

Energy Systems - For and Against

Non Renewable: Fossil Fuels | Geothermal | Nuclear | Biomass |

Renewable: Conservation | Solar | Tidal | Water | Wind | Derived = Biofuels | Hydrogen | Synthetic | Urban Waste

Non Renewable Resources

Energy Resources

Advantages

Disadvantages

Fossil Fuels

<ul style="list-style-type: none"> Petroleum 	<ol style="list-style-type: none"> Can be used at one site (power stations), or be mobile (cars, generators ...) The technology well advanced Is relatively cheap while stocks plentiful. Easy to transport nationally and globally. High net useful energy yield. Moderate environmental impact (depends on sulphur content). 	<ol style="list-style-type: none"> Supply becoming scarce world wide. Net useful energy yield declining and prices increasing as deposits are becoming more costly to access. Exhaust fumes (carbon dioxide) causing global warming - climate change.
<ul style="list-style-type: none"> Natural Gas 	<ol style="list-style-type: none"> The technology well advanced Easy to transport nationally Cheaper than petroleum but price is increasing High net useful energy yield. Low environmental impact 	<ol style="list-style-type: none"> Supply becoming scarce world wide. Net useful energy yield declining and prices increasing as deposits are becoming more costly to access. Difficult and expensive to transport globally Exhaust fumes (carbon dioxide) causing global warming - climate change.
<ul style="list-style-type: none"> Coal 	<ol style="list-style-type: none"> The technology well advanced Easy to transport nationally and globally Large supplies world wide - according to Greenfleet, Australia has enough coal to last us 400 years. High net useful energy yield. Relatively cheap - price is increasing though Low environmental impact if burnt by fluidized-bed firing and magnetohydrodynamic generators. Can be converted to cleaner burning synthetic natural gas or synthetic oil 	<ol style="list-style-type: none"> Very harmful environmental impact Not useful for powering vehicles in solid form - conversion to electricity could be used to recharge batteries in electric cars etc. Net useful energy yield declining and prices increasing as deposits are becoming more costly to access as pollution controls are implemented world wide. Net useful energy yield declines and prices rise when coal is converted to synthetic natural gas or oil. Requires large amounts of water for coal processing and cooling of power plants. Exhaust fumes (carbon dioxide) causing global warming - climate change
<ul style="list-style-type: none"> Oil shale 	<ol style="list-style-type: none"> Large supplies available Can be used at one site (power stations), or be mobile (cars, generators ...) 	<ol style="list-style-type: none"> A relatively new technology High cost Low to moderate net useful energy yield. Environmental impact high Requires large amounts of water for processing Exhaust fumes (carbon dioxide) causing global warming - climate change.
<ul style="list-style-type: none"> Tar sands 	<ol style="list-style-type: none"> Very large supplies Can be used at one site (power stations), or be mobile (cars, generators ...) 	<ol style="list-style-type: none"> A relatively new technology High cost Low to moderate net useful energy yield. Environmental impact high Requires large amounts of water for processing Exhaust fumes (carbon dioxide) causing global warming - climate change

Geothermal Energy (trapped pockets)

<ol style="list-style-type: none"> The technology well advanced Low overall supply but very high in select areas near deposits Moderate environmental impact Moderate cost and moderate net useful energy yield for easily accessible and large deposits. 	<ol style="list-style-type: none"> Only useful in selected areas Must be converted to electricity at the site Cannot be used to power vehicles unless charging of batteries for electric motors or hydrogen gas production High cost and low net useful energy yield for less accessible and small deposits Requires large amounts of water for processing and cooling
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Energy Resources	Advantages	Disadvantages
Nuclear Energy		
<ul style="list-style-type: none"> Conventional Fission 	<ol style="list-style-type: none"> The technology well advanced Low environmental impact on air and water and moderate impact onland - depends on entire system operating within set guidelines. 	<ol style="list-style-type: none"> Dependent on uranium supplies be available Costs of building nuclear power stations higher as stricter safety and environmental standards are applied Low to moderate net useful energy yield Very high environmental impact if an accident or sabotage resulted inthe melt down of the plant releasing deadly radioactive material. Storage of radioactive waste also a major concern. Require large amounts of water for cooling power plants Commits future generations to storing radioactive waste - requires thousands of years of protective maintenance Cannot be used to power mobile vehicles unless electricity is used to produce hydrogen gas or to recharge batteries.
<ul style="list-style-type: none"> Breeder Fission 	<ol style="list-style-type: none"> Extends uranium supplies to several hundred years Low environmental impact on land if entire system operates correctly 	<ol style="list-style-type: none"> Technology only young Very high costs with fiancial government backing required Net useful energy yield unknown but at best moderate Very serious and long last environmental impact if an accident or sabotage resulted inthe melt down of the plant releasing deadly radioactive material. Storage of radioactive waste also a major concern. Require large amounts of water for cooling power plants Commits future generations to storing radioactive waste - requires thousands of years of protective maintenance Cannot be used to power mobile vehicles unless electricity is used to produce hydrogen gas or to recharge batteries.
<ul style="list-style-type: none"> Fusion 	<ol style="list-style-type: none"> Almost unlimited supply of energy if fusion of deuterium (extracted from water) is utilised A moderate environmental impact Less dangerous than Conventional or Breeder Fission as melt down cannot occur. Other problems of theft, eliminated and smaller quantities of radioactive waste produced. Has potential to be an infinite source of electricity for use in vehicles where batteries could be charged or hydrogen gas be produced to be used in place of fossil fuels Could be used as a fusion torch to vaporize and convert cars, glass bottles etc back to their basic elements for reuse. 	<ol style="list-style-type: none"> Technically very difficult and still in its early stages of development Would not supply large amounts of energy Development costs high Operating costs high Net useful energy yield still unknown Radioactive waste must be stored safely Require large amounts of water for cooling power plants May require expensive or rare elements (helium and lithium) to aid the process.

