ABSTRACT
With the growing awareness of the need for Smart Grid, various countries are taking initiatives for developing Smart Grid.

However, there is limited research on utilizing Smart Grid for Demand-Response (DR).

This study advances the current system of DR by creating a Smart Grid Simulator that allows an intuitive demand response analysis.

The simulator demonstrates that substantial amount of electric power can be reduced efficiently by selective demand control over Smart Grid.

The graphical interface allows generating the electrical usage data and displays both individual and aggregate usage data over time.

This research employs U.S. census data for accurate estimate of family and lifestyle style as electric power usage is simulated by taking various inputs including the number of houses, family size, work and life patterns, etc.

This study explores potential Privacy issues in Smart Grid and suggests data anonymization as a viable solution for preventing them.

Moreover, this study proposes directions for future research on electric devices control using Smart Grid Simulator.

DATA STRUCTURE OF SMART GRID SIMULATOR
We composed three major types that affect usage amount of electricity: Family Type, House Type, and Person Type.

The number of household members and their ages were considered as a key element which decides consumption of electricity in each household.

We divided “all household by size” into seven parts and named them as Family Type. Table 1 shows how Family Type was created based on the data of U.S. Census Bureau.

The size of the house was also accounted as a main factor of electric power usage and was labeled as House Type.

Table 2 illustrates how electric devices were divided based on House Type.

USAGE DATA GENERATION
We combine all the data types to create the list of devices for each house, then configure the device usage pattern data based on their usage profiles.

Figure 2 shows the process of creating Master Usage Data.

Figure 3 exhibits how usage data gets generated.

Figure 4 shows the process of creating Master Usage Data.

Figure 5 demonstrates how data is encrypted.

PRIVACY PROTECTION
The electricity usage pattern reveals the number of home appliances in use and the frequency of those devices being used throughout the day.

Ultimately, it exposes the number of household members along with their sex, age, and economic standard.

As shown in Figure 4, a shortage can be prevented by turning off the electrical devices in varying priority. It illustrates that the electricity provider can reduce the demand effectively by utilizing priority-based DR.