Sustainable Homes powered by Blue and White Energy

ANNOOR MACHINES

Background

How did the team decide on this project?

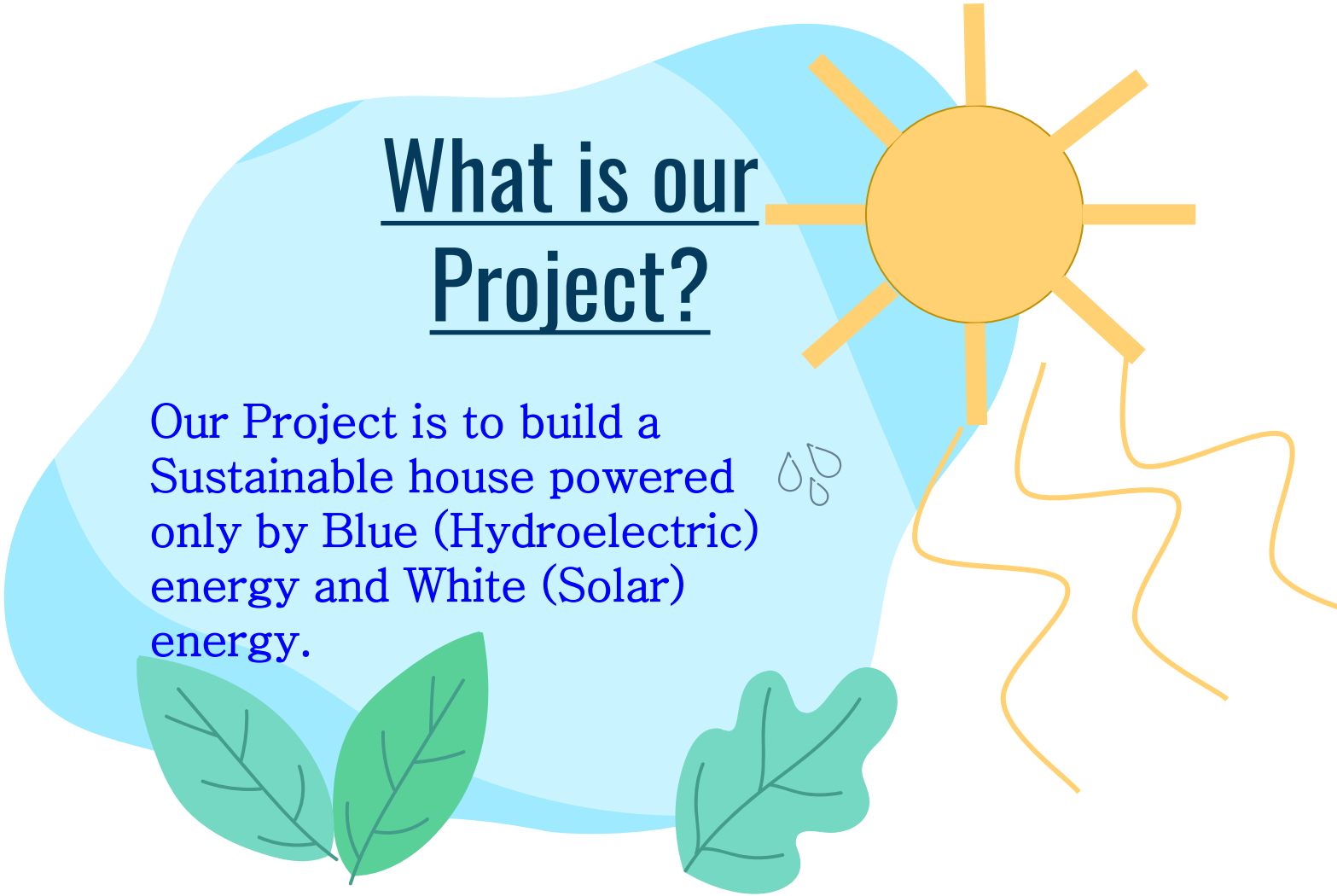
We all got together and talked about what types of energy we should use. We agreed that using renewable and clean energy (Like hydro and solar energy) would be better because of environmental benefits. Every member of our team then researched about solar and hydroelectric energy.

