An assessment of micro-wind turbines

A. In terms of micro-renewable energy sources suitable for private use, a 15-kilowatt (kW) turbine is at the biggest end of the spectrum. With a nine metre diameter and a pole as high as a four-storey house, this is the most efficient form of wind microturbine, and the sort of thing you could install only if you had plenty of space and money. According to one estimate, a 15-kW micro-turbine (that's one with the maximum output), costing £41,000 to purchase and a further £9,000 to install, is capable of delivering 25,000 kilowatt-hours (kWh)' of electricity each year if placed on a suitably windy site.

B. I don't know of any credible studies of the greenhouse gas emissions involved in producing and installing turbines, so my estimates here are going to be even more broad than usual. However, it is worth trying. If turbine manufacture is about as carbon intensive per pound sterling of product as other generators and electrical motors, which seems a reasonable assumption, the carbon intensity of manufacture will be around 640 kilograms (kg) per £1,000 of value. Installation is probably about as carbon intensive as typical construction, at around 380 kg per £1,000. That makes the carbon footprint (the total amount of greenhouse gases that installing a turbine creates) 30 tonnes.

C. The carbon savings from wind-powered electricity generation depend on the carbon intensity of the electricity that you're replacing. Let's assume that your generation replaces the coal-fuelled part of the country's energy mix. In other words, if you live in the UK, let's say that rather than replacing typical grid electricity, which comes from a mix of coal, gas, oil and renewable energy sources, the effect of your turbine is to reduce the use of coal-fired power

stations. That's reasonable, because coal is the least preferable source in the electricity mix. In this case, the carbon saving is roughly one kilogram per kWh, so you save 25 tonnes per year and pay back the embodied carbon in just 14 months - a great start.

D. The UK government has recently introduced a subsidy for renewable energy that pays individual producers 24p per energy unit on top of all the money they save on their own fuel bill, and on selling surplus electricity back to the grid at approximately 5p per unit. With all this taken into account, individuals would get back £7,250 per year on their investment. That pays back the costs in about six years. It makes good financial sense and, for people who care about the carbon savings for their own sake, it looks like a fantastic move. The carbon investment pays back in just over a year, and every year after that is a 25-tonne carbon saving. (It's important to remember that all these sums rely on a wind turbine having a favourable location)

E. So, at face value, the turbine looks like a great idea environmentally, and a fairly good long-term investment economically for the person installing it. However, there is a crucial perspective missing from the analysis so far. Has the government spent its money wisely? It has invested 24p per unit into each micro-turbine. That works out at a massive £250 per tonne of carbon saved. My calculations tell me that had the government invested its money in offshore wind farms, instead of subsidising smaller domestic turbines, they would have broken even after eight years. In other words, the micro-turbine works out as a good investment for individuals, but only because the government spends, and arguably wastes, so much money subsidising it. Carbon savings are far lower too.

F. Nevertheless, although the micro-wind turbine subsidy doesn't look like the very best way of spending government resources on climate change mitigation, we are talking about investing only about 0.075 percent per year of the nation's GDP to get a one percent reduction in carbon emissions, which is a worthwhile benefit. In other words, it could be much better, but it could be worse. In addition, such investment helps to promote and sustain developing technology.

G. There is one extra favourable way of looking at the micro-wind turbine, even if it is not the single best way of investing money in cutting carbon. Input- output modelling has told us that it is actually quite difficult to spend money without having a negative carbon impact. So if the subsidy encourages people to spend their money on a carbon-reducing technology such as a wind turbine, rather than on carbon-producing goods like cars, and services such as overseas holidays, then the reductions in emissions will be greater than my simple sums above have suggested.

<u>Questions 14-20</u>

Reading Passage 300 has SEVEN paragraphs, A-G.

Choose the correct heading for each paragraph from the list of headings below.

Write the correct number (i-ix) in boxes 14-20 on your answer sheet.

List of Headings

i A better use for large sums of money.

ii The environmental costs of manufacture and installation.

iii Estimates of the number of micro-turbines in use.

iv The environmental benefits of running a micro-turbine.

v The size and output of the largest type of micro-turbine.

vi A limited case for subsidising micro-turbines.

vii Recent improvements in the design of micro-turbines.

viii An indirect method of reducing carbon emissions.

ix The financial benefits of running a micro-turbine.

14. Paragraph A

15.Paragraph B

16.Paragraph C

17.Paragraph D

18.Paragraph E

19.Paragraph F

20.Paragraph G

Questions 21-22

Choose TWO letters, A-E.

The list below contains some possible statements about micro wind-turbines.

Which TWO of these statements are made by the writer of the passage?

A. In certain areas, permission is required to install them.

B. Their exact energy output depends on their position.

C. They probably take less energy to make than other engines.

D. The UK government contributes towards their purchase cost.

E. They can produce more energy than a household needs.

Questions 23-26

Complete the sentences below.

Choose NO MORE THAN THREE WORDS from the passage for each answer.

23. ..... would be a more effective target for government investment than micro-turbines.

24. An indirect benefit of subsidising micro-turbines is the support it provides for .....

25. Most spending has a ..... effect on the environment.

26. If people buy a micro-turbine, they have less money to spend on things like foreign holidays and .....

ANSWER
14. v 15. ii 16. iv 17. ix 18. i 19. vi 20. viii 21. & 22. B, E [in either order] 23. offshore wind farms 24. developing technology 25. negative 26. cars