

Gamification to engage citizens in the use of smart metering systems

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Background

Although households engagement in the energy system is one of the main drivers for the EU smart meters roll-out policy, it is uncertain that the introduction of smart meters will inevitably have an immediate impact on households' energy consumption behavior. Motivation techniques from the uprising research area of gamification can play a key role in increasing households' engagement in smart meters enabled applications and allowing them to recognize the direct relationship between their energy consumption behavior and the performance of their household. Gamification describes those features of an interactive system that aims to motivate and engage users through the use of game design elements and mechanics. The considered applications enabled by smart meters are classified in three main categories: i) Energy Efficiency, ii) Self-consumption and iii) Demand Response (DR), as seen in Fig. 1.

Methodology

The purpose of this study is identifying all system components that are necessary for a long-term participation of households in gamified smart meters enabled applications. A conceptual diagram of our proposed framework is illustrated in Fig. 2. In this framework, the main requirements necessary to enable households participation and enhance smart meters enabled applications can be divided into: energy education; energy conservation; machine-human interaction; and flexibility and control. In order to fulfil these requirements, different technological, social and economic components are needed, which are:

- 1. Technical solution:** apart from the smart meter, an Energy Management System (EMS) that receives the meter readings, measures the local renewable energy production, and possibly controls households' flexible appliances is considered as an essential part of the technical component. The EMS stores and processes the data, and forwards the results to a web-based and/or a mobile-based application, which is responsible for data access.
- 2. Game design elements and mechanics:** a combination of game mechanics is required to engage households in the considered applications. A survey of European research and innovation projects that incorporate gamification techniques is done to review the most commonly used game mechanics in this area (see Fig. 3). The game mechanics required for each application are incorporated in the EMS and displayed in the mobile/web app interface.
- 3. Value propositions:** identifying the value streams resulted from households' participation is necessary for their long-term engagement in the considered applications. These value streams are not only restricted to households. Long-term engagement through gamification can also bring value to energy suppliers and society as a whole. For instance, customers' unique drivers, interests and reactions can be learned by suppliers, and used to improve provided service and increase households participation. Besides, smart meters enabled applications can lead to a reduced amount of CO2 emissions which creates an important value for the society in general.

