

次の文を読み、設問A～Fに答えなさい。星印(\*)のついた単語には、文末に訳注があります。

After decades of rancorous\* debate, only a handful of the most doctrinaire\* diehards\* still dispute the idea that human activity is heating up the planet. All the signs seem to point that way: storms have become more intense and weather patterns more erratic\*; the past decade has been by far the hottest on record; and the rise in temperature has been greatest in polar regions and around cities. These facts dovetail\* ominously\* well with the theory that carbon dioxide (CO<sub>2</sub>), released by burning coal, oil and gasoline for heat, electricity and transportation, is trapping excess energy from the sun. Global warming is real — and will probably get worse.

The only way to slow it down, almost every scientist agrees, is to restructure the way we produce energy. Such stopgap\* measures as insulation, carpooling and energy-efficient light bulbs are all useful ways to begin curbing\* the burning of carbon-rich fossil fuels. But in the long run, as the world's population continues to increase and living standards rise, these measures will not be enough.

That's why experiments now going on in laboratories around the world are so important. At a research center outside Stuttgart, Germany, engineers at Daimler-Chrysler have created a high-performance car whose tail pipe emits nothing but water vapor. In a giant wind tunnel at NASA's Ames Research Center in California, engineers are set to analyze air turbulence\* in order to make superefficient wind-power turbines. In Japan scientists are perfecting paper-thin solar cells that will be cheap to produce and could turn every house into its own electricity supplier. These ventures, along with many others, are beginning to draw the outlines of a world in which energy use keeps rising and, though fossil fuels remain an important power source, CO<sub>2</sub> levels in the atmosphere actually begin to drop.

Cars like the NECAR 4, housed in a lab near Stuttgart, could help make that happen. This experimental vehicle, being jointly developed by Ford, DaimlerChrysler and Canada's Ballard Power Systems, gets its energy from hydrogen — the most abundant fuel in the entire universe. Hydrogen, unlike fossil fuels, contains no carbon

atoms and thus generates zero carbon dioxide. However, it could produce some pollution, since burning hydrogen taints\* the atmosphere by rearranging air molecules to form nitrogen oxides and ozone.

But NECAR 4 doesn't burn hydrogen. Instead, it uses an onboard fuel cell, developed by Ballard, to let hydrogen combine slowly with oxygen at moderate temperatures. What comes out is plain H<sub>2</sub>O and electricity. Fuel cells were invented in the 1800s and adopted by NASA for generating clean power in space in the 1960s. Only in the past decade have they been made small enough to fit inside a car. The NECAR 4, based on a Mercedes-Benz A-class compact sedan, accommodates five people plus luggage, reaches speeds of 90 m.p.h. (145 km/h) and goes about 280 miles (450 km) between fill-ups. "It's comparable," says Ferdinand Panik, head of DaimlerChrysler's Fuel Cell Project, "to the impact the microchip had on computer technology."

That impact may be felt very soon. The first major field test of fuel-cell vehicles will take place this year in California. And by 2004, DaimlerChrysler and Ford — as well as GM, Toyota and other companies — expect to be selling fuel-cell cars directly to consumers.

Ideally, the hydrogen would be produced sustainably\* with renewable electricity from the sun or wind. But even under the most optimistic predictions\* for improvements in renewable technology, the electricity required to split H<sub>2</sub>O into H and O would be prohibitively expensive. So the first large-scale plants will probably wrest\* hydrogen from old-fashioned fossil fuels.

That's extraordinarily good news for China, whose gigantic size, rapid industrialization and huge domestic coal reserves threaten to pump cataclysmic\* amounts of CO<sub>2</sub> into the air over the next century. While scaling fuel cells down to fit inside cars and trucks has been a challenge, scaling them up or linking them together to run factories and power plants should be no problem at all.

The one danger in pulling hydrogen from fossil fuels is that it leaves carbon dioxide behind. If the CO<sub>2</sub> is simply vented into the atmosphere, global warming will

be as big a problem as ever. There is an alternative though: pump it into the ground. In Norway, for example, the energy company Norsk Hydro is building a power plant that will be fueled with hydrogen drawn from natural gas. The CO<sub>2</sub> that's left over will be reinjected into an oil field on the continental shelf. Not only will this take the carbon dioxide out of circulation but it will also pressurize the field and make the remaining oil easier to pump out. In Europe and the U.S. pumping CO<sub>2</sub> into underground aquifers\* has proved an effective way of keeping it out of the atmosphere.

