

Energy Communities and Energy Conservation

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Introduction

This paper aims to investigate the effect of a newly created social identity on energy conservation by studying individuals that become members of a clean energy community. Clean energy communities are characterised by their aim to promote renewable energy as well as energy efficiency (Gui & MacGill, 2018; Mlinarič et al., 2019). Energy communities are social networks and in many cases entail interaction between community members, which may be conducive to creating a new social identity within their members. Multiple authors (e.g. Bomberg & McEwen, 2012; Rogers et al., 2008; Seyfang, Park, & Smith, 2013) have stressed the importance of shared identity for progress and success in the field of renewable energy projects. Initial qualitative evidence suggests that involvement in energy communities may indeed encourage sustainable energy behaviours (Biddau, Armenti, & Cottone, 2016; Middlemiss, 2011). Sloot et al. (2018) observe based on survey data that being part of an energy community potentially enhances community members' motivation to engage in energy conservation. Yet none of these studies accounted for the self-selection of individuals into energy communities.

Furthermore, an extensive literature has considered the effect of behavioural interventions on stimulating electricity conservation (e.g. Alcott, 2011; Brandon et al., 2019; Tiefenbeck et al., 2019; Andor and Fels, 2018; Buckley, 2020). While these interventions usually focus on regular customers of energy suppliers, to our best knowledge, they have not been applied in the context of clean energy communities so far. Yet, energy communities have distinct features that make the application of behavioural interventions to stimulate conservation behaviour very promising. Energy communities allow for testing the combination of new technologies with interventions

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that harness the potential of the new social network. An example of such technology is a smart shower meter that provides real-time feedback during showering, which is used in the current study.

This paper aims to investigate to what extent the membership in an energy community induces electricity conservation and enhances the effect of real-time feedback on water and electricity consumption. It is the first study to explore this relationship in a field experiment, in which random assignment of participants to treatment groups allows for estimation of causal effects. The results are important for the effective design and support of energy communities and behavioural interventions to induce household electricity conservation.

Methodology

300 households participate in the field experiment that is implemented in collaboration with GEN-I, an energy utility in Slovenia. At the start of the study, a virtual energy community is established. Approximately 150 households are randomly assigned to become a member of this community. During a period of 5 months, the community receives monthly newsletters with energy saving tips, testimonials, comparison reports of electricity use within and outside the community, and members have access to an interactive virtual portal. Half of the members and half of the non-members additionally receive real-time feedback on resource consumption during showering. This allows us to disentangle the effects of real-time feedback on electricity and water conservation of community and non-community members.

We have access to daily smart meter and showerhead data from all households on their daily electricity as well as water consumption and shower behaviour. The experimental data is complemented by pre- and post-intervention survey data, including information on sociodemographic characteristics of the participants (e.g. age, gender, education, household income, employment status) as well as information on household size, household characteristics, house characteristics, energy sources used, number and type of electric appliances used, age of electric appliances used, energy literacy, and personal attitudes. In the post-treatment questionnaire, data on energy literacy, personal attitudes, and sense of social and environmental identity is collected.

Hypotheses and expected results

This paper aims to investigate whether membership in an energy community, by establishing a new social identity that is associated with greater awareness for resource use and stronger motivation to engage in energy conservation behaviours, can significantly decrease household electricity consumption of members.

Further, previous research e.g. by Tiefenbeck et al. (2018; 2019) has shown that real-time feedback during showering reduces resource consumption by 22%. Providing real-time feedback on resource consumption during showering has the potential of significantly reducing the electricity consumption needed to heat the water for showering. While the above hypothesis has been evaluated in previous research, this study aims to evaluate the extent to which energy community membership can enhance the effect of real-time feedback on energy consumption from showering.

In addition, we aim to test whether households in energy communities experience a sense of social identity through their community membership, and whether they become more aware of their electricity consumption than households in the control group.

Finally, real-time shower feedback might trigger a moral licensing effect. Tiefenbeck et al. (2013) show that residents who received weekly feedback on their water consumption lowered their water use, but at the same time increased their electricity consumption compared with the control group. While there is precedent for such a moral licensing effect in the literature, it is also conceivable to expect that there is no moral licensing effect on electricity consumption in our study. This is because the participants see a visualisation of their electricity consumption over time on the virtual portal. This draws attention to electricity consumption and leaves less room for subconscious behavioural adjustments, especially as the participants can directly detect when their electricity consumption patterns are increasing.

The results will inform about the potential of clean energy communities to stimulate energy conservation behaviour.

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