DPS STS SCIENCE AND TECHNOLOGY CLUB

SCIENCE MAGAZINE

GREEN ENERGY

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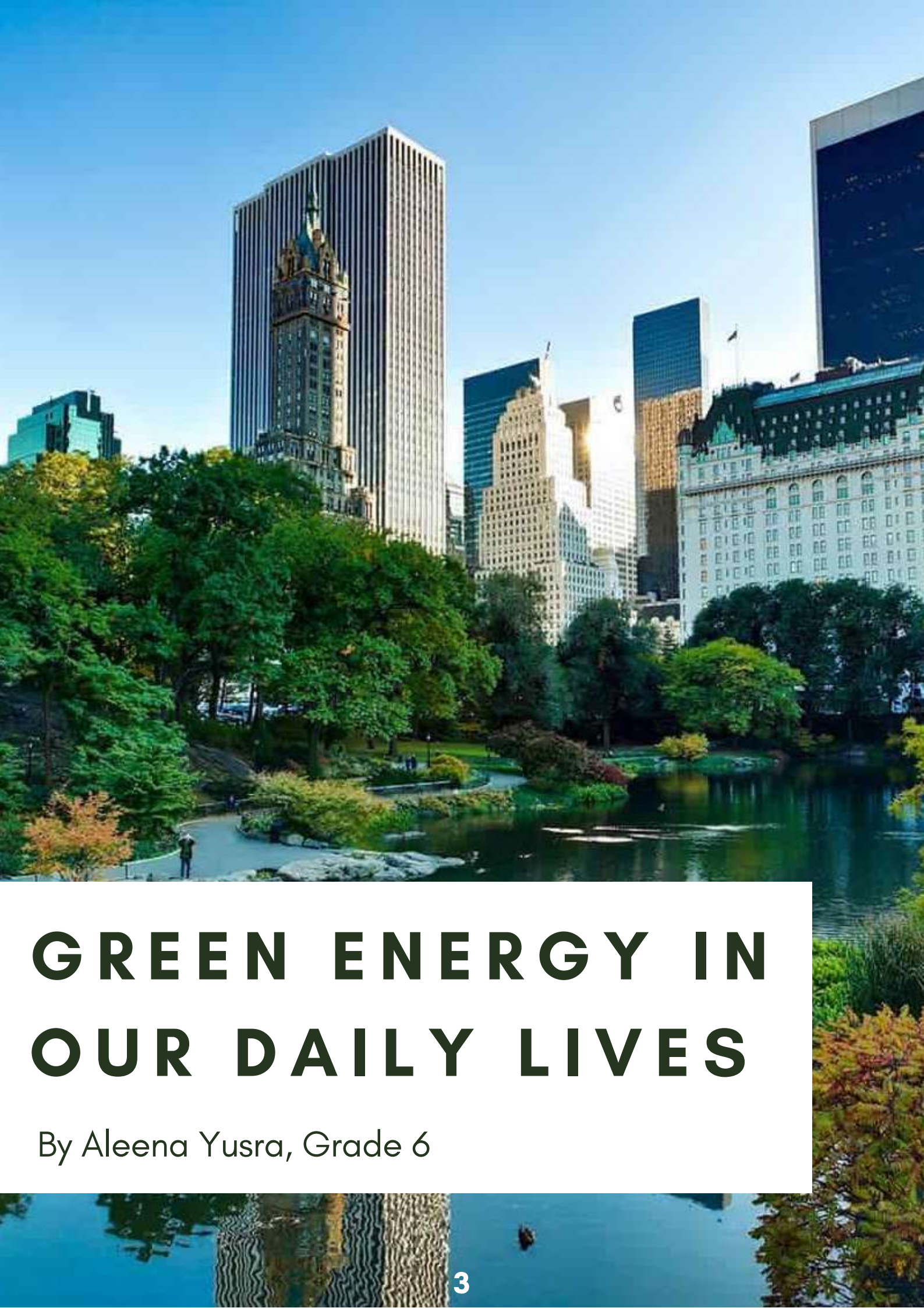


GREEN ENERGY IN OUR DAILY LIVES

By Aleena Yusra, Grade 6

WHAT IS GREEN ENERGY?

The term "green" strikes up images in our minds of positive consequences and environmental improvement, which is precisely what green energy implies. It is a form of energy that is manufactured and regenerated using natural resources. The idea with green energy resources is that they have beneficial environmental consequences since they are often renewable or clean (harmless) energy.

ADVANTAGES OF GREEN ENERGY

- **In contrast** to the finite resource of fossil fuels, there are numerous types of renewable energy sources that are endless.
- Green energy has **fewer ecological consequences** than fossil fuels and has good impacts.
- Many countries are obliged to rely on others to meet their energy requirements. Renewable energy may enable countries to become **more self-sufficient**, allowing them to set their own prices and even boosting local economies.
- Green energy **contributes in the fight against global warming** by reducing the emissions of carbon dioxide and other greenhouse gases.

DIFFERENT TYPES OF GREEN ENERGY

SOLAR PANELS

Solar panels generate the sun's rays into electricity, which residents may consume while selling the excess to the local power grid.

Solar electricity is also commonly seen among households, utility-scale farms, and huge corporations across the world.

Solar power has grown at a pace of 42 percent each year on average during the previous ten years. Indicating that solar energy is becoming increasingly prominent.

WIND TURBINES

Mankind has been harnessing the energy of the wind for over 7,000 years. Wind turbines that generate electricity have become increasingly prevalent across the world, with wind capacity expanding by more than 22 times from 23,900 MW in 2001 to 539,000 MW in 2017.

HYDROPOWER

Hydropower is a renewable energy source that is replenished on a regular basis by rain and snow. Dams have been used to regulate river currents and water flow for thousands of years.

CHANGES WE CAN MAKE TO INCREASE THE USE OF GREEN ENERGY IN DAILY LIFE

USE ROOFTOP SOLAR PANELS

Rooftop solar panels are more popular than ever. Installing photovoltaic (PV) panels on your roof or in your garden will capture the sun's energy, converting it into usable energy to power your home.

SWITCH TO SOLAR OVENS

Consider using solar energy to power your oven, saving you a lot of money (and energy). Solar ovens work by trapping sunlight and using it to heat food.

