

A general scheme of this type has recently been discussed in a report by the State Department outlining a possible organization for the international control of atomic energy. According to this report the large central units in which plutonium is produced, as well as all sources of uranium and thorium, would be controlled and operated by an international organization which would distribute or sell plutonium in a denatured form for use by individual consumers. The authors of this report express the view that it may be possible to denature plutonium so as to make its use for military uses exceedingly difficult and time consuming and express the hope therefore that it may be feasible to exert only a minimum international control on the users of denatured plutonium without danger that it may be diverted secretly to construction of weapons. Such a scheme undoubtedly has some attractive features although the report may be over-optimistic in its estimate of the difficulties to divert denatured plutonium to military uses. There is no denying the fact that the possible use of plutonium for aggressive warfare constitutes a difficulty for the industrial uses of atomic energy that is much greater than any technical difficulty that we can foresee. The problem of preventing this use is essentially political and not technical and I do not see much hope of solving it unless the very basis of the relationships among nations should be thoroughly changed in the future years.

NECESSITY OF SHIELDS

Going back to the technical problems, I would like to mention one more factor of atomic energy units which will prove a serious limitation to their general use. During the process of fission, which is basic to the production of atomic energy, not only energy but also radiations of various kinds particularly neutrons and gamma rays are produced. Unless they are prevented from doing so by a shield, these radiations would escape from the pile and their intensity would be so terrific that they would kill in a very short time any living being who were to approach an unshielded operating unit. It is therefore an essential necessity to shield the pile with such materials as to prevent the escape of lethal radiations. In principle the problem is not at all difficult to solve. It is sufficient, for example, to surround the pile with a concrete wall of several feet thickness in order to eliminate completely any danger. On the other hand there is no way to eliminate the radiations without the use of a very heavy shield. Indeed in many designs of piles that have been discussed the shield represents by far the greatest part of the weight of the installation. The necessity of surrounding the pile with a heavy shield will prevent several uses of atomic power. It does not appear possible for instance to design an atomic power unit light enough to be used in a car or in a plane of ordinary size. Perhaps a large locomotive may be the smallest mobile unit in which an atomic power plant conceivably could be installed.

We may summarize this discussion by stating that there is definitely a technical possibility that atomic power may gradually develop into one of the principal sources of useful power. If this expectation will prove correct, great advantages can be expected to come from the fact that the weight of the fuel is almost negligible. This feature may be particularly valuable for making power available to regions of difficult access and far from deposits of coal. It also may prove a great asset in mobile power units for example in a power plant for ship propulsion. On the disadvantage side we have some technical limitations to the applicability of atomic power of which perhaps the most serious is the impossibility of constructing light power units; also there will be some peculiar difficulties in operating atomic plants, as for example the necessity of handling highly radioactive substances which will necessitate, at least for some considerable period, the use of specially skilled personnel for the operation. But the chief obstacle in the way of developing atomic power, will be the difficulty of organizing a large scale