# TITLE

**[0001]** System for determining characteristics and power usage profiles of electricity consuming devices.

# DESCRIPTION

**[0002]** As required, detailed embodiments of the present invention are disclosed herein; however, it is to be understood that the disclosed embodiments are merely exemplary of the invention that may be embodied in various and alternative forms. The figures are not necessarily to scale; some features may be exaggerated or minimized to show details of particular components. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a representative basis for teaching one skilled in the art to variously employ the present invention.

**[0003]** One non-limiting aspect of the present invention relates to a system for determining characteristics and power usage profiles of electricity consuming devices (e.g. consumer home appliances or industrial machinery).

**[0004]** SmartGrid is an active area of research and is expected to offer many services. One of which is electricity load curtailment in response to events such as threat to grid reliability (e.g. unexpected high demand), shortage of new generators and spikes in energy prices. One aspect of the present invention contemplates methods that curtailment service providers can deploy to curtail energy consumption. One of these methods employs two-way communication between the load and curtailment service provider. Using two-way communication, the curtailment service provider can switch on and off (or change load profile when appliances allow it) individual appliances in consumer homes or industrial sites.

**[0005]** Consumer homes have many appliances. Some of these appliance use electricity as intake and some use some other forms of energy (e.g. natural gas). There are also some appliances (e.g. dryer) that use both electricity and natural gas. One aspect of the present invention

contemplates a Curtailment Service Provider (CSP) being provided an energy consumption profile of each appliance in order to effectively (with least impact on consumer) curtail load. This (energy consumption profile) information for example should help curtailment service providers to only affect appliances that are most suitable for the type and amount of load CSP want to curtail.

[0006]        One aspect of the present invention contemplates facilitating consumers visibility into the energy consumption of consumer devices.  Many devices continue to consume some energy even when turned off (e.g. set top box).  Many devices are switched on all the time but the consumer has little idea of how much energy is consumed when the device is on but not in use (e.g. computer).

[0007]        One aspect of the present invention contemplates a few methods for providing the Curtailment Service Provider capabilities to understand the power consumption profile of each device and some sample actions that can be taken based on that information.

[0008]        INFORMATION TRACKING METHODS:

[0009]        *        Each SmartGrid enabled appliance in the consumer home reports the manufacturer and model number to the CSP. CSP BSS/OSS maintains a database of all devices and their energy profile. CSP consults the database with the information provided by the appliance to obtain the energy profile for the appliance.

[0010]        *        As a result of age, and other reasons (e.g. wear and tear), the energy profile of appliances can change overtime. This means that the information stored in the database may not stay aligned with the real consumption behavior of the device. As a resolution to this we propose, a couple of potential solutions:

[0011]                        - As part of option#1, the appliance itself or an external device in the home is responsible for monitoring and reporting appliance's load profile to the CSP. The CSP then uses this information to update the database.  This allows the CSP to maintain an accurate load profile on each device.

[0012]                        - As part of option#2, CSP periodically (every 6 months or so) runs test on each appliance. As part of this test, CSP turns an appliance ON and simultaneously monitors the change in electric consumption from the smart meter. CSP runs this test a couple of times in a

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row, for about a minute or so, to account for the errors that may have been introduced as a result of other simultaneous user actions.

**[0013]** - As part of option#3, CSP waits for user (or other automatic mechanism) to turn on the appliance. Once CSP receives a switch ON indication from the appliance, the CSP starts monitoring the electric consumption (including any changes). CSP measure the electric consumption from the smart meter until a couple of minutes after the switch OFF event it receives from the same appliance. This would allow the CSP to know the energy consumption profile for the device without having to actively run the test.

**[0014]** * Consumer accesses CSP data and enters information about the priority of device availability (e.g. "in the event of a power shortage, bedroom and landscape lighting can be turned off first, then garage lighting and stereo system, then washer/dryer/dishwasher and finally the lights in the living room and power to my telephone and computer are the last devices that should be curtailed).

**[0015]** * Consumer sets policy for certain devices (e.g. from midnight to 7 am no power is allowed to the stereo system or Set Top Box, unless they are in active use.)

**[0016]** ACTIONS THAT COULD BE TAKEN:

**[0017]** * Energy consumption could be curtailed based on:

**[0018]** - Device type, location, power profile, local weather conditions, season or time of day, energy costs or any combination

**[0019]** - Consumer defined policy

**[0020]** * Per device energy usage patterns could be made available to consumer

**[0021]** The invention may provide a couple of innovative methods to learn energy profile of appliances in a home. Which will allows a service provider to intelligently curtail load. An effective load curtailment service would require CSP to understand load profile of appliance in the home.

