NE250 Summary 3 **Mitch Negus**
9/15/2017

Molten salt reactors: A new beginning for an old idea

David LeBlanc

A new crop of startup companies has emerged in the past several years, for the most part developing advanced reactor designs. While their designs incorporate the latest technology and innovations in the nuclear field, some of the reactor concepts date back to the beginnings of nuclear power. Molten salt reactors (MSRs) are one such technology, originally studied by Oak Ridge National Lab (ORNL) in the middle of the twentieth century. David LeBlanc's article returns to ORNL's MSR designs and attempts to find new solutions to some of the more daunting challenges facing those models. In particular LeBlanc approaches the design of a similar reactor with different priorities–namely the generation of affordable and safe electricity, rather than operating on limited uranium supplies.

While the article thoroughly explores the evolution of the Oak Ridge MSR designs, it especially emphasizes how what was termed a "plumbing problem" in the original design could be fixed using a straightforward geometric adjustment. Before, the Oak Ridge design incorporated two fluids, such as a layer of thorium tetrafluoride surrounding a core of uranium tetrafluoride. The layers would be separated by a graphite moderator, which could be manufactured to provide increased surface area between the two liquids. This manufactured graphite would eventually require replacement, however, and due to its complicated geometry the entire component would need to be removed. LeBlanc proposes that this expensive replacement could be avoided if the reactor core was changed from a generally spherical shape to an elongated cylinder. Then, easily manufactured geometries could still provide reasonable power outputs.

LeBlanc goes on to explore the variety of ways that such a reactor could be implemented, finally proposing three specific models that he would like to see tested. While I found his discussion concerning the intricacies going in to each model, I do think he would make the article more effective if it was split into two separate pieces: one on the merits of the cylindrical redesign of the MSBR, and another on the models that he would like tested. As it was, the paper seemed excessively long and somewhat sporadic, jumping from how a geometric redesign would save the MSBR from its prior shortcomings and strongly advocating for a two-fluid reactor model, before then extolling the DMSR converter and its single-fluid mode of operation.