

Planning in a changing environment : Applications of portfolio optimisation to deal with risk in the electricity sector

Odeh, R. P., Watts, D., & Flores, Y. (2018). Planning in a changing environment: Applications of portfolio optimisation to deal with risk in the electricity sector. *Renewable and Sustainable Energy Reviews*, 82, 3808-3823. <10.1016/j.rser.2017.10.089> Accessed 20 Feb 2021.

Abstract

Today's quickly changing world forces society to deal with uncertainties that produce high levels of environmental, social, and economic risks, thereby jeopardizing sustainable development. Portfolio optimisation is an effective tool for formally dealing with such uncertainties, because the social and private optimum is not found by analysing cost/returns and risks of individual assets, projects, actions or plans, but rather requires analysing them all together in the form of a portfolio. This paper presents a review of portfolio optimisation applications from the perspective of energy regulation in an attempt to guide the electricity sector towards sustainable development. Liberalized electricity markets have different sources of uncertainties, ranging from the traditional (e.g. fuel prices, electricity demand, and resource availability, etc.) to the latest sources of risks linked to a society that is more concerned about sustainability. We have found multiple research opportunities, especially in spatial modelling, transmission, and renewable generation, as well as others related to new social and environmental impacts and risks. The portfolio literature available to date excessively simplifies the power system. Supply, demand, and transmission modelling in portfolio analysis are not consistent with planning models, and therefore produce conflicting results. Additionally, despite abundant literature that analyses renewable complementarity, actual portfolio optimisation models ignore this effect, which leads to suboptimum portfolios. Environmental and social costs and risks, such as air and water pollution, land use, community values, and public opposition, among others, have also been ignored..