



# The inc-dec game and how to mitigate it

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**Differences in the rules between the power exchange and real-time markets create opportunities for arbitrage, where actors exploit price differences to increase their profits. This leads to higher costs for consumers, inefficient investments, and an increased risk of power shortages. The paper proposes several measures to counteract these problems.**

The power exchange considers transmission constraints between zones but overlooks many network details, such as local bottlenecks and the need for voltage control. The transmission system operator takes these factors into account on its real-time markets, which ensure that the power system meets quality standards. These differences sometimes lead to predictable price differences, enabling arbitrage.

The inc-dec game involves actors selling more electricity on the power exchange than they plan to produce, only to buy back the electricity cheaper in real time. This arbitrage primarily benefits production with low technical capability, as such production has lower value in real time when all the details of the power system are considered. It includes production that is poorly located within the grid or has limited ability to contribute to essential system services like voltage control and flexibility.

In normal cases, arbitrage is beneficial as it balances prices in the market and updates them based on latest information. However, the inc-dec game, which exploits differences in regulations, has harmful effects. It leads to overselling in the power exchange by sources with lower technical capability. Large adjustment volumes in real time make the system less efficient and increase the risk of power outages. In the long term, the inc-dec game results in higher costs for consumers. Furthermore, price signals become distorted, making it more profitable to invest in production with lower technical capability.

The UK and other countries with large zones, lightly regulated real-time markets and a stressed power system are particularly affected by the inc-dec game. The ongoing energy transition, with a significant increase in electricity consumption, could worsen the situation.

The paper evaluates various measures using a theoretical model and proposes several solutions to mitigate the problems associated with the inc-dec game. Firstly, increasing the number of zones per country ensures that the power exchange considers more details of the



grid. Secondly, improving network tariffs to better account for local bottlenecks and the need for voltage control is beneficial. Furthermore, stricter regulation of real-time market trading can counteract strategic behaviour. Lastly, transmission system operators can take short-term measures that will somewhat increase transmission capacity within the existing grid. Such measures will mitigate stress in the power system.