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A Digital Solution to Support Site Selection and Resilience of Advance and Small Modular Reactors Installation

This paper proposes a novel recommendation tool for evaluating potential installation sites for Advanced and Small Modular Reactors (AMRs and SMRs) considering a multidimensional perspective. It combines various types of spatial and non-spatial data into the Geographic Informa□on System at a 0.12 km² resolution, incorporating diverse parameters including transportation infrastructure, topography, water access, and geohazards. The tool offers flexibility for users to define the decision
variables and assign weights reflecting their relative impacts. Leveraging multi-objective optimization, it potentially presents the Pareto frontier and provides a user-specific ranking of geographic areas. For broader applicability, the tool employs a digital twin-based assessment of potential interactions with existing electrical grids. The DIgSILENT simulator enables comprehensive power system analysis,
encompassing diverse studies such as load flow, consumption, and contingency assessment.
Furthermore, it incorporates climate predictions, such as sea surface temperature and sea level rise, to account for the multi-decade lifespans of SMRs. Additional relevant variables can be integrated based on user requirements to maximize project resilience. In conclusion, our approach accelerates the development and deployment of AMRs and SMRs to meet the growing global energy demand. Through a holistic site selection process, our solution provides an innovative framework for sustainable energy management.

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