

# Cable Health and Aging Management Program

## Background

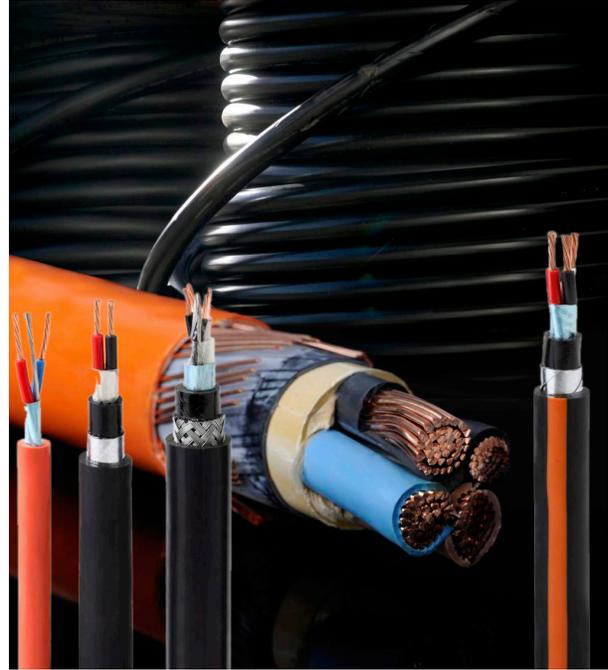
Cable integrity is vital to the safe and efficient operation of a nuclear power plant or facility, especially as a plant enters into long-term operation of 40 years or more. Despite their importance, cables typically receive little attention – they are considered passive, long-lived components that are very reliable. However, cable failures have caused plant shutdowns, safety concerns and loss of revenue.

Performance and safety concerns demand proactive and preventative approaches to cable integrity and reliability. A cable health and aging management program anticipates and addresses cable aging issues, helps reduce maintenance costs, avoids unscheduled shutdowns and repairs, incorporates industry best practices and addresses regulatory requirements.

Cable integrity issues must address cables in adverse conditions, including:

- Being submerged in water or harsh chemicals
- Being located in areas of high temperature or radiation
- Having high-resistance splices and complex connections

These harsh operating conditions can lead to premature cable degradation. Plant operators must anticipate potential concerns and proactively inspect, repair and/or replace critical cable systems.



## Description

Westinghouse's Cable Health and Aging Management Program (CHAMP) is a comprehensive program to meet the plant operating conditions and demands of today and tomorrow.

CHAMP is composed of six elements that use technical and economic inputs to establish a plant-specific, comprehensive, cable-aging management program for action.

**ONE** – Cable monitoring is prioritized based on:

- Initial maintenance rules, anticipation of licensing renewal and other regulatory or operating requirements
- Safety classification
- Criticality to the operation of the plant
- Initial walkdown and other criteria (which may reduce the number of cables to be monitored)

**TWO** – Creation of a CHAMP Dynamic Component Database (DCD) comprising:

- Cable location and routing information
- Cable information from other databases
- Plant environmental zones that act as aging stressors (e.g., temperature, radiation, underwater, etc.)
- Cable health, activities and status, as determined by walkdown and initial test results

**THREE** – Walkdowns provide a basis for determining initial areas of concern. They consist of:

- Visual inspections for discoloration, hardening, cracking, wet environment and other factors
- Documentation to include photographs and infrared thermography
- Measuring environmental parameters such as temperature, radiation, etc.
- Identifying cables with photographic and/or video documentation
- Developing recommendations for any adverse conditions that have been found
- Identifying damaged cables and making recommendations for necessary action
- Identifying new cables to be monitored based on the existence of adverse conditions
- Updating the CHAMP DCD

**FOUR** – Field testing (such as tan delta, partial discharge, LIRA®, high potential and time-domain reflectometer) and laboratory testing of field samples provide a basis for establishing appropriate maintenance activities and further updating the CHAMP DCD.

Full-scope engineering analysis includes weight and thermal calculations for cable trays, rerouting of cables, determination of new shielding requirements, and calculation of remaining life and degradation rates to provide a cable health life cycle.

Westinghouse is the exclusive provider of the LIRA cable assessment testing system in North America with the ability to perform on-site testing, sales of LIRA test units, training, and maintenance and calibration of units. The LIRA system is based on frequency domain refractometry, and can assess both the overall health of cables, as well as find specific faults in low-, medium- or high-voltage shielded or unshielded cables.

**FIVE** – Qualified laboratory to perform commercial grade dedication and/or equipment qualification (EQ) for cables and components. Westinghouse also has complete physical science and experimental laboratories.

**SIX** – Analysis of the CHAMP DCD will provide an assessment of overall cable health. Based on that analysis, damaged cable sections are repaired; new cable sections can be spliced in and/or an entire cable may be replaced. If necessary, a schedule will be established for the next interval testing. Field support includes repair and/or replacement of cables, installation of heat blocks and needed plant modifications. These actions are, once again, used to update the CHAMP DCD.

## **Benefits**

By teaming with Westinghouse, customers receive a comprehensive cable program through a responsive single-source partner. The CHAMP DCD organizes the results into a presentable format to monitor and maintain the program and provides documented proof of the efforts associated with a successful program.

The Westinghouse CHAMP is a “living strategy” that is continually reviewed and revised. Regular updating of the CHAMP DCD provides the vigilant monitoring necessary for overall cable health and prioritizes tasks based on both potential risk and cable integrity.

*LIRA is a registered trademark of Wirescan AS.*