CREATE LESS WASTE

We can all be more conscious of our decisions. We may decrease trash by choosing packaging that can be recycled and reused. We cut procedures and energy usage by doing so. All of these can contribute to lower CO2 emissions.

USE BIOETHANOL TO POWER CARS

Bioethanol has long been seen as a potential replacement for petrol. Bioethanol is a substitute for petrol and we create it through the main sugar fermentation process. This form of fuel comes from a renewable source such as crops. Therefore, it does not come from a finite source. In the UK alone, cars make up 22% of all greenhouse gas emissions. However, if we make the switch, then not only will we reduce Co2 emissions directly but the crops that are grown will also help to reduce them.

SUSTAINABLE INNOVATIONS IN THE ENERGY INDUSTRY

LITHIUM-GLASS BATTERIES

These batteries, unlike regular batteries, have a very extended life span. They have double the energy density of a standard battery and their capacity increases with time. The batteries charge faster, cost less, and work at lower temperatures than any other variety.

LIQUID SUNLIGHT

Solar power is used to convert liquid sunlight into a fuel source. Scientists have been attempting to utilize this liquid as a long-term energy source by combining it into artificial photosynthesis.

WASTE POWERED PLANE

Fuels generated from waste, such as wood and domestic trash, are reacted with catalytic chemicals to power these waste-powered planes.

ARTIFICIAL PHOTOSYNTHESIS

The method of gathering and storing energy from sunlight is known as artificial photosynthesis.

SOLAR POWER TRAIN

Byron Bay developed and built a solar-powered train that runs entirely on renewable energy. The train has 100 seats and goes 3 kilometers. This technique is expected to be beneficial in cities with rail systems, especially as transportation is responsible for some of the highest levels of carbon emissions in many regions.

BIOFUEL

By Noela Sarwar, Grade 9

BIOFUEL - THE FUTURE OF RENEWABLE ENERGY ?

Firstly, let's understand what biofuel is. Biofuel is a kind of combustive fuel which is sourced from biomass meaning plants, algae material or waste animal materials. You may be familiar with any biofuels such as wood,biogas,biodiesel,methanol,ethanol,etc.

They work like fossil fuels, they burn when ignited, releasing energy that can be converted to motion in a car, or heat for a house. The only difference between them and fossil fuels is that they can be renewed more quickly guaranteeing a better stability for our energy consumption in the future while also being sustainable for the environment.

Whenever we think of renewable energy, we are 90% convinced that it should be implemented and researched more about, being a pillar for saving the environment, but usually the only obstacle that hinders our belief in it are the prices.

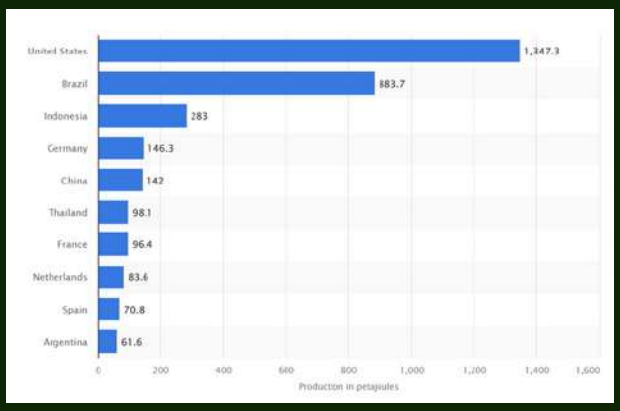
Renewable energy is really expensive to produce and bring to the market, but this is where biofuels take the spotlight.

They are becoming cheaper day by day as industries all over the world are competing with oil in the U.S market. And to do that, they are being made cheaper.
Energy Departments are spearheading research to develop crops that produce more biofuel, which will lower costs.

Biofuels are efficient as the follows:- Biodiesel provides 93% more usable energy than the fossil energy needed for its production, reduces GHGs by 41% compared with diesel, reduces several major air pollutants, and has minimal impact on human and environmental health through N, P, and pesticide release. Their efficiency is incredible for a resource that also promises a low-carbon intensive environment.

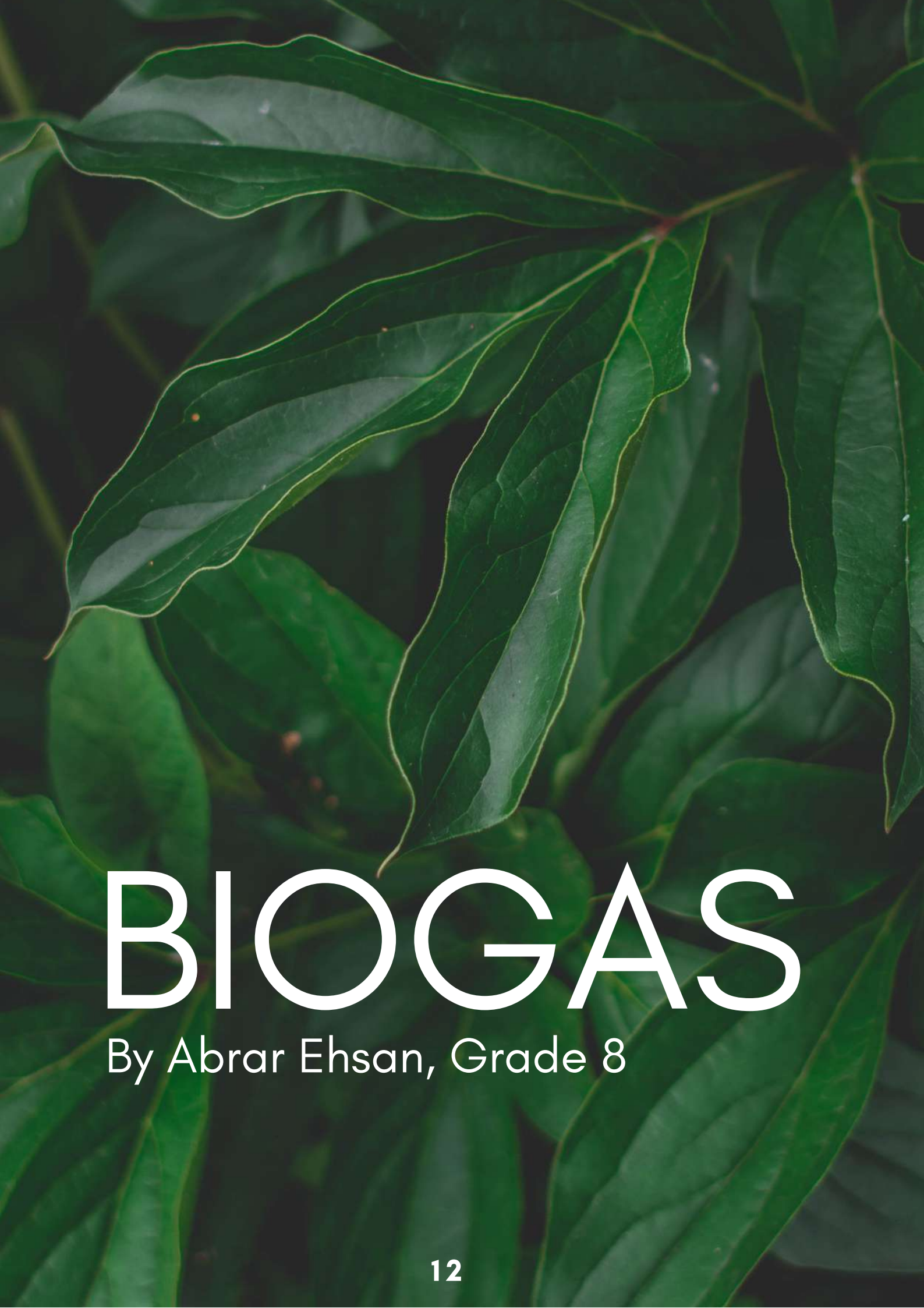
But one disadvantage could be that it needs huge amounts or irrigation as a huge percentage of water is being invested in the production.This could lead to a water crisis for other purposes other than this project. It is however very reliable if the Water Conservation Project is activated before the mainstream production of biofuels. In that way we'll have control of the raw material and considering the world is already on their feet for water conservation and the awareness is positive, it gives us a ray of hope for the future.

