17 SDGs- History, targets, implementation, Capacity Development.


1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

HISTORY

- The Sustainable Development Goals (SDGs) United Nations Conference on Sustainable Development in Rio de Janeiro in 2012. The objective was to produce a set of universal goals that meet the urgent environmental, political and economic challenges facing our world.

- The SDGs replace the Millennium Development Goals (MDGs), which started a global effort in 2000 to tackle the indignity of poverty. The MDGs established measurable, universally-agreed objectives for tackling extreme poverty and hunger, preventing deadly diseases, and expanding primary education to all children, among other development priorities.
- The 17 Sustainable Development Goals (SDGs) concern everyone: governments worldwide, civil society, the private sector, academia, and individuals. There has been some progress in recent years, but substantial challenges remain.

The 17 SDGs are in jeopardy

- Countries have been working since 2016 to translate the shared vision for fighting poverty and reducing inequalities into National Development Plans (NDPs). Achieving the 17 SDGs by 2030 requires a focus on the priorities and needs of the world's most vulnerable populations and countries.

- However, according to the latest report on the state of implementation of the SGDs, the2030 Agenda goals are in jeopardy – mainly due to ongoing and interconnected global crises: For example, the war in Ukraine, which is exacerbating food, humanitarian, energy, and refugee crises; as well as the impacts of the COVID-19 pandemic and climate change.

- https://www.welthungerhilfe.org/our-work/focus-areas/civil-society-and-advocacy/sustainable-development-goals

MODULE 2: Advances in Energy Systems and Sustainable Practices

- Energy is the capacity to do work. A plenty of energy is needed to sustain industrial growth and agricultural production.

CLASSIFICATION OF ENERGY

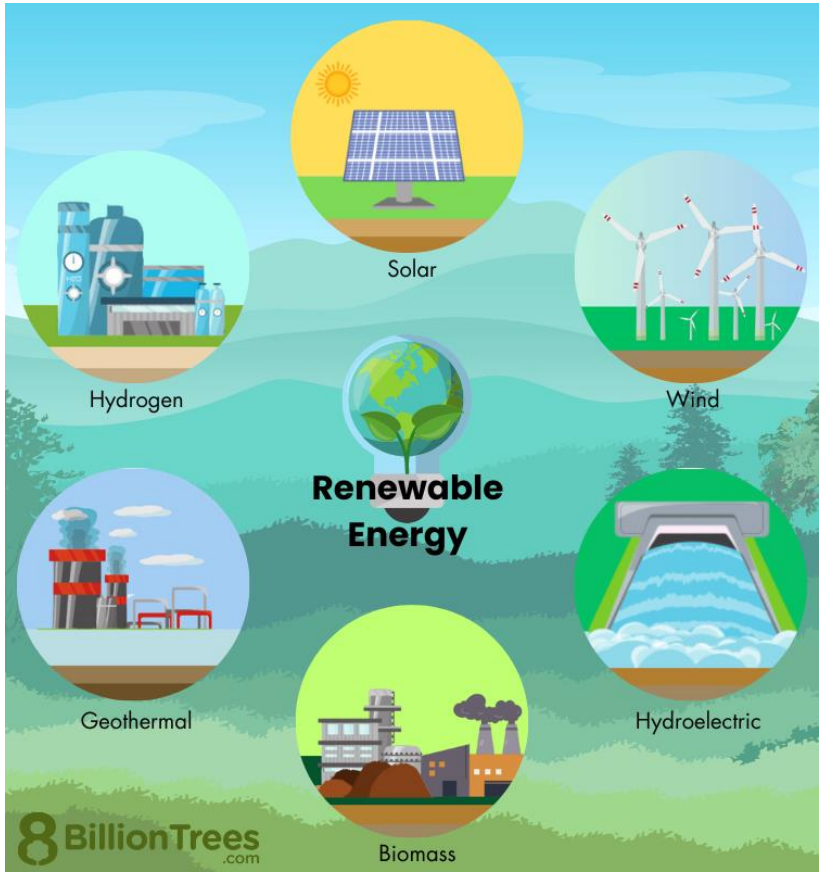
1. **Conventional energy**: is in practice for long duration of time and well established technology is available to tap and use them. e.g. Coal, oil, natural gas, hydro power, nuclear power etc.

