS SAY THEY ARE **"ADDICTED"** TO THEIR **SMARTPHONES**

18%

37%

ON AVERAGE, MOMS SPEND **37% OF THEIR DAILY MEDIA TIME** WITH THEIR **SMARTPHONES**, WHICH IS **DOUBLE** THAT **SPENT ON TV** AND MORE TIME THAN WITH OTHER MEDIA, INCLUDING **RADIO, MAGAZINES, AND NEWSPAPERS**

2012

SMARTPHONE ADOPTION BY MOMS HAS GROWN **64%** IN THE LAST **TWO YEARS**

72 MILLION iPhones WERE SOLD IN 2011

IF YOU **STACKED** THAT MANY **iPhones TOGETHER** ITS WEIGHT WOULD **EQUAL THAT OF THE EIFFEL TOWER**

APPLE STOCK TOPPED **$600 IN MARCH 2012** UPON GENERATING **$128 BILLION** IN SALES IN 2011

APPLE IS NOW THE MOST **VALUABLE COMPANY ON EARTH** AT **$621 BILLION** MAKING IT **MORE VALUABLE THAN:**

COCA-COLA $157 BILLION

VERIZON WIRELESS $110 BILLION

WALMART

40% OF

REVENUE IS CREDITED TO THE **iPhone** ALONE

40%

APPLE NOW HAS **$97.6 BILLION** IN CASH

Impacts of Smartphones on Society

Smartphones are popular among people for the applications they offer to users. Smartphones make communications with people quite easier. People enjoy a lot of benefits in various forms of their daily work. Some advantages smartphones provide – better means of communication, learning options to users, great exposure to the latest things, ways to personality development, simple ways to access applications, ideas to succeed in business, platforms to grow their applications and more.

1. Impact on Business
   Smartphones create new dimensions for business. It is not only the smartphone vendors enjoying business but also created a new domain for app development companies, Internet service providers, and other related sectors.
2. Impact on Education
   Smartphones provide a unique way to improve the quality of education. The use of the Internet has become a part of life for every student. Internet together with Smartphones – provide an alternative channel to deliver education services and distance education.
3. Health Impact
   According to surveys, more than 10 million users in the USA use Smartphone to search for health information and facilities. 27% of the users use smartphones for online activities. Today there are several apps to manage prescriptions, promote alternative treatment options, provide price comparison, and validate prescriptions. Today several apps are available to track exercise, diet and blood pressure – enabling smartphones to play a key role in the health sector.
4. Psychological Impact
   Smartphones are said to reduce stress in busy work life. I today's busy schedules mobile phones provide a means to interact with friends and families as an when they get time. The smart use of Smartphone increases your brain's functioning helping to stay active. Instead of using Smartphone only for entertainment it could be used to access useful information, for example, access the news headlines, latest technology updates, and more.
5. Social Impact
   Social life has been drastically changed with the introduction of smartphones and this domain has encountered most of the impact from the use of smartphones. Smartphones play an important role in the integration process of people with special needs, elderly age and with some sort of disabilities.

It is true that the smartphone has a sizeable impact on society and other aspects of life. Smartphone has impacted almost all walk of human life. The prominent areas, where impacts of Smartphone are obvious include business, education, health, and social life. Mobile technology has drastically changed the cultural norms and individual behaviors. The impacts are both on the positive side and also on the negative side. There are several ways that can help control and minimize the negative impact of Smartphone use in society by educating users on how to use Smartphones smartly. The Smartphone is only a pocket-sized PC today but the device seems to have limitless potential!

https://smallbusiness.chron.com/benefits-smartphone-technology-57037.html

What Are the Benefits of Smartphone Technology?

by Brian Jung; Reviewed by Elisa Shoenberger, M.B.A; Updated February 12, 2019

Related Articles

- 1Importance of Technology in the Workplace
- 2What Is the Role of the Cell Phone in Communication Today?
- 3Advantages and Disadvantages of Technology Advances
- 4Mobile Technology for Business

After only about a decade, smartphone technology is so successful that businesses and employees have trouble imagining a day without them. Besides making phone calls, nearly all smartphones today can natively provide directions through GPS, take pictures, play music and keep track of appointments and contacts. Through the installation of apps, the list of possible smartphone uses multiplies by tens of thousands and grows longer everyday. Your business can make good use of this rapidly evolving technology.

