



High renewable electricity penetration: marginal curtailment and market failure under “subsidy-free” entry¹

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Abstract

Ambitious plans to decarbonise electricity will require high levels of variable renewable electricity (VRE). At high VRE penetration, the surplus that cannot be exported must be curtailed (spilled). The last MW of wind capacity will be curtailed 3+ time more hours than the average, but even in efficiently designed markets, price signals for VRE investment are given by average, not marginal, curtailment, creating a “tragedy of the commons” that requires a corrective charge to restore efficiency. The paper sets out an analytical model calibrated to Ireland in 2026, showing the source of this distortion and estimates of its magnitude.

Keywords renewable electricity, marginal wind curtailment, integration costs, market failures, inertia charges

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