IOT Smart Energy Management System

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IIOT Enrgy Management System

- IoT Energy Management is a process that includes **planning and management of energy consumption patterns** in different industries.

- Internet of things Energy Management is designed to **monitor and optimize energy compliance** thereby improving **better capacity utilization, boosting business productivity, reducing maintenance & man-power, and increasing the reliability of energy assets.**

- IoT-backed sensors keep an **eye on consumption patterns** and provide insights into inefficient areas which in turn help to **analyze energy consumption usage and pattern.**

- These solutions can be utilized to manage and optimize energy consumption patterns by taking **complete control of energy data** at the most fundamental and granular level.

Smart Energy

What is Smart Grid

A Smart Grid is an electricity network that can intelligently integrate the actions of all users connected to it – generators, consumers and those that do both – in order to efficiently deliver sustainable, economic and secure electricity supplies.

Source: European Technology Platform Smart Grids

Traditional Power Grid and Smart Grid

Characteristics	Traditional Power grid	Smart Grid
Technology	**Electromechanical:** • Traditional energy infrastructure is electromechanical. • No communication between devices.	**Digital:** • employs digital technology allowing for increased communication between devices and facilitating remote control
Distribution	**One-Way Distribution:** Power can only be distributed from the main plant using traditional energy infrastructure.	**Two-Way Distribution:** While power is still distributed from the primary power plant, it can also go back up the lines to the main plant from a secondary provider. e.g. solar panels, can put energy back on to the grid.
Generation	**Centralized:** Power must be generated from a central location.	**Distributed:** Using smart grid infrastructure, power can be distributed from multiple plants and substations to aid in balancing the load, decrease peak time strains, and limit the number of power outages.

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Traditional Power Grid and Smart Grid

Characteristics	Traditional Power grid	Smart Grid
Sensors	**Few Sensors:** • The infrastructure is not equipped to handle many sensors on the lines. • Difficult to pinpoint the location of a problem and can result in longer downtimes.	**Sensors Throughout:** • Multiple sensors placed on the lines. • Easily pinpoint the location of a problem • Helps reroute power to where it is needed while limiting the areas affected by the downtime.
Monitoring	**Manual:** Due to limitations in traditional infrastructure, energy distribution must be monitored manually.	**Self:** The smart grid can monitor itself using digital technology. This allows it to balance power loads, troubleshoot outages, and manage distribution without the need for direct intervention from a technician.

Traditional Power Grid and Smart Grid

Characteristics	Traditional Power grid	Smart Grid
Control	**Limited:** Difficult to control power infrastructure.	**Pervasive:** With the increased amount of sensors, energy companies have more control over power distribution. Energy and energy consumption can be monitored all the way down the line; from the moment it leaves the power plant, all the way to the consumer.
Costumer Choice	**Fewer:** The traditional power grid system infrastructure is not properly equipped to give customers a choice in the way they receive their electricity.	**Many:** Using smart technologies, infrastructure can be shared. Alternative energy companies come on to the grid allowing consumers to have more choice.

CHALLENGES IN IMPLEMENTING IOT ENERGY MANAGEMENT SOLUTIONS

Connectivity

❖ The integration of your new **IoT connection to an existing legacy system** is a challenge due to technology generation gaps and modernization of existing infrastructure is required.

Privacy And Data Security

❖ There is a high number of important **consumer data** involved in this type of setup which can turn out to be disastrous for the consumers and tarnish the reputation of the company.

Integration

❖ Integrating IoT technology with existing platforms can be a big challenge for any company and the whole situation becomes even more difficult in the energy sector due to the complexity of existing infrastructure.

IOT BASED INTELLIGENT ENERGY MANAGEMENT SOLUTION

- **Energy monitoring and benchmarking** are important for energy management, as they **enable decision-makers to identify improvement areas** and to keep a track of the effects of their decisions on energy consumption use.

- IoT is set to become the ultimate driver of energy efficiency and sustainability in the coming years paving the way for conserving a tremendous amount of energy.

- IoT energy management systems help organizations establish an efficiently functioning business with marginally reducing operational expenditure.

