

# Global Instrumentation and Control

## Analog Electro Hydraulic – Digital Replacement

### Background

As support for analog electro hydraulics (AEH) diminishes, Westinghouse has recognized the need for an AEH digital replacement (AEH-DR). The AEH-DR is an Ovation®-based fit, form and function digital replacement for the AEH that provides redundancy, reduced maintenance costs and advanced features.

Westinghouse made use of its “in-house” technical knowledge of the AEH, as well as experience from digital upgrades, to develop the AEH-DR as a low risk “plug and play” solution.

### Description

The Westinghouse AEH-DR was designed around the following tenants:

- **Minimal Plant Changes**

The AEH-DR utilizes a duplicate of the existing main control room panel so that operators will not require system training. By utilizing the same panel design, changes to the plant’s wiring and simulator are not required.

- **Ease of Demolition and Installation**

The existing AEH cabinets and plant wiring will be re-used. The AEH-DR is provided on pre-wired panels with demolition and installation instructions so it is a “plug and play” retrofit. The plant can easily install the AEH-DR with minimal schedule impact or Westinghouse can provide full installation services.

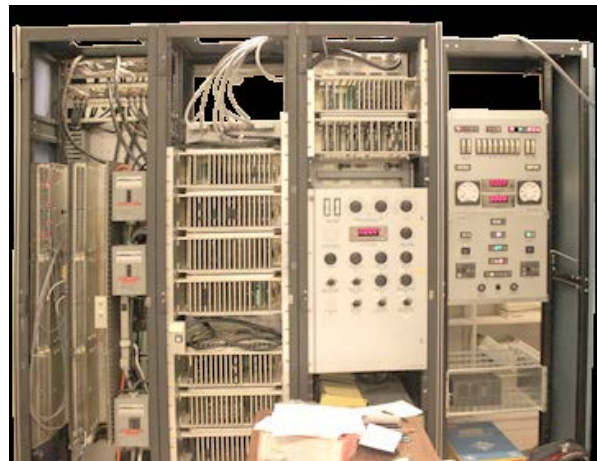
- **Improved Functionality/Upgradeability**

Process control, reliability, availability and operability are all improved with the AEH-DR. The same Ovation controller, power supplies and turbine-specific input/output devices (speed detector module, valve positioner module and servo driver module) are utilized in the AEH-DR as in Westinghouse’s full-scale turbine control and protection system solution. In fact, the AEH-DR can be expanded as desired to a full-scale digital

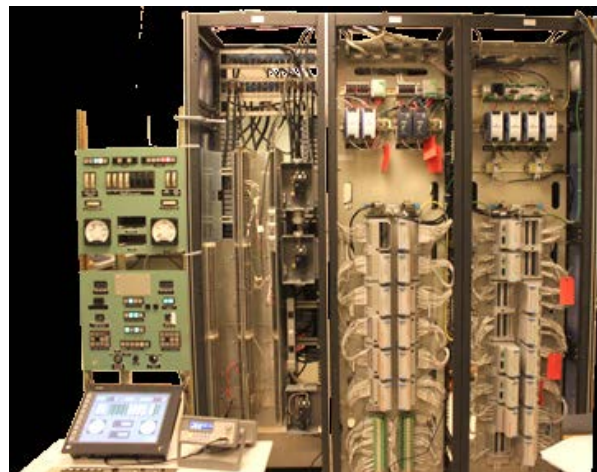
control system solution with no loss of components.

- **Eliminate Obsolescence Issues**

The AEH-DR utilizes the same Ovation platform that Westinghouse has chosen for its AP1000® nuclear power plants, as well as all non-safety digital upgrades, providing long-term Westinghouse support for the AEH-DR.



Before: Analog Electro-hydraulic Control System



After: Analog Electro-hydraulic Digital Replacement Control System

## System Features

The AEH provides the following features:

- Standard
  - Speed control
  - Overspeed control
  - Load control
  - On-line valve testing
  - Frequency control
  - Impulse pressure control
- Optional
  - Megawatt control
  - Redundant linear-voltage differential transducers (LVDTs)
  - Turbine protection

## Benefits

- The AEH-DR is designed such that processing single-point vulnerabilities and several system hardware single-point vulnerabilities are eliminated. Processing redundancy is provided, which increases reliability to over 99.9 percent
- No system calibration is required – reduced maintenance cost
- Valve calibration is reduced to a half day for all valves
- The servo positioners interface directly with existing valve actuators and feature automatic LVDT calibration of turbine valves, which can be accomplished in “minutes” versus “hours,” reducing manpower and critical path time
- Heat generating 120 VAC valve test panel is replaced with a redundant 48 VDC unit using existing interface cables
- Speed detector module architecture provides a third level of speed protection and functional redundancy
- Pre-wired to accept a third speed probe
- Expandable to add LVDT redundancy to the governor valves
- Pre-wired to accept LVDT redundancy for the governor valves
- Infrastructure components can be reused to make the AEH-DR part of a full distributed control system

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