2. **Non-conventional energy**: source can be used with advantage for power generation as well as other applications in a large number of locations and situations. These energy sources cannot be easily stored and used conveniently. e.g. Solar, wind, tidal and geothermal etc.

Based upon nature, energy sources are classified as

- 1. **Renewable energy** sources are inexhaustible and are renewed by nature itself. Solar, wind, tidal, hydro and biomass are few examples.
- 2. **Non-renewable energy** sources are exhaustible within a definite period of time depending upon its usage. Fossil fuels (coal, oil, gas) and nuclear fuels are few examples.

Renewable	**Nonrenewable**
1. sun	1. coal
2. water	2. natural gas
3. wood	3. petroleum
4. wind	4. nuclear fission
5. biomass	
6. geothermal	
7. ocean tides	



Solar Energy

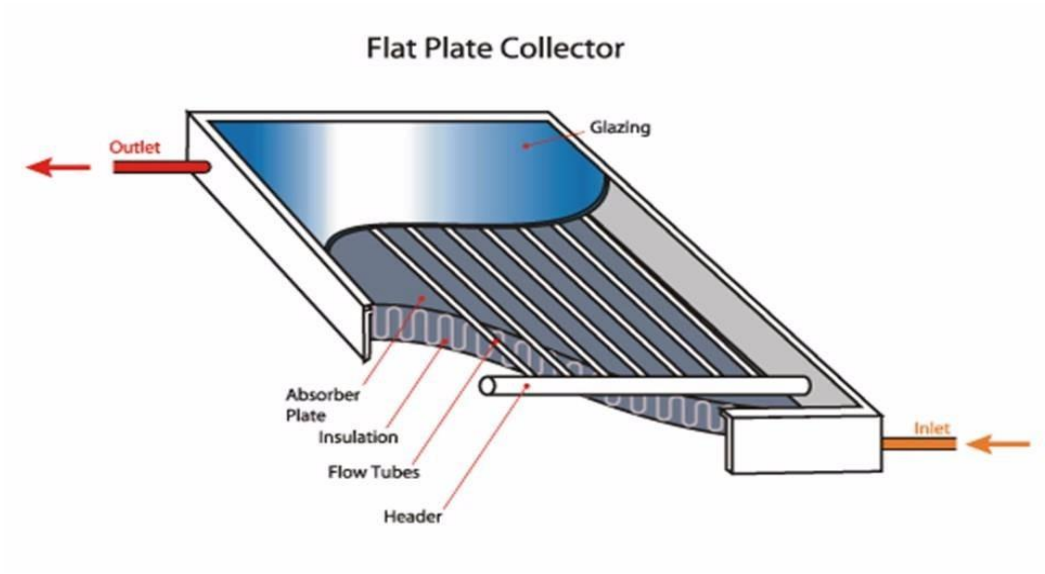
- The surface of the earth receives about 10^14 kW from sun in the form of solar energy which is approximately five orders of magnitude greater than that currently being consumed from all resources. There are two obvious obstacles to harnessing solar energy. Firstly it is not constantly available on earth. Thus some form of storage is needed to sustain solar energy through the night and during rainy season. Secondly the solar energy is diffused. Although the total amount of energy is enormous, the collection and conservation of solar energy into useful forms must be carried out over a large area which entails large capital investments. By using solar radiation, water or any fluid can be heated by using a solar collector. Such systems can provide hot water for different applications in industries directly or as boiler feed and also in hostels, hotels and canteens. There are two types of solar collectors in use:

