MODELLING AGEING AT THE LEVEL OF ELECTRICAL SYSTEMS FROM CERNAVODA NPP

Mirela NIȚOI[1], M. PAVELESCU[2]

Abstract. *The effects of age-related degradation of plant components, systems and structures are necessary to be assessed in order to assure the continuous safe operation of nuclear power plants. The ageing process is an ongoing process, its evolution depends on many factors (physical properties of materials, operating conditions, period of operation, loads), and can lead to reduced efficiency of the component if it's left unmitigated. The Probabilistic Safety Analysis (PSA) is an efficient system analysis method which can be used to assess the risk of operation of an aged plant. The paper will present the benefits of using PSA in evaluation of impacts of ageing effects, as the changes induced by the ageing effects incorporation in the analysis results, for electrical power systems of Cernavoda NPP.*

Keywords: ageing effects, PSA, electrical power systems

1. Introduction

The degradation of the functional capability of components, systems and structures can be determined in time by a number of factors as follows: typical stressors for operating environment (irradiation, primary and secondary chemistry, vibration loads), service wear (accumulation of fatigue damage due to plant operational cycling, wear of rotating equipments), excessive testing of equipment or improper installation, application or maintenance. The ageing process is an ongoing process, and can lead to reduced efficiency of the component. If the phenomenon is left unchecked and unmitigated, the ageing could increase the risk associated with the facility operation [1].

As no facility can be considered immune to the ageing effects, the ageing phenomena represent a significant factor of concern, because of the tendency for safety level of the aged facility to be diminished as the time is passing.

Assuming that during the component life period there is no preventive or corrective maintenance, the component failure rate will follow the bath-tube curve.

The service life of any equipment, generally comprises three main phases, characterized by specific failure rates, as in the figure 1: [1], [2]

[1]Institute for Nuclear Research, Str. Câmpului nr.1, Mioveni, 115400, Argeș, Romania, e-mail: mirela.nitoi@nuclear.ro.
[2]Academy of Scientists, Str. Splaiul Independentei nr.54, sector 5, 050094, Bucharest, Romania, e-mail: mpavelescu2002@yahoo.com.