

# **Effective design of domestic energy efficiency displays: a proposed architecture based on empirical evidence**

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**Abstract— Demand-side management is widely considered a key tool to achieving decarbonization in the energy sector. In this regard, providing end users with detailed information about their consumption patterns enables them to make informed decisions to reduce or adapt their energy consumption. This requires the deployment of interactive feedback technologies such as domestic energy displays, dedicated apps/web portals, or ambient interfaces. Extensive research and numerous pilot projects have examined the effects of these technologies on end-user behavior and identified the importance of an appropriate device design to achieve the desired demand response. However, a clear framework for designing these feedback technologies to ensure the desired behavioral change does not exist.**

**To fill this gap, this paper presents an exhaustive review of existing research on feedback, with a particular focus on interactive devices. This review has identified ten key parameters that should be considered by device designers, including the type and form of the information provided (medium, units, disaggregation level, comparisons, goal setting), the design of the interface and devices themselves, the possible inclusion of penalties and rewards, and privacy concerns. Recommendations are provided for implementing these parameters in such a way that end-user interactions and responses are maximized. These recommendations would make domestic displays more effective in creating the desired household behavioral change to maximize energy conservation. Moreover, critical areas are identified where further research is necessary before a prudent recommendation can be made.**

**Index Terms— Energy efficiency; Demand response; Eco-feedback; Domestic display; End-user behavior**

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