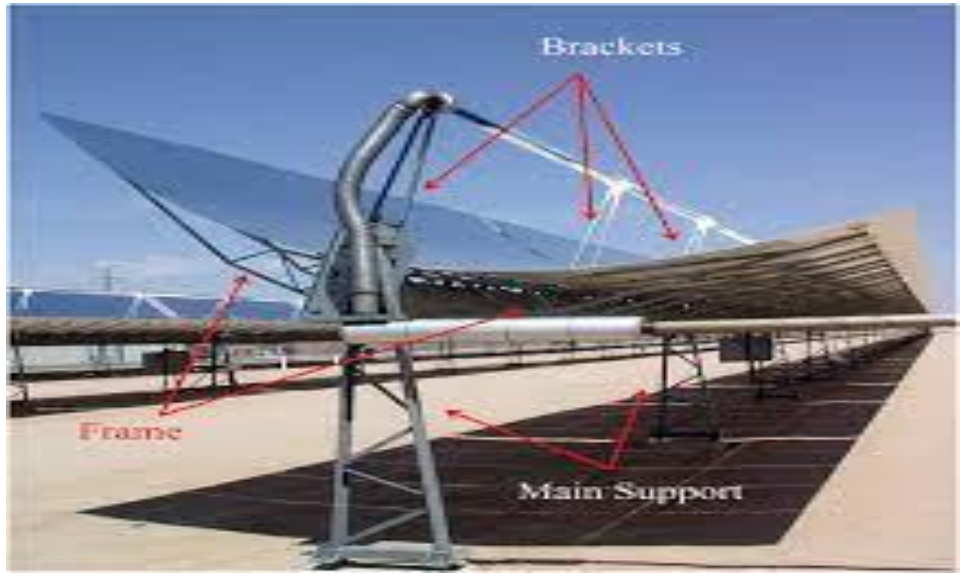
- **Flat plate collector:**

The absorber plate is metallic. It is usually coated black to absorb more heat energy. Tubes, passages or channels integral with the collector carry water or other working fluid. Insulation should be provided at the back and at the sides to minimize the heat losses. Usually glass wool is used as insulation material. A transparent cover (glass) will be provided at the top to permit the radiation from the sun to the metal plate.

- **Parabolic or concentrating collector**

Highly polished metallic surfaces are used as the reflector. The reflector will have a parabolic shape so that the sun rays striking the profile will be reflected on its focal point. If a tube carrying a fluid is kept along the focal line, the fluid will be heated to a very high temperature.





- **Advantages**

1. Renewable source of energy
2. Pollution free
3. After the capital cost, the cost of power generation is quite low
4. Wide range of applications, powering street lights to satellites

- **Disadvantages**

1. Capital cost is very high
2. Large area of land is required
3. Large number of solar panels are required
4. Affected by seasons

WIND ENERGY

- The electrical energy can be generated by wind energy by utilizing the kinetic energy of wind.

The wind energy which is an indirect source of energy can be used to run a wind mill which in turn drives a generator to produce electricity. Wind mills are classified into two types.

Horizontal Axis Wind Turbine

Horizontal axis wind turbines have the main rotor shaft running horizontally. Fig shows a schematic arrangement of a horizontal axis machine. This system consists of a tower mounted two bladed or multi bladed rotor facing the wind, rotating around a horizontal axis and turning an electrical generator. The Blades are generally made of composite material, usually fiber reinforced plastic (FRP) because of its high strength and light weight. Wind mills are manufactured with a capacity from a few kilowatts to several megawatts in Europe, the USA, and other parts of the world including India.

