

WHEN GRID TARIFFS MEET RENEWABLE SUPPORT SCHEMES: EVIDENCE OF POLICY CONFLICTS FROM A MARKET EQUILIBRIUM PERSPECTIVE

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Abstract

1. Content

Integrating fluctuating renewable energy sources remains a central challenge in decarbonizing the German power system. However, policies that promote electrification and variable-renewable integration may conflict with regulatory requirements for secure distribution-grid operation. Flexible sector-coupling technologies such as electric vehicles and heat pumps can support market integration by shifting demand, yet their rapid diffusion increases local grid stress. Zonal wholesale price formation neglects these local constraints and reinforces synchronized load behavior. To address this, the German regulator has introduced dynamic distribution grid charges in 2025. While intended to reduce peak-driven grid congestion, these charges create a second price signal that interacts with wholesale price formation and renewable-support mechanisms, potentially undermining market returns for subsidized ground-mounted solar PV.

2. Methods

This paper analyzes these interactions by reformulating the bottom-up electricity-market model ELTRAMOD as a mixed-complementarity problem (MCP), jointly solving wholesale market clearing and the dispatch of flexible loads subject to dynamic grid fees

3. Results

The results show that dynamic fees systematically shift consumption into evening and early-morning hours, deepening PV self-cannibalization, lowering market revenues, and increasing support needs. The study underscores the importance of aligning distribution-grid regulation with renewable-promotion policies to avoid unintended distortions and ensure system-wide efficiency.

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