Differing Communication Options

Old school cell phones can call and text. While this can get your message across, smartphones allow you multiple ways of communicating with your staff, customers and suppliers. Not only can they call, text and IM, these communication tools give you access to email, immediate photo sharing,

video calling and video conferencing. You can chair a staff meeting from anywhere you have phone service! You can also remain connected through social networking sites like Twitter, Facebook and LinkedIn.

Exploring the Web

How many times each day do you consult the internet for news or other information essential to your business? At first, web browsing happened at a desk in an office, where a wire could reach a PC. Wireless access and laptops moved the web to pretty much anywhere in the house or office, but smartphone technology, including broadband wireless, has sent the web onto the subway, into cars and to the park — wherever there is cellular coverage. What's more, the latest smartphones can display nearly as much of the internet as PCs, including business news sites and streaming high definition videos.

From Several Devices to One

Once, you might have needed an entire bag to carry around all the devices needed for daily business activities. You would need your pager, cell phone and your PDA. You might also need an MP3 player, an e-book reader, a camera and a GPS device. Through miniaturized hardware that packs a processor, speakers, a camera, a GPS receiver, a Wi-Fi adapter and a high definition touch-sensitive screen into a cell-phone-sized device, a smartphone puts all of this functionality into your pocket. One of your workers can easily search for directions to a client's business, read a sales flier before a meeting starts and transmit an ad sale to your office from via a mobile hotspot.

Availability of Many Applications

The late twentieth-century saw an explosion of computer applications. The early twenty-first century brings hundreds of thousands of smartphone apps. The sensors built into the smartphone as well as its portability and programmability have made it a device with almost limitless applications. Beyond the tons of games (your workers do need a break now and then), there are numerous productivity apps available to save a good idea when inspiration strikes, organize meeting notes, and hosts of other possibilities. You and your staff can keep fit with health and fitness apps to track miles walked and the calories you've consumed. Internet radio and podcasting apps put you in touch with whole new worlds of audio. Compass

apps, leveling apps and flashlights provide handheld utilities. Apps that let you paint, modify photos or create music tap into your creativity.

Renewable Energy

Since the discovery of coal, oil, and other non renewable resources human life has relied on the sources of energy to power our every day lives. As humans have learned more about science, energy, and engineering new renewable energy sources have been discovered. These energy sources have proven to reduce the carbon footprint of the energy industry while also providing a more consistent source of energy to human populations.

Your goal is to read the provided articles on renewable energy resources and construct a one page paper either in support of renewable energy or critiquing renewable energy. You must include information from the articles in your response. Your response should highlight the good and the bad of renewable energy.

Week 3 assignment reading

https://www.renewableresourcescoalition.org/nuclear-energy-pros-cons/

Nuclear Energy: Pros & Cons

By Renewable Resources Co | *Last Updated: November 19, 2016*

Nuclear energy is a hot topic in today's world.

Renewable energy sources such as solar and wind haven't yet proven themselves as viable solutions to meet the population's wide-scale energy needs.

With constantly growing energy demands, it's imperative we explore nuclear as a dependable energy source.

The process used to produce nuclear energy is called fission. Nuclear fission occurs when the atom of a nucleus is split, releasing very large amounts of energy.

In nuclear power plants, atoms are continuously split, creating chain reactions that provide high amounts of sustainable energy for a long period of time.

Nuclear energy, much like other power sources, certainly doesn't come without its drawbacks.

Disposal of radioactive waste, high up-front construction costs, and public safety are key factors that need to be evaluated.

Let's take a closer look at some of the major pros and cons of nuclear energy.

Pros

After the meltdown at Three Mile Island in 1978 and the Chernobyl explosion in 1986, the nuclear industry fell dormant.