Our next question was, "How would we be able to apply this in a way it would benefit not only us but the environment as well?"

During our group discussion, we brainstormed our ideas and then voted on the idea we thought was best.

What is our Project?

Our Project is to build a Sustainable house powered only by Blue (Hydroelectric) energy and White (Solar) energy.



What is Hydroelectric energy?

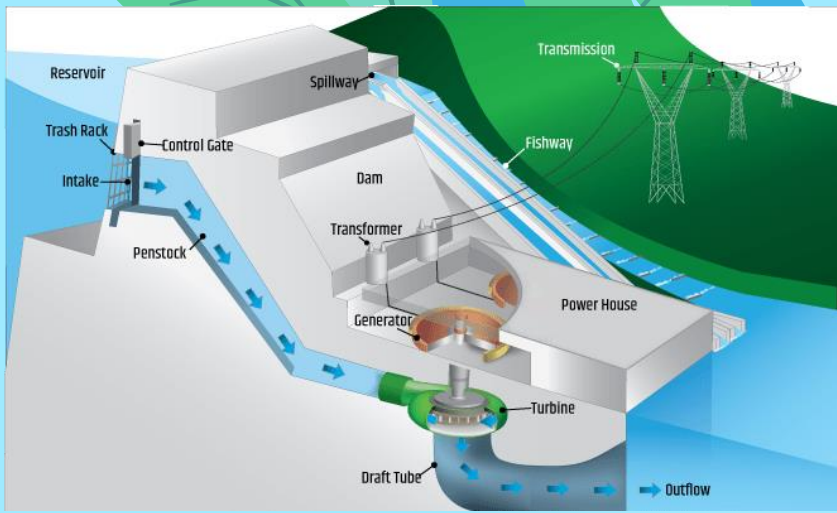
- Hydroelectric energy is energy that is generated by the motion of water to generate electricity.

- We learned that there are **Three Types of Hydropower Facilities.**

    1. Impoundment Facilities
    2. Diversion Facilities
    3. Pumped Storage Facilities

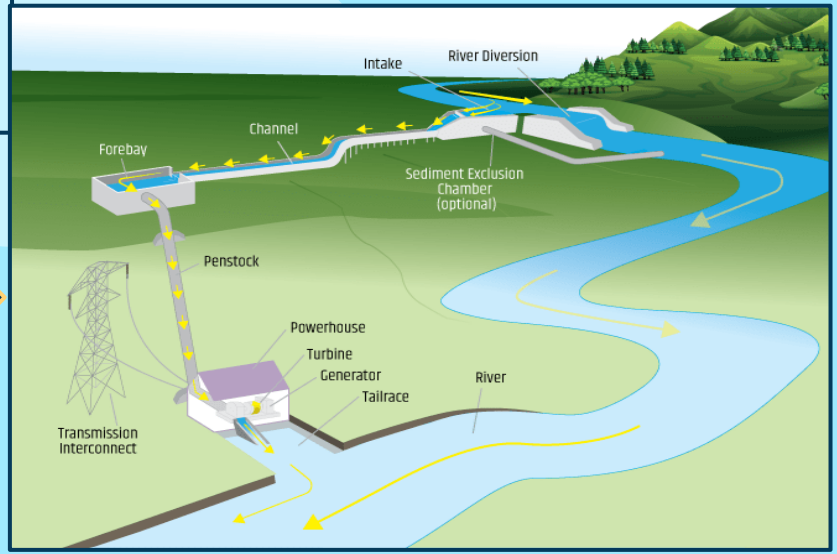
01 IMPOUNDMENT FACILITIES

Impoundment facilities are usually large hydropower systems that use dams to block a large running source of water (pools, Rivers) to create hydroelectric energy. Water from the large, running source of water travels through a trash rack (To filter the water) and into a turbine causing it to spin. This activates the generator to produce hydroelectric energy. Water may be released from a tube built under the turbine called a draft tube to release water for environmental benefits such as flood control, fish passage, and recreation.



