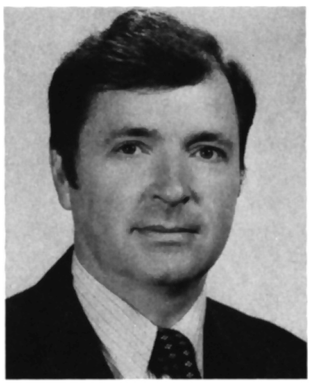
COMMENTS



Reviewers for *Fusion Technology* are asked to screen every paper submitted to the journal for technical soundness and potential importance to the community. Thus the quality of articles has been extremely high, and the journal has been privileged to publish a number of articles that have already had a significant impact on directions in the development of fusion energy. In other cases, the importance, hence impact, of papers has not yet been recognized but may occur in the future as researchers continue to study the archival literature. As editor, I have normally refrained from commenting in this space on specific articles. However, in view of its obvious importance, and frankly, my personal interest and prior involvement in research on advanced (or alternate) fuel fusion, I feel some remarks are justified in the case of the paper, "Lunar Source of ^{3}He for Commercial Fusion Power," by L. J. Wittenberg, J. F. Santarius, and G. L. Kulcinski, in this issue.

One reason an editor hesitates to comment on papers is that despite the strong effort by reviewers, mistakes can slip by so that the "test of time," i.e., the continued study and review by readers and users of material in the article, provides the ultimate review. Because of this fact, some additional steps were taken in the case of the "Lunar Source" paper. Namely, extra reviewers were used to ensure detailed coverage of the various facets involved in the study. This unusual step does not negate the need for the test of time, but it does increase the probability that the test will be passed.

In their paper, the authors disclose their startling discovery that very significant amounts of ^{3}He can be obtained by mining the lunar surface. This source of ^{3}He has occurred as the result of deposition due to continual bombardment of the surface by the solar wind. The authors estimate that the ^{3}He obtainable in this manner would provide $\sim 10^7$ GW(electric)·yr of electrical power from D-^{3}He fusion reactors. Further, their calculations indicate that even when the energy required to recover the ^{3}He is accounted for, an energy payback ratio >200 could be achieved. Assuming that these results stand the test of time, this discovery will be extremely important to the development of fusion power.

The use of alternate (nontritium) fusion fuels has always been an ultimate goal for fusion power in order to reduce problems associated with tritium handling, neutron damage to materials, and neutron-induced radioactivity. Further, increased plant efficiencies become accessible by use of direct energy conversion techniques to capitalize on the increased charged-particle fraction obtained in the fusion process. Unfortunately the ideal fuel for this task, p-^{11}B appears to be too difficult, if not impossible, to ignite using presently known confinement techniques. D-^{3}He has always been a close second in desirability but the problem has been to find an appropriate source for ^{3}He.

Techniques like breeding ^3He from semicatalyzed deuterium reactors or from tritium decay require a complex system of satellite-generator reactors. The proposal to obtain ^3He from Jupiter or other planets seemed too futuristic. However, the proposal for lunar mining opens up an entirely new avenue. The authors point out that if it is accepted that space scientists will be able to "tap" into the lunar source of ^3He by the turn of the century, this could provide a "bridge" between the use of our present limited sources of ^3He and the "ultimate" source in Jupiter. In this view we could set the goal for fusion as the development of a D-^3He power economy at the turn of the century. Not only would this have immense implications to terrestrial electrical power production, but it would also have an extremely important impact on fusion power for various applications in space. This picture still faces various possible stumbling blocks; however, the realization that this extremely important fuel—^3He—is available on our neighbor, the moon, makes rethinking our plans for the development path for fusion power mandatory.

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