Vertical Axis Wind Turbine

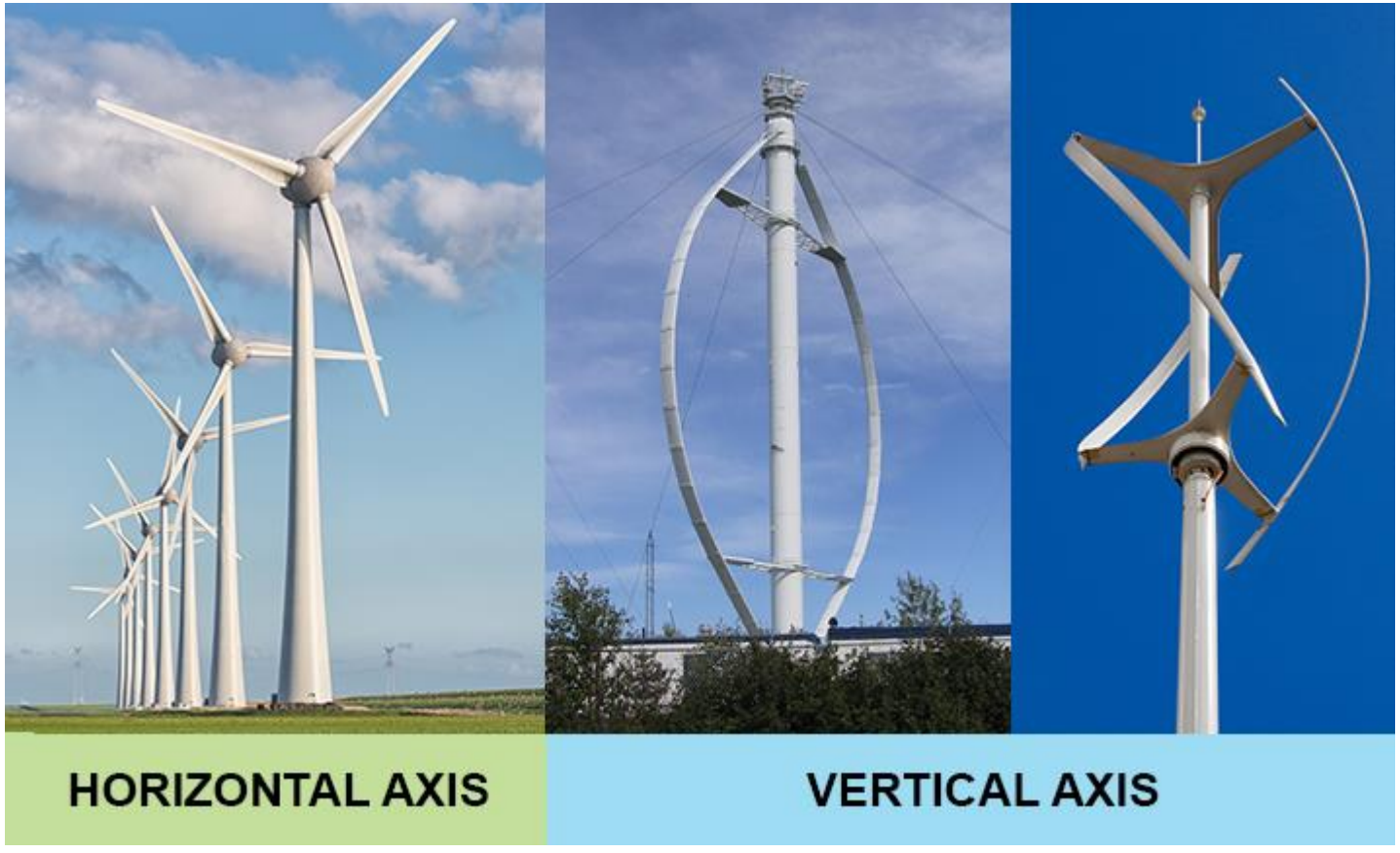
Vertical axis wind turbines have the main rotor shaft running vertically. The tower construction is simple here because the generator and gear box can be placed at the bottom, near the ground.

Advantages

1. Wind is Renewable and free of cost
2. Pollution free
3. Can be installed in remote villages, thus reducing costly transmission lines

- **Disadvantages**

1. Capital cost is very high
2. Large area of land is required
3. Maintenance cost is very high



TIDAL ENERGY

- The periodic rise and fall of water level of sea which are carried by the action of the sun and moon on water of the earth is called “tide”. The large scale up and down movement of sea water represents an unlimited source of energy. The main feature of the tidal cycle is the difference in water surface elevations at the high tide and at the low tide. If the differential head could be utilized in operating a hydraulic turbine, the tidal energy could be converted into electrical energy by means of an attached generator.