1. ADVANCED ANALYTICS

- IoT solutions based on artificial intelligence and machine learning can get intelligent actionable insights from the business.
- It provides transparent insights into the critical energy parameters such as **power interruption patterns, voltage and frequency trends, etc.**
- Advance analytics adds intelligence to this data making it **decision-able, enabling real-time alerting, automate optimization, etc.**

2. REAL-TIME ENERGY MONITORING

- IoT solutions integrated with machine learning **help monitor energy compliance** within business procedures to improve efficiency.
- Application of IoT for energy management helps you with **business analytics and energy quality control** on your devices to **lower costs, boost efficiencies and reduce environmental impact.**
- It also helps in finding out the main causes of **inefficiency and improvement areas,** thus **reducing the wastage of resources.**

3. PREDICTIVE ANALYSIS

- Predictive analysis with the power of artificial intelligence and machine learning enables **real-time updates if a machine needs to be repaired or replaced.**
- With the help of machine learning, the IoT network extracts **real-time data** from sensors and devices to **predict the failure of a component of a machine before time.**
- It increases the **uptime of devices and reduces maintenance costs**

4. CENTRALIZED DASHBOARD

- Our centralized dashboard provides all the information related to the installed devices on machines on a single unified window.
- It displays the **energy load** throughout the day that project useful data in an intuitive and easy to understand manner.
- An IoT based energy management platform for industrial facilities or commercial settings provide **single window visibility to monitor multiple sites,** respond to alerts, analyze metrics and reports together.

5. SMART AND CUSTOMIZED REPORTS

- The reports are **readily available with just one click.**
- Data related to specific parameters and device performance is continuously sent by the real-time energy monitoring system, which can be measured into analytical reports and calculated to develop efficiency-boosting operations.
- A customizable report on energy usage and consumption helps you to remotely **identify & proactively assess issues to reduce maintenance costs and extend asset life.**

THE BENEFITS OF IOT ENERGY MANAGEMENT SYSTEMS

Smart energy management solutions based on the Internet of Things have a wide range of benefits for the different industry verticals.
Let's find out how the Internet of Things and energy efficiency can benefit each other for the different industry verticals:

1. COST SAVINGS

➢ IoT energy management solution helps organizations to **reduce energy spending and operating expenses and minimize man-power.**
➢ You can predict the consumption pattern and accordingly, spend and plan.

2. HIGHER ENERGY EFFICIENCY

➢ Data collected by sensors can be used to regulate air-conditioning and lighting levels in real-time.
➢ Application of IoT in energy management in the form of smart sensors and detectors **reduces overall energy consumption.**

3. REMOTE ACCESS

➢ Cloud access allows those responsible to remotely monitor and regulate their energy systems in real-time.

➢ It gives you the power to **identify, track, and understand your energy usage** and to report on your performance over time.

4. INSIGHTFUL REPORTS

➢ **Data related to specific parameters and device performance** is continuously sent by the real-time energy monitoring system, which can be measured into analytical reports and calculated to develop efficiency-boosting operations.

5. CONSUMPTION PATTERNS

➢ IoT **provides reports, data charts, and visualization** which helps you to comprehend the information easier.

➢ These reports helps to **track operational inefficiencies.**

6. ACCESSIBILITY

➢ IoT energy management solutions provide **easy accessibility, usability, management control to avoid any mishaps.**

➢ You can also get **proactive alerts** for asset failure situations.

Smart Grid Benefits

Operational Efficiency

- Integrate distributed generation
- Optimize network design
- Enable remote monitoring and diagnostics
- Improve asset and resource utilization

Energy Efficiency

- Reduce system and line losses
- Enable DSM offerings
- Improve load and VAR management
- Comply with state energy efficiency policies

Smart Grid

Customer Satisfaction

- Reduce outage frequency and duration
- Improve power quality
- Enable customer self-service
- Reduce customer energy costs

Green

- Reduce GHG emission
- Integrate renewable generating assets
- Comply with Carbon/GHG legislation
- Enable wide adoption of PHEV