GE VERNOVA

HITACHI

FACT SHEET

Safety Enhancement

SPENT FUEL POOL LEVEL MONITOR

The Spent Fuel Pool Level Monitor (SFPLM) is a robust liquid-level measurement system that provides accurate measurement of the Spent Fuel Pool (SFP) water level with NUMAC electronics located up to 1000′ from the SFP.

Objective

Provide a simple, highly robust solution that possesses the following features:

- Severe Accident/Station Blackout (SBO) survivability
- Remote electronic operation – up to 1000 feet
- Continuous, accurate readings greater than 1″ resolution
- Simple and flexible installation – no penetrations to SFP liner or under water modifications
- Low Maintenance – single cable, no sensor drift over time
- In-situ functional tests
- Meets or exceeds US NRC EA-12-051, JLD-ISG-2012-03, and NEI 12-02 requirements
- Optional temperature sensor for monitoring and trending

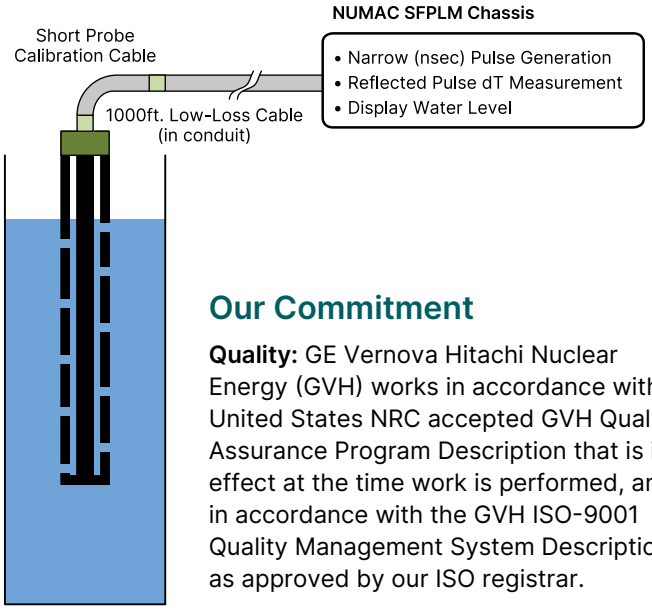
Features

- Proprietary Time Domain Reflectometry (TDR) technology
- Two channels of 1E qualified NUMAC electronics with qualified 1E software
- NUMAC electronics can be located up to 1000 feet from SFP
- Configurable alarms
  - 3 pre-set water level alarms
  - Sudden loss of cooling inventory alarm
  - Optional high temperature alarm
- Optional capability to interface with plant computer
- Trending displays – plot water level and/or temperature
- Commercial Ethernet-based wireless compatibility
- Reliable power management
  - 40 Watts operating power
  - 25 Watts operating power in display “Sleep” mode
  - “On Demand” operation for extended battery operation
  - 72 hour external battery power/UPS capability
- Passive sensor – no moving parts or electronics in SFP area
- Robust stainless steel, heavy-wall probe largely impervious to temperature, radiation, saturation and corrosion associated with severe accident conditions
- Single, ~0.5″ diameter low-loss coaxial cable – no complex wiring; simple, flexible routing

NUMAC Qualification

Seismic (IEEE Std 344), Environmental (IEEE Std 323) 5°C to 50°C, EMC (EPRI TR-102323-R3).

All NUMAC electronic assemblies meet IPC-610 requirements.



Our Commitment

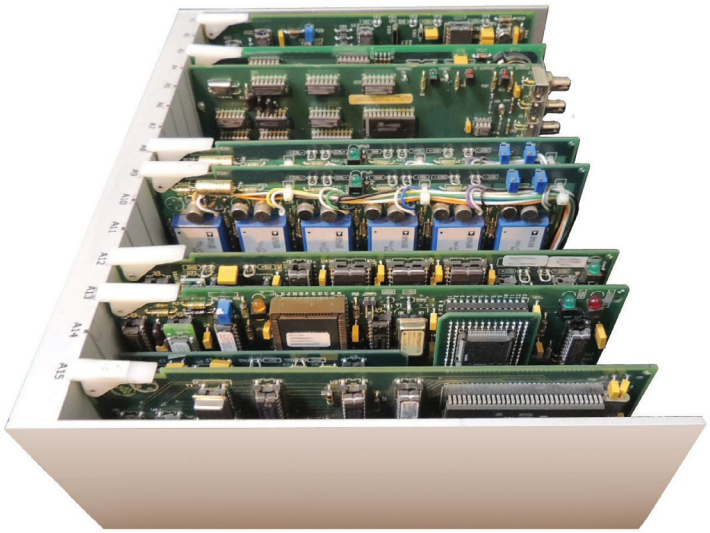
Quality: GE Vernova Hitachi Nuclear Energy (GVH) works in accordance with the United States NRC accepted GVH Quality Assurance Program Description that is in effect at the time work is performed, and in accordance with the GVH ISO-9001 Quality Management System Description, as approved by our ISO registrar.

