

Global Instrumentation and Control

WINCISE (Westinghouse In-Core Information Surveillance & Engineering)

Background

WINCISE™ (Westinghouse In-Core Information Surveillance & Engineering) is an operational support system that uses Westinghouse technology licensed by the U.S. Nuclear Regulatory Commission (NRC) to obtain an accurate, continuous core power distribution measurement. Westinghouse developed this system as a replacement for the movable in-core detector system (MIDS). WINCISE uses the patented Optimized Proportional Axial Region Signal Separation, Extended Life (OPARSSEL™) in-core instrument thimble assembly (IITA) that contains five vanadium detector elements and a core exit thermocouple (CET). The integral CET significantly reduces maintenance and resulting personnel dose, as well as critical path time associated with the use of reactor-vessel-head-mounted CET.

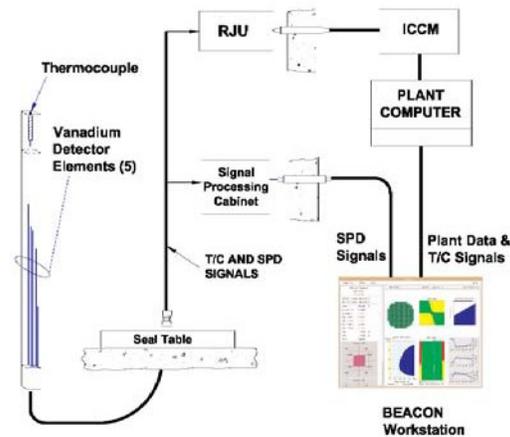
The power distribution monitoring software used to continuously process the detector signals is the Westinghouse Best Estimate Analyzer for Core Operations Nuclear (BEACON™) system, licensed by the NRC for use with the OPARSSEL design to produce accurate core power distribution measurements. The OPARSSEL design significantly reduces detector emitter material depletion and mechanical failures, which are major costs associated with the use of other fixed in-core detector system designs.

Description

The OPARSSEL detector design uses vanadium detector emitter elements as opposed to the rhodium material used in the typical IITA design. Vanadium depletes approximately six times slower than rhodium; therefore, the OPARSSEL detector assembly lifetime is six times longer than the rhodium detector assembly. Coupled with the ductility and radiation damage resistance of vanadium, the OPARSSEL design significantly reduces failures due to routine environmental or handling conditions.

The OPARSSEL IITA design also contains a Class 1E qualified CET, thus eliminating the need for the top-mounted CET system. The WINCISE

thermocouple electrical connections are located at the MID system seal table, eliminating the need to disconnect and reconnect thermocouples on the reactor vessel head during an outage. Also, removing the top-mounted thermocouple system reduces the number of penetrations in a new vessel head and the potential for leaks following a refueling outage.



Schematic of WINCISE system

Benefits

WINCISE provides continuous 3-D power distribution monitoring that allows:

- Rapid power ascension following a refueling outage
- Ability to avoid overly conservative operating strategies that limit operations
- Use of more economical fuel management strategies

WINCISE replaces MIDS hardware and electronics, eliminating:

- Maintenance issues with obsolete hardware
- MIDS thimble cleaning, maintenance and eddy current inspections, MIDS thimble vibration-wear-related replacement, drive and path selector hardware replacement and maintenance, and control cabinet maintenance

- Need to purchase, replace, store and track highly radioactive spent movable detector fission chambers
- Need to isolate containment for personnel entry during a flux map, a significant as low as reasonably achievable (ALARA) concern

WINCISE can eliminate existing CET connections on the reactor vessel head, which saves approximately four to eight hours of outage critical path time and radiation exposure.

WINCISE can also eliminate the penetrations required for thermocouple columns in a new reactor vessel head.

Deliverables

The Westinghouse WINCISE system, which is easily installed during a typical refueling outage, includes the following deliverables:

- OPARSSEL IITA (same number and location as current MIDS thimbles)
- In-containment signal processing system (SPS) needed to condition the detector signals to the BEACON system software platform without requiring additional containment penetrations
- Class 1E thermocouple connectors and cables
- WINCISE IITA hardware installation
- Advisors for installation of cables and the SPS
- IITA insertion and removal tool
- Seal table maintenance fittings compatible with the WINCISE IITA

Experience

WINCISE has been developed using proven components. The OPARSSEL detector assembly is based on previous in-core instrumentation (ICI) designs and was tested in a CE design unit for three cycles. The cables are of a proven mineral-insulated design. The SPS is derived from the SPS design in operation at a unit in Europe and is in operation at a unit in United States. BEACON has been in operation for ICI processing and is licensed by the U.S. NRC for use with the OPARSSEL design.

The Westinghouse WINCISE system is currently in use at one unit in the U.S.

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