

RFA-17-14606, MW-scale Commercial Reactor

Oklo reactors have the potential to be located close to populated areas, enabling flexible siting to meet a wide variety of potential customer needs. One of the biggest challenges for design and siting for advanced reactors is determining source terms and accident scenarios. To properly account for the unique characteristics of an advanced reactor, many effects must be accounted for which may be particular to a certain design. For example, the Oklo reactor has a small core, is not pressurized, operates without pumps, and does not have a large coolant inventory. Using a physics-based mechanistic source term calculation, the beneficial effects of these unique characteristics can be quantified.

DOE Office of Nuclear Energy funded work at Sandia National Laboratory (SNL) and Argonne National Laboratory (ANL) has focused on generic mechanistic source term calculations for fast reactor designs. The Oklo design shares some key characteristics with the generic reactor designs previously evaluated, including the use of metal fuel and operation in a fast spectrum. Therefore, this experience can inform Oklo's mechanistic source term calculations. The intent of this collaboration is to provide assistance to Oklo staff to analyze the source term of their specific reactor design. SNL and ANL assistance may include identification of models, code and methodology specific changes that may be required to accurately model the unique Oklo reactor design, training, expert advice, and limited scope generic source term analysis. Enabling design-specific mechanistic source term calculations for the Oklo reactor, will benefit Oklo's design, and serve as a test case for a new mechanistic source term methodology which will prove out a process to enable the commercialization efforts of other advanced reactors.

The main impact will be in Oklo's development in preparation for licensing and commercialization. Oklo is currently engaged in pre-application interactions with the Nuclear Regulatory Commission whose feedback has emphasized the value of source term calculations. The expertise located at ANL and SNL will accelerate Oklo's implementation of these tools needed to complete the source term calculations and provide a major benefit to their design efforts.

The project results will inform siting implications for Oklo reactors. This is particularly relevant for locations where Oklo reactor heat and power users would benefit from the reactor being located nearby, which may open up new market opportunities.