

2. An offshore wind farm project using turbines to generate electricity is to be built along the Atlantic coast of the United States. It will be located about 13 km from the coast in water with an average depth of 10 m.
- (a) **Describe** one environmental benefit associated with an offshore wind project.
 - (b) **Identify** and **describe** one potential economic effect of an offshore wind project.
 - (c) **Describe** one additional way, other than wind power, that oceans can provide renewable energy for the generation of electricity.

The project will consist of 200 wind turbines, each with a capacity of 4 megawatts (MW). Each turbine costs \$1.2 million to build. Electrical demand in the area to be served by the project is expected to be 2.0×10^6 MWh per year.

- (d) **Calculate** how much electricity (in MWh) the wind project needs to generate per year in order to provide 80% of the annual electrical demand in the service area. Show all work.
- (e) Customers in the service area pay \$0.20/kWh for electricity. **Calculate** how much revenue will be produced if the wind turbines provide 80% of the annual electrical demand in the service area. Show all work.
- (f) Assuming all turbines are operating, **calculate** how many hours the wind turbines must operate to provide 80% of the annual electrical demand in the service area. Show all work.

4. Dams are built by humans for various purposes including hydroelectric power generation and control of downstream flooding.
- (a) **Explain** how electricity is generated at a hydroelectric dam.
 - (b) **Identify** TWO economic benefits, other than hydroelectric power generation and control of downstream flooding, associated with dams.
 - (c) **Describe** one ecological benefit of seasonal flooding of the floodplain of a free-flowing river.
 - (d) Some dams have been removed from rivers.
 - (i) **Explain** how removal of a dam can benefit fish populations.
 - (ii) **Describe** one negative environmental consequence of removing a dam from a river (other than effects on fish populations).
 - (e) Dams are also built by beavers, a keystone species in some North American ecosystems.
 - (i) **Define** keystone species.
 - (ii) **Describe** how dams built by beavers can make beavers a keystone species in some ecosystems.

STOP

END OF EXAM