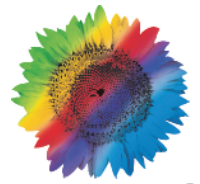


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Achieving Sustainability through Smart Meter & Smart Grid

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Introduction

Sustainability is the capacity to endure. It's defined as development which meets the needs of people living on the earth currently without compromising on the ability of people in the future to provide for themselves. But at the current rate of growth of the human population, sustaining our resources is impossible in perpetuity. The world simply cannot continue consuming at a rising rate while resources begin to fall, because at some point, there will be no resources left to consume. Hence the ultimate goal for sustainability would be to achieve harmony with the environment, so that fewer resources are consumed than are being created.

The different ways through which environmental sustainability could be achieved are as follows:

- Monitoring
- Controlling
- Conserving the energy

Importance of Metering the Energy Consumption to attain sustainability

Energy management needs to be done to save the Energy. Energy needs to be saved globally for the following reasons:

- Reduce our dependence on the fossil fuels that are becoming increasingly limited in supply.
- Reduce the damage we are doing to the planet earth.

One of the best techniques to be followed for doing Energy Management is Metering the Energy Consumption of the Consumers. This helps in the following ways:

- Monitoring the energy consumption.
- Identifying the opportunities to save energy
- Estimating how much energy each opportunity could save.
- Using the meter data to find and quantify routine energy waste and to also investigate the energy savings.

Smart Metering & Smart Grid

Smart Grid: A smart grid delivers electricity from suppliers to consumers using two-way digital technology to control appliances at consumers' homes to save energy, reduce cost and increase reliability and transparency.

Smart Metering: Smart Metering refers to using advanced meters in conjunction with communication systems to allow customers to monitor their energy consumption in real time

Achieving Sustainability through the smart meters and smart grids

While the USA nation's transportation sector emits 20% of all the carbon dioxide we produce, the generation of electricity emits 40% – clearly presenting an enormous challenge for the electric power industry in terms of global climate change. Smart Grid deployment is a key tool in addressing the challenges of climate change, ultimately and significantly reducing greenhouse gases and criteria pollutants such as NOx, SOx and particulates.

A new report from the Department of Energy's Pacific Northwest National Laboratory (PNNL) says that a smart electric grid could reduce carbon emissions from the utility industry by 12 percent and reduce usage by the same amount. If smart grid benefits were fully realized in the United States 442 million metric tons of carbon emissions could be saved. This amount is equal to permanently closing 66 average coal-fired plants.

A utility with around 3 M customer base with a smart decrease of electricity usage by just 2.5 percent can cut CO2 emissions by over 1M Ton annually. If smart grid technologies made the United States grid 5% more efficient, it would equate to eliminating the fuel and greenhouse gas emissions from 53 million cars.

Smart grids allow consumers to play an active role in balancing the electricity system, as they will be able to sell energy back to the grid. This would in turn help improving the energy efficiency and reducing the emissions which are generated at the peak hours.

Direct mechanisms are smart grid advances that increase operational efficiency and reduce the cost of power transmission. If savings are continually reinvested in carbon reduction, additional carbon savings will result. Demand response and energy storage devices that allow for the integration of renewable power into the grid are indirect mechanisms that offset the need to build additional power generating capacity in the future.

For the growing number of environmentally-aware consumers, a smarter grid finally provides a “window” for them to assess and react to their personal environmental impacts. Already, some utilities are informing consumers about their carbon footprint alongside their energy costs. In time, the Smart Grid will enable consumers to react in near real-time to lessen their impacts.

Smart meters help in Dynamic load management. This allows suppliers to reduce peak electricity demand and smooth the demand for power. This approach could enable a number of inefficient power stations to be decommissioned (with considerable CO2 savings) because they would no longer be required to provide costly “spinning reserve” to meet demand peaks.

For optimizing energy efficiencies, AMI technologies can help utilities and consumer's alike to understand better and manage energy use. With AMI, energy consumption is recorded at regular time intervals (e.g., every 15 minutes) and then billed at different rates based on peak and off-peak hours. As a result, consumers and suppliers can collectively lower overall energy requirements and reduce carbon emissions.

