

# Probability Models for Lifetime and Integrity Assessment of Equipment and Components of WWER type NPP

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## Abstract

**Keywords:** Methods for non-destructive examinations (ultrasonic), defect of the metals (weld), NPP components, probability, models for lifetime assessment.

**Introduction:** The probability models for lifetime and integrity assessment of equipment and components of WWER NPPs based on the In-service inspection results achieved via non-destructive methods are not standardized methods and research studies are not undertaken yet. At the same time using of probability methods is recommended as a good practice in Series of IAEA Safety Guides as well as in the Unified Procedures for Lifetime Assessment of Components and Piping in WWER NPP, VERLIFE, European Commission, 2008, and in many other publications (Ostreykovskiy, Getman). As a typical example of such models is seen the risk assessment from facility destruction which is the basis of the Risk-informed In-service Inspection (RI-ISI).

**Extent:** It is known the lifetime of the NPP's components is an accident value – so the lifetime must be periodically calculated. This article suggests probability models for lifetime assessment of facilities at NPP in operation based on the Weibull distribution or log-normal distribution, or graphic methods. The research studies are performed using an ultrasonic method (referent mechanism - material fatigue).

First group results: If we suppose, we have 1 defect in a component. It is possible to study the progress of one parameter of the defect (a size) in different periods of the time of NPP exploitation. It is possible to predict the time of moment, when our defect will reach to limited size.

Second group results: If we suppose, we have more than 1 defect in a component. The investigations of the sizes of the defects may be represented by the Weibull distribution or log-normal distribution. It is possible to predict the lifetime of the component.

**Summary:** Based on the results from non-destructive examinations, it is presented a probability models for lifetime assessments.