Highlights

1. Feedback to consumers may or may not reduce energy consumption.

2. The major uncertainty is in consumers' responses.

3. Info-gap decision theory is used to model and manage this uncertainty.

4. Feedback regimes are evaluated by their robustness to uncertainty.

Abstract   Diverse types of feedback to energy consumers have been studied for reducing energy use. The effect of feedback on energy consumption ranges from nil to substantial, and formulating feedback programs faces great uncertainty. The challenge is to choose the feedback program to reliably achieve a specified reduction in energy use. The major uncertainty is in consumers' responses. This article uses info-gap decision theory to model and manage this uncertainty. Info-gap theory is a non-probabilistic methodology for modeling and managing deep uncertainty by assessing robustness to uncertainty. Three main conclusions are reached. First, predicted outcomes are not reliable for evaluating a proposed feedback program. Rather, the robustness to uncertainty should be used, as developed generically and demonstrated by example. Second, robustness trades off against quality of the outcome: robustness to uncertainty gets larger (which is good) as the required reduction of energy usage is diminished (which is bad). Third, the preference between alternative programs may change as the required level of reduction in energy use is altered. The info-gap analysis of robustness supports the evaluation of alternatives and their prioritization in light of confidence in outcomes as assessed by robustness to uncertainty. The analysis is illustrated with a realistic example.

\website\IGT\ybh-ener-feedbk2021abs.tex   22.1.2021