A smart grid infrastructure can enable utilities to deal with load distribution in times of increased need and ensure power is always available from these means. A smart grid also underpins the success of metering and billing technologies, such as smart metering, and allows utilities to deal with increased usage data and provide accurate billing.

Smart Grids will help to achieve sustainable development, linking different but complementary renewable resources, Combined Heat and Power (CHP) and other cleaner and more efficient distributed generation technologies. Smart Grids networks will, in addition to electricity flows, establish a two-way flow of information between supplier and user, increasing energy saving and reduction of CO2 emissions.

Sustainability reasons for Utilities to adapt Smart Grid

Energy efficiency

On the load side, consumers capable of exercising usage control are suddenly and simultaneously also able to exercise their environmental stewardship, resulting in tremendous consumer-side energy efficiencies.

Integration of renewable energy sources

Given the significant concerns regarding climate change, the need for distributed solar and wind power is critical. According to the European Wind Energy Association, integrating wind or solar power into the grid at scale – at levels higher than 20% – will require advanced energy management techniques and approaches at the grid operator level. The Smart Grid's ability to dynamically manage all sources of power on the grid means that more distributed generation can be integrated within it.

Preparation for the future

A smarter grid is also a necessity for plugging in the next generation of automotive vehicles – including plug-in hybrid electric vehicles (PHEVs) to provide services supporting grid operation. Such ancillary services hold the potential for storing power and selling it back to the grid when the grid requires it.

According to the Pacific Northwest National Laboratory, existing U.S. power plants could meet the electricity needs of 73% of the nation's light vehicles (i.e., cars and small trucks) if the vehicles were replaced by plug-ins that recharged at night. Such a shift would reduce oil consumption by 6.2 million barrels per day, eliminating 52% of current imports.

Major Challenges in Water Utilities industry in the area of sustainability

To understand about the usage of smart metering in the water utility industry we need to first understand the key challenges faced by the water utility industry in the area of sustainability.

Two major challenges faced by Water Utility Industry in the sustainability area are:

- 1) Water Scarcity:
- 2) Leakage

Water Scarcity

Water scarcity has become a global issue. The demand is increasing year on year. The increase in the demand is not only due to increase in the population but also due to people's life style changes.

Leakage

Almost a quarter of water entering the distribution system is lost in leakage. This attributes to 10% of water industry's total greenhouse gas emissions.

How Smart Metering is used to addressed the two major challenges faced by the Water Utility Industry

Addressing Water Scarcity through smart metering

Smart metering provides detailed information on usage of water at regular intervals. It helps in measuring the water usage and bringing awareness of the usage to water to the end user & there by reducing consumption.

Display devices located prominently serve as a constant reminder about the need for water conservation. Preliminary investigation indicates that customers with displays are more likely to use less water. Displays tailored to the specific needs of the user, such as those comparing current water usages with neighborhood averages or with consumption in previous months, may help consumer's further focus on conservation.

Addressing Leakages through smart metering

Smart metering can provide the Utilities with time-of-use or interval data of the water usage. This data could be used to detect the leakages.

1) Leakage detection at the customer's place

Leak detection for households is relatively simple. Leaks or faulty plumbing are the most likely culprits if hourly usage never drops to zero. Utilities can use more sophisticated algorithms, generally available from software vendors, to identify possible leaks at commercial and industrial properties with round-the-clock water use.

2) Detect small leaks in the mains

A utility that compares a day's consumption for a group of customers (such as residences on a block) with readings from a water main serving that block may be able to identify small leaks (or possibly theft) before they become too large to be overlooked.

3) Identify the location and extent of a water main break

Smart meters can activate the communication link to the utility and send "last gasp" messages when they detect a significant drop in pressure.

Addressing electricity cost control for utilities

Help control electricity costs for utilities that pump water to a high point during off-peak hours, then use gravity feeds when electricity prices are higher. Utilities that want to avoid turning on the pumps during high-price periods can develop water rates that track electricity rates and thus excess on-peak water consumption. These rates may become increasingly popular as electric utilities institute exceptionally high “critical peak” prices.

Reference

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