

SES19-2019-000064

Abstract for an Invited Paper  
for the SES19 Meeting of  
the American Physical Society

**Alternatives to Californium-252 as a Neutron Source for the Non-Destructive Assay of Commercial Nuclear Fuel**  
RALPH REDA, University of North Carolina Wilmington

Non-Destructive Assay has long been used for quality control and nuclear material accounting of light-water reactor nuclear fuel rods. In this method, fuel rods traverse through a scanner with an activation zone in which they are subjected to neutron radiation. The induced fission activity is subsequently measured as the rods exit the irradiator. From this and other information, the enrichment and other quality control characteristics of each rod and pellet are determined. Californium-252 ( $^{252}\text{Cf}$ ) has long been used as the neutron source in the fuel rod scanners, because it is an intense neutron emitter and is readily packaged in compact, portable capsules. Due to increasing cost and supply concerns with  $^{252}\text{Cf}$ , nuclear fuel manufacturers, are seeking alternate neutron sources. This talk will discuss the pros and cons of replacing  $^{252}\text{Cf}$ -based active interrogation with high-flux, accelerator-based neutron sources or eliminating neutron sources all together and shifting to passive non-destructive assay methods.