Tidal Power Plant

A Tidal power plant mainly consists of the following:

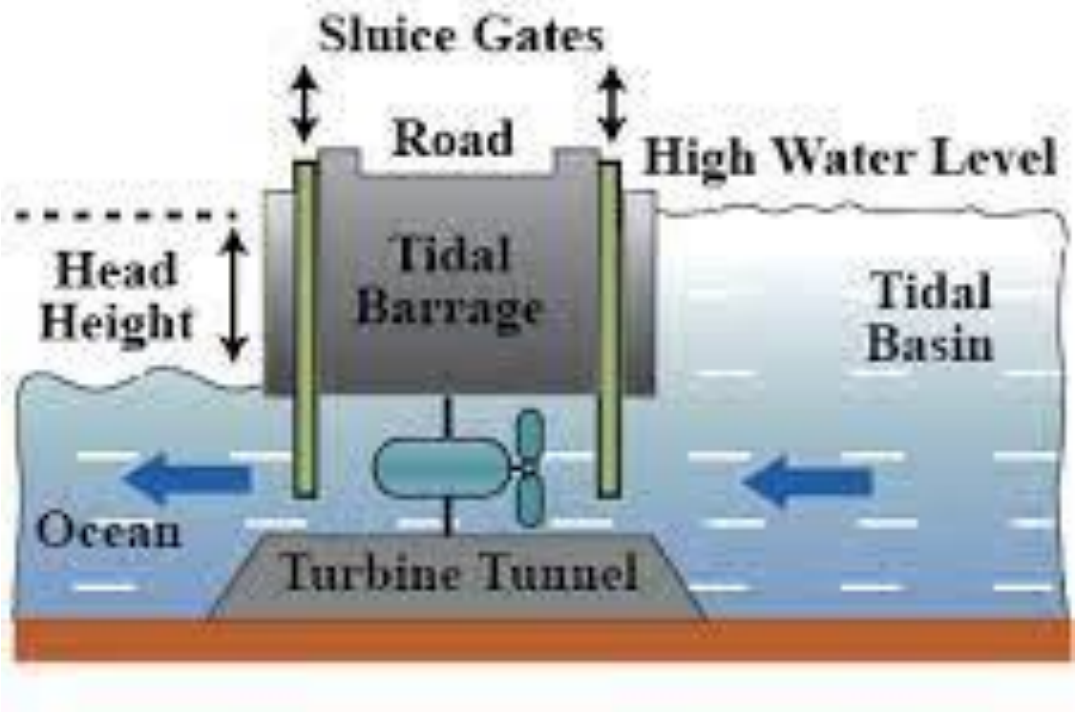
1. A barrage with gates and sluices

2. One or more basins

3. A power house

A barrage is a barrier constructed across the sea to create a basin for storing water. The barrage has to withstand the pressure exerted by the water head and also should resist the shock of the waves. A basin is the area where water is retained by the barrage. Low head reversible water turbines are installed in the barrage separating the sea from the basin. During high tide, water will flow from sea to tidal basin through turbine, thus producing electricity. During low tide, water will flow from tidal basin to sea through turbine producing electricity.

- **Advantages**
- 1. It is inexhaustible source of energy
- 2. No problem of pollution
- 3. The cost of power generation is quite low
- 4. High output can be obtained compared to solar or wind energy
- **Disadvantages**
- 1. Capital cost is very high
- 2. As the head is not constant, variable output is obtained
- 3. As the head is low, large amount of water is necessary for the turbine
- 4. It will not operate when the available head is less than 0.5m



OCEAN THERMAL ENERGY CONVERSION

- OTEC uses the temperature difference of the sea water at different depths to generate electricity. OTEC utilizes the temperature difference that exists between the surface waters heated by the sun and the colder deep (up to 1000m) waters to run a heat engine. This source and sink provides a temperature difference of 20□C in ocean areas within 20 of the equator. These conditions exist in tropical coastal areas, roughly between the tropic of Capricorn and the tropic of cancer. Such a small temperature difference makes energy extraction difficult and expensive. Hence, typically OTEC systems have an overall efficiency of only 1 to 3%.

Advantages

OTEC uses clean, renewable, natural resources. Warm surface seawater and cold water from the ocean depths replace fossil fuels to produce electricity.

Suitably designed OTEC plants will produce little or no carbon dioxide or other polluting Chemicals

There is enough solar energy received and stored in the warm tropical ocean surface layer to provide most, if not all, of present human energy needs.