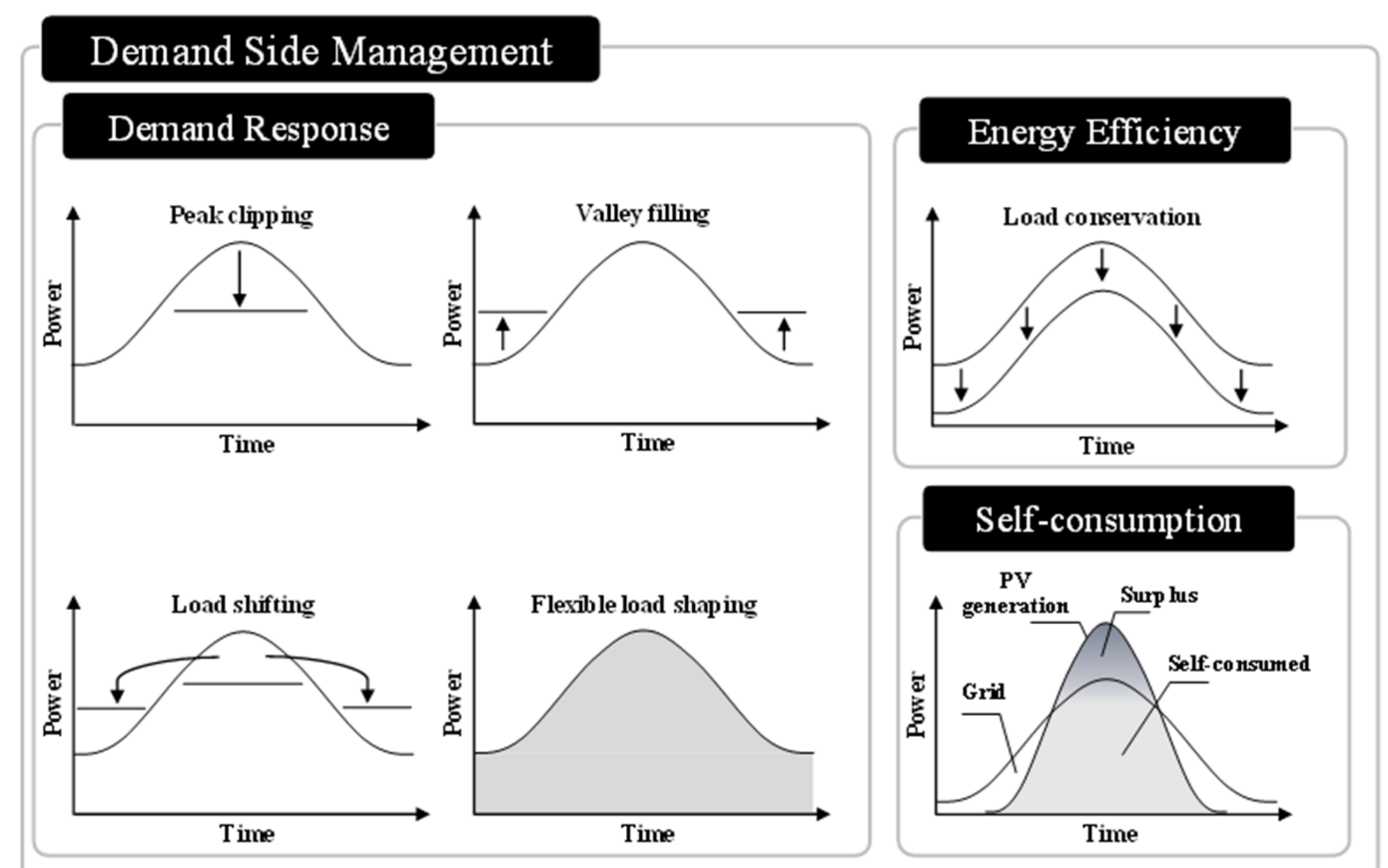


Figure 1. Smart meters enabled applications.

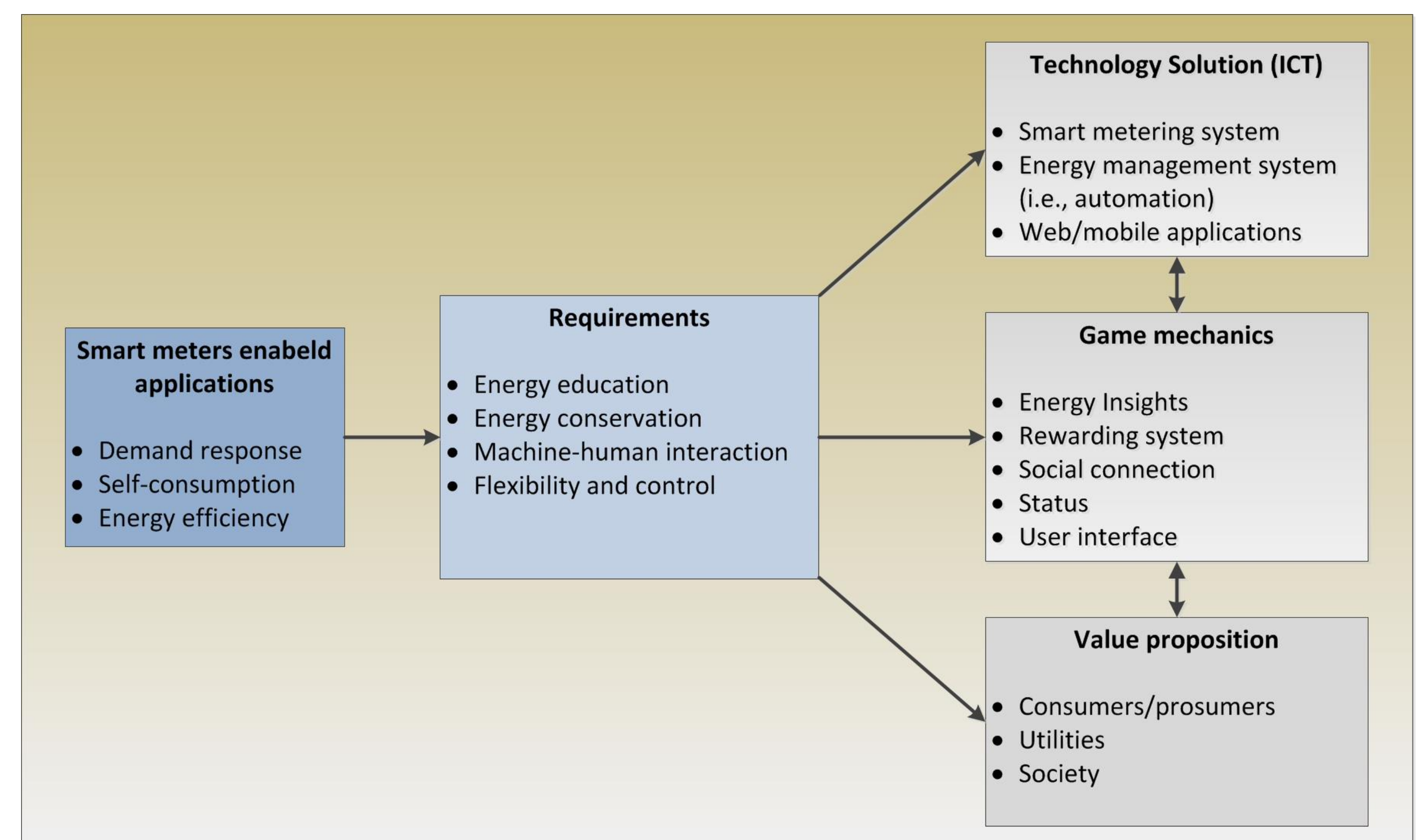


Figure 2. Conceptual diagram of the proposed framework for gamified smart meters enabled applications.

