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## **USING MONTE CARLO SIMULATION TO ASSESS THE IMPACT OF RISKS AND MANAGERIAL FLEXIBILITY ON DIFFERENT GENERATION TECHNOLOGIES**

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### **Overview**

This paper reviews the limits of the traditional ‘levelised cost’ approach to properly take into account risks and uncertainties when valuing different power generation technologies. We introduce a probabilistic valuation model of investment in three base-load technologies, and show how such a probabilistic approach provides investors with a much richer analytical framework to assess power investments in liberalised markets.

### **Methods**

The paper introduces a probabilistic valuation model of investment in three base-load technologies (Combined Cycle Gas Turbine (CCGT), coal plant, and nuclear plant) and successively explores how such a probabilistic valuation approach can give insights on the three problematic issues with the traditional levelised cost approach:

its failure to take into account the various uncertainties that characterise generation investments in electricity markets;

its inability to incorporate the value associated with technological and managerial flexibility, and

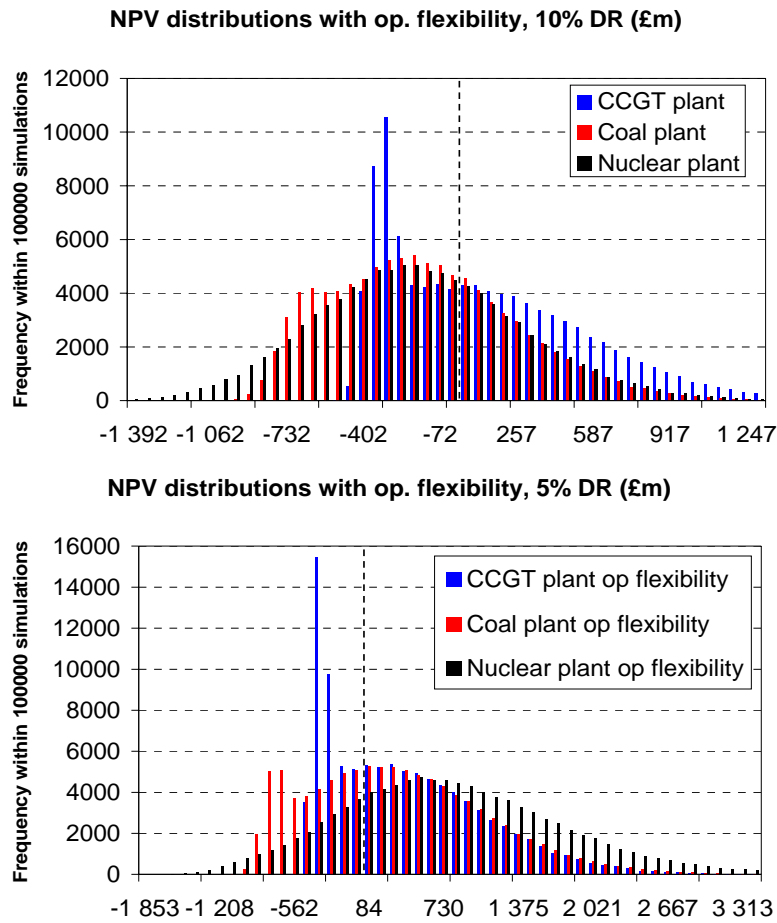
the fact that generation technologies are valued on a stand alone basis, without recognising the complementarities in the risk-return profiles of different assets that a generation company operates.

### **Results**

We show first that Monte-Carlo simulations give much more insight on the risk-return profiles of the different technologies in liberalised electricity markets.

Second, we demonstrate that taking into account the operational flexibility to operate or not a power plant depending on the relative fuel, carbon, and electricity prices greatly improves the value of a CCGT as compared to the other technologies.

Figure 11 - NPV distributions for the three technologies with operating flexibility, 10% and 5% discount rates (£m)



Lastly, we show how investors can take advantage of the complementarity of the three technologies different risk-return profiles by investing in mixed portfolios. In particular, introducing nuclear in a gas-dominant portfolio mitigates the likelihood of making large losses due to gas and carbon price uncertainty, without major negative impacts on the expected NPV.