



Ocean Energy

Shaneisia Bailey

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Read the passage below and then complete the activities that follow.

About **71%** of the Earth's surface is covered with water, while only **29%** consists of land. Only about **3%** of water on Earth is freshwater. The remaining **97%** of water is all from our oceans and seas! Our oceans are home to thousands of species of creatures. In addition to being a natural habitat, our oceans provide a large portion of our oxygen, provides us with food, jobs and entertainment. It is also important to note that our oceans can be a huge source of renewable, sustainable, reliable and cost-effective energy. We refer to this energy as ocean energy. What is ocean energy though?

WHAT IS OCEAN ENERGY?

Ocean energy refers to the **changes** in the **salinity, thermal gradients, tides, currents** or **waves** that can be used to **generate electricity**.



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The main source of energy for oceans comes from the sun that provides the ocean with direct light and heat energy through solar radiation. Additionally, oceans get energy from the winds, geothermal heat, temperature differences and the gravitational pull that the moon exerts on the Earth.

Ocean energy is often contained in waves, currents, tides and thermal gradients. How are each of these formed and how do we harness the energy in each?

WAVES

Waves are mainly formed by the interaction of wind with water. When wind passes over the surface of the water, it passes energy to the ocean, causing it to move in a circular motion that results in the formation of a wave. The harder the wind blows, the stronger the wave.

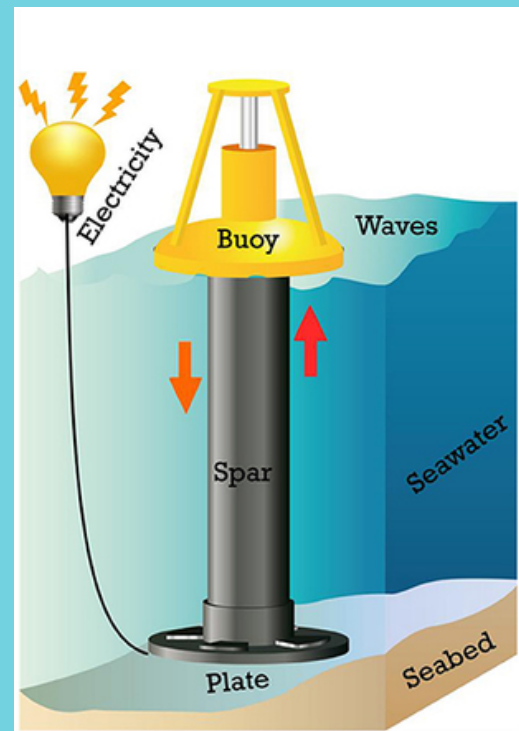
Wave energy converters can be used to obtain electricity. Some wave energy converters make use

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of buoys that float on the ocean and move with the motion of the waves. These buoys are attached to various mechanisms such as a cylinder that moves a piston that drives a generator that converts this motion into electricity.



TIDES AND CURRENTS

Tides are formed primarily through the gravitational pull of the sun and moon on the Earth. Since the moon is much closer to the Earth than the sun, it will have a greater effect on the tides. The production of high or low tides strongly depend on the relative positions of the sun, moon and the Earth.

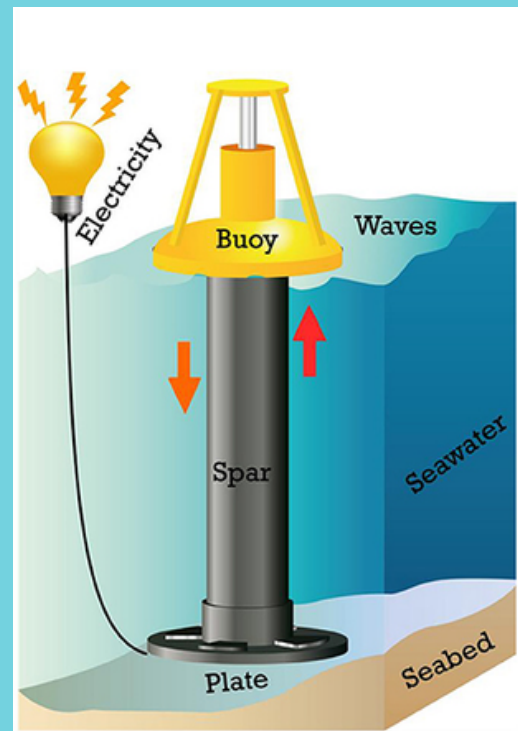
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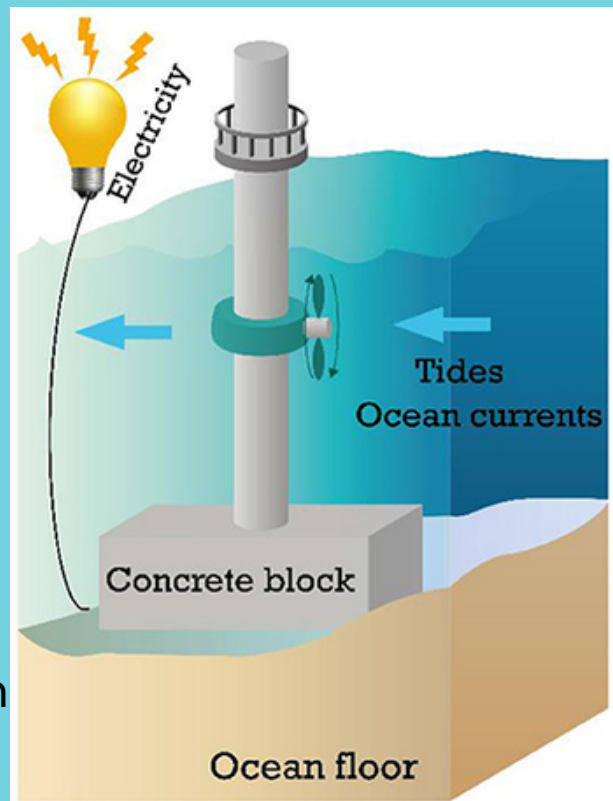
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In order to obtain the energy stored in currents, tidal stream technology is used. Tidal stream technology make use of underwater turbines. These turbines behave in a similar manner to wind turbines. These turbines have rotors that turn constantly due to the pressure generated by the movement of the ocean currents and tidal currents. They are then connected to a generator that will produce electricity.



