

NE-18-16146, Plasma Separation Process Feasibility Study for the Commercial Enrichment of Gadolinium-157

With the U.S. nuclear power fleet under pressure to stay economically competitive, utilities are actively working on innovative initiatives to reduce total fuel cycle and operational cost. One such initiative under investigation by Exelon Corporation (Exelon) and Oak Ridge National Laboratory (ORNL) is the use of enriched gadolinium in the fuel designs, specifically for the boiling water reactor fleet and to a lesser extent, the pressurized water reactor fleet. Exelon will evaluate advancements in plasma separation process related technology and design enhancements to develop a modern business case for building and operating a plasma separation process facility for gadolinium-157 enrichment. The plasma separation process is drawn from ORNL's nuclear fusion and plasma science programs, which are heavily invested in these same technologies.

The availability of enriched gadolinium has a potential \$100M per year impact on the cost of fuel for the existing boiling water reactor and pressurized water reactor fleet. This project will determine if currently available technology can be used to modernize the plasma separation process to a level of cost effectiveness to realize the potential cost saving in the nuclear fuel cycle. Although this initiative has broad market impacts, the largest economic benefit will be realized by the boiling water reactor fleet.