

# Ultrasonic Level Measurement System (ULMS)

## Background

Various maintenance and inspection activities require that the water level in the reactor coolant system (RCS) be lowered into the loop piping. This operation is referred to as "mid-loop" operation. When in mid-loop operation, the residual heat removal system (RHRS) is susceptible to air ingestion, which can result in losing the capability to remove decay heat. Because of the frequency and potential severity of events where decay heat removal capability was temporarily lost in mid-loop operation, a significant amount of effort and activity has been expended by the nuclear industry and regulatory institutions over the years to address this issue.

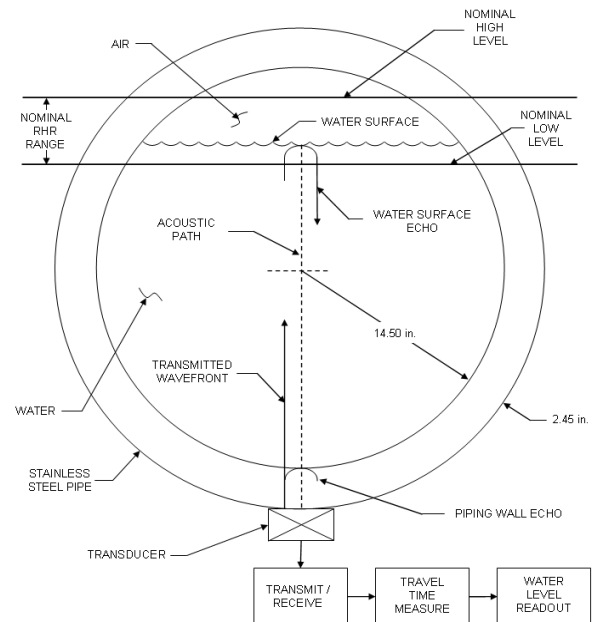
The NRC Generic Letter 88-17, "Loss of Decay Heat Removal" contains a requirement for two independent and continuous indications of the Reactor Coolant System (RCS) water level during reduced inventory conditions. The requirement stems from loss of decay heat removal events associated with air ingestion in the Residual Heat Removal pumps. Recognizing these concerns, Westinghouse has developed a water level indication system that provides an accurate measurement of hot leg water level.

The Westinghouse Ultrasonic Level Monitoring System (ULMS) uses non-intrusive ultrasonic technology to provide a highly accurate and reliable measurement of reactor coolant water level in the pressurized water reactor (PWR) hot or cold leg during mid-loop operations. Unlike typical sight-glass or differential pressure indications using long runs of tubing, the ULMS is not susceptible to erroneous readings caused by air accumulation or constrictions in the tubing. It is not sensitive to differing pressures, such as would be experienced during RCS vacuum refill evolutions.

## Description

The Westinghouse ULMS is available in two configurations: a permanently-mounted system, and temporary system installed each refueling outage where mid-loop operations are planned. The ULMS consists of an ultrasonic transducer

located directly at the bottom of the hot leg near the suction line for the RHRS. The signal is monitored from outside the bio-shield and can be sent to the control room, if desired.



## Benefits

The Westinghouse ULMS offers several significant advantages over other means of mid-loop level monitoring:

- Accurate and reliable
- Non-intrusive; requires no pressure boundary penetrations
- Control room indication available
- Fast response
- Unaffected by the RCS pressure if vacuum refill technology is used

## **Deliverables**

Westinghouse provides the ULMS hardware along with the installation and startup advisory. The customer will also receive Westinghouse proprietary information, including an instruction manual, interface requirements and electronic connection drawings.

## **Experience**

Westinghouse has, without incident, provided the ULMS services for over two dozen refueling outages globally.