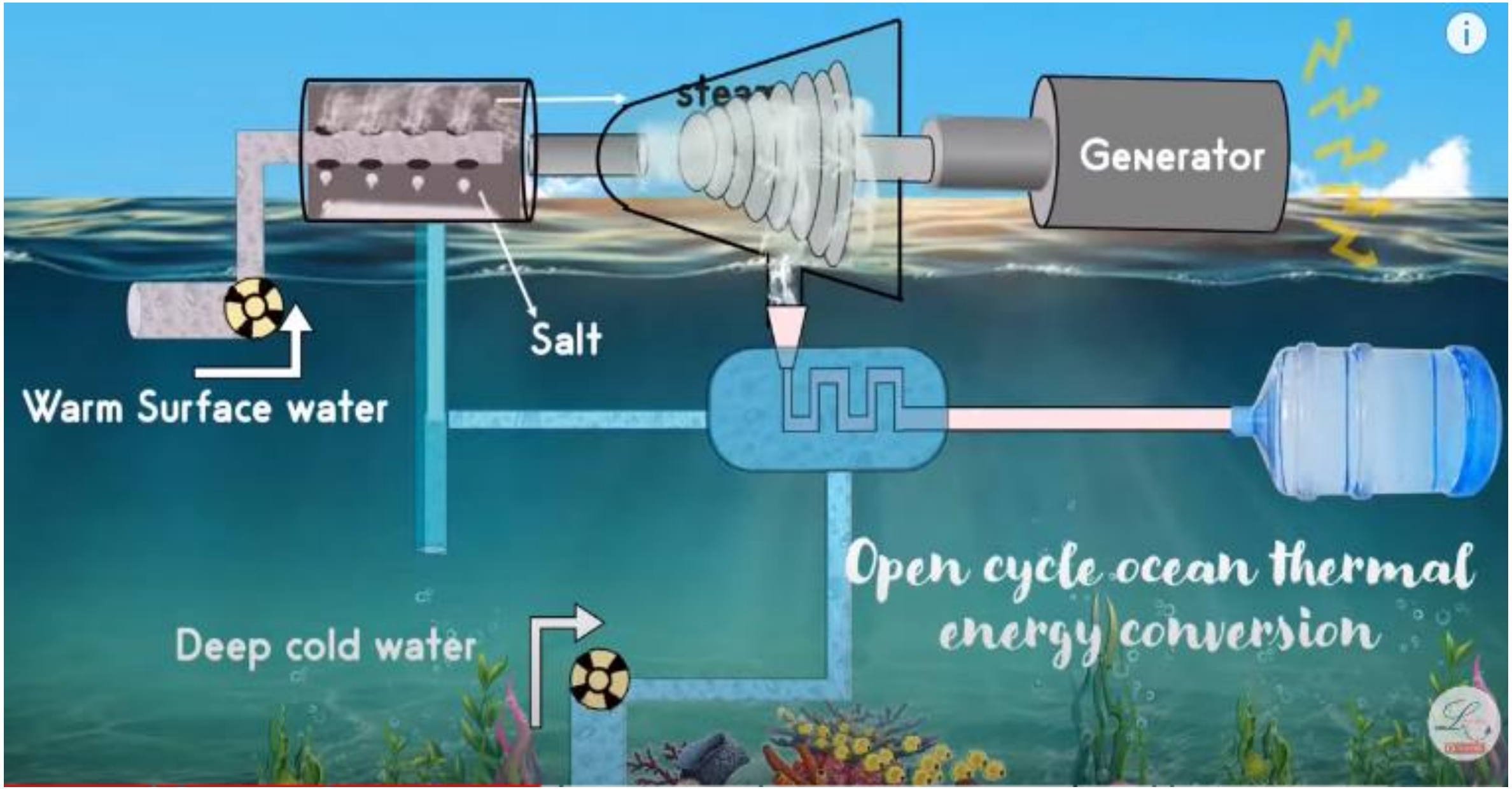
The use of OTEC as a source of electricity will help reduce the state's almost complete dependence on imported fossil fuels.