Quite a few plants stopped producing power, and the construction of new plants was brought to a halt.

Since then, a resurgence has occurred. In the age of technology, energy demands are at an all-time high, and nuclear had to be looked at as a viable source.

Below you will find the pros that led to the revival of nuclear energy.

Low Greenhouse Gas Emissions.

Compared to coal, gas, and other electric-generating plants, nuclear offers the lowest by far in greenhouse gas release.

Carbon dioxide and similar gases, known for depleting Earth's atmosphere, have notoriously been an issue in the climate change debate. Due to this fact, nuclear energy has once again been looked at for power production.

According to the Nuclear Energy Institute (NEI), nuclear energy produces more clean-air energy than any other source. It produces 62 percent of all emission-free electricity in the United States.

In nuclear reactors that utilize large cooling towers, it's a common misconception that pollution is massively dumped into the air. The large clouds you see leaving the smoke stacks are nothing more than vaporized water.

High Power Output.

One of the most appealing reasons for nuclear energy is its incredibly high fuel to power output ratio. It has the capacity to meet city and industrial needs with just one reactor, let alone multiple.

A relatively small amount of uranium can be used to fuel a 1000 Megawatts electric plant, providing enough electricity to power a city of about half a million people.

Renewable sources, such as solar and wind, provide only enough power to meet residential or office needs. They don't yet have the capacity of nuclear to handle large-scale power needs, especially in the manufacturing world.

https://energyinformative.org/wind-energy-pros-and-cons/:

Wind Energy Pros and Cons

This article contains the most important facts about wind power that should be included on any balanced wind energy pros and cons list. Everything you are about to read is properly referenced at the bottom of this page.

See in-depth explanations further down**. Let's start with a quick overview:**

Pros of Wind Energy

- Wind energy is a green energy source and does not cause pollution.
- The potential of wind power is enormous – 20 times more than what the entire human population needs.[1]
- Wind power is renewable and there is no way we can run out of it (since wind energy originates from the sun).
- Wind turbines are incredible space-efficient. The largest of them generate enough electricity to power 600 U.S. homes.[2]
- Wind power only accounts for about 2.5% of total worldwide electricity production, but is growing at a promising rate of 25% per year (2010).[3]
- Prices have decreased over 80% since 1980 and are expected to keep decreasing.[4]
- The operational costs associated with wind power are low.
- Good domestic potential: Residential wind turbines yields energy savings and protects homeowners from power outages.

Cons of Wind Energy

- Wind is a fluctuating (intermittent) source of energy and is not suited to meet the base load energy demand unless some form of energy storage is utilized (e.g. batteries, pumped hydro).
- The manufacturing and installation of wind turbines requires heavy upfront investments – both in commercial and residential applications.
- Wind turbines can be a threat to wildlife (e.g. birds, bats).

- Noise is regularly reported as a problem by neighboring homes.
- How wind turbines look (aesthetics) is a legitimate concern for some people.

Advantages of Wind Energy

1 Green

Wind energy is a green energy source. Harnessing wind energy does not pollute the environment nearly as much as fossil fuels, coal and nuclear power do.

It is true that the manufacturing, transportation and installation of a wind turbine contributes to global warming slightly, but the electricity production itself does not involve any emissions of climate gases whatsoever.

There are some environmental issues associated with wind energy that we will discuss in the disadvantages section.

2 Enormous Potential

As mentioned in the introduction of this article, the potential of wind power is absolutely incredible. Several independent research teams have reached the same conclusions: The worldwide potential of wind power is more than 400 TW (terawatts).[1]

Harnessing wind energy can be done almost anywhere. Whether or not a resource is financially feasible is another question.

3 Renewable

Wind energy is a renewable source of energy. Wind is naturally occurring and there is no way we can empty the energy resources. Wind energy actually originates from the nuclear fusion processes that take place on the sun.