Fossil fuels will remain an important energy source for the foreseeable future, but they will eventually run out and the world will have to switch to what environmental visionaries\* have been dreaming about since the original Earth Day: endlessly renewable power from wind and sun.

Wind has the edge. It's fast catching up with oil and gas in cost efficiency with the help of experiments such as the one at Ames Research Center. By comparing what they learn from the wind tunnel's smooth airflow with data from the turbulent breezes at the National Renewable Energy Laboratory's test range near Golden, Colorado, engineers expect to build a new generation of superefficient wind turbines with blades well over 200 ft (60 m) across.

Efficiency doesn't help when the wind isn't blowing; you need to store energy generated during gales\* for use when the air is still. The best way to do that, says Robert Williams, of Princeton University's Center for Energy and Environmental Studies, is to use the excess to compress air and force it into subterranean\* aquifers, caves or salt domes.

Then, when the wind dies, the compressed air can be pulled out to help drive the turbines. "The technology was originally developed in the 1960s," says Williams, "to let nuclear power plants store excess electricity during off-peak hours." Now it could permit countries rich in wind resources — including China, the U.S., Denmark and Germany — to take advantage of a free, unlimited and nearly pollution-less source of electricity.

On the solar-power front, the visions of 1970s-era environmentalists can still be realized, at least in part, if manufacturers could find a way to produce silicon-based photovoltaic\* cells more efficiently and thus drive down their high cost. One strategy is to reduce the thickness of a solar cell from the current standard — about that of a piece of cardboard — to one-hundredth of that size. Such thin-film cells, whose development is furthest along in Japan, will use less raw material and will be far easier to manufacture with the extraordinary purity required to make them efficient enough to be economical.

Beyond that, their light weight will make installation\* easy, permitting them to be applied as building façades\* or even over windows. Because a given solar cell is sensitive to just a few colors of the many that make up sunlight, researchers are working on multilayered cells, which will trap most of the colors of the rainbow.

Since the sun doesn't shine with equal power everywhere, even a building slathered\* with solar cells will need another source of electricity. One possibility: a system that uses both solar cells and a two-way fuel cell. During daylight, when the solar cells are operating, excess electricity could be run through a fuel cell to produce hydrogen from water. At night, the fuel cell could use the hydrogen to produce electricity again.

Ideally, every factory, building, home and vehicle would have its own clean, renewable power source, eliminating oil wells, coal mines, power plants and power lines — and all the environmental disruption\* they cause. For now, though, the world has a more urgent mission: to stop the planet from overheating, and do it in a hurry. Thanks to the fuel-cell cars and more advanced wind turbines and solar cells that are close to fruition\*, the global-warming challenge seems a little less daunting\* than it did just a few years ago.

(Michael D. Lemonick 著 : Time, April-May 2000 から引用, 一部改変)

訳 注

- rancorous : 恨みのある  
doctrinaire : 理論一辺倒の  
diehard : 頑強な抵抗者, がんこな保守派政治家  
erratic : 不規則な  
dovetail : ぴったり当てはまる  
ominously : 不吉な  
stopgap : 間に合わせの, 一時しのぎの  
curb : 抑制する  
turbulence : 乱気流  
taint : 汚す  
sustainable : 維持できる  
prediction : 予言  
wrest : むりに得る  
cataclysm : 激変, 大変動, 一大異変  
aquifer : 含水層  
visionary : 空想家, 夢見る人  
gale : 大風  
subterranean : 地下の  
photovoltaic : 光起電型  
installation : 取り付け  
façade : 正面, 前面, 外見  
slather : たくさん使う  
disruption : 崩壊  
fruition : 実現  
daunt : ひるませる

設 問

- A：この論文の内容にふさわしい題名を考え，答案用紙 2—1 A欄に日本語 15 字以内で書きなさい。
- B：著者が指摘した地球環境の変化とその原因を，答案用紙 2—1 B欄に日本語 120 字以内で書きなさい。
- C：従来の水素燃料車の欠点と，近未来車 NECAR4 の環境に対する利点を答案用紙 2—1 C欄に日本語 160 字以内で説明しなさい。
- D：著者が指摘した風力をエネルギー源とした場合の欠点と，その対策について答案用紙 2—2 D欄に日本語 120 字以内で書きなさい。
- E：太陽電池をエネルギーとした場合の夜間の対策案を答案用紙 2—2 E欄に日本語 70 字以内で書きなさい。
- F：この論文で論じられている問題に対する，あなた自身の考えおよび提案を答案用紙 2—2 F欄に日本語 200 字以内で書きなさい。

以 上