Spillover effects of distribution grid tariffs in the internal electricity market: an argument for harmonization?

Peak demand-based tariffs and storage

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Spillover effects of distribution grid tariffs

Redesign of distribution grid tariffs due to distributed storage, PV,…

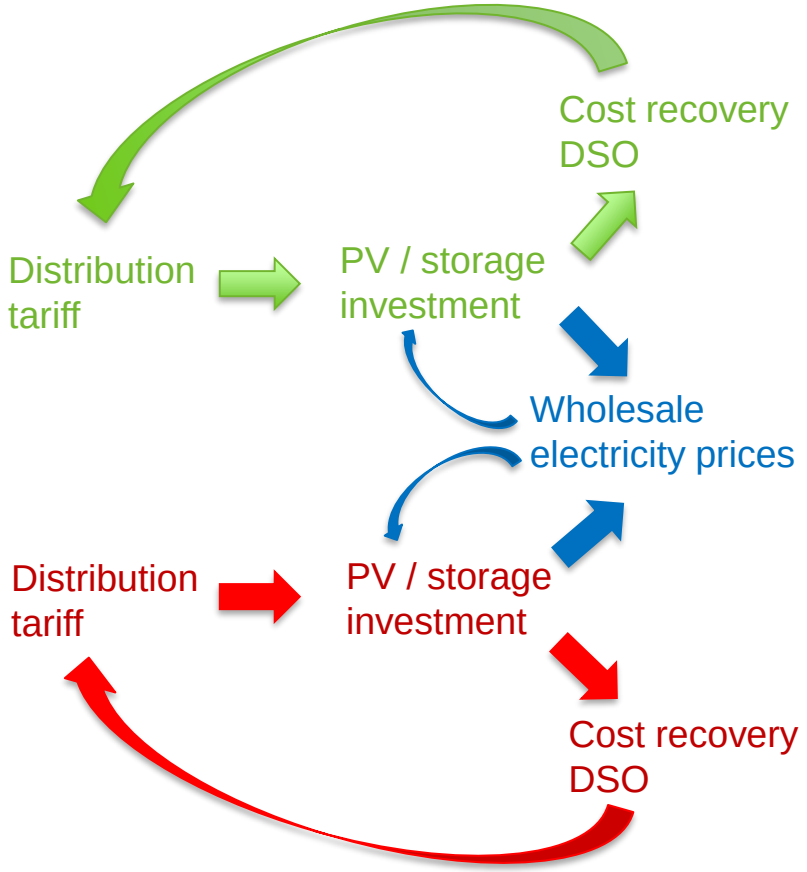
Clean Energy Package: harmonized distribution tariff structures?

1. Direct (national) effect of distribution tariffs: implicit subsidies
   - Volumetric net-metering tariff (€/kWh) promotes PV
   - Peak demand-based tariff (€/kW) promotes storage
2. **Spillover – wholesale market effects?**

Modelling approach

Direct effects

Wholesale market effects



Welfare and storage investment spillovers

"Reference country": peak demand tariff (€/kW) => storage?

Peak reduction => distribution costs ↘ => tariffs ↗ => storage ↗

Price arbitrage => energy costs ↘ => arbitrage potential ↘ => storage ↘

Non-cooperative behavior

Equilibrium?

Market effect

Impact of "neighboring country"?

FIX: fixed tariff (€/year)

NM: volumetric net-metering tariff (€/kWh)

PD: peak demand tariff (€/kW)

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Welfare and storage investment spillovers

PD/PD: 2.3 GWh storage => costs +0.4%

PD/FIX: storage neighboring country ↘

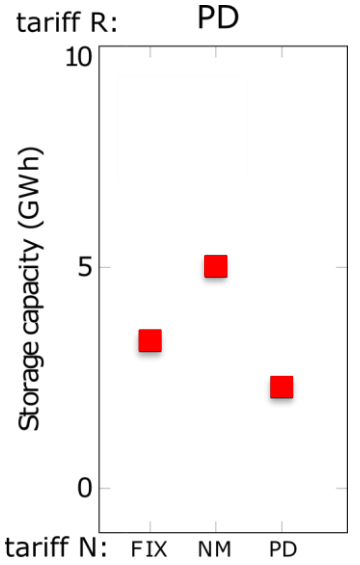
=> (initial) arbitrage potential ↗

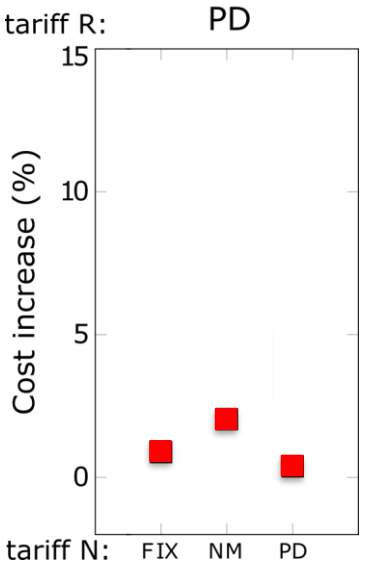
=> 3.3 GWh storage => costs +0.9%

PD/NM: PV neighboring country ↗

=> arbitrage potential ↗↗

=> 5.0 GWh storage => costs +2.0%





Arbitrage potential => more storage

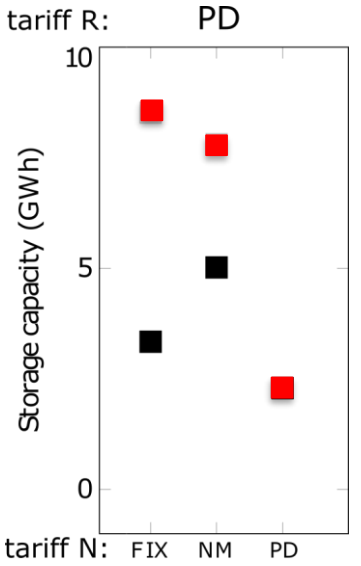
=> non-cooperative behavior

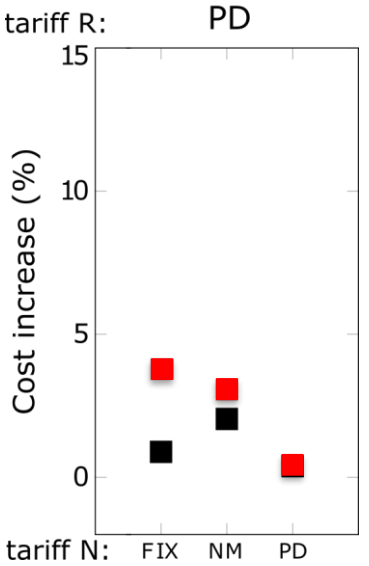
Neighboring country x5

PD/PD: 2.3 GWh storage => costs +0.4%

PD/FIX: storage neighboring country ↘ + market size ↗
=> arbitrage potential ↗↗↗
=> 8.5 GWh storage => costs +3.8%

PD/NM: PV neighboring country ↗ + market size ↗
=> arbitrage potential ↗↗↗↗
=> 7.8 GWh storage => costs +3.0%





Arbitrage potential => more storage

=> shift of focus to arbitrage

Conclusions

Spillovers in country with peak demand-based tariff from unharmonized distribution tariff in neighboring country?

Storage: positive

less storage in N => more arbitrage potential

Welfare: negative

more storage in R => more non-cooperative behavior

Country size has significant impact

Thank you!

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