

Coupled Investments in SMRs and Industrial Sites: a Real Options Analysis

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Extended Abstract

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Abstract Summary

Decarbonising industrial heat has become a pivotal challenge for policymakers and industrial stakeholders alike. However, investment in low-carbon heat technologies is still timid. This is hindered by risk aversion, the irreversibility of investment, and the fragmented nature of industrial heat demand, among other factors.

This paper explores the potential role of Small Modular Reactors (SMRs) in supplying decarbonised heat and electricity to industrial sites. These technologies offer high-temperature capabilities of decarbonized heat production at stable cost, yet face significant economic and infrastructural barriers. In the context of a possible deployment of such technology to supply heat and/or electricity to an industrial firm, emerges the issue of agreements on bilateral contracts between SMR developers and industrial firms, which may offer a viable pathway to overcome investment hurdles and align supply with demand.

To investigate this, we develop a coupled investment model within a Real Options Analysis framework, capturing the strategic decision-making processes for both an industrial firm and a SMR developer. The model considers five options for the industrial firm and three for the SMR firm, incorporating the irreversibility of capital expenditures, and the potential for bilateral contracting in heat and electricity supply.

Our numerical results suggest that both firms delay their investment decisions when given the option to wait before investing. For the industrial firm, this means keeping its initial gas boiler for a longer period, while for the SMR firm, it means holding off on investment and construction of the SMR. In addition, risk aversion exacerbates the postponing of heat decarbonization investments when the SMR investment is not an option. Finally, when contracting between the firms is allowed, an increased risk aversion motivates both firms' to sign heat and electricity supply contracts in order to hedge against energy price risks.

Presenting Author Biography

Cyrian Hallermeyer holds an engineering degree from CentraleSupélec, Université Paris-Saclay, where he specialized in energy systems. He holds a Master's degree in Environmental Engineering (Climate, Environment, and Sustainability) at the Massachusetts Institute of Technology.

Back in France, he began in 2024 a PhD in economic engineering at LGI CentraleSupélec, IFP School, and EDF Research & Development, focusing on hybrid nuclear systems, under the supervision of Pascal Da Costa and Frédéric Lantz.