Measuring Large-Scale Energy Demand Flexibility: Evidence from a Nationwide Natural Field Experiment*

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Abstract

Demand flexibility at scale is likely to be an important part of the future energy system. This study evaluated the world's first nationwide domestic and commercial demand flexibility program. We analyzed the policy using a randomized encouragement design, assigning 2.6 million residential and business customers to receive randomized encouragement to sign up to the demand flexibility program and 119,999 customers to a control group. The program paid consumers to reduce their demand below a predicted baseline at peak demand across 16 events (i.e., when the system was stressed) during the Winter of 2023/24. The program reduced overall peak grid demand by 23.1% among compliers, at an average household remuneration of £2,900 per MWh. We estimate that the reduction among *all* program participants was 28.1%. The adoption of solar panels and batteries, heat pumps, and EVs all increased demand response.

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