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VARIOUS CONCEPTS AND PROSPECTS OF ELECTRICITY DEMAND SIDE MANAGEMENT

Parveen MD
(1), Assistant Professor, Malla Reddy Engineering college

Abstract— The need for a big installed capacity is becoming more urgent as peak demand continues to rise at an alarming rate. Developing nations cannot reach their capacity goals by building new power plants. We need to find creative approaches to reducing our energy use while yet meeting our needs. Strategies for demand response management (DSM) that lessen peak use and benefit utilities right away are a viable option.

Key words— Load Scheduling, Load Curve, Energy Efficiency, Demand Side Management, and Energy Conservation.

I. **INTRODUCTION**

II. The DSM's Central Idea

III. The term DSM was developed during the 1973 energy crisis in the US. The primary purpose of DSM is to lower peak demand at power plants, thus its other names: Energy Side Management [3] and Energy Demand Management. The DSM provides options for treating a wide range of individuals. DSM allows utilities to postpone or completely avoid investing in new power plants by adjusting when and how much their customers use electricity [6]. DSM gives a chance for residential users to take advantage of a utility's financial incentive to reduce their power bill and so save money. DSM would result in more affordable manufacturing and a more marketable product for businesses. DSM, or demand side management, is the practice of coordinating efforts between a utility and a customer to change the frequency or duration of the latter's energy use at the meter.

IV.Why is DSM necessary, B.

V.From 1981, when the country's installed capacity was 30,000 MW, to 2001, when it was over 100,000 MW, the power industry in India has seen a more than threefold increase. Unfortunately, the country's power grid still faces frequent blackouts and low-quality electricity despite the rise in supplies. The gap between electric energy demand and supply is widening at a daily pace of 3 percent. Construction of a new power plant, although necessary, is both time-consuming and costly. Though plans for IPPs topped 150,000 MW in 1991, only 3,500 MW of IPP electricity was actually online by 2001.

VI. The inefficiency of the final user system contributes to India's electricity crisis. Irrational tariffs, technical stagnation in manufacturing processes and equipment, ignorance, and a lack of policy drivers all play a role. DSM may be used across all industries in India to significantly cut down on energy use. Cost-effective DSM schemes have been shown in several studies in China and elsewhere to cut power usage and peak demand by 20-40% [3].

VII. Objectives of the DSM II

VIII. DSM intends to promote energy-efficient gadgets while simultaneously decreasing peak power consumption. Overall electrical network load may be lowered by lowering both total consumption and peak demand. Flattening the load profile, It's all about energy conservation, baby.

IX. The goal of the DSM methods is to increase end-use efficiency such that the

addition of additional producing capacity may be avoided or at least delayed. The DSM distinguishes three main ideas:

X. Energy conservation, demand response,

XI. together with Reducing Energy Waste [5].

XII. TYPES OF DSM MEASURES AND PROGRAMS

XIII. Utilities use a variety of methods to persuade energy consumers to alter their demand profiles by moving demand to the valley. Peak demand and energy use may be lowered in a variety of ways.

XIV. DSM-based treatment plans often include of

XV. • Abundant financial incentives

XVI. Planning for Heavy Demands and Peaks

XVII. • Reducing Energy Waste

XVIII. A. Monetary Incentives and a Slew of Other Programs

XIX. Strategies that fall under the DSM umbrella include those aimed at reducing energy consumption and increasing the effectiveness of power generation. The DSM plans prioritize optimum end-use efficiency to forestall or delay the installation of additional generators.

XX. Attractive rates, such as a high unit rate during peak load times, an average cost per unit during base load times, and a reduced rate for energy consumption during low demand periods, should be provided to consumers. Customers participating in the DSM financial incentive program should be subject to variable pricing depending on when they use energy.

XXI. Here are the pre-requisites for starting the program:

XXII. Thus, units used at peak load should be charged the highest cost, while those consumed during base load should be paid at an average rate, and those consumed during low demand should be charged at a reduced rate. Therefore, it is necessary to differentiate between peak load, baseload, and low demand times.

XXIII. However, there are some customers who are ready to pay a higher unit cost during peak load periods, provided that they are not allowed to exceed their sanctioned maximum demand in terms of kilowattage.

XXIV. Since customers utilize energy, he must be familiar with the load period, which may be peak load, base load, or discounted load time, among other classifications.

XXV. EFFECTIVENESS

XXVI. Customers are willing to move their load to the valley to lower their energy cost without cutting down on their energy usage (disconnected time). During peak use times, customers may convert excess energy into thermal power to use later.

XXVII. Load scheduling applications

XXVIII. The power plants are built to handle peak loads, which means they have a big installed capacity and high generating costs per unit. Developing nations cannot reach their capacity goals by building new power plants.

XXIX. The load factor of a power plant is less than 1. Since power plants are built to provide maximum demand, the greater the rate per unit of production, the lower the load factor. It is more expensive to generate electricity per unit [7] and more expensive to meet peak demand than it is to meet demand during the off-peak periods.

XXX. In the load scheduling technique [8], we split the whole load of 19200 KW into three groups, with 400 KW set aside as base load and permitted to provide for 24 hours. This helps us decrease peak demand.

XXXI. Each team has a window of opportunity to function that lasts for eight hours. It is shown in Figure 2 that the utility has direct control over the load and that the load scheduling settling time is implemented in the MATLAB

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Simulink model for load scheduling that was built.