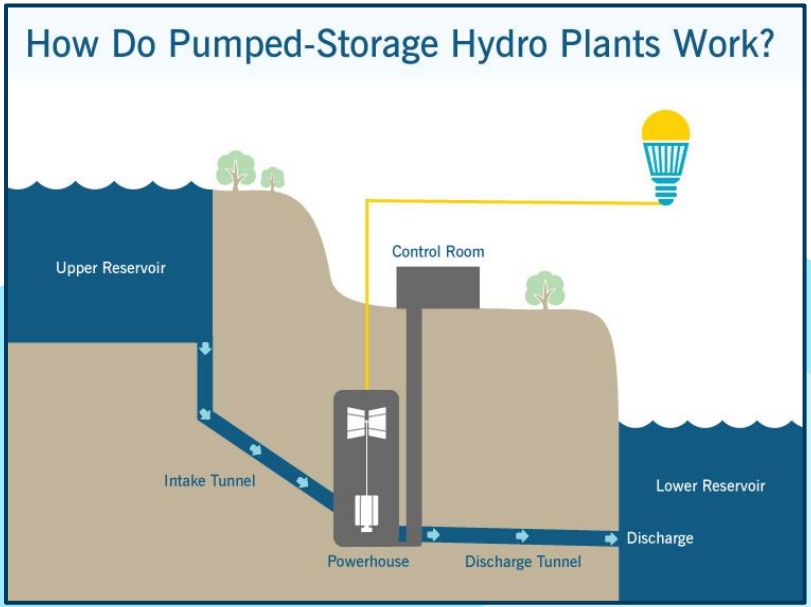
02 DIVERSION FACILITIES

A diversion Facility, or in other words, a “Run-of-River” facility, “channels a portion of a river through a canal and/or penstock to utilize the natural decline of the river bed elevation to produce energy.”



03 PUMPED STORAGE FACILITIES

A pumped storage facility (PHS), stores energy produced by other energy/power sources (solar, wind, and nuclear) to be used for later use. It works almost like a battery! They store energy by taking water from a lower elevated reservoir to a higher elevated reservoir.



WHAT IS SOLAR ENERGY?

Solar energy is any type of energy generated by the sun. Solar energy can be harnessed directly or indirectly for human use. These solar panels, mounted on a rooftop, harvest solar energy and convert it to electricity.

Five Reasons Home Solar and Batteries Is an Excellent Choice

1. Gives you control over your electricity. ...
2. Provides clean, renewable energy. ...
3. Increases home value. ...
4. Qualifies for tax breaks and cash incentives. ...
5. Costs have fallen.

What are the 4 main types of solar energy?

1. Passive solar gain.
2. Solar thermal (for heating)
3. Concentrated solar power (for electricity)
4. Solar Photovoltaics (electricity)

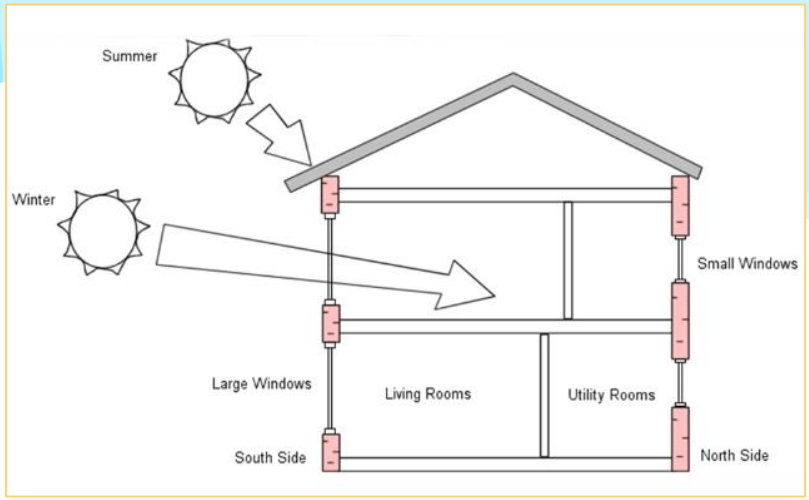
https://www.viridiansolar.co.uk/resources-2-0-different-forms-solar-energy.html

WHAT IS SOLAR ENERGY?