In 2020, USA used the most biofuel upto 1347.3 petajoules, after that Brazil rounded to 900 petajoules, Indonesia 283 petajoules, Germany 146.3 petajoules and China 142.
Around 10% of the world use biofuels. 9.1% of world total primary energy in 2017 was supplied by biofuels and waste, and almost all (92.4%) was produced using solid biofuels.(The remaining 8% was supplied by liquid biofuels, biogases and waste). 4.6% out of the 10% is used to power world electricity.
Since a positive number of the world is already using Biofuels, and it has a minimal disadvantage practically when coming to production, theoretically it can replace fossil fuels, if only as mentioned above, the water crisis problem is solved beforehand.



Finally, there are discussions that this energy would hinder food production. This is however debatable as that will occur only if biofuel is the only reliance of renewable energy in this world and produced in huge masses. Although it is something that should be more implemented, there will be a lot of other renewable energy sources to cover up the energy consumption needs so biofuels don't have to cover up as much as they would need to, resulting in a crisis. If the plan of renewability is balanced and researched in collaboration with other sustainable resources, food production won't be an issue.

There's a popular proverb that nature has provided us with the solution before the problem. If we really have the solution in our hands in such abundance, why not use biofuels?



BIOGAS

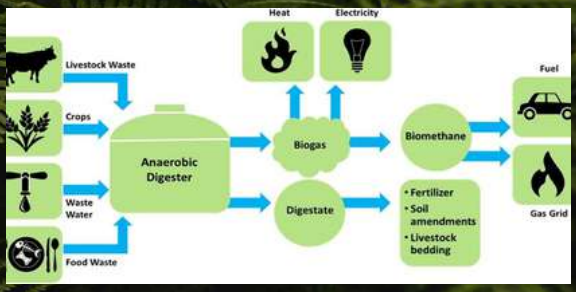
By Abrar Ehsan, Grade 8

BIOGAS

Biogas is a mixture of gases, primarily consisting of methane and carbon dioxide, produced from raw materials such as agricultural waste, manure, municipal waste, plant material, sewage, green waste, and food waste. Biogas is produced by anaerobic digestion with anaerobic organisms or methanogen inside an anaerobic digester, biodigester, or bioreactor. Biogas is primarily methane and carbon dioxide and may have small amounts of hydrogen sulfide, moisture, and siloxanes.

Biogas plants rely on anaerobic digestion, a fermentation process in which waste is digested by microbes to produce methane gas. The waste can be converted into bio-fertilizer and spread directly onto fields, or the biogas itself can be used interchangeably with natural gas as fuel.

Biogas is produced by anaerobic (anoxic) digestion of organic matter such as sewage sludge, animal waste, and municipal solid waste (MSW). During the 30-day fermentation period, 80-85% of biogas is produced in the first 15-18 days. Biogas production can reduce the potential for contamination of wastewater by reducing the oxygen demand for organic matter.



The technology used to produce biogas is relatively cheap. It's easy to set up and needs little investment when used on a small scale. Small biodigesters can be used right at home, exercising kitchen waste and beast ordure.

Biogas is a renewable and clean energy source. Gas Biogas produced by biodigestion is a renewable and clean energy source. The gas produced by biological digestion is environmentally friendly. It actually reduces greenhouse gas emissions.

Methane is the main gas of biogas. Methane is also the main component of natural gas, which is a fossil fuel. Biogas can replace natural gas in many applications such as cooking, heating, steam generation, power generation, vehicle fuel, and pipeline gas.

Laboratory experiments have shown that pretreatment with ammonia can increase methane production from fertilizer fibers by more than 200%. Testing in a pilot plant brings this method closer to large implementation. Which can make it more efficient.

The most countries which use the most biogas are China, the United States, Thailand, India, and Canada. The share of biogas was 14%. In 2018, Asia will account for 38% of the world's bioenergy production, with 243 TWh production, followed by Europe with 35%. Electricity-only plants are designed specifically for power generation.