NUMAC Instrumentation

The NUMAC Spent Fuel Pool Level Monitor (SFPLM) System consists of two (2) channels of 19″ rack-mounted NUMAC chassis, two (2) stainless steel passive probes, and two (2) interface coaxial cables.

SFPLM Standard Features

- Proprietary TDR Impulse generator and high speed discriminators for reflected pulses – provides continuous level measurement with high signal to noise ratio and high accuracy (<1 inch). Electronics can be located in a controlled environment up to 1000 ft from the SFP. No post-installation sensor calibrations.
- Automatic battery backup on loss of AC power provides up to 72 hours of operation. Estimated battery capacity remaining available on display.
- Leverages the NUMAC Safety-Related Operating System, including watchdog timers to guard against faulty inputs and common mode failures.
- Built-in Self-Test system maximizes channel availability by detecting and annunciating system failures in <1 minute.
- Display screens are NUREG 0711 Human Factors Engineered. Primary information available on main display with soft-keys for trend displays, diagnostics, surveillance, and user help. Configurable alarms and other parameters are stored in non-volatile memory with key-lock and password access control.
- Digital accuracy for water level, low drift, and 24 month surveillance intervals. Calibration/Surveillance functions are controlled from the front panel without disconnecting cables or probing internal circuits.



SFPLM Standard Features (continued)

- Relay outputs (Form-C) for water level, temperature, loss-of-inventory alarms are adjustable, plus an INOP/Trouble notification alarm is included.
- Outputs for extended monitoring range:
  - Ethernet output provides system parameters and values for remote monitoring and data storage, and is capable of interfacing with an 802.11 wireless router (transmit-only protocol)
  - Output for level configured for 0-10V, 0-1V, or 4-20 mA

SFPLM Optional Enhancements

- Optional fuel pool temperature measurement with digital readouts displayed on the front panel, and 0-10V, 0-1V, or 4-20 mA output
- Optional multi-probe calibration enables interchangeable electronics for additional flexibility
- Optional portable electronics packaging that satisfies “partial portability” guidance as described in NEI 12-02, Revision 1, Sect 3.1

SFPLM Dimensions & Connections

4U (EIA standard) 19″ wide X 7″ high rack-mount chassis weighing 32.5 lbs. Chassis, retention fasteners, and top cover are seismically-qualified. Connector bracket in rear of chassis interfaces all electrical signals. Retractor arm provides cable routing behind NUMAC chassis for field cabling.

SFPLM Power

120 VAC (90-132VAC), 50-60 Hertz, <40 Watts, Each channel includes a self-contained back-up 24 VDC source capable of SFPLM operation for 72 hours. This utilizes a 120 VAC power supply and a 24 VDC power supply which are auctioned. The 24 VDC UPS (Uninterruptible Power Supply) consists of a battery, trickle charger, and monitoring circuit.

Minimization of Obsolescence Issues

Leverages industry-standard NUMAC design. 1100+ NUMAC chassis in operation with over 16,000 years of operational experience. GVH is committed to provide spare parts, training and ease of maintenance to minimize obsolescence concerns. The SFPLM shares many common components such as chassis, front panel, power supplies, and electronic modules with other NUMAC family members thereby facilitating spares provisioning. NUMAC obsolescence is managed at the card level, minimizing the impact of technology changes. New cards manufactured today maintain compatibility with existing installations. This allows GVH to continue supporting the NUMAC Chassis installed as far back as 1985 without requiring a system level change out.

Learn more at gevernova.com/nuclear

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