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The effect of the guard location in a nuclear facility on performance criteria

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ABSTRACT

The major functions of a physical protection system (PPS) are detection, delay, and response. Detection function is mainly to sense an adversary's intrusion and assess alarm events, and its physical implementation includes intrusion sensors, alarm communication systems and entry control facilities. Delay function can be accomplished through various passive and active barriers, makes adversary's advance toward his goal slow. Response function is to practically stop adversary actions. There are response guards responsible for the response function in a nuclear facility. They can be located at one or more posts to take action against adversary's progress after alarm occurred.

The mostly used quantitative effectiveness measure of a PPS is the probability of interruption (PI) derived from delay time after detection and guard response time. Delay time is a variable dependent on adversary's capabilities and guard response time varies with the distance between a guard post and destination to be dispatched. According to the advanced technology of digital computing, software programs such as SAVI (System Analysis of Vulnerability to Intrusion) provide PI based on user input including adversary capability, protective elements, guard response time, and other PPS information. However guard response time is considered as a constant not a variable. That means same guard response time is always set regardless of the variable guard travel time from a post to a location where guards can interrupt the adversary's action.

Since the location of guards may be easily changed in contrast to detection elements or delay elements and can be considered as a flexible mean against temporarily upgraded threat, a trial to investigate the changes of PI and CDP (Critical Detection Point) in case that guard response time is a variable was started. We defined several detection and delay elements along an adversary intrusion path and guard travel times as many as the number of detection elements. An analysis result under many assumptions shows the guard location near a detection element with most high detection probability gives the highest PI value even though further analysis required.

The purpose of the trial is to verify the feasibility of incorporation the guard response time variable into an effectiveness evaluation software program for PPS that KAERI is developing.