



# Contractual Framework for the Devolution of System Balancing Responsibility from the Transmission System Operator to Distribution System Operators

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**Abstract** The goal of this research is to trigger the devolution of the system balancing responsibility entirely belonging to the transmission system operator (TSO) to several local distribution system operators by fairly allocating system balancing cost based on a cost-causality principle. Within the devolved system balancing scheme, distribution system operators (DSOs) have appropriate motivation for reducing the variability and uncertainty caused by units in their own area. As the number of renewable electricity sources (RES) being connected to the local distribution system increases, it would be advantageous for the TSO to share the increasing burden of the system balancing responsibility with multiple DSOs.

To achieve this, we suggest that, first DSOs be designated as the representatives of their own jurisdictions with primary economic responsibility for balancing payments that are originally charged to each energy market participant. Second, this research proves that a cost-causality based cost allocation scheme(CC-CAS) is superior to an energy-amount based cost allocation scheme (currently widely used) in terms of economic efficiency. Additionally, to avoid the side effect that a DSO with a large amount of RES may face a high and risky balancing payment under the CC-CAS, this research also proposes an optimal balancing payment insurance (BPI) contract which helps the DSO hedge the risks associated with uncertain balancing payments.

**Keywords** System Balancing Responsibility, Devolution Principle, Cost-causality Principle, System Balancing Cost Allocation, Risk Hedging Contract

**JEL Classification** D21, G22, L94

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