As long as the sun keeps shining (don't worry, according to scientists it will for another 6-7 billion years)?, we will be able to harness wind energy on earth. **This is not the case for fossil fuels (e.g. oil and natural gas), which our society relies heavily on today.**

4 Space-Efficient

The largest wind turbines are capable of generating enough electricity to meet the energy demand of 600 average U.S. homes.[2] The wind turbines can't be placed too close to each other, but the land in-between can be used for other things. **This is why many farms would benefit more from installing wind turbines as opposed to solar panels.**

5 Rapid Growth

Although wind power only accounts for about 2.5% of total worldwide electricity production, the capacity is growing at an incredible rate of 25% per year (2010).[3] This does not only contribute in the fight against global warming, but also helps lowering costs:

6 Prices are Decreasing

Prices have decreased over 80% since 1980.[4] Thanks to technological advancements and increased demand, prices are expected keep decreasing in the foreseeable future.

7 Low Operational Costs

It is generally true that operational costs tend to be low once the turbines first have been manufactured and erected. However, not every wind turbine is created equal – some are more susceptible to maintenance than others.

8 Good Domestic Potential

People can generate their own electricity with wind power in much the same manner as people do with the best solar panels **(photovoltaics).**

Net metering (currently implemented in more than 40 states across the U.S.[5]) allows homeowners to receive bill credits for their excess electricity productionThere is good money to save/earn with residential wind turbines, but maybe the best perks come from not being reliant the utility for electricity, which can protect you from blackouts as well as fluctuating energy prices.

How much money can a solar roof save you in New Jersey?

Profit from your roof space: find local deals on solar in your area, eliminate your power bill.

Calculate My Savings!

Disadvantages of Wind Energy

1 Unpredictable

Wind is unpredictable and the availability of wind energy is not constant. Wind energy is therefore not well suited as a base load energy source. If we had cost-effective ways of storing wind energy the situation would be different.

We can hope for breakthroughs in energy storage technologies in the future, but right now, wind turbines have to be used in tandem with other energy sources to meet our energy demand with consistency.

2 Costs

The cost-competitiveness of wind power is highly debatable. Both utility-scale wind farms and small residential wind turbines typically rely heavily on financial incentives. This is to give wind power a fair chance in the fierce competition against already well-established energy sources such as fossil fuels and coal.

Solar power (PV) is generally regarded as the first choice for homeowners looking to become energy producers themselves, but wind turbines make an excellent alternative in some situations. **It would take a wind turbine of about 10 kilowatts and $40,000 to $70,000 to become a net electricity producer.** Investments like this typically break even after 10 to 20 years.

5 Threat to Wildlife

Birds, bats and other flying creatures have slim chances of surviving when taking a direct hit from a rotating wind turbine blade. However, some environmentalists have blown this issue out of proportions.

Studies have estimated the number of annual avian fatalities by U.S. wind turbines from 10,000 all the way to 440,000. As a comparison, collisions with buildings may kill up to 976 million birds.[6]

3 Noise

Noise is a problem for some people that live in the proximity of wind turbines. Building wind turbines in urban environments should be avoided. Noise is not a problem with offshore wind turbines at all. New designs show significant improvements compared to older models and generate less noise.

4 Looks

While most people actually like how wind turbines look, there is always some who don't. Wind turbines leave a smaller footprint on land compared to the majority of other energy sources (including solar, nuclear and coal). The problem is mitigated if the wind turbines are built outside urban areas.

What exactly is wind energy? Wind energy actually comes from the sun. Solar radiation unevenly heats the surface of earth, which causes hot air to rise and cool air to fill the void. This movement is the definition of wind energy. Wind is a kinetic form of energy (motion).

There are several techniques we can use to harness this energy. Wind power is a term used to encapsulate all processes that convert wind energy into useful work. This article has mainly been about the advantages and disadvantages of generating electricity with wind turbines (one aspect of wind power).

How can we generate electricity with wind energy? Wind turbines are complicated, but here's the basic gist: Kinetic energy in the wind is converted into mechanical energy (the rotation of turbine blades), which again is converted into electricity by a generator sitting inside the hub of the structure.

