do is poke a stick in the ground and stand back; oil comes pouring forth—or did; most of those fields have long since been exploited. Saudi Arabian oil lies much deeper, but once the wells are dug it comes out cheaply and easily. Oil under the North Sea is something else again: the technology required is at the very limits of scientific knowledge, the costs are immense and the uncertainties serious. And to secure oil from the shale rock of Utah and Colorado may well be a losing proposition under any circumstances. One expert’s estimate is that, while it is perfectly possible to mine the rock, cook it, extract kerogen and distill it into oil, pipe it to where it is needed and refine it into commercially valuable products, the energy requirements are such that for every gallon of gasoline you get out of the refinery you may well have expended more than one gallon to get it there.

Almost the same arguments apply to atomic power—at least, of the kind we now take for granted, from light-water fission reactors. It takes uranium to fuel them. There is a great deal of uranium in the world, but most of it is in very dilute concentrations, very expensive to extract. The most productive mines are already in operation, and their output (it is called “yellowcake”) is rather fully committed. Some experts say that any atomic power plant completed after 1976 will have to face an uncertainty as to whether yellowcake will be available to fuel it for its operational life. There are other possible kinds of fission power plants, but the other varieties have flaws of their own, not least of which is that few can be on-line producers in time to alleviate the energy crunch.

A more serious flaw is the well-known danger of plutonium-235. Pu\(^{235}\) is the stuff atomic bombs are made of; it is also highly toxic chemically, physically perilous in a radioactive sense, and long-lived. The wastes from a breeder reactor are a political danger as soon as the system begins to operate: the risk of terrorists acquiring the few pounds of plutonium necessary to make an atomic bomb raises problems that have never had to be solved before, starting with the capacity for a tiny group to threaten any city in the world with the fate of Hiroshima. The same wastes remain a danger to every living thing for a period so long that it can scarcely be comprehended: a quarter of a million years, fifty times as long as all of recorded history.

It is the danger to the environment which finally dooms most of the proposals for major new energy sources. Even if you can protect plutonium from hijacking . . . even if you can find ways to deal with poisonous by-products and cure the damage of air, water and soil pollution . . . even if science succeeds in solving all the technological problems and society accepts the