Reading 62

Ocean Energy Systems

In recent years, the oceans have been seen as a potential source of energy. Oceans are huge reservoirs of renewable energy, which have yet to be properly harnessed*. Some estimates say that during the second decade of this century, ocean energy sources will generate more than 1,000 megawatts of electricity, which is enough to power a million homes in the industrialized world. Several technologies have been developed for exploiting these resources in a practical way, among which ocean thermal energy conversion (OTEC) is one of the most promising. Experimental OTEC plants have been constructed using different operating principles, although as yet no large-scale commercially **viable** plant has been launched.

The basic operation behind this system uses the heat energy stored in the oceans as a source of power. The plant exploits the difference in water temperature between the warm surface waters heated by the sun and the colder waters found at ocean depths. A minimum temperature difference of 20 degrees Celsius between surface and depth is required for efficient operation, and this situation is typically found only in tropical and subtropical regions of the world. There are two basic kinds of OTEC system: the open cycle system and the closed cycle system. In the open cycle system, the warm surface water is converted into steam in a partial vacuum and this steam drives a turbine connected to an electrical generator. In a closed cycle system, the warm surface water is used to boil a fluid, such as ammonia, which has a low boiling point. In both systems cold water pumped up from the ocean depths condenses the vapor. In the open system, the steam is condensed back into a liquid by cold water pumped from deep-ocean water and then discharged. In the closed system, the condensed ammonia is used to repeat the cycle continuously. Various hybrid systems using characteristics of both open and closed cycle plants have also been designed.

The OTEC system is potentially an important source of clean, renewable energy, which could significantly reduce our reliance on fossil fuels and nuclear fission. [A] Unlike **other forms** of renewable energy, such as those provided directly by the sun and wind, OTEC plants can generate power 24 hours per day, 365 days per year. Furthermore, the design of this technology avoids any significant release of carbon dioxide into the atmosphere. OTEC can offer other important benefits apart from power production. [B] Aquaculture is one important spinoff. [C] It may also be economically feasible to extract minerals from the pumped seawater. [D] Freshwater for drinking and irrigation is another by-product, and this will be an important advantage in regions where freshwater is limited.

Some drawbacks to this form of power generation have been noted. Perhaps the biggest drawback at present is the high capital cost of initial construction due mainly to the expense of the large pipeline used to pump water from 1,000 meters below the surface. Furthermore, the conversion of thermal to electrical energy in the OTEC system works at very low efficiency, which means that these plants will have to use a lot of water to generate practical amounts for the power grid. For this reason, the net power output is reduced, since a significant portion of the output must be used to pump water. There are also potential ecological drawbacks, since the water discharges will change the water temperature and disturb some marine habitats. This impact could, however, be minimized if the water is discharged at greater depths.

The main obstacle created by high initial expenses will have to be met before OTEC competes with **conventional** alternatives, and until such time, OTEC will remain restricted to experimental plants. When technology permits lower start-up costs, this technology will make an important contribution to world energy requirements.

‘harnessed: controlled for use

13 The word “viable" in the passage is closest in meaning to

A clever
B feasible
C optimistic
D convenient

14 It can be inferred from the passage that

A renewable energy can be put into reservoirs
B the experimental plants are ready to be launched
C the oceans could be used in the future to generate electricity
D 1,000 megawatts of electricity is the amount needed in the average home

15. According to the passage, what can be inferred about the factor that allows the ocean to be used as an energy source?

A The oceans are so large that they can produce a lot of energy.
B In polar climates, the sun does not sufficiently heat the deeper water for practical energy use.
C The oceans can store vast amounts of heat energy to be used to run basic electricity plants.
D The plants are typically found in the tropical and subtropical regions of the world because of the warm weather.

16 According to the passage, in what way are the basic kinds of OTEC systems similar?
A They turn surface water into steam.
B They use cold water to cause condensation.
C They discharge unused water into the ocean.
D They convert water in a vacuum.

17 The phrase "other forms" in the passage refers to energy produced through

A fossil fuels and nuclear fission
B chemical reactions
C OTEC systems
D sun and wind

18 In paragraph 3, what can be inferred about the different sources of energy?

A We rely too much on fossil fuels and nuclear fission.
B Renewable energy releases a lot of carbon dioxide into the atmosphere.
C Energy from OTEC is provided directly by the sun and wind.
D Energy forms other than OTEC do not have important benefits.