Energy Systems - For and Against

Renewable Resources

Energy Resources

Advantages

Disadvantages

Conservation	<ol style="list-style-type: none"> 1. Can be implemented fairly quickly 2. Technology simple and well developed 3. Saves money 4. Reduces Energy waste. 5. Reduces environmental impact by requiring less use of other energy alternatives 6. Allows the demand on fossil fuels to be stretched over a longer time frame 7. Very high net useful energy yield 8. Decreases heat buildup in the atmosphere from energy use. 	<ol style="list-style-type: none"> 1. Requires mandatory regulations - voluntary and adherence to regulations not always followed 2. Depends on individuals accepting more complex life cycle energy. On going costs of all energy systems and devices need to be considered not just initial cost
Water power (hydroelectricity)	<ol style="list-style-type: none"> 1. Source of energy is free 2. Relatively low operating and maintenance cost 3. Technology well developed 4. Can be operated from remote location 5. Low overall supply but plentiful near rivers and areas capable of being dammed 6. High net useful energy yield 7. Has a long life 8. Low environmental impact on air and a moderate impact on water 9. Decreases heat buildup in the atmosphere 	<ol style="list-style-type: none"> 1. Available only in a few selected areas 2. Most rivers near a large populated area already dammed. 3. Dams tend to fill up with silt 4. Moderate to high development costs 5. Lake destroys land ecosystems behind dam and alters those below dam 6. Cannot be used to power vehicles unless electricity is used to produce hydrogen gas or to recharge batteries.
Tidal Energy	<ol style="list-style-type: none"> 1. Source of energy is free 2. Very small overall supply but plentiful in selected areas with high daily tidal flows 3. Low environmental impact on air 4. Net useful energy yield unknown 5. Decreases heat buildup in the atmosphere 	<ol style="list-style-type: none"> 1. Available only in a few selected areas 2. Technology improving but still young 3. Development and operating costs vary according to site - usually moderate to high 4. Ecology of bays and estuaries drastically changed and possible damaged 5. Cannot be used to power vehicles unless electricity is used to produce hydrogen gas or to recharge batteries.
Solar Energy		
<ul style="list-style-type: none"> • Low Temperature heating (for homes & water) 	<ol style="list-style-type: none"> 1. Energy supply free and readily available on a sunny day 2. Technology for heating individual homes and water heaters simple and available 3. Moderate net useful energy yield 4. Low environmental impact 5. Very safe energy source 6. Decreases heat buildup in the atmosphere 	<ol style="list-style-type: none"> 1. Usefulness depends on the number of sunny days each year 2. Supply not available at night or on cloudy days - requires a back up system (a second energy source) to supplement energy needs 3. Production costs can be high depending on unit installed 4. Cannot be used to power vehicles
<ul style="list-style-type: none"> • High temperature heating & production of electricity 	<ol style="list-style-type: none"> 1. Energy supply free and readily available on a sunny day 2. Moderate environmental impact 3. Very safe energy source 	<ol style="list-style-type: none"> 1. Technology development still on going 2. Usefulness depends on a plentiful year round supply of sunlight 3. Supply not available at night or on cloudy days - requires a large back up system (a second energy source) to supplement energy needs

