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Techno-Economic Analysis of SMR Cogeneration with Desalination: A Case Study in Türkiye

In the face of escalating global water scarcity, integrating Small Modular Reactors (SMRs) with desalination emerges as a promising solution. This study assesses the feasibility and economic viability of SMRs for cogeneration with desalination, focusing on Türkiye.

SMRs, compact nuclear reactors, offer a unique opportunity to generate electricity and produce clean water through desalination. We evaluate SMR cogeneration systems in various coastal regions of Türkiye, considering different desalination technologies.

Using the IAEA DEEP program version 5.1 and a computer simulation model, we assess the economic efficiency of the system's annual operation, incorporating revenue from electricity and water sales. We also consider seasonal and daily variations in electricity prices and seawater temperature for a comprehensive evaluation.

We use the Mixed Integer Linear Programming (MILP) algorithm to identify the best siting location, configuration, and operational strategies for the SMR cogeneration-desalination system, aiming to maximize the net present value (NPV).

This study's findings offer valuable insights into SMRs' potential to address energy and water challenges. It also provides essential guidance for policymakers, energy planners, and stakeholders navigating the complex intersection of energy and water resource management, which can help Türkiye progress towards energy security and water sustainability amid increasing climate change pressures

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YES

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