If you want to learn more about the two questions above, go to How Wind Turbines Generate Electricity where the topics are covered more in-depth. Also check out 5 Mind-Blowing Wind Energy Facts.

The bottom line: The future of wind power looks promising. The development of several massive wind farms (both on- and offshore) is taking place as you read this. It will be interesting to see how far we've come ten years from now. The United States aims to produce at least 20 percent of its electricity by wind power by 2030.

https://www.greenmatch.co.uk/blog/2014/08/5-advantages-and-5-disadvantages-of-solar-energy

What Are the Advantages and Disadvantages of Solar Power?

Did you know that the energy sun provides to the earth for one hour could meet the global energy needs for one year? Undoubtedly, the sun is a powerful energy source, and even though we are not able but to collect a fraction of this energy, yet harnessing this power by installing solar panels can make a significant difference to the planet.

While it has been widely criticised for being expensive or inefficient, solar energy has now proved to be extremely beneficial - not only for the environment but also for private economy.

Thanks to available solar panel grants, as well as, the increasingly competitive prices in the market, solar energy has become the main source of energy for more and more families. The technology has been drastically improved the last years, and has been complemented by solar battery storage systems, turning solar into a significantly more efficient source of clean energy.

However, there are always downsides no matter the energy source you choose to analyse. **GreenMatch** has outlined the key advantages and disadvantages of solar power in the following points:

Advantages of Solar Energy	Disadvantages of Solar Energy
Renewable Energy Source	Cost
Reduces Electricity Bills	Weather Dependent
Diverse Applications	Solar Energy Storage is Expensive
Low Maintenance Costs	Uses a Lot of Space

Technology Development	Associated with Pollution

Advantages of Solar Energy

1. Renewable Energy Source

Among all the benefits of solar panels, the most important thing is that solar energy is a truly renewable energy source. It can be harnessed in all areas of the world and is available every day. We cannot run out of solar energy, unlike some of the other sources of energy. Solar energy will be accessible as long as we have the sun, therefore sunlight will be available to us for at least 5 billion years when according to scientists the sun is going to die.

2. Reduces Electricity Bills

Since you will be meeting some of your energy needs with the electricity your solar system has generated, your energy bills will drop. How much you save on your bill will be dependent on the size of the solar system and your electricity or heat usage. Moreover, not only will you be saving on the electricity bill, there is also a possibility to receive payments for the surplus energy that you export back to the grid. If you generate more electricity than you use (considering that your solar panel system is connected to the grid).

3. Diverse Applications

Solar energy can be used for diverse purposes. You can generate electricity (photovoltaics) or heat (solar thermal). Solar energy can be used to produce electricity in areas without access to the energy grid, to distill water in regions with limited clean water supplies and to power satellites in space. Solar energy can also be integrated into the materials used for buildings. Not long ago Sharp introduced transparent solar energy windows.

4. Low Maintenance Costs

Solar energy systems generally don’t require a lot of maintenance. You only need to keep them relatively clean, so cleaning them a couple of times per year will do the job. If in doubt, you can always rely on specialised cleaning companies, which offer this service from around **£25-£35**. Most reliable solar panel manufacturers offer **20-25 years** warranty. Also, as there are no moving parts, there is no wear and tear. The inverter is usually the only part that needs to be changed after **5-10 years** because it is continuously working to convert solar energy into electricity and heat (solar PV vs. solar thermal). Apart from the inverter, the cables also need maintenance to ensure your solar power system runs at maximum

efficiency. So, after covering the initial cost of the solar system, you can expect very little spending on maintenance and repair work.

5. Technology Development

Technology in the solar power industry is constantly advancing and improvements will intensify in the future. Innovations in quantum physics and nanotechnology can potentially increase the effectiveness of solar panels and double, or even triple, the electrical input of the solar power systems.

Disadvantages of Solar Energy

1. Cost

The initial cost of purchasing a solar system is fairly high. This includes paying for solar panels, inverter, batteries, wiring, and for the installation. Nevertheless, solar technologies are constantly developing, so it is safe to assume that prices will go down in the future.