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Energy Resources	Advantages	Disadvantages
	<ol style="list-style-type: none"> Decreases heat buildup in the atmosphere Some governments offering rebate based on number of panels 	<ol style="list-style-type: none"> Production costs are high depending on unit installed - can take up to 20 years to recoup outlay in savings Low net energy yield because solar energy must be highly concentrated Use of photovoltaic cells in solar panels expensive though price is coming down Disruption of desert ecosystem Cannot be used to power vehicles unless electricity is used to produce hydrogen gas or to recharge batteries. Requires large amounts of water for cooling
Wind Energy		
<ul style="list-style-type: none"> Home & neighbourhood turbines 	<ol style="list-style-type: none"> Free and readily available on a windy day Technology well developed Very low environmental impact Moderate net useful energy yield Decreases heat buildup in the atmosphere from energy use 	<ol style="list-style-type: none"> Insufficient wind in many places Requires conventional backup electrical system or expensive storage system Production and installation costs are moderately high Cannot be used to power vehicles unless electricity is used to produce hydrogen gas or to recharge batteries.
<ul style="list-style-type: none"> Large scale power plants 	<ol style="list-style-type: none"> Free and readily available on a windy day Low environmental impact Moderate net useful energy yield Decreases heat buildup in the atmosphere from energy use 	<ol style="list-style-type: none"> Continuous high wind levels only available at a few sites Technology still being developed Requires conventional backup by electric power plants or expensive storage system Development costs high Low net useful energy yield Cannot be used to power vehicles unless electricity is used to produce hydrogen gas or to recharge batteries. Requires large amounts of water for cooling
Geothermal Energy	<ol style="list-style-type: none"> Moderate overall supply Moderate environmental impact 	<ol style="list-style-type: none"> Technology still being perfected Only useful in selected areas Must be converted to electricity on site Low net useful energy yield Cannot be used to power vehicles unless electricity is used to produce hydrogen gas or to recharge batteries. Requires large amounts of water for cooling
Biomass	<ol style="list-style-type: none"> Technology well developed Low to moderate net energy yield Moderate development cost but costs can vary depending on location and system 	<ol style="list-style-type: none"> Large amount of land required May be limited because rate of use exceeds rate of renewal and sufficient land not available in some areas Moderate to high environmental impact from ecosystem disruption and simplification, erosion when land is cleared, water from runoff of fertilisers and pesticides and air pollution when fuel is burned

Energy Systems - For and Against

Derived Fuels

Energy Resources

Advantages

Disadvantages

<ul style="list-style-type: none"> Biofuels (Alcohols & Natural Gas from plants & organic waste) 	<ol style="list-style-type: none"> Can be used in stationary and mobile energy systems As an Alcohol, fairly easy to transport nationally and globally Moderate development cost - varies according to system used 	<ol style="list-style-type: none"> Large land requirements Limited due to demand exceeding rate of renewal Moderate to high environmental impact from ecosystem disruption and simplification, soil erosion, water pollution from runoff of fertilisers and pesticides and air pollution when fuel is burned
<ul style="list-style-type: none"> Hydrogen Gas (from coal or water) 	<ol style="list-style-type: none"> Very low environmental impact from burning fuel Does not produce carbon dioxide when burned Fairly easy to transport Technology still to be tried with vehicles Good alternative for heating homes and powering vehicles when oil supplies run out Fairly easy to transport nationally by pipeline 	<ol style="list-style-type: none"> Requires an essentially infinite source of heat or electricity to produce hydrogen gas from coal or water Development and operating costs relatively high depending on source of heat or electricity Net useful energy yield low to moderate depending on source of heat or electricity Environmental impact of entire system varies between low to very high depending on source of heat or electricity.
<ul style="list-style-type: none"> SNG (Synthetic Natural Gas) 	<ol style="list-style-type: none"> Easy to transport nationally Low environmental impact Technology in late stages of development 	<ol style="list-style-type: none"> Accelerates reduction in supply of coal Low to moderate net useful energy yield High development and operating costs High environmental impact on land and water because of increased production of coal Difficult and expensive to transport globally as liquid SNG Not currently accepted as a fuel for vehicles but could be Requires large amounts of water for processing
<ul style="list-style-type: none"> Synthetic oil & Alcohols from coal & organic waste 	<ol style="list-style-type: none"> Can be used in stationary and mobile energy systems Fairly easy to transport nationally and globally 	<ol style="list-style-type: none"> Accelerates reduction in supply of coal Supply of organic waste widely dispersed and somewhat limited in supply Hinders recycling of organic wastes back to the land as a fertilizer Low to moderate net useful energy yield Technology needs further development High environmental impact on land and water because of increased production of coal
<ul style="list-style-type: none"> Urban Waste 	<ol style="list-style-type: none"> Moderate to large supplies in heavily populated areas Technology well developed Decreases solid waste disposal Low environmental impact on the land 	<ol style="list-style-type: none"> Supply limited in non urban areas Supply could be limited if recycling schemes implemented High development and operating costs Moderate to high environmental impact on air and water Low to moderate net useful energy yield Production of carbon dioxide when fuel is burned could cause climate change Cannot be used to power vehicles Burns paper and other organic wastes rather than recycling them.