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Title: How is behavior influenced through energy feedback messaging?

Abstract: One of the most overlooked and underutilized resources to creating a more energy efficient built environment is humans. To mitigate the negative impacts of population growth and energy consumption, the smart home of the future will provide residents feedback when home energy systems are being used to over consume energy resources. A better understanding of how energy feedback can sway behavior is needed to appropriately design "smart" infrastructure. Technology innovations have continuously provided efficiency boosts, but personal behaviors have dampened expected impacts. Energy feedback messaging is an emerging socio-technological innovation which has begun to improve energy behaviors of residents. Some of the main factors of feedback messages that have shown to dictate the effectiveness of energy feedback messaging include information type, timing, and display format. The delivery of energy feedback messages is evolving and an update to our design protocols is needed. Direct, indirect, daily, monthly, event-oriented, pattern-driven, neighbor comparison, tips, and competition based feedback are a few of the many examples of feedback strategies. From advanced energy monitors to enhanced utility bills, all electricity customers will have an opportunity to be provided feedback in the future. To investigate the impact of design on feedback effectiveness, our approach uses an fNIRS machine to measure neural activation through blood flow to quantify brain stimulation of messages, a survey to collect participants perceived willingness to change their energy consumption behaviors after seeing messages, and interview data of how these messages can be personalized to evoke a response in our study participants. By understanding the human response to energy feedback messages, we can improve the effectiveness of energy feedback messaging to optimize energy consumption and improve resident's quality of life.