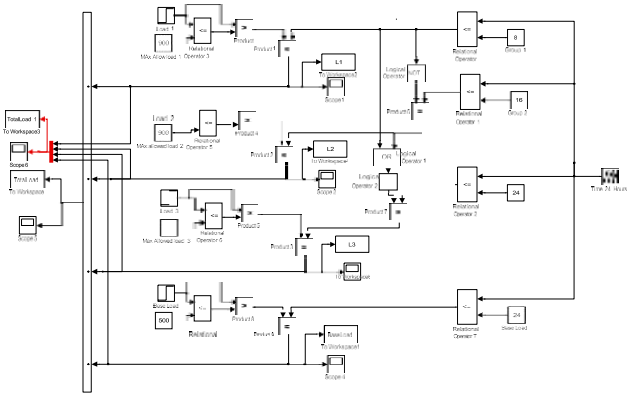

Figure.1. Simplified model of Load Scheduling

XXXII. PROGRAMS FOR ENERGY CONSERVATION

We are unable to meet the energy demands of many sectors of our economy, and we must perform power outages and load

losing even current clients' interest There is little hope that this scenario will improve soon. However, load scheduling techniques assist lessen peak demand by moving demand to the valley, which lowers consumption overall. Thus, there are other strategies available for dealing with this problem than these. A lack of money and resources, as well as the extra time needed for appropriate installation, make setting up a new producing plant more challenging in a developing nation like India.

A. Lighting

Lighting accounts for a considerable portion of total energy consumption, particularly during times of peak demand. Lighting accounts for half of commercial buildings' energy use and ten percent of industrial energy use. Numerous places suffer from excessive lighting energy waste, but this is easily remedied by implementing a few basic measures. It is possible to decrease energy usage in a variety of institutional settings, such as schools and workplaces.

A significant quantity of energy has also been shown to be wasted at the university or college level. So, to save energy, we must limit the quantity of electrical equipment brought into campus, implement an automated switching system, and place sensors throughout the building.

Happy Times

It has also been noted that a great deal of energy is lost in lighting during celebrations such as weddings, parties, and other special events due to the usage of inefficient decorative lights. Therefore, it is important to raise awareness about the power crisis, inspire people to switch to energy-efficient light bulbs, and discourage the use of excessively flashy decorative lighting. Increasing daytime activities might be a simple answer to this issue.

weddings and celebrations during the day instead of at night.

Lights on the street

The value and wastefulness of street lighting are well knowledge. It has been noted that street lights are seldom turned off, despite the fact that they must be on from dusk till dawn (exactly when they must be turned on varies with the seasons). Put in LDR circuits with these street lights to automatically switch them off as the sun comes up to conserve electricity.

The usage of outdated incandescent bulbs is another problem with public lighting. Light bulbs of this kind should be replaced with more energy-efficient lights since they lose so much energy on heating and only convert 3-6% of the total energy to light.

EFFECTIVENESS

Lighting plays a vital role in every facet of human life. The above does not indicate that illumination is not necessary. Therefore, high-quality, energy-efficient lighting is required. The following actions may have a significant impact on reducing power consumption:

High-efficiency compact fluorescent lights (CFLs) should be used instead of standard light bulbs.

• Electronic blast was set up as an alternative to the inductive Chock.

• Lighter-colored paints will reflect more sunlight.

A good habit to get into is always switching off the lights when they're not in use.

• Proper utilization of Sun light is essential for efficient lighting savings.

B. Agricultural and Industrial Development

It is estimated that around 23% of all electricity produced is used in agriculture, largely for pumping loads. About a third of the electricity produced in India is used to power electric motors, which use up about 65% of the electricity used by industry. About half of the produced electricity is used to meet these two loads. Therefore, it is essential to concentrate primarily on these aspects. The following suggestions may help cut energy use in certain fields:

Reduced-Power Induction Motor

With a full load efficiency of 85%, induction motors are widely employed in the industrial sector. Energy-efficient motors with a 90%-92% efficiency rating should be used to replace the current standard IM motors. The payback period for these motors is just one to two years, despite being three to four times as expensive as a regular induction motor.

Motors That Change Their RPMs

As the technology for induction motors evolves, variable speed drives will also be necessary. As they are consistent with the affinity laws, variable speed drives aid in cutting down on power use.

The statute states that

Rotational Energy = (Motor RPM) 2 Torque

Force = Velocity x Twist To put it another way, it means that 3 Power = (Motor Speed).

A pump's output drops by a factor of the speed's square when it's operated at half speed, but its energy consumption drops dramatically as a result.

Defining the Critical Variable

Most industrial machinery has a low trailing power factor because of how it is often used. Power consumption increases as the power factor rises. If you want to cut down on your electricity bill, you should pair the load that's causing the low power factor with some power factor correction equipment.

Supreme Leader

All of the machinery is running at less than 100% of its capability, on average. Since the equipment continues to consume energy even when there is no load attached to it, there is a power drain. Installing an automated load controller power boss with motors may help cut down on this kind of waste by regulating the

current used by the motor in accordance to the associated load.

EFFECTIVENESS

The use of an efficient motor may save consumption by about 7 percent. However, the most gain may be had by integrating a power electronics converter with these motors to create variable speed driving. When used together, these two factors provide an efficiency gain of 15-30%. Energy efficient motors, variable speed drives, and power bosses may reduce energy use by as much as 40 percent, but their hefty upfront costs have discouraged many potential buyers.

Benefits of the Diagnostic and Statistical Manual of Mental Disorders, LXXVII

The ultimate benefits to the customer, the utility, and society that arise from DSM's reduced peak demand on power plants and electrical energy savings are:

To put off building a new power plant.

Putting off costly expenditures to establish transmission and distribution networks.

Preventing disruptions in the power supply.

As a result, there are fewer power outages.

Stress on the power plant is decreased, which in turn decreases pollution levels in the surrounding area.

Reduced emissions of potentially dangerous green gases occur as a consequence of reduced