THE LARGEST BIOGAS POWERPLANTS

Nature Energy Korskro biogas plant, Denmark

Mexico City waste-to-energy plant, Mexico

C2e Renewables North Carolina, US

Jordberga Biogas plant, Sweden

Diageo's on-site biogas plant in Speyside, Scotland

THE LARGEST BIOGAS POWERPLANTS

DONG Energy's biogas plant in Manchester, UK

Nijhuis Industries Biogas plant, Ukraine

Agro-industrial biogas plant, Spain

Be'er Tuviya plant, Israel

THE LARGEST WIND POWER PLANTS

By Namila Anwar Beg Samanza, Grade 6

As we know, Wind energy is one of the fastest-growing sources of renewable energy in the world. The global wind energy market has nearly quadrupled in size over the past ten years. Well, there are many large wind power plant farms around the world. Let us have a look at them.

01 Gansu Wind Farm

"The Gansu Wind Farm '', also known as the "Jiuquan Wind Power Base", is located in the west of Gansu province in China, on the borders of the Great Gobi Desert. With a planned capacity of 20GW, it is the world's largest wind farm. As soon as the farm is completed, it will be home to more than 7,000 turbines and will produce sufficient power to power a small country.

02 Alta Wind Energy Centre (AWEC)

The "Alta Wind Energy Centre", also referred to as the "Mojave Wind Farm". It is situated in the Tehachapi Pass of the Tehachapi Mountains, in Kern County, California. It has a viable dimension of about 1550MW and is also one of the largest wind farms in the United States. Initially developed by "Terra-Gen Power", an associate of "ArcLight Capital Partners" and "Global Infrastructure Partners" , the farm supplies approximately 1500 MW to Southern California Edison, the component of a 25-year power purchase agreement.

03 Muppandal Wind Farm

The "Muppandal Wind Farm'' is located in the Kanyakumari district of India, it is one of the largest operational wind farms in the country. Operated by the Tamil Nadu Energy Development Agency, it has a total installed capacity of 1500MW.

04 Hornsea One

Hornsea One, with a total capacity of 1.2 GW, is also one the largest offshore wind farms in the world. It was also the first offshore wind farm in the world to outstrip 12 GW in capacity. Located off the Yorkshire coast, it covers about 407 square kilometres and fringes 174 Siemens turbines, each with an individual capacity of 7 MW.

05 Jaisalmer Wind Park

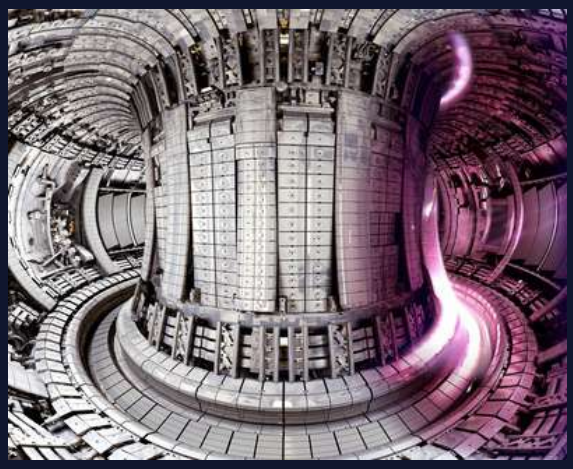
The Jaisalmer Wind Park, located in the Jaisalmer district, Rajasthan, in Western India, is the second-largest wind farm in India, with a capacity of 1,064MW. The project, developed by Suzlon, was initiated in August 2001 and reached its current capacity in April 2012.

NUCLEAR FUSION

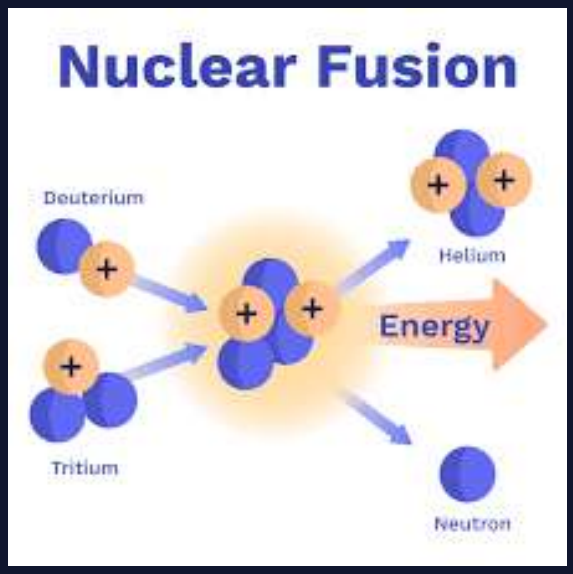
By Parikshit Singh, Grade 8

NUCLEAR FUSION

Non-renewable sources of energy are slowly coming to an end, our world is gradually running out of fossil fuels. Earth has been polluted by the use of fossil fuels more than over the past 200 years. In order to present a solution to this problem, scientists have explored various other sources of energy like wind, solar, nuclear, hydroelectric etc. All of these sources have been extremely helpful towards the contribution of running the world entirely through green energy. Fossil fuels being redacted from our environment also results in decreased pollution which slows down global warming and can give our planet access to a viably longer lifespan. One of the most prominent examples of the renewable, clean and green forms of energy is Energy production from Nuclear Fusion.



Nuclear Fusion is the way through which the Sun and all the stars in the universe are powered and supported. In layman's language, it uses the energy in Hydrogen as well as Helium and powers it up to an even larger level. It occurs at a very high temperature. It is a very advanced procedure and only some people have been able to achieve it. According to multiple scientists' predictions, if they are able to master Nuclear Fusion, basically in easy words, unlimited amounts of energy can be transferred from the hydrogen and helium atoms into electricity, heat and many other forms of energy.



NUCLEAR FUSION

Nuclear Fusion was first officially carried out on 1 November 1952, in the Ivy Mike hydrogen (thermonuclear) bomb test. Mark Oliphant first discovered the concept of Nuclear Fusion based on Einstein's theory of e=mc^2. In simpler terms, this equation states that energy (e) and mass (m) are the same structural part of a main body and are interchangeable. As mentioned earlier, Hydrogen and Helium are needed for successful Nuclear Fusion, but there is a catch to it, normal hydrogen would not work and needs a special type of neutron to successfully achieve Nuclear Fusion. These neutrons are known as Deuterium and Tritium respectively. Unfortunately, Tritium is extremely rare on earth. However, a possible substitute for Tritium would be Helium-3, an isotope of helium. This isotope is also rare on Earth but is (assumably) abundant on Moon. So, instead of creating it manually on Earth, we can mine it easily on the moon.

