

IMPACT OF SOME CONCEPTUAL ASPECTS OF CONTAINMENT AND SURVEILLANCE ON MODERN SAFEGUARDS

A. L. BIAGGIO*; M. A. MARZO*

*Brazilian Argentine Agency for Accounting and Control of Nuclear Material (ABACC)

e-mail: biaggio@abacc.org.br

Abstract

Conceptual aspects of C/S systems are reconsidered in order to facilitate the proper incorporation of advanced technologies in modern safeguards. Single and dual systems are analyzed and unattended and remote monitoring systems are conceptually addressed. The present situation for off load reactors is briefly discussed. Finally, it is concluded that current modern systems seem not to have been properly conceived, making difficult its incorporation in modern safeguards as well as the reduction of inspector's presence at the facilities.

EXTENDED SYNOPSIS

The extensive efforts aimed at using modern containment and surveillance systems (C/S) complemented by new technologies, like remote monitoring (RM), make it necessary to reconsider basic concepts in order to allow the proper incorporation of such systems on modern safeguards. The intention of this paper is to promote a discussion on subjects like redundancy, diversity and the meaning of tamper proof systems and devices. Consequently, the paper also addressed the need to review the classical approach for C/S when dealing with long term unattended systems. Later, the present situation regarding RM for light water reactors is discussed and the approach suggested is analyzed.

Regarding "classic" C/S, until now the practice has been to distinguish between two cases: a) "Single Systems"; and b) "Dual Systems". Conceptually, a C/S system is conformed by several physical barriers and one or more devices. The devices are aimed at assuring that no nuclear material is removed throughout a movable physical barrier (usually a seal) or throughout an open part of the containment (usually surveillance). It should be noted that "single" or "dual" does not usually applies to the whole C/S system but to the redundancy and diversity of the devices used.

In this conceptual framework, the authors describe a logic that justifies the need to re-verify the inventory of nuclear material for "single systems". Then, the case of "dual systems" is addressed with the same methodology.

In a further step, the question of systems that operate unattended for extended periods is analyzed and considerations are made regarding design criteria for such systems. Such criteria consider the subject of 'tamper proof" C/S systems in the context of modern technologies and reduced inspection frequencies. The concepts are expanded considering the possible use of RM and their advantages and difficulties. In dealing with RM the author used their experience in preparing performance requirements for a complex RM system and addressed the case of off load reactors.

Finally, it is explained why current modern systems seem not to have been properly conceived, making difficult its incorporation in modern safeguards as well as the reduction of inspector's presence at the facilities.