

# PREFACE:

## MOLTEN-SALT REACTORS

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The achievement of a cheap, reliable, and safe breeder remains the primary task of the nuclear energy community. (In expressing this view, I suppose I betray a continuing frustration at the slow progress of fusion research, even though the Russian success with the tokamak has quickened the pace.) Actually not much has changed in this regard in 25 years. Even during World War II, many people realized that the breeder was central. It is only now, with burner reactors doing so well, that the world generally has mobilized around the great aim of the breeder.

As all readers of *Nuclear Applications & Technology* know, the prevailing view holds that the LMFBR is the proper path to ubiquitous, permanent energy. It is no secret that I, as well as many of my colleagues at ORNL, have always felt differently. When the idea of the breeder was first suggested in 1943, the rapid and efficient recycle of the partially spent core was regarded as the main problem. Nothing that has happened in the ensuing quarter-century has fundamentally changed this. The successful breeder will be the one that can deal with the spent core most rationally—either by achieving extremely long burnup, or by greatly simplifying the entire recycle step. We at Oak Ridge have always been intrigued by this latter possibility. It explains our long commitment to liquid-fueled reactors—first, the aqueous homogeneous and now, the molten salt.

The molten-salt system has been worked on, mainly at Oak Ridge, for about 22 years. For the first 10 years, our work was aimed at building a

nuclear aircraft power plant. The first molten-salt reactor, the Aircraft Reactor Experiment, was described in a series of papers from Oak Ridge that appeared in the November 1957 issue of *Nuclear Science and Engineering*.

The present series of papers reports the status of molten-salt systems, and particularly the experience we have had with the Molten-Salt Reactor Experiment (MSRE). The tone of optimism that pervades these papers is hard to suppress. And indeed, the enthusiasm displayed here is no longer confined to Oak Ridge. There are now several groups working vigorously on molten salts outside Oak Ridge. The enthusiasm of these groups is not confined to MSRE, nor even to the molten-salt breeder. For we now realize that molten-salt reactors comprise an entire spectrum of embodiments that parallels the more conventional solid-fueled systems. Thus molten-salt reactors can be converters as well as breeders; and they can be fueled with either  $^{239}\text{Pu}$  or  $^{233}\text{U}$  or  $^{235}\text{U}$ .

However, we are aware that many difficulties remain, especially before the most advanced embodiment, the Molten-Salt Breeder, becomes a reality. Not all of these difficulties are technical. I have faith that with continued enlightened support of the US Atomic Energy Commission, and with the open-minded, sympathetic attention of the nuclear community that these papers should encourage, molten-salt reactors will find an important niche in the unfolding nuclear energy enterprise.