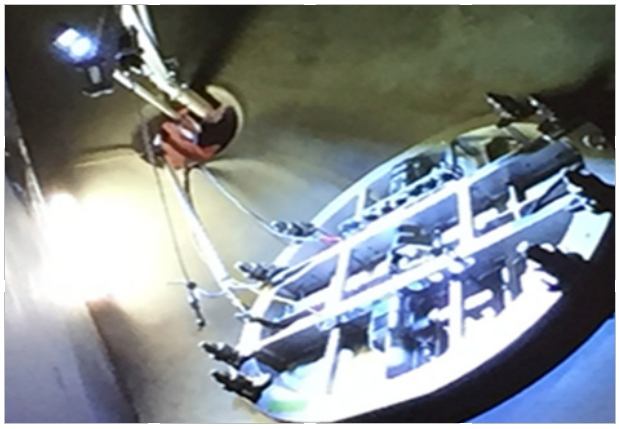
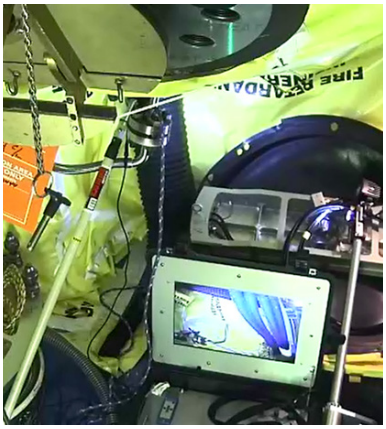
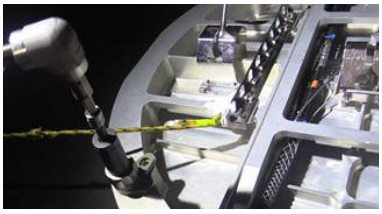
Innovation Initiative

Zero Entry Nozzle Dam ZEND

Success Story







PLANT
NextEra Energy Seabrook 1

LOCATION
Seabrook, NH, USA

CHALLENGE
Manual nozzle dam installations and removals currently require entry into the steam generator and can be a high-dose, confined space, critical path activity.

SOLUTION
- Eliminate channel head entry and confined space requirements
- Improved ALARA and dose reduction
- Improved safety
- Reduction in RP Support, breathing air supply, and platform decontaminationde

COST SAVINGS
– Two person-rem of dose

– Sixteen confined space entries

– Six hours of schedule

Innovation At Work
Innovation is one component of a continuous improvement cycle aimed at enhancing existing solutions and creating real technological breakthroughs for new market opportunities. Our established Innovation Team can observe the performance of plant outages to determine what proven technologies or the development of a new product can streamline various maintenance and reactor tasks. Our goal is to help our customers achieve outage excellence.

Challenge
Most existing domestic and international PWR nuclear power plants utilize steam generator nozzle dams (NDs). A ND temporarily isolates a steam generator (SG) from the primary reactor coolant system during a refueling cycle. Historically, trained technicians are required to enter the SG through a small manway opening to manually install and remove the NDs. The environment is one of high radiation, contamination and confined space. The utility may be required to provide equipment such as safety, anti-contamination and breathing air for the technician's protection. The length of time that a technician can work inside of the SG is limited by the utility. Personnel radiation protection rules and stay times are proportional to the measured radiation/contamination fields of the inside of the SG. With the aging population of SGs, the measured radiation field inside of the SGs tends to increase, thereby, shortening the allowable work time.

Solution
Zero Entry Nozzle Dams (ZEND), developed by the Innovation Team as a means of installing the NDs without requiring entry into the SG. Seabrook Station is a 4-loop Westinghouse PWR and, after power uprate, Seabrook operates with one of the highest Thot values in the industry. Seabrook has also incurred stress corrosion cracking in the SG tubes. As a result they have been required to perform eddy current inspections on all four SGs during every outage.

The Seabrook ZEND system involves a remote manipulator beam and specialized handling equipment on the NDs to allow manipulation and installation from outside of the SG. Long handled, right-angle tools were developed, along with specialty bolt retention mechanisms, to allow tightening of the eight studs required to fasten the NDs to the permanently installed nozzle retention rings inside the SGs. In Seabrook's spring 2017 outage, over two person-rem of dose savings was achieved, along with the elimination of sixteen separate confined space entries into the SGs. ZEND enabled installations to occur in parallel SGs thereby reducing the schedule by six hours.

CONTACT INFORMATION: 44 Shelter Rock Road, Danbury, CT 06810 USA
outage&fuel@curtisswright.com | +1.203.448.3310