2. Weather Dependent

Although solar energy can still be collected during cloudy and rainy days, the efficiency of the solar system drops. Solar panels are dependent on sunlight to effectively gather solar energy. Therefore, a few cloudy, rainy days can have a noticeable effect on the energy system. You should also take into account that solar energy cannot be collected during the night. On the other hand, if you also require your water heating solution to work at night or during wintertime, thermodynamic panels are an alternative to consider.

3. Solar Energy Storage Is Expensive

Solar energy has to be used right away, or it can be stored in large batteries. These batteries, used in off-the-grid solar systems, can be charged during the day so that the energy is used at night. This is a good solution for using solar energy all day long but it is also quite expensive. In most cases, it is smarter to just use solar energy during the day and take energy from the grid during the night (you can only do this if your system is connected to the grid). Luckily your energy demand is usually higher during the day so you can meet most of it with solar energy.

4. Uses a Lot of Space

The more electricity you want to produce, the more solar panels you will need, as you want to collect as much sunlight as possible. Solar PV panels require a lot of space and some roofs are not big enough to fit the number of solar panels that you would like to have. An alternative is to install some of the panels in

your yard but they need to have access to sunlight. If you don’t have the space for all the panels that you wanted, you can opt for installing fewer to still satisfy some of your energy needs.

5. Associated with Pollution

Although pollution related to solar energy systems is far less compared to other sources of energy, solar energy can be associated with pollution. Transportation and installation of solar systems have been associated with the emission of greenhouse gases. There are also some toxic materials and hazardous products used during the manufacturing process of solar photovoltaic systems, which can indirectly affect the environment. Nevertheless, solar energy pollutes far less than other alternative energy sources.

http://www.wvic.com/content/how_hydropower_works.cfm

How Hydropower Works

Hydropower plants capture the energy of falling water to generate electricity. A turbine converts the kinetic energy of falling water into mechanical energy. Then a generator converts the mechanical energy from the turbine into electrical energy.

Hydroplants range in size from "micro-hydros" that power only a few homes to giant dams like Hoover Dam that provide electricity for millions of people.

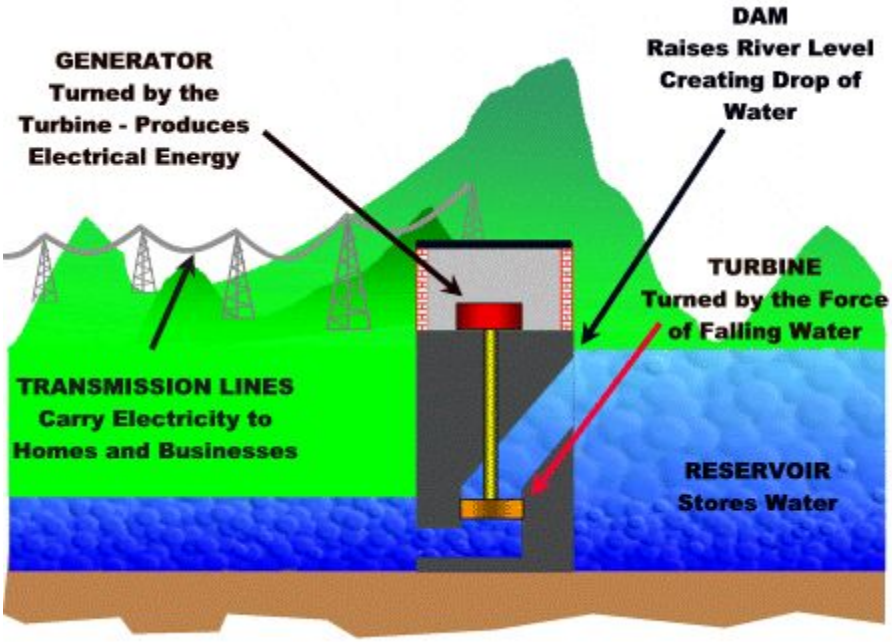
The photo on the right shows the Alexander Hydroelectric Plant on the Wisconsin River, a medium-sized plant that produces enough electricity to serve about 8,000 people.