If we achieve this goal, one glass of seawater would be equivalent to the power of 1 barrel of oil. Even if Nuclear Fusion faces a failure in one of its reactions, it won't be as catastrophic as compared to failures of other forms/sources of energy. Tritium leaks can be detected and be diluted immediately.

Modern-day tech giants and geniuses like Bill Gates and Elon Musk are also looking forward to funding better facilities being made for Nuclear Fission among many other governments, private investors, companies etc. The youngest person ever to achieve Nuclear Fusion was Jackson Oswalt from the USA. He achieved this feat at the naive and simple age of 12 and also won a Guinness World record for it. Kudos to him!

Ivy Mike Bomb Test
The First Official Nuclear Fusion

JACKSON OSWALT
The youngest person to achieve nuclear fusion

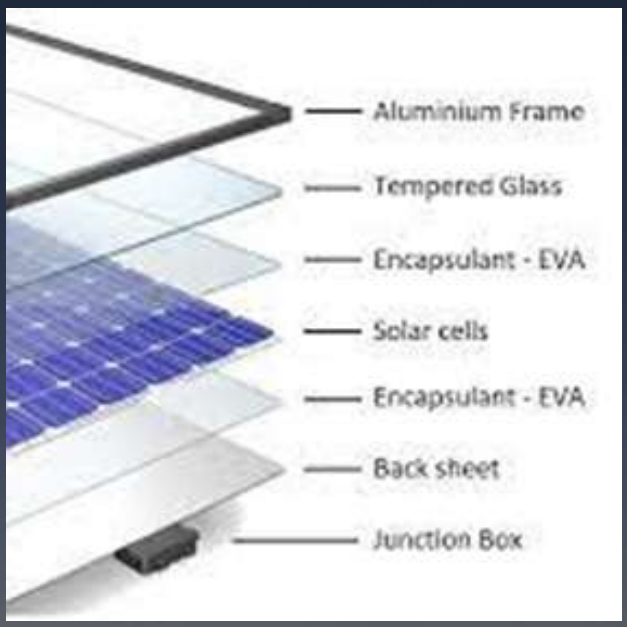
SOLAR ENERGY

By Abiyan Haque, Grade 8

Solar panels crown rooftops and roadside signs, and help keep spacecraft powered. But how do they?

Simply put, a solar panel works by allowing photons, or particles of light, to knock electrons free from atoms, generating a flow of electricity, according to the University of Minnesota Duluth. Solar panels actually comprise many, smaller units called photovoltaic cells — this means they convert sunlight into electricity. Many cells linked together make up a solar panel.

Each photovoltaic cell is basically a sandwich made up of two slices of semi-conducting material. According to the Proceedings National Graduate Conference 2012, photovoltaic cells are usually made of silicon — the same stuff used in microelectronics.



To work, photovoltaic cells need to establish an electric field. Much like a magnetic field, which occurs due to opposite poles, an electric field occurs when opposite charges are separated. To get this field, manufacturers "dope" silicon with other materials, giving each slice of the sandwich a positive or negative electrical charge.

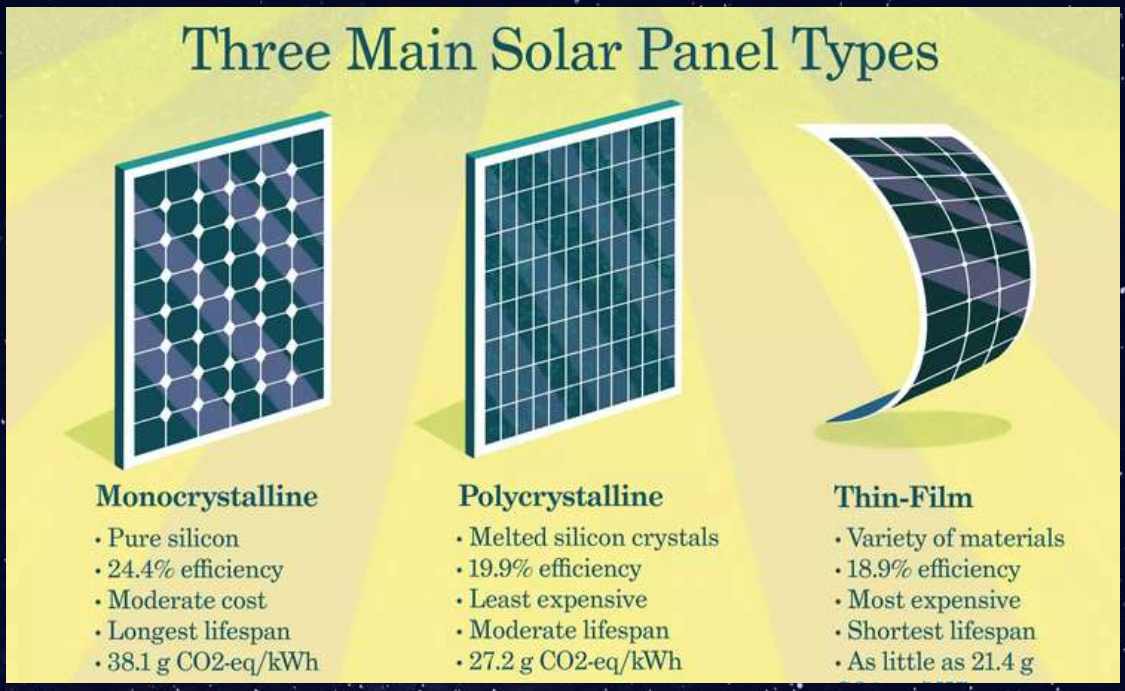
Specifically, they seed phosphorous into the top layer of silicon, according to the American Chemical Society, which adds extra electrons, with a negative charge, to that layer. Meanwhile, the bottom layer gets a dose of boron, which results in fewer electrons, or a positive charge. This all adds up to an electric field at the junction between the silicon layers. Then, when a photon of sunlight knocks an electron free, the electric field will push that electron out of the silicon junction.