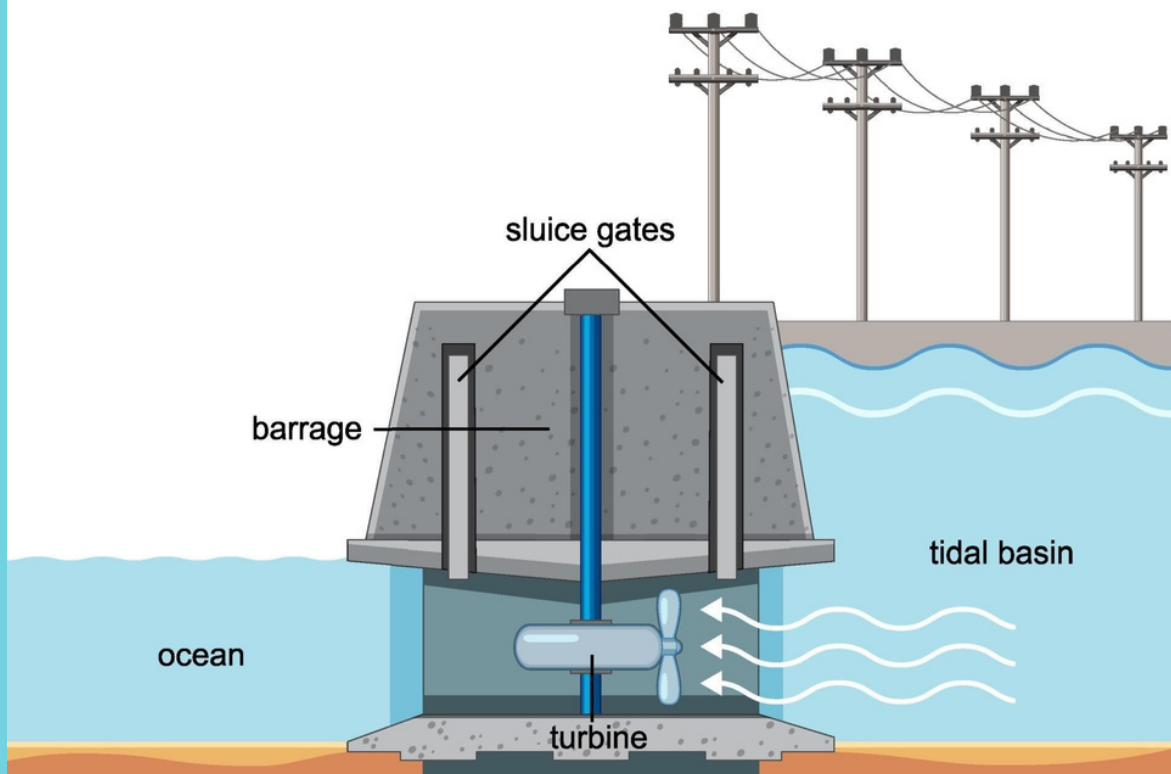
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Tidal energy is obtained through the use of dams called barrages. At high tide, the gates of the barrage are closed to create a temporary reservoir of water behind the barrage. At low tide, the gates of the barrage are opened, and the stored water flows out fast enough to move a series of turbines that are connected to a generator which produces electricity. Barrages are typically built in areas with significant tidal power.