System for determining characteristics and power usage profiles of electricity consuming devices
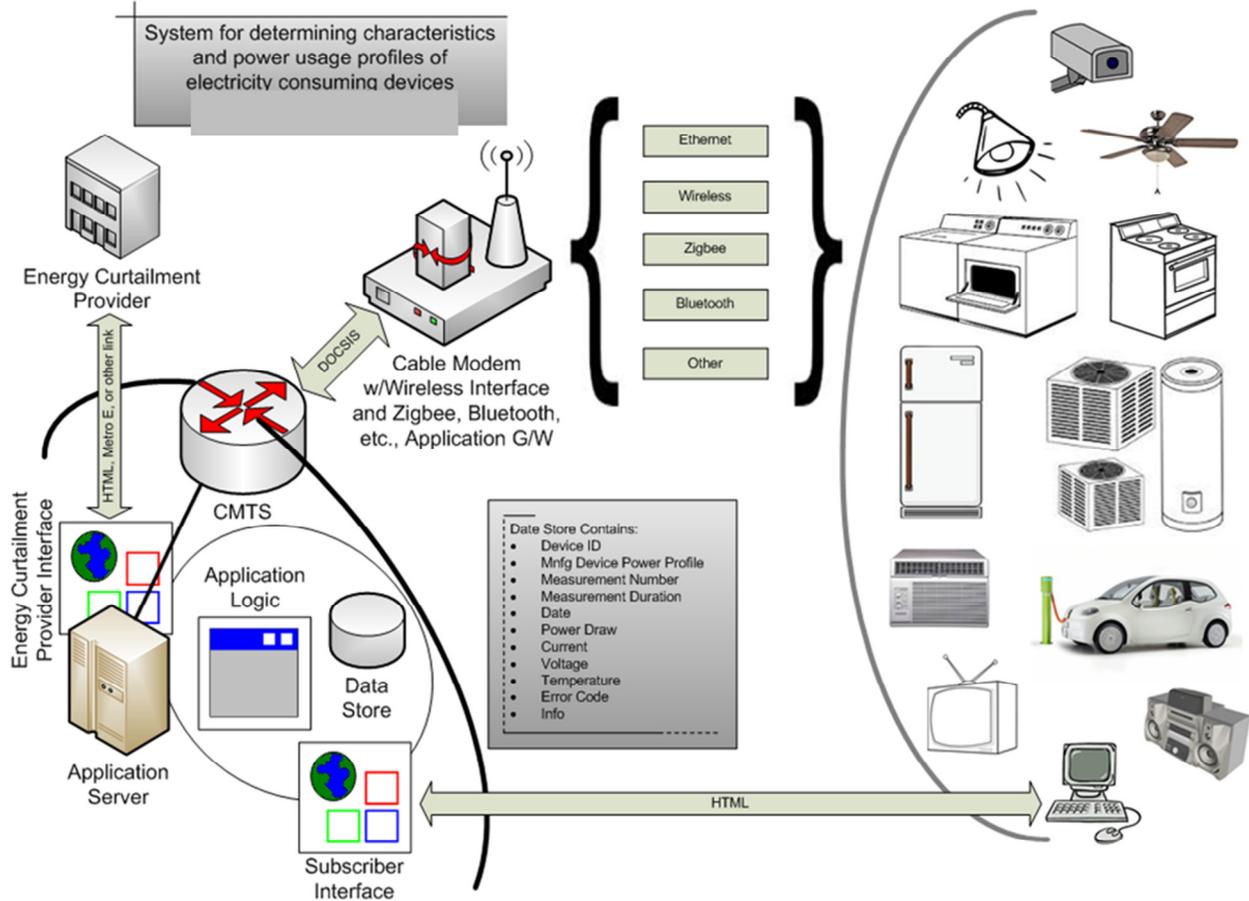
**[0022]** While exemplary embodiments are described above, it is not intended that these embodiments describe all possible forms of the invention. Rather, the words used in the specification are words of description rather than limitation, and it is understood that various changes may be made without departing from the spirit and scope of the invention. Additionally, the features of various implementing embodiments may be combined to form further embodiments of the invention.