

# **Opportunities in Seismic Design**

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## **ABSTRACT**

Nuclear power plant designs for year 2020 and beyond are radically new (compared to existing nuclear power plants) in all aspects, including structural engineering. Today, we have a unique opportunity to engineer such extraordinarily complex systems in collaboration of all involved engineering disciplines: nuclear, mechanical, materials and civil. There are two principal advantages of such a design approach: 1) the safety of the nuclear power plant system will be increased through better engineering and better understanding of accident and failure processes; 2) the cost, both monetary and to the environment, to build, operate and maintain new nuclear power plant system will be lower. In this presentation, I will first describe the probabilistic performance-based design methodology developed recently for conventional structures, compare it to probabilistic methods used to design nuclear facilities in the past and suggest a common framework for risk-informed design of new nuclear facility structures. Then, I will describe a number of innovations in structural engineering available today for design and construction of new nuclear facility structures. Two of these new technologies, namely base isolation and double-skin steel-plate-reinforced concrete structures, are very promising. Recently, we completed a preliminary design of a base-isolated modular pebble-bed AHTR to demonstrate the advantages of integrating nuclear and structural concepts from the very beginning of NPP design. It is imperative that civil and nuclear engineers cooperate to maximize the benefits of new technologies to make new nuclear power facilities sufficiently safe and more economical to build, operate and maintain.