A couple of other components of the cell turn these electrons into usable power. Metal conductive plates on the sides of the cell collect the electrons and transfer them to wires, according to the Office of Energy Efficiency and Renewable Energy (EERE). At that point, the electrons can flow like any other source of electricity.

Researchers have produced ultrathin, flexible solar cells that are only 1.3 microns thick — about 1/100th the width of a human hair — and are 20 times lighter than a sheet of office paper. In fact, the cells are so light that they can sit on top of a soap bubble, and yet they produce energy with about as much efficiency as glass-based solar cells, scientists reported in a study published in 2016 in the journal Organic Electronics. Lighter, more flexible solar cells such as these could be integrated into architecture, aerospace technology, or even wearable electronics.

There are other types of solar power technology — including solar thermal and concentrated solar power (CSP) — that operate in a different fashion than photovoltaic solar panels, but all harness the power of sunlight to either create electricity or to heat water or air.

WHAT ARE THE 3 TYPES OF SOLAR PANELS?



Ninety percent of the photovoltaic solar cells used in the world are made of silicon, and 95% of those installed in residential settings are silicon-based.

There are 3 types of solar panels primarily used in the solar industry:

1. Monocrystalline solar panels
2. Polycrystalline solar panels
3. Thin film (amorphous) solar panels

These 3 types of panels are used for 4 main types of solar energy:

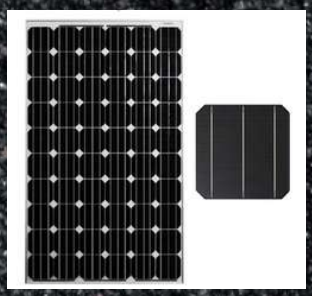
1. Electric Systems
2. Water Heating
3. Pool Heating
4. Concentrated Power
5. Monocrystalline Solar Panels

3 MAIN TYPES OF SOLAR PANELS

01

Monocrystalline solar panels

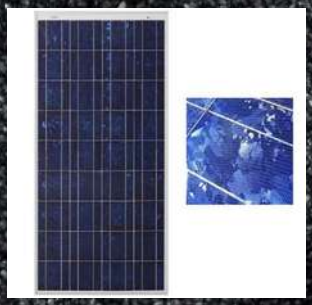
They might best be remembered and described by their sometimes-used alternate name, single crystalline panels. Mono panels, as they are commonly referred to in the solar industry, are the most efficient because they are the purest, made of a single silicon ingot using the Czochralski method.



02

Polycrystalline Solar Panels

Once again, the alternate name for polycrystalline solar panels, multicrystalline, helps to describe its composition. Poly panels, as these solar panels are referred to in the alternative energy business, are multiple pieces of silicon that are melted, treated, and molded into uniform rectangles.



03

Amorphous (Thin Film) Solar Panels

The least expensive, and also the least efficient, solar panel option is thin film. Thin film solar panels are made from a photovoltaic substance that is applied to a substrate like glass.

WHAT YOU SHOULD CONSIDER WHEN CHOOSING TYPES OF SOLAR PANELS

Now that you have a little more information about the 3 types of solar panels, how do you decide? Here are some things you should consider:

- Space available for installation
- Environmental conditions
- Amount of shade
- Cost per watt
- Storage requirements
- Possibly, country of origin, if that is an issue on your radar.

HOW TRANSPORTATION IS BECOMING GREENER

By Imad Fawaz Ayaan, Grade 8

Transportation is a part of daily human life. Through transportation, we can travel from one place to another, whether that is to school, work, or any other places. With that being said, what effect does it have on our planet? Transportation vehicles like cars, buses and trains contribute to about one-fifth of carbon dioxide emissions. This causes things like air pollution, which leads to global warming. Moreover, using these transportations that burn fuel isn't good for humans, since it might cause health issues.

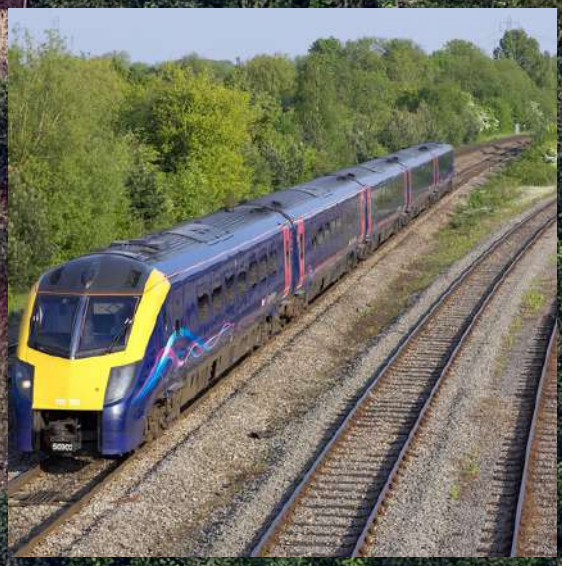
Over the years, scientists have been trying to develop a solution to put a stop to these harmful means of transportation. This is where green transportation comes in. These transport modes rely on sustainable and renewable energy sources such as solar, hydroelectric, wind and biomass energy. What makes green transportation so useful is that it relies on energy sources that will never run out, instead of non-renewable sources like fossil fuels.

As new inventions and technological advances are still in progress, responsible citizens should try to make the best out of what they already have. Simple solutions include walking or riding bicycles to nearby destinations, since they have no impact on the environment. There are more advanced vehicles, like electrical cars or green trains. When it comes to electrical cars, Tesla is one of the most popular manufacturers of such cars. These cars use clean energy, which can produce power for the

car to run on without harming the environment. For the same reason, green trains have increased in production. China's bullet trains are completely powered by electricity, and there are trains in London that use solar panels to power themselves with solar energy.

Some may ask, what's the point of introducing eco-friendly vehicles in the first place? Well, besides the aforementioned points, these renewable energy source reliant transportations bring benefits to both the environment and people. For starters, it significantly reduces environmental pollution due to less fossil fuels being burned. Switching to renewable energy sources for transportation also saves money in the long run, since people wouldn't have to keep spending money on fuel if they just got a solar powered car, for example. Manufacturing more green vehicles will also open up for job opportunities and will lead to a sustainable economy. Lastly, since these green vehicles won't produce any harmful gases, human health will improve.

