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A new formulation for optimizing coal procurement in power generation

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The continuity of coal supply is an essential component in the operation of power generation plants. However, reducing the cost of coal procurement by focusing on the cheapest supplier can put power generators in the unenviable position of being responsible in the event of coal supply shortage. In essence, this paper deals with efficient coal procurement, whilst ensuring energy security. As a possible improvement initiative, a new approach to coal procurement analysis based on risk assessment is proposed. The proposed algorithm quantifies the risk of a supply shortage in monetary terms, based on the probability of shortages and cost to the coal power generation plant. The algorithm also includes the size of coal shipments and coal reserve margin. This new method is developed from two new concepts - the Non-delivery Probability Table (NdPT) and Supply Shortage Impact (SSI). The NdPT gives the probability of shortage from a particular procurement portfolio, whilst the SSI determines the cost of shortages. These steps can lead to the development of risk values which will then be compared with the cost of procurement. Subsequently, a genetic algorithm approach is used to optimize the risk and cost of the coal procurement portfolio. From the developed model, it was found that the cost of procurement (i.e., price) is a more dominant factor when compared to risk of procurement in load allocation. However, the loads must be allocated for a number of small sized vessels in order to decrease the value of total exposure which comprises risk and cost of procurement.

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