Parts of a Hydroelectric Plant

Most conventional hydroelectric plants include four major components (see graphic below):

1. **Dam.** Raises the water level of the river to create falling water. Also controls the flow of water. The reservoir that is formed is, in effect, stored energy.
2. **Turbine.** The force of falling water pushing against the turbine's blades causes the turbine to spin. A water turbine is much like a windmill, except the energy is provided by falling water instead of wind. The turbine converts the kinetic energy of falling water into mechanical energy.
3. **Generator.** Connected to the turbine by shafts and possibly gears so when the turbine spins it causes the generator to spin also. Converts the mechanical energy from the turbine into electric energy. Generators in hydropower plants work just like the generators in other types of power plants.

4. **Transmission lines**. Conduct electricity from the hydropower plant to homes and business.



How Much Electricity Can a Hydroelectric Plant Make?

The amount of electricity a hydropower plant produces depends on two factors:

1. **How Far the Water Falls.** The farther the water falls, the more power it has. Generally, the distance that the water falls depends on the size of the dam. The higher the dam, the farther the water falls and the more power it has. Scientists would say that the power of falling water is "directly proportional" to the distance it falls. In other words, water falling twice as far has twice as much energy.
2. **Amount of Water Falling.** More water falling through the turbine will produce more power. The amount of water available depends on the amount of water flowing down the river. Bigger rivers have more flowing water and can produce more energy. Power is also "directly proportional" to river flow. A river with twice the amount of flowing water as another river can produce twice as much energy.

Can I Figure Out How Much Energy a Dam in My Area Can Make?

Sure. It's not that hard.

Let's say that there is a small dam in your area that is not used to produce electricity. Maybe the dam is used to provide water to irrigate farmlands or maybe it was built to make a lake for recreation. As we explained above, you need to know two things:

1. **How far the water falls.** From talking to the person who operates the dam, we learn that the dam is 10 feet high, so the water falls 10 feet.

2. **Amount of water flowing in the river.** We contact the United States Geological Survey, the agency in the U.S. that measures river flow, and learn that the average amount of water flowing in our river is 500 cubic feet per second.

Now all we need to do is a little mathematics. Engineers have found that we can calculate the power of a dam using the following formula:

Power = (Height of Dam) x (River Flow) x (Efficiency) / 11.8

Power	The electric power in kilowatts (one kilowatt equals 1,000 watts).
Height of Dam	The distance the water falls measured in feet.
River Flow	The amount of water flowing in the river measured in cubic feet per second.
Efficiency	How well the turbine and generator convert the power of falling water into electric power. For older, poorly maintained hydroplants this might be 60% (0.60) while for newer, well operated plants this might be as high as 90% (0.90).
11.8	Converts units of feet and seconds into kilowatts.

For the dam in our area, lets say we buy a turbine and generator with an efficiency of 80%.

Then the power for our dam will be:

Power = (10 feet) x (500 cubic feet per second) x (0.80) / 11.8 **= 339 kilowatts**

To get an idea what 339 kilowatts means, let's see how much electric energy we can make in a year.

Since electric energy is normally measured in kilowatt-hours, we multiply the power from our dam by the number of hours in a year.

Electric Energy = (339 kilowatts) x (24 hours per day) x (365 days per year) = **2,969,000 kilowatt hours.**

The average annual residential energy use in the U.S. is about 3,000 kilowatt-hours for each person. So we can figure out how many people our dam could serve by dividing the annual energy production by 3,000.

People Served = 2,969,000 kilowatts-hours / 3,000 kilowatt-hours per person) = **990 people.**

So our local irrigation or recreation dam could provide enough renewable energy to meet the residential needs of 990 people if we added a turbine and generator.

Note: Before you decide to add hydropower to a dam, have a hydropower engineer review your calculations and consult with the local resource agencies to be sure you can obtain any permits that are required.