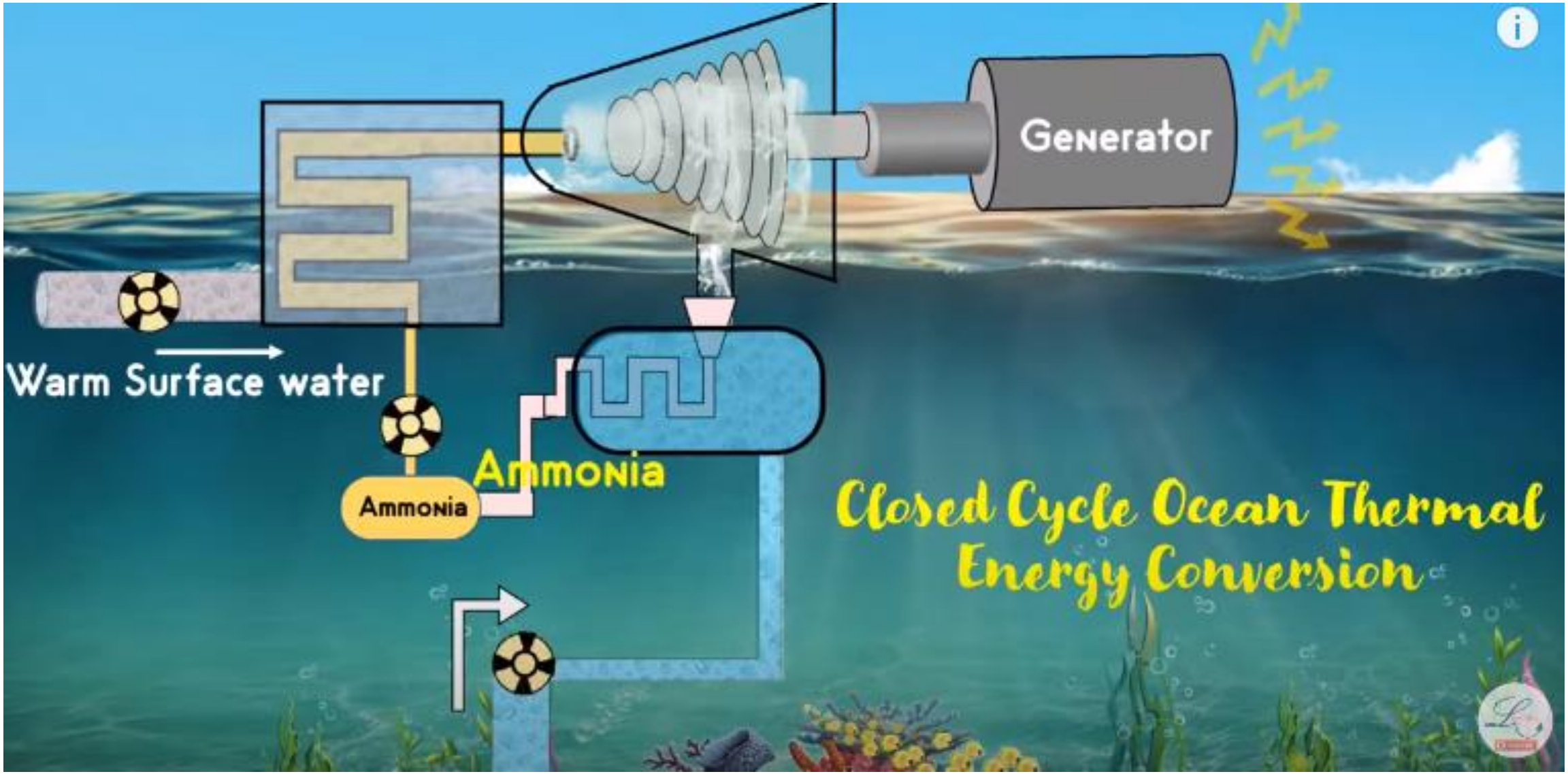
Disadvantages

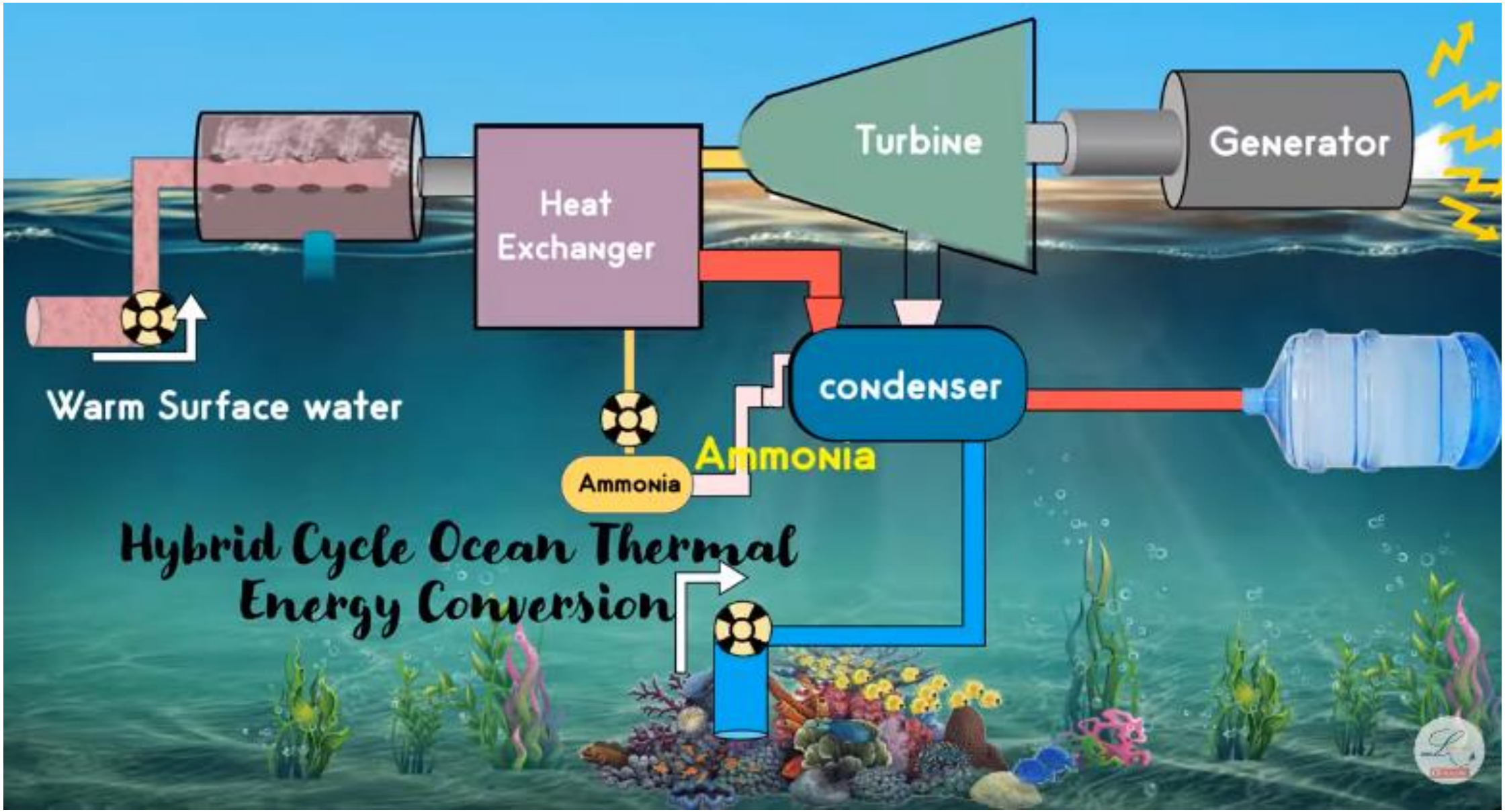
OTEC-produced electricity at present would cost more than electricity generated from fossil fuels at their current costs.

OTEC plants must be located where a difference of about 20º C occurs year round. Ocean depths must be available fairly close to shore-based facilities for economic operation. Floating plant ships could provide more flexibility.

Construction of OTEC plants and lying of pipes in coastal waters may cause localised damage to reefs and near-shore marine ecosystems.


Steam
Generator
Salt
Warm Surface water
Deep cold water
Open cycle ocean thermal energy conversion


Generator
Warm Surface water
Ammonia
Ammonia
Closed Cycle Ocean Thermal Energy Conversion


Turbine
Generator
Heat
Exchanger
Warm Surface water
condenser
Ammonia
Ammonia
Hybrid Cycle Ocean Thermal
Energy Conversion