

# Congestion management in electricity networks: Nodal, zonal and discriminatory pricing

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**Abstract** Wholesale electricity markets use different market designs to handle congestion in the transmission network. We compare nodal, zonal and discriminatory pricing in general networks with transmission constraints and loop flows. We conclude that in large games with many producers who are allowed to participate in the real-time market the three market designs result in the same efficient dispatch. However, zonal pricing with counter-trading results in additional payments to producers in export-constrained nodes.

**Keywords** Congestion management, wholesale electricity market, transmission network, nodal pricing, zonal pricing, countertrading, discriminatory pricing, large game

**JEL Classification** J C72, D44, D61, L13, L94

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