

Entry Costs and Investment Thresholds in Competitive Electricity Markets

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Extended Abstract

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Abstract Summary

Energy system models and competitive market equilibrium frameworks commonly represent capital costs through levelized cost of electricity or annualized capacity parameters, an approach that scales all costs proportionally with installed capacity. For technologies requiring first-of-a-kind prototype development---design certification, factory establishment, first-unit construction inefficiencies---alongside regulatory infrastructure and supply chain development, this specification mischaracterizes the qualitative nature of investment decisions. We extend the competitive electricity market framework of Milstein et al. (2022) to decompose capital costs into irreversible *entry costs* and recurring *capacity-scaling costs*. The framework demonstrates that cost structure specification fundamentally shapes viability assessment through a mechanism operating independently of context-specific parameters: entry costs create economies of scale that transform smooth viability into discrete threshold effects. Using small modular reactor data and Israeli market calibration as an illustrative application, we show that proportional-cost specifications suggest flexible entry at modest scales under typical financing conditions, while decomposed specifications reveal sharp thresholds requiring large-scale deployment and exceptional financing. Extensive robustness analysis---varying cost structure from complete elimination of entry costs to doubled baseline allocation---confirms this qualitative distinction persists. Only when entry costs vanish entirely does the smooth viability pattern emerge. This validates that specification choice, not parameter precision, drives the fundamental result. The framework provides practitioners with a tractable, portable approach to incorporate entry barriers into competitive equilibrium models, generalizing beyond nuclear to other infrastructure-intensive technologies including carbon capture, hydrogen infrastructure, and advanced transmission systems.

Presenting Author Biography

Lior Gallo is a Ph.D. candidate at Tel Aviv University, researching the economic viability of nuclear energy in Israel. He holds a master's in Economics and Statistics from the Hebrew University. Alongside his research, Lior is a researcher at the Bank of Israel, advising the government on energy and environmental policy. He is a member of the Israeli Climate Forum, an initiative of the President of Israel, and represents the state in IPCC climate negotiations. His work on electricity demand forecasting and energy security has significantly influenced Israel's national planning strategies and climate change adaptation policies.