In the end, green transportation is being developed by manufacturers to serve the entire world. It's a great initiative to reduce our carbon footprint so that we can look forward to a healthier environment. This kind of clean energy can help us deal with the shortage of non-renewable energy sources in the future and can even fully replace it. The future is counting on clean energy to replace our daily lives.



FORMULA-E

By Jawadul Islam (Salvin), Grade 12

THE WORLD OF FORMULA-E

AN INTRODUCTION

WHAT IS FORMULA E?

Formula E is the eco-friendly brother of Formula 1. It is the next exciting motorsport competition whose main mission is to promote sustainability, electric vehicles, and the reduction of carbon footprint of Earth all under the name of racing.

HOW DID FORMULA E START OUT?

Like every genius innovation that has come to the light of Earth, Formula E's beginnings could be traced back to just a simple idea in 2011.

It was a cold evening on the 3rd of March 2011, when FIA president Jean Todt and the future Formula E chairman Alejandro Agag met in a Paris restaurant. They discussed on the idea of introducing a new motorsport competition, one where not a single greenhouse gas would ever be emitted. As they discussed about this, a question developed. What if they could replicate Formula 1 into a more eco-friendly version? Maybe call it Formula E? As the discussion got more interesting, Jean Todt rushed to get a paper napkin. Reaching for a pen in his pocket, he jotted down all these ideas that were rushing through the pair's minds.

The ideas that were jotted down from a casual conversation would soon be translated into reality. Along the years, Formula E has gone from strength to strength, with some of the world's fastest electric cars racing in the most famous cities of the world, from the city of love, Paris, to the city that never sleeps, New York!

Formula E has helped ushered in a new era of electric vehicles, and has revolutionized the automobile industry, making the world's biggest automobile companies of the world shift their focus to developing more sustainable and environment friendly vehicles. It has also helped raise awareness to global audiences around the world on the drastic effects of climate change, and what happens if we don't take action.

The 2018 Jaguar Formula E Racing Car

How Air moves in a Formula E car

THE AERODYNAMICS

All Formula E cars are designed the same. They have the same front wing, the rear wing, chassis and many other things. While the design may be the same, it's worth looking at what makes these cars go so fast

THE FRONT WING

The front wing is one of the most important parts of the car. It determines how the air is going to behave as it goes through the car. The front wing is designed to produce as much downforce as possible, as downforce makes it possible for cars to have more grip.

The Front Wing

THE REAR WING

The rear wing determines the top speed of a car. Suppose a car is racing down a very long straight, the rear wing will be kept at flat as possible to reduce any possible drag and allow the car to reach the highest speed possible.

Now suppose the car is racing on a track with a lot of corners. Now, the rear wing will be at the highest angle possible, as this will produce a lot of drag force, allowing the car to slow down as it races through a corner.

The rear wing is ultimately what decides the speed of a car, and produces the necessary drag force for it to slow down.

The Rear Wing

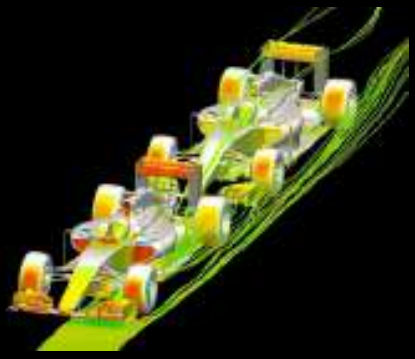
SLIPSTREAM & DIRTY AIR

WHAT IS SLIPSTREAM?

Imagine an object moving through air. As it moves, the air is going to be displaced, which creates a region of lower pressure behind it. The air around the object will move to fill that region of lower pressure. This is why you feel wind blowing when someone runs past you.

This same concept can be applied to racing cars. When a car travels through air, it is displaced, hence leaving a region of lower pressure behind it. When another car is behind the car that displaces the air, it benefits from the reduction of air drag, allowing the car behind to accelerate quicker and overtake the car in front.

This is what is known as slipstream. It works when a driver gets close to the rear of the car in front to benefit from drag reduction and obtain significant straight line speed!



A diagram on how slipstream works

WHAT IS DIRTY AIR?

As air passes over a Formula 1 car's surfaces it produces a wake of turbulent air that hampers the aerodynamic flow of cars directly behind it. This wake – nicknamed 'dirty air' – can be of benefit to a following car on the straight, as the car in front is effectively punching a hole in the air and doing more work.

Dirty air does, however, hamper the efficiency of the following car's own aerodynamic surfaces, reducing downforce, making it slower in the turns, and limiting the effectiveness of the cooling system.

A diagram on how Dirty Air works

THE WORLD OF FORMULA-E

HISTORY

HOW HAS FORMULA E CHANGED OVER THE YEARS?

While the Formula E Championship is just seven seasons old, the on-track technology is ever-evolving and has undergone revolutionary changes in that six-year spell. It has come a long way since its debut in 2014!

SEASON 1

Concept to reality in less than a year. The prototype laid the groundwork for Gen1 in 2012.

The Gen1 car harboured battery-electric technology that had never been tried on a race track. Two cars per driver balanced the need for battery capacity and speed, for the best possible racing on-track.

The inaugural calendar brought Formula E to fourteen countries and racing in the heart of major cities around the world including London, Miami, Beijing and Berlin.

Nelson Piquet Jr. took to the top step twice for China Racing/NEXTEV TCR to claim the first Formula E Drivers' title.

SEASON 4

Season 4 welcomed ABB as title partner of Formula E, as the global technology company and the championship came together to drive progress at the forefront of electrification and sustainable technology.

Sam Bird flew out of the blocks for victory on the return to Hong Kong a the opener, whilst Felix Rosenqvist added a pair of wins to his tally for Mahindra Racing in Round 2

Audi's first victory came in Mexico City, at the hands of German driver Daniel Abt and he would add another in spectacular style on home soil in Berlin

WHAT IS ATTACK MODE?

Attack Mode is a temporary power boost used in all Formula E races by all drivers. The power boost is equivalent to an increase of 35 kW, which the drivers must manually initiate by pressing a button on their steering wheel.

