

Household Preferences for Home Energy Management Systems: Evidence from a Discrete Choice Experiment in Switzerland

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Extended Abstract

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Abstract Summary

Residential demand-side flexibility is widely recognized as a key component of decarbonized energy systems, yet its realization critically depends on household adoption of digital technologies such as Home Energy Management Systems (HEMS). This paper examines the foundations of HEMS adoption using a Discrete Choice Experiment embedded in the Swiss Household Energy Demand Survey (SHEDS 2025), with a focus on differences between homeowners and tenants.

The results show that adoption decisions are governed by a tight trade-off between upfront costs and energy savings. Although savings are valued positively, their marginal utility is insufficient to offset strong cost sensitivity, particularly among tenants, whose sensitivity to cost is higher than that of homeowners. Corresponding willingness-to-pay estimates indicate that households assign a relatively low economic value to incremental energy savings, implying that many currently available HEMS configurations fall below households implicit adoption threshold.

Non-monetary attributes, including automation and data privacy, do not exhibit significant average effects but display substantial heterogeneity, suggesting that their relevance is segment-specific rather than population-wide. As a result, these attributes do not compensate for the economic constraint on adoption at the aggregate level.

Taken together, the findings point to a structural limitation in the diffusion of HEMS: when economic returns are marginal, adoption remains constrained, limiting the aggregation of

flexible demand and thereby the contribution of households to system-level flexibility. This highlights a disconnect between the technical potential of HEMS and their realized deployment.

From a policy perspective, the results suggest that uniform financial incentives are unlikely to induce large-scale adoption. Instead, effective interventions must increase the realized value of flexibility, for example through dynamic pricing, demand response mechanisms, or integrated service offerings that alter the household-level decision trade-off.

Presenting Author Biography

Shadi Firoozyaliyadeh is a PhD student at ETH Zurich and the Paul Scherrer Institute. Her PhD focuses on integrating behavioral and socio-technical dimensions into energy system analysis to better understand real-world decision-making. She works on how digitalization and social interactions shape energy demand, technology adoption, and flexibility, with a focus on their implications for Switzerland's transition to net-zero emissions. Her work combines empirical insights with system-level analysis to support more realistic and policy-relevant pathways toward a decarbonized energy future.