1. Passive Solar Gain

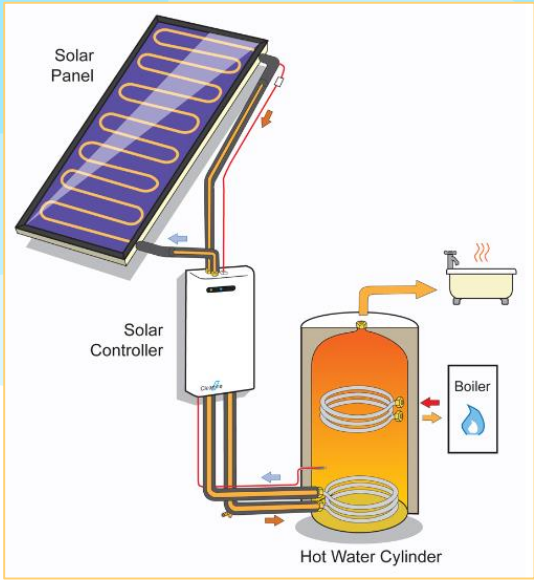
how passive solar gain works

This form of energy is often taken for granted; but can contribute a significant amount of the energy demands of a well-designed building in the heating season. Sunlight enters a building through windows, and warms the inside. In an average house in the UK, passive solar gain contributes 14% of the heating demand.



2. Solar Thermal

A solar thermal panel is simply a black surface that absorbs light, heats up and transfers the heat into a working fluid. It can be unglazed or glazed. Glazed panels can be flat, or made up of a collection of glass tubes. The working fluid moves the heat to a place where it is useful – perhaps a hot water store, swimming pool or directly to space heating for a building.



solar water heating system

WHAT IS SOLAR ENERGY?

3. Concentrated Solar Power
If the sun's rays are concentrated by mirrors, much higher temperatures can be created. The light is focused onto a central point with a carrier fluid such as oil flowing through it. The oil heats up to around 400C, hot enough to heat water and make high pressure steam that can drive a turbine and generate electricity.

concentrating solar system

4. Photovoltaic Solar
Photovoltaic (PV) cells, which convert light directly into electricity. The most common technology uses *thin wafers of silicon semiconductor materials, connected in series in a photovoltaic panel* or module.

The direct current (DC) electricity the solar PV panels produce needs to be converted to alternating current (AC) for grid-connected applications. A ***solar inverter*** performs this trick, enabling any energy generation in excess of local demand to be exported to the grid and used elsewhere.

https://www.viridiansolar.co.uk/resources-2-0-different-forms-solar-energy.html

PROBLEM ANALYSIS

The Main Problem: CLIMATE CHANGE

Over 99% of experts agree on the basic facts of climate change. It's real, it's human-caused, it's harming people now, but it's solvable.

WE'VE ALWAYS HAD EXTREME WEATHER, BUT HUMAN-CAUSED CLIMATE CHANGE IS MAKING IT A LOT WORSE.

- *Heatwaves are now longer, hotter, and more frequent.*
- *More of our rain comes in the form of torrential downpours that can lead to flooding.*
- *Hurricanes are stronger, intensify more rapidly, and deliver heavier rain.*
- *Wildfires burn larger areas and their season has expanded.*

Unless we stop emitting heat-trapping carbon pollution, these extreme events will keep getting worse.

