Innovative Billing Mechanism for Reducing Energy Consumption

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Extended Abstract:

Reducing energy consumption from buildings has been a major concern for environmental agencies in the United States. Per the Buildings Energy Data Book of the Environmental Protection Agency, the buildings in the US consumed 7% of global energy in 2010. Various agencies at Federal and State levels have developed and implemented mechanisms to reduce energy consumption by the building sector. The Department of Defense has also implemented one such mechanism for its military bases. The mechanism penalizes high energy users and rewards the low energy users and thus aims to reduce the overall energy consumption. When the billing mechanism was implemented at a US Army privatized community, the overall energy consumption did reduce but it created frustration among many residents because of a perceived lack of predictability in amounts due or credited. If this billing mechanism is continued it is feared that the residents would move out of the base which would eventually not be a favorable outcome.

Hence in this research a billing mechanism has been developed that would enable the government agencies to optimally penalize or and reward the residents for their consumptions. The problem has been modeled as a two player game theory model where the Agency is the leader and the resident is a follower. Since the players have several objectives each player's problem is a multi-objective problem. The paper includes various user scenarios and demonstrates the use of the model to determine strategies to reduce the energy consumption.