19 In paragraph 3, why does the author write about aquaculture and mineral extractions?

A To give examples of possible developments related to OTEC
B To demonstrate what other activities can be done in the ocean
C To point out OTEC's advantages in regions of limited resources
D To show how the environment can be improved by using clean, renewable energy

20 According to the passage, all of the following are problems with the OTEC system as a power-generating system EXCEPT

A the costs of constructing the power system
B the damage caused to fishing grounds
C the effect of discharged water on the environment
D the amount of water needed to produce a useful amount of electricity

21 The word “ conventional ” in the passage is closest in meaning to

A conservative
B traditional
C tentative
D natural

22 Which of the sentences below best expresses the essential information in the highlighted sentence in the passage? Incorrect choices change the meaning in important ways or leave out essential information.

A Water outflow temperatures could upset local marine life.
B Water discharges will disturb the ecology of the oceans.
C The OTEC system has a tendency to upset marine environments.
D Outflows of water will affect the ocean temperature at great depths.

23 Which of the following statements most accurately reflects the author’s opinion about OTEC technology?

A OTEC will eventually supply most of the world's energy needs.
B The disadvantages of OTEC energy outweigh its advantages.
C OTEC technology has a useful role to play in total energy production.
D Only very large OTEC plants can be made efficient.

24 Look at the four squares [ ] that indicate where the following sentence could be added to the passage.

The nutrient-rich cold water is an excellent medium for growing phytoplankton, which provide support for various commercially exploitable fish and shellfish.

Where would the sentence best fit? Choose the letter of the square that shows where the sentence should be added.

25 An introductory sentence for a brief summary of the passage is provided below. Complete the summary by circling the THREE answer choices that express the most important ideas in the passage. Some sentences do not belong in the summary because they express ideas that are not presented in the passage or are minor ideas in the passage. Write the letters of the answer choices in the spaces where they belong.

The OTEC system of power generation is a promising source of energy.
•
•
•

Answer Choices

A OTEC systems use ocean temperature differences at different climates to create a significant amount of energy.
B OTEC systems can produce clean, renewable energy without harmful environmental effects.
C The OTEC system's pump would require a significant amount of energy of the total output.
D OTEC plants can produce more than enough electricity to supply over a million energy users.
E The OTEC system can generate power nonstop, unlike other renewable resources like sun and wind energy.
F OTEC system has the added benefit of providing nutritious cold water suitable for fish production.

Источник задания: Cambridge Preparation to the TOEFL

Reading 62 — Keys

13 B

Something that is "viable" or "feasible" is capable of working successfully.

14 C

The article implies that OTEC energy, despite some drawbacks, is likely to generate electricity in the future. The oceans store energy, and the author mentions that this system could be used to reduce our reliance on nonrenewable sources.

15 D

According to the reading, a temperature difference of at least 20 degrees Celsius between surface and deep water is necessary for efficient energy production.

16 B

According to the passage, both systems use cold water to condense vapor.

17 D

The phrase "other forms" refers to renewable energy directly provided by the sun and wind.

18 A

The fact that OTEC could produce energy that would allow us to reduce our use of fossil fuels and nuclear fission implies that the author thinks we rely too much on these nonrenewable kinds.

19 A

The author mentions that the OTEC technology has other benefits apart from clean energy production.

20 B

No mention is made of the damage that could be caused to fishing grounds.

21 B

The "conventional" alternatives are those that are the more established or accepted as "traditional." Here, it refers to alternatives such as wind power and solar energy.

22 A

Water outflows arc water discharges that will raise the water temperature and affect creatures in the marine habitat.

23 C

The author mentions both benefits and disadvantages of OTEC but overall suggests that this energy technology could contribute a portion of the total energy production.

24 C

The sentence gives an explanation of the reason aquaculture is an important spinoff.

25

B

OTEC systems use the variations of water temperature to produce clean, renewable energy.

D

A million energy users is a significant number to be supplied with energy.

E

The OTEC system can run 24 hours a day for every day of the year.