



## Current Status of RPV Material Characterization from Decommissioned Zion Nuclear Power Plant

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### Introduction

The decommissioning of the Zion Units 1 and 2 Nuclear Power Plant (NPP) in Zion, Illinois presents a unique opportunity for characterization of actual reactor pressure vessel (RPV) material after in-service degradation and its comparison with currently available models for prediction of radiation embrittlement of RPV steels. Through RPV wall thickness attenuation and properties distribution can be addressed as well. All of these efforts will provide a better understanding of materials degradation and other issues associated with extending the lifetime of existing NPPs beyond 60 years of service. In support of extended service and current operations of the US nuclear reactor fleet, the Oak Ridge National Laboratory, through the Department of Energy, Light Water Reactor Sustainability Program, is coordinating procurement of materials, structures, components, and other items of interest from the decommissioned reactors. In this presentation, the current status of RPV material characterization from decommissioned Zion NPP Unit 1 will be presented. The main interest of this program is the circumferential beltline Linde 80 WF-70 weld and A533B base metal from intermediate shell. The Zion Unit 1 had been in operation for about 15 Full Power Years. The peak fluence on internal surface of vessel is about  $0.7 \times 10^{19} \text{ n/cm}^2$  ( $E > 1 \text{ MeV}$ ) and all efforts were made to harvest material from that region. Charpy impact, fracture toughness, tensile, and hardness testing is under way to perform through thickness characterization of mechanical properties of base and beltline weld materials. In addition to mechanical properties, chemical composition and various microstructural techniques, including but not limited to Atom Probe Tomography, Small Angle Neutron Scattering, and Positron Annihilation Life Spectrometry, will be applied as well.