

~~SECRET~~

Report by M.A.U.D. Committee on the use  
of Uranium as a source of power, Part I

~~SECRET~~

Summary and recommendations

~~SECRET~~

It has been known for the past few years that very large stores of atomic energy are present in Uranium. Besides the extremely slow release which occurs naturally and is an example of radio-activity, there is another process which gives some hope that it may be possible to release the energy fast enough to have practical applications. The possibility of using this energy release to make an explosive of great violence has been discussed by us in another report, and has been shown to involve the extraction of the most active constituent of the Uranium, called U<sub>235</sub>. If, however, we wish to use the atomic energy as a prime mover, that is as a substitute for coal or oil in the production of power, this extremely difficult and expensive operation may not be necessary. The presence of the less active part of the Uranium, though it makes it harder to release the energy, does not decrease, and may indeed increase, the amount available. The problem is to find an arrangement which will give a release of atomic energy with ordinary Uranium, either as metal or preferably in a compound, since the extraction of the metal is still not an easy operation. Experiments to determine whether such an arrangement is possible have been carried out by various workers in this and other countries, and most recently by Dr. Halban and Dr. Kowarski, who have proved that it can be done by mixing Uranium oxide in suitable proportions with a substance known as heavy water.

Though this substance is at present only available as a fairly rare chemical, and although quantities of the order of several tons would be required to make the apparatus work, we consider that the method has considerable possibilities. The energy that can theoretically be derived from uranium consumed in this way amounts to 12 million H.P. hours per lb. and in addition large amounts of artificial radio-active substances would be formed which might have important applications. Besides the production of the heavy water there are a number of problems still to be solved in making and using such a device. It will be necessary to provide means of controlling the process and preventing an explosion, which though not violent enough to have much military value would wreck the apparatus and building. The rate at which power can be generated is in fact limited by the rate at which it can be taken away in the form of heat, either in steam or some other cooling material. Such a plant would produce radio-active effects of enormous intensity and the greatest care would have to be taken to shield the workers. It is clear that the scheme requires a long term development and we do not consider that it is worth serious consideration from the point of view of the present war.

We are informed, however, that steps are being taken in U.S. to produce heavy water on a large scale, and since Drs. Halban and Kowarski have done all that they can with the supplies which they brought to this country, we think that they should be allowed to continue their work in U.S. Arrangements should be made through the existing channels to keep us informed of their results, since if, as we hope, the work on

REPRODUCED AND NOT RECLASSIFIED  
BY U. S. DEPARTMENT OF ENERGY  
OFFICE OF CLASSIFICATION  
DATE 08-26-78  
REASONED & CONFIDENTIAL  
CLASSIFIED BY [signature]

~~RESTRICTED DATA~~

This document contains restricted data as defined in the Atomic Energy Act of 1954, its amendments or the provisions of its extension, in any form or by any means.

~~RESTRICTED DATA~~