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IEEE Guide for the Application of Human Factors Engineering to Systems, Equipment, and Facilities of Nuclear Power Generating Stations

Sponsor

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of the
IEEE Power Engineering Society**

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Foreword

(This Foreword is not a part of IEEE Std 1023-1988, IEEE Guide for the Application of Human Factors Engineering to Systems, Equipment, and Facilities of Nuclear Power Generating Stations.)

The need for the application of human factors engineering (HFE) in the design, operation, testing, and maintenance of nuclear power generating stations has been demonstrated by plant operating histories and regulatory and industry reviews. Prior to the incident at Three Mile Island-Unit 2 (TMI-2), little guidance for the application of HFE in nuclear power plants existed, even though well established HFE principles were available and routinely applied to aerospace, defense, and other industries. Studies of operational nuclear power plants prior to 1980 found that many did not reflect the application of HFE in the design. The evaluation of the TMI-2 incident revealed that proper application of HFE in nuclear power plant design could contribute to reducing human errors and could improve accident prevention and mitigation. Based on this potential for improving nuclear plant safety, the Nuclear Regulatory Commission (NRC) began instituting guidance for the incorporation of HFE principles in the design of nuclear power plants. In 1981 the NRC published NUREG-0700, Guidelines for Control Room Design Reviews,¹ which provided HFE criteria for evaluating existing nuclear plant control rooms and those under construction. During this same time industry groups such as the Electric Power Research Institute (EPRI), the Institute of Nuclear Power Operations (INPO), and others also provided research, studies, and methodologies to support the application of HFE to further the safe operation of nuclear power plants.

The intent of this guide is to provide guidance to management and engineers to develop an integrated program for the application of HFE in the design, operation, and maintenance of nuclear power generating stations. In both the design and construction of new nuclear power plants and operation and maintenance of existing nuclear power plants, the design or modification of man-machine systems is being undertaken. Typically, many diverse activities are being conducted independently, for example, design, construction, and development of operating, maintenance, and testing procedures.

The above mentioned activities should be integrated to obtain an acceptable level of man-machine performance. An ongoing program is needed to ensure that HFE is an equal design consideration with the traditional engineering disciplines in those activities that have a significant human interface. A significant human interface is defined as an interface between personnel and equipment, facilities, software, or documentation, where the resulting human performance is a determinant in the achievement of system performance. The definition for significant human interface does not include those interfaces covered by Occupational Safety and Health Administration regulations and standards pertaining to the general safety and health of employees.

This guide is intended to provide overall guidance for establishing a program for the application of HFE to systems, equipment, and facilities of nuclear power generating stations. It is applicable to new facilities or modifications to existing facilities. Guidance is provided on the program organization and applicability, the plant design aspects to consider, the HFE methodologies that may be used, and a typical program plan for the application of HFE.

It is intended that this guide will be a top-level guide under which additional IEEE Standards may be written to provide guidance for carrying out various specific aspects of the HFE program plan. It is expected that these IEEE Standards may address such areas as methodologies for evaluating man-machine performance, methodologies for considering human reliability, man-machine interface design criteria, and others.

This standard was prepared by a Working Group of Subcommittee 7, Human Factors and Control Facilities, Nuclear Power Engineering Committee of the IEEE Power Engineering Society.

¹This publication is available from Superintendent of Documents, US Government Printing Office, Washington, DC 20402.

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