To fire up ATTACK MODE, drivers will need to arm their car, drive off the racing line, and through the Activation Zone. It's only here that they'll be able to collect an extra 30 kW of power - raising their total to 250kW. Drivers that secure the extra speed, can use it for a few laps when they want to race harder, giving them the edge to keep ahead

Attack Mode allows drivers to get extra power and accelerate faster than their competitors

FUN FACTS

Formula E is electrifying in more ways than one! The thrilling, high-speed sport is the world's first fully-electric racing championship. What's more, these precision-made motors zoom across the track at speeds of up to 280 kmph. Whoosh!

- The first Formula E race took place at the Beijing Olympic Green Circuit on 13 September 2014. Envision Virgin Racing Driver, Sam Bird became the first Formula E driver to win a race in every Formula E season, after winning the 2019 Santiago ePrix.

Sam Bird, the winner of the first race of Formula E

- The cars are made from super high-tech material like carbon fiber, aluminum and Kevlar. These lightweight materials mean that a car, including the driver, only weighs about 800kg, which helps them accelerate to speeds of 100kmph in 2.8 seconds!
- The new Formula E cars with their 250kw motors are able to go from 0-100km/h in just 2.8 seconds which also compares very nicely to the Formula 1 cars doing the same in 2.4 seconds.

A Formula E Powertrain

Formula E is a super exciting race and fun for drives, teams and fans alike. Electric vehicle technology is the future and events like these races only progress the technology and make it better for everyone. So if you have any interest in racing, give Formula E a watch and support this great futuristic sport!

EFFICIENT USE OF OUR CURRENT GREEN ENERGY

By Ahana Tajnim Khan, Grade 9

EFFICIENT USE OF CURRENT GREEN ENERGY

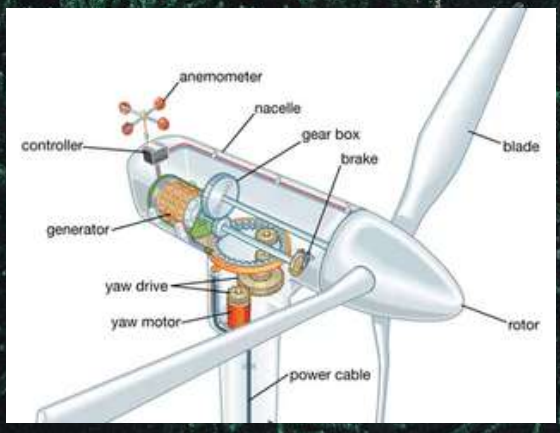
When it comes to energy efficiency, renewable energy is generally more efficient than non-renewable energy. The energy we get from wind, the sun, and hydro turbines can be reused without relying on an exhaustible or finite element.

THE MOST EFFICIENT GREEN ENERGY RESOURCE

Wind is generally labelled as the most efficient renewable energy as additional water and fuel aren't required, can be placed in open areas etc. Offshore wind speeds tend to be faster than on land. However, building increasingly large turbines requires greater investment of both money and resources, and intensifies the problem that turbines can only be productive in windy areas by making some turbines simply too large to operate in parts of the world. Distributed wind are smaller turbines that can be deployed in a greater range of locations and can involve individual people directly.

DEVELOPMENTS IN THE WIND ENERGY SECTOR

Apart from that, Halo's shrouded turbine can produce roughly twice the power of conventional turbines of the same size as it maximises its efficiency despite its limited size because of the static shrouds built around the three rotating blades, which create a fixed perimeter around the edge of the rotor sweep area, the space where the blades turn, effectively increasing the wind speed. New research suggests that vertical turbine design is more efficient than traditional turbines in large-scale wind farms.



DEVELOPMENTS AND IMPROVEMENTS ON THE TOP 3 MOST EFFICIENT ENERGY SOURCES AFTER WIND

GEOTHERMAL ENERGY

Five tips for maximizing the efficiency of our geothermal heat pump:

- Increasing ground loop size
- Choosing an open water well loop
- Cleaning our heat pump's heat exchanger
- Turning our buffer tank temperature down
- Changing our air filter

CPG could be used in many locations that do not have the correct underground reservoirs, expanding the geographic range of geothermal power generation. The excess energy (such as electricity generated from the sun or the wind) from renewable sources could be used to provide the energy needed to compress the CO2 sequestered from fossil fuel power plants, storing the waste renewable energy to be later recovered as geothermal energy.

HYDROELECTRIC ENERGY

Some of the most salient flexibility technologies under development are: stabiliser fins, an adjustable diaphragm installed in the draft tube cone, J-grooves, air injection/admission, axial water injection with high/low velocity and low/high discharge, tangential water injection at a cone wall, axial water injection with a counter-flow tangential component, ejector power plants for the excess flow rate, two-phase air-water injection along the axis, hydroelectric energy storage solutions, battery hybrids, and smart modelling and control solutions to increase unit flexibility and operating range.

NUCLEAR ENERGY

The best-known way to fully utilize nuclear fuel is to recycle or reprocess the waste produced in the fuel cycle (by using heat and other forms of energy generated by nuclear power plants as a by-product for seawater desalination, hydrogen production, district heating and various industrial applications). Gen IV reactors will also allow more efficient use of nuclear fuel.

LIST OF THINGS WE CAN DO AS INDIVIDUALS/A COUNTRY/AN ORGANIZATION

01 Small Wind Electric Systems at Home

In order to efficiently use this energy from home, small wind electric systems are one of the most cost-effective, if we have enough wind resources in our area and the situation is right.

02 Using Energy Efficient Light Bulbs

Using energy-efficient light bulbs and energy-efficient devices for lighting, heating, cooling, refrigeration, etc.

03 Rethinking the way we design buildings

Rethinking the way we design buildings, for example allocating specific buildings to feature solar panels and placing them in areas with optimum sunlight.

04 Energy Efficiency as a module topic in School

Including energy efficiency as a module topic in state schools so that students are educated about what it means to make the most of sustainable energy sources.

05 Energy efficiency policies from businesses

Businesses and organizations establishing energy efficiency policies so that customers are incentivized to support companies that use more sustainable, energy-efficient practices.

06 Being aware of energy use at home

Maintaining an awareness of the energy we use at home, switching off lights when we leave a room, only using heating and air conditioning when necessary, etc.

07 Switching to clean energy provider

Switching to an energy provider that uses clean, affordable, and renewable energy.

THANK YOU

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