

# Digital Representation of Assets for Monitoring, Diagnostics, Prognosis, and Corrective Actions

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Existing nuclear facilities have structures, systems, and components (SSC) that experience degradation and necessitate reliable pre- and post-natural-hazard event condition assessment. This condition assessment should be timely and efficient for intelligent maintenance during normal operating conditions and post-event evaluation.

This presentation describes a three-dimensional digital representation of an existing nuclear facility that includes visualization of the location and characteristics of SSCs with historical plant and monitoring data in a centralized repository to (i) facilitate information sharing and (ii) inform assessment and decision-making. The digital representation of the SSCs of the nuclear facility allows owners, engineers, and inspectors to conduct virtual walk-downs of the facilities. During these virtual walk-downs, the selection of an asset provides images that describe attributes such as the type of asset, date of installation/construction, general characteristics and functionality, relative importance, clearances, potential seismic interactions, maintenance history, qualitative condition assessment history, and quantitative condition assessment history based on measured data (e.g., strain, displacement, etc., which are represented in both graphical and tabular format).

The availability of such information during normal operating conditions is useful to monitor the condition of assets for (intelligent) predictive maintenance, which involves degradation prediction and tracking, to promote the efficient allocation of resources for upgrades and life extension. After a natural-hazard event, the abovementioned information is useful, in tandem with physical post-event reconnaissance, to efficiently identify assets that may require further inspection and/or corrective actions. More rapid and reliable decision-making is fostered by having a centralized, visual repository of information that can be accessed in real-time, which also helps mitigate the potential for errors and reduce costs. At the same time, the availability of a digital representation of the nuclear facility is also useful for personnel training purposes.

This presentation provides an example of the application of this concept to track and diagnose the condition of structural members and equipment supports in an existing nuclear facility. The goal is to facilitate prognosis and decisions on the required frequency of inspections, the potential need for corrective actions, and the appropriate time to perform upgrades.