RETHINKING NUCLEAR ENERGY INVESTMENTS: A LARGE TECHNOLOGICAL SYSTEM PERSPECTIVE

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As nations confront the grand challenge of climate change, nuclear power is increasingly considered a strategic investment for decarbonizing the energy sector. However, prevailing assessment models predominantly rely on economic and financial parameters, thereby neglecting the broader societal implications of nuclear energy. This paper adopts a Large Technological System (LTS) perspective and employs a multiple case study approach to develop a comprehensive assessment framework for nuclear-related investment decisions. By conceptualizing the nuclear LTS as an ontological object of inquiry, we extend the evaluative scope beyond individual infrastructures to encompass the entire system that is directly or indirectly influenced by nuclear investments. Nuclear LTSs transcend mere physical infrastructure (e.g., power plants) to include intangible yet essential components such as universities, research institutions, regulatory bodies, and contractual frameworks. This expanded perspective enables a more holistic understanding of national nuclear landscapes by integrating socio-economic, political, technological, socio-cultural, and environmental dimensions into the assessment process. The resulting model provides a robust and adaptable tool that can be easily implemented by a diverse array of stakeholders, including policymakers, investors, non-governmental organizations, and local communities. By moving beyond reductionist economic analyses, this study contributes to a more nuanced and multidimensional evaluation of nuclear power investments. In doing so, it facilitates informed decision-making processes that reflect the complex interdependencies between technological systems and societal structures. Ultimately, this research underscores the need for an integrative approach to nuclear energy governance, ensuring that investment decisions align with broader sustainability and societal objectives.

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