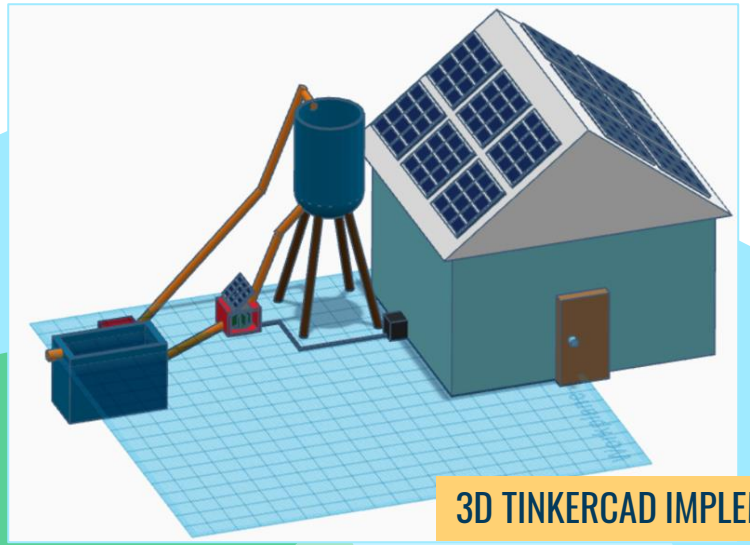
OUR PART OF THE SOLUTION: SUSTAINABLE HOMES POWERED SOLELY BY BLUE AND WHITE ENERGY

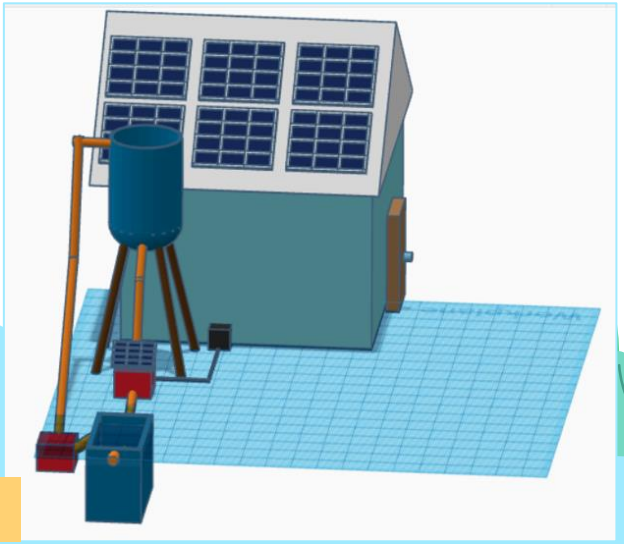
https://sciencemoms.com/the-facts/

Sustainable Homes powered by Blue and White Energy

OUR INNOVATIVE IDEA

Our idea is to design a sustainable home powered solely by solar and **our innovative *Mini Hydro Station*** powered by rainwater. Rainwater can be pumped back to storage using only excess solar power. The Mini Hydro Station will only be used as a standby power in addition to the battery banks.





3D TINKERCAD IMPLEMENTATION

COSTS & MANUFACTURING

A full solar system (approximately 20 solar panels) + installation ~ $15,000-$25,000

Water tank ~ $5,000

Water pump ~ $500

Turbine/Generator ~ $1,000

Water reservoir ~ $200

Pipes ~ $50

APPROX. TOTAL: **$32,000**

SHARING

Our school and community through our Robotics website: https://annoorrobotics.com/

SOURCES OF INFORMATION

Hydroelectricity/ Blue energy:

- https://education.nationalgeographic.org/resource/hydroelectric-energy
- https://fourearths.com/types-of-hydroelectric-power/
- https://www.energy.gov/eere/water/types-hydropower-plants

Solar/ White energy:

- https://www.seia.org/initiatives/about-solar-energy
- https://www.viridiansolar.co.uk/resources-2-0-different-forms-solar-energy.html

General:

- https://sciencemoms.com/the-facts/
- https://www.youtube.com/watch?v=Wk8_YpT11t0
- https://www.sciencedaily.com/releases/2016/10/161024090454.htm

TEAM MEMBERS

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Thanks!

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