

# Enhanced Use of Digital I&C and Optimized Human-Machine Interface

Instrumentation and control (I&C) and human-machine interface (HMI) systems affect all areas of plant operation and can profoundly impact plant reliability, efficiency, and operating costs. Quickly developing new I&C technologies and approaches will be critical to maintaining safety and competitiveness in the face of aging and equipment obsolescence in the current fleet, license renewals, and new plant construction.



Digital technology is the foundation for I&C and HMI in new plants and for upgrading the current fleet. These new technologies bring capabilities that improve reliability and availability, reduce costs, and enhance safety, but they also bring significant technical and regulatory challenges.

There are several open technical and regulatory issues in the areas of I&C and HMI that need coordinated, proactive industry attention. The issues—including software common cause failure, defense-in-depth and diversity, safety/non-safety information and controls on the same HMI—are open in the sense that there is limited guidance and no consensus among utilities, suppliers, and the Nuclear Regulatory Commission (NRC) with regard to what solutions are technically appropriate and acceptable to regulators.

Failure to resolve these issues has already resulted in protracted regulatory reviews for operating plants that are implementing digital upgrades to safety systems, increased costs, and delays in planned upgrades for other plants. The NRC has indicated that failure to resolve these issues generically will delay the evaluation and approval for combined construction and operating licenses (COLs) for new plants. This could cost the industry billions of dollars in delayed startups and power production, in addition to the increased licensing costs.

## EPRI's R&D Plan

EPRI is engaged in an aggressive two-year effort to resolve technical and policy issues to enable installation of digital I&C systems in new and existing plants.

EPRI is critically reviewing system evaluation tools and methods as well as risk modeling methods for monitoring the risk-impact of systems. This effort is drawing on a significant body of recent EPRI work in this area.

## Collaboration

EPRI is addressing the technical needs of the industry, through the Nuclear Energy Institute (NEI), as they address policy issues with the NRC. EPRI will be directly supporting the technical needs of utilities as they implement, operate, monitor, and update these systems in the future.

June 2007

## Electric Power Research Institute

3420 Hillview Avenue, Palo Alto, California 94304-1338 • PO Box 10412, Palo Alto, California 94303-0813 USA  
800.313.3774 • 650.855.2121 • [askepri@epri.com](mailto:askepri@epri.com) • [www.epri.com](http://www.epri.com)

© 2007 Electric Power Research Institute (EPRI), Inc. All rights reserved. Electric Power Research Institute, EPRI, and TOGETHER... SHAPING THE FUTURE OF ELECTRICITY are registered service marks of the Electric Power Research Institute, Inc.

♻️ Printed on recycled paper in the United States of America