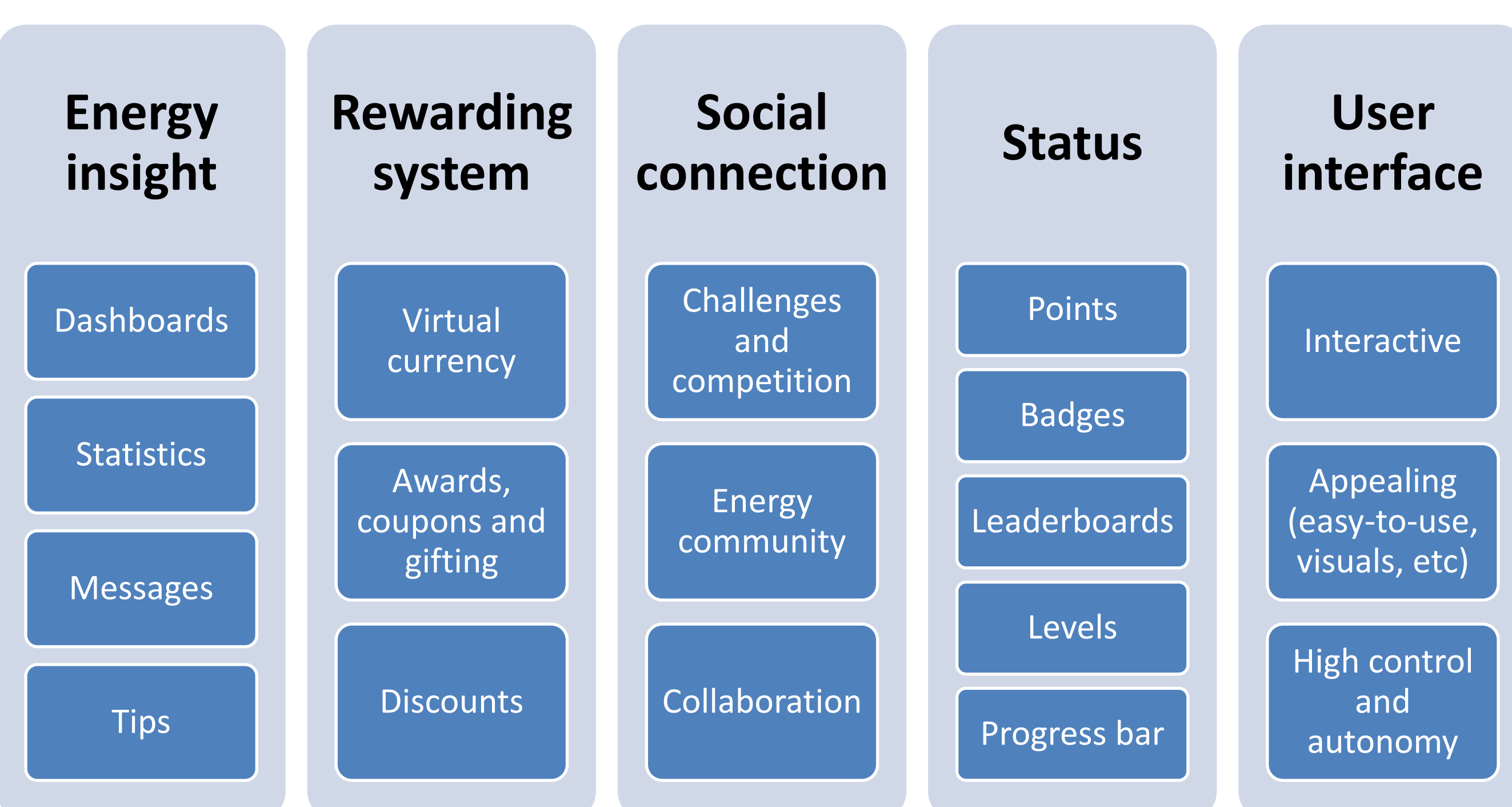


Figure 3. Game design elements and mechanics.

Conclusions and lessons learned

Throughout the surveyed literature and projects, several suggestions and recommendations have been proposed for developing a gamified platform for smart meters enabled applications. Defining a clear objective of the game and understanding the target group is the first step to consider in the platform design. After that, the considered game mechanics should be clearly defined; such as how/why points are given, and the formulation of the rewarding function. Using the platform to share knowledge (e.g., tips for energy saving, quizzes) can provide opportunities for increasing and enhancing the energy education levels and awareness of households. The next step is to have a concrete plan on how to maintain the long-term engagement of the target group of households, and on how to promote the platform in order to reach more households. It is also important that the gamified platform looks attractive and intuitive to use. It should fit to the needs of the target group already defined, including the possibility to create an avatar, collect locally relevant information, and have an easy access to help or FAQ area. Besides, it should have easily understandable measurement units and progress display, make use of emotions and narratives, and do not overburden households.

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