Tidal Power Station



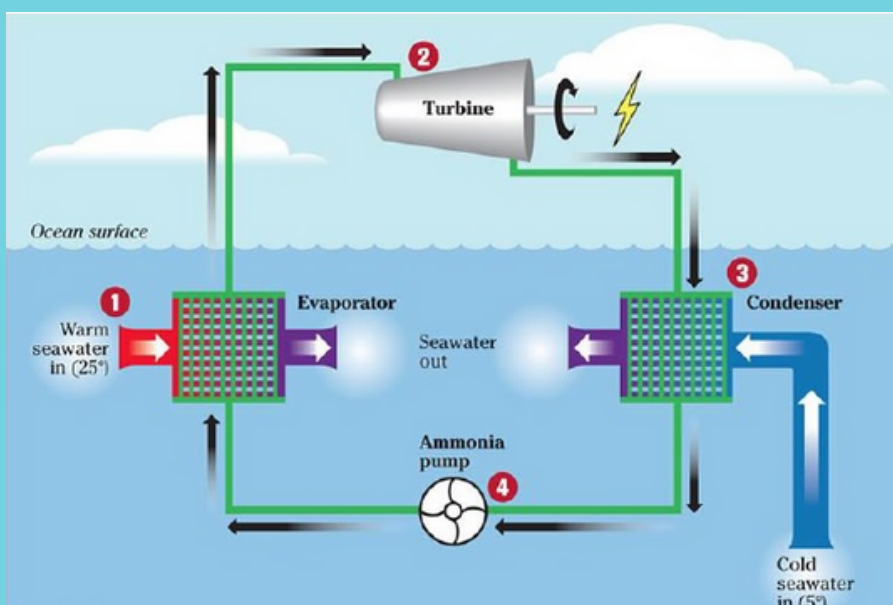
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OCEAN THERMAL ENERGY CONVERTER

Another means by which we can obtain ocean energy is through the use of ocean thermal energy converter. Ocean thermal energy converters convert thermal differences between warm surface seawater and cold deep seawater into electricity. With OTEC, warm ocean surface water is pumped through an evaporator that evaporates a fluid which is often times the surface water itself. This results in a vapour that expands and drives a turbine generator that produces electricity. The vapour is then condensed back into a fluid using cold water pumped from deep in the ocean.



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ANSWER THE QUESTIONS BELOW

1. What percentage of Earth's surface is covered with water?
 - a. 29%
 - b. 80%
 - c. 97%
 - d. 71%
2. What percentage of water on Earth is freshwater?
 - a. 97%
 - b. 28%
 - c. 3%
 - d. 10%
3. Which of the following technologies is used to get ocean energy from waves?
 - a. Tidal stream technology
 - b. Ocean thermal energy converter
 - c. Barrage
 - d. Wave energy converter
4. Which of the following technologies is used to get ocean energy from currents?
 - a. Tidal stream technology
 - b. Ocean thermal energy converter
 - c. Barrage
 - d. Wave energy converter

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ANSWER THE QUESTIONS BELOW

5. Which of the following technologies is used to get ocean energy from tides?
- a. Tidal stream technology
 - b. Ocean thermal energy converter
 - c. Barrage
 - d. Wave energy converter

6. How is electricity obtained from waves?

7. How is electricity obtained from tides?

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MCQ

Answer the multiple choice questions below.

8. How is electricity obtained from currents?

9. How is electricity obtained using ocean thermal energy converter?

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KEY TERMS

Explain each keyword below.

<i>Keywords</i>	<i>Meaning</i>
Ocean energy	
Ocean thermal energy converter	
Barrage	
Thermal Gradient	

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KEY TERMS

Explain each keyword below.

<i>Keywords</i>	<i>Meaning</i>
Tide	
Wave	
Current	
Geothermal	
Tidal stream technology	

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WORD SEARCH

Complete the word search below.

Ocean Energy

Y	G	R	E	N	E	N	M	O	T	I	O	N	R
R	O	T	A	T	I	O	N	D	O	T	I	B	I
R	T	E	S	R	I	T	H	A	B	I	T	A	T
W	S	T	P	E	V	A	P	O	R	A	T	O	R
I	R	R	A	F	R	E	S	H	W	A	T	E	R
N	N	E	R	P	I	S	T	O	N	I	Y	R	C
D	T	N	S	T	E	B	V	B	E	W	C	E	O
T	U	R	B	I	N	E	S	U	S	A	U	S	N
R	O	T	O	R	C	V	I	O	E	V	R	E	D
A	I	N	O	M	M	A	O	Y	D	E	R	R	E
B	A	R	R	A	G	E	B	A	I	S	E	V	N
N	O	I	T	A	I	D	A	R	T	I	N	O	S
E	R	U	T	A	R	E	P	M	E	T	T	I	E
R	R	T	N	A	E	C	O	I	I	A	S	R	R

WIND
EVAPORATOR
MOTION
FRESH WATER
BARRAGE
PISTON
TURBINES
RADIATION
HABITAT
RESERVOIR
CURRENTS
TEMPERATURE
AMMONIA
OCEAN
TIDES
BUOY
SPARS
ROTOR
ROTATION
CONDENSER
ENERGY
WAVES

Play this puzzle online at : <https://thewordsearch.com/puzzle/5781660/>

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DO SOME RESEARCH

List four benefits of ocean energy

1. _____
2. _____
3. _____
4. _____

List four challenges of ocean energy

1. _____
2. _____
3. _____
4. _____

OPTIONAL

Do a debate amongst your peers either defending or going against the use of ocean energy.

Debate Motion: Resolved, That the use of ocean energy is an effective solution for addressing global energy demands.

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