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RANGERS

Design and Performance Assessment of Engineered Barrier Systems in a Salt Repository for HLW/SNF

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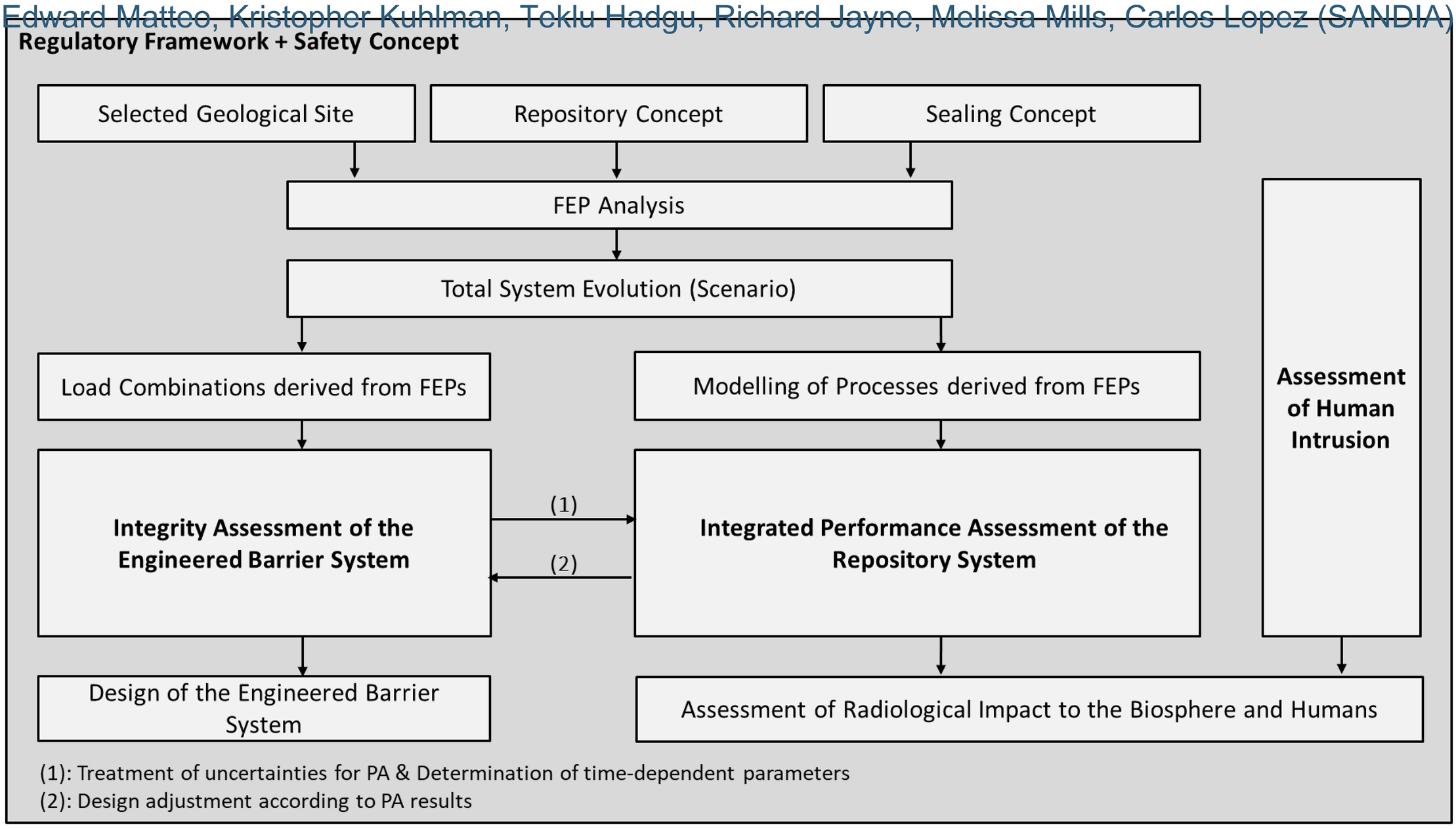

BGE TECHNOLOGY GmbH (BGE TEC) and Sandia National Laboratories (SNL) developed and tested jointly a methodology for the safety assessment of engineered barrier systems (EBS) for an HLW/SNF repository in salt.

Long-term-isolation in such a repository is provided by a multi-barrier system including natural and engineered barriers. The salt provides the natural barrier, whereas the engineered barriers are different sealing components installed in the repository.

The proposed methodology uses all aspects of design and the integrity assessment of the EBS, as well as their treatment in the scope of an eventual integrated total performance assessment. Starting from the regulatory framework, a safety concept is defined. This is a basis for the development of a repository concept and a sealing concept for the selected geological site. The evolution of the resulting repository system can be analysed by developing a Features, Events, and Processes (FEP) catalogue that describes all properties and evolutions that occur in the repository system over the performance period. Based on the FEPs, the relevant loads (disturbances)

The relevant processes have also to be modelled and considered in the performance assessment. FEP interactions are described in scenarios. The relevant scenarios impacting the EBS, as well as the repository, can be derived from the FEP catalogue.

While a comprehensive FEP analysis is not usually performed until after a site has been selected and characterized, RANGERS proposes that there are certain important aspects of EBS performance that can be studied by means of a preliminary FEPs analysis focused on EBS relevant FEPs. Ultimately, process models, based upon numerical models and experiments, are used to assess the integrity of the EBS as well as their impact in the integrated performance assessment simulations. For this purpose, the link between the (preliminary) FEPs and performance assessment is a key aspect of the proposed methodology. The main goal is to improve the representation of the EBS in the performance assessment (PA) of the repository, by comprehensive and specific analyses of the behaviour of the EBS under thermo-hydro-mechanical and chemical (THMC) conditions. The results of these analyses can be considered in the PA model and thus reduce the material and model uncertainties describing the EBS in the PA model.