The Advanced Test Reactor (ATR) is a Department of Energy (DOE)-owned test reactor whose principal function is to provide a high neutron flux for testing reactor fuels and other materials. The reactor also provides other irradiation services such as radioisotope production. The reactor has a design thermal power of 250 MW with a nominal operating pressure of 360 psig at the top of the core and a nominal maximum reactor outlet temperature of 170°F. The ATR and its support facilities are located at the ATR Complex of the Idaho National Laboratory (INL).

The ATR Updated Final Safety Analysis Report (UFSAR) evaluates the safety basis of the facility to meet the requirements of DOE 0 5480.23, "Nuclear Safety Analysis Reports," and 10 CFR 830, “Nuclear Safety Management.” The format and content of the UFSAR follows the NRC Regulatory Guide, RG 1.70, “Format for Safety Analysis Reports,” and as such, the design basis events considered in the UFSAR are similar to those considered for the commercial reactor industry. Those events considered include external events, and specifically for this analysis, seismic events.

The ATR UFSAR has fully evaluated the impact of seismic events on the primary coolant system (PCS) and has shown conclusively that the consequences of seismically-induced loss of coolant accidents (LOCAs) meet the ATR plant protection criteria (PPC). However, an ATR Unreviewed Safety Question (USQ) determination has identified that a seismic event involving the ATR experiment out-of-pile loop piping has not been fully addressed in the ATR accident analysis.

An extensive analysis was conducted to address the ATR USQ by analyzing the seismic break and leakage in all four existing experiment standard in-pile Tubes (SIPTs), one large IPT (LIPT), and one additional SIPT scheduled for future installation. The seismically-induced experiment loop LOCA is postulated to occur simultaneously with the currently analyzed seismically-induced LOCA involving the ATR PCS. The combined effect of a seismically-induced LOCA involving both the PCS and out-of-pile loop piping was evaluated using the RELAP5, ATR-SINDA, and SINDA-SAMPLE codes to ensure that the ATR PPC are satisfied. This paper summarizes the challenges associated with the analysis and the final conclusions for continued safe operation of ATR.