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Evaluating the results of a site-specific PSHA from the perspective of a risk analyst

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From 1998 till 2015 Swiss Nuclear Power Plants sponsored a set of comprehensive site-specific PSHA-studies (PEGASOS, PEGASOS Refinement Project) to obtain the requested input for their plant specific probabilistic risk assessments following the US SSHAC procedures at their most elaborated level 4. The studies were performed by well-known earth scientists working completely independent from sponsors under participatory review of the Swiss Nuclear Safety Inspectorate. Risk analysts of Swiss Nuclear Power Plants recently have been mandated to implement the final results of the studies in their risk assessment studies. This triggered an in depth assessment of the results focussed on their practical applicability for risk studies. This assessment resulted in some important insights that are of interest for future PSHA studies performed for new nuclear power plants. The assessment included a review of the completeness of results with respect to risk applications as well as plausibility checks of hazard results based on Black Swan Theory and known historical events. The key lessons and recommendations for more detailed project output specifications for future projects are presented in the paper. It was established that future PSHA projects shall provide the joint probability distribution of ground motion hazard and the associated strong motion duration as the output to allow for a technically meaningful risk assessment. The recommendation of WENRA (West European Nuclear Regulators) published in their reference levels to perform natural hazard assessment preferably based on physical grounds (deterministic method) is also rationalized by recommending an holistic approach to hazard analysis comparing PSHA insights with the results of modelling deterministic Seismic Hazard Analysis.