NE-22-28590: Chlorine Nuclear Data Measurement and Evaluation

TerraPower, is based in Bellevue, Washington. Their mission is to provide the world with clean, safe, affordable, and reliable energy, and improve quality of life without burdening the environment. TerraPower is developing the Molten Chloride Fast Reactor and the Molten Chloride Reactor Experiment.

Design and operation of MCRE relies heavily on the quality of nuclear data including nuclear data for ^{35}Cl and ^{37}Cl for many reactions. Recent $^{35}Cl(n,p)$ measurements significantly disagree with evaluated nuclear data (ENDF/B-VIII.0) in the most important neutron energy range to the MCRE. This project will perform new measurements of $^{35}Cl(n,p)$, analyze the experimental data from these measurements, generate new ^{35}Cl and ^{37}Cl cross section evaluations in ENDF/B format, and assess the impacts of the expected changes to chlorine nuclear data by comparing analysis of MCRE with updated cross section libraries to results with existing nuclear data.

TerraPower will partner with the Los Alamos Neutron Science Center (LANSCE) at Los Alamos National Laboratory (LANL). This LANSCE team has extensive knowledge and experience in measuring fast spectrum cross sections for chlorine isotopes. Producing high quality measurements of ^{35}Cl and ^{37}Cl cross sections and re-evaluating the chlorine evaluated nuclear data libraries will reduce regulatory uncertainty of chloride salt reactors.