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Operational Status and Upgrade of the Spallation Neutron Source at Oak Ridge National Laboratory (REMOTE)

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This presentation will highlight Spallation Neutron Source (SNS) achievements, difficulties and upgrade plans over the past two years. Six mercury target modules were operated without a leak or target related interruption to the neutron science user program. Sustained design improvement, improved fabrication oversight, disciplined target management and –most recently gas bubble injection –are all contributing to reliable target operation at MW power levels. Commissioning target gas injection at the end of 2017 was a major achievement. Measured reductions in mercury vessel pulse fatigue stress have exceeded expectations, and PIE assessments confirm that cavitation damage is significantly reduced. Increasing the gas flow rate to further extend target operating power and lifetime is planned over the next several years. Sustained operation at 1.4 MW has started with the presently running target, T20.

There were difficulties with neutron source operations during this period. Water began leaking inside the monolith core vessel that surrounds the target, neutron moderators and reflector assemblies in September of 2016. Three water loops serve equipment within this volume. The inner reflector plug (IRP) was the main leak source which worsened over time. While neutron production could continue, the IRP was not replaced until early 2018 due to fabrication delays. During the installation process an inspection camera viewed the aluminum neutron and proton beam windows. The proton beam window –replaced in early 2017 –clearly suffered some corrosion. Nevertheless, it remains in service.

Conversion to heavy water in cooling loop #4 is now providing a boost in neutronic performance. An upgrade project to the facility has been approved to double the power capacity of the accelerator which will enable operation of the planned Second Target Station. Part of the approved upgrade project provides for 2.0 MW operation of the First Target Station.

Presenter: RIEMER, Bernard (ORNL)

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