Westinghouse, Long Term Operations

DVR for MUR Uprates

The Westinghouse Solution

Westinghouse has supported Measurement Uncertainty Recapture (MUR) scope for 60+ applications worldwide, with a 100% approval record for successful licensing of MUR.

MUR power uprates reduce the 2% Core Thermal Power (CTP) uncertainty assumption associated with 10 CFR Part 50 Appendix K. Traditionally, MURs have been implemented improved measurement instrumentation. Data Validation & Reconciliation (DVR) is a pro statistical method that uses data from existing plant instrumentation (i.e. no additional instruments need to be installed) to improve the overall accuracy of the CTP value.

Why use DVR for MUR Uprates?

For over 30 years, DVR has been successfully employed for thermal performance analysis in power recovery operations. The DVR models developed are custom to the nuclear power plant (NPP) and are fed measurements from hundreds of plant instruments. These models determine the most probable true state of the feedwater flow measurement to reduce the CTP's uncertainty. These reductions are made using correction factors (CF's) output by the DVR model and input into the plant secondary calorimetric.

The aim of using DVR for MUR is similar to that of more traditional MUR power uprates (e.g. Leading Edge Flow Meters (LEFM)), but at a lower cost and with less invasive plant modifications. As with other MUR power uprates, the reconciled CTP measurement will allow for increases in MW output of 1.0 to 1.5%.

DVR for MUR Project Phases

Phase 1: Build DVR model and preliminary SAT

- This phase will define the % power uprate achievable for the MUR, & may include recommendations for improvements or necessary maintenance on plant instruments to achieve desired % power uprate result
- Perform initial Site Acceptance Testing (SAT)

Phase 2: Licensing Submittal and supporting MUR engineering

- Includes engineering package, LAR development, and NRC review

Phase 3: Implementation, final SAT, and Training

Customer Benefits

- The uprate can be achieved with no major physical modifications to the plant systems (i.e. no pipe-cutting, no equipment installations, etc.), and at a lower cost
- DVR is already used by many NPP's to monitor thermal power measurement drift and to return to rated power (i.e. power recovery)
- Eliminates the need to depend on the quality of any single measurement (e.g. LEFM output)
- Minimal operator action required
- In 2023, NRC Safety Evaluation Report ML23193A782 on EPRI topical report 3002018337 was issued, endorsing the application of DVR for MUR
- A pilot implementation of using DVR for MUR is underway at Salem Units 1&2

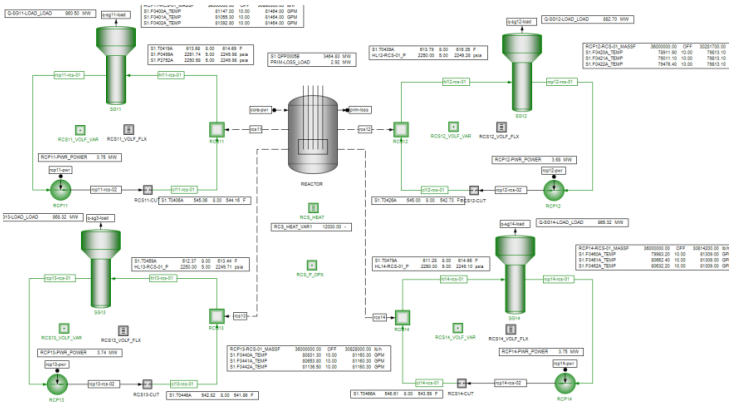

Figure 1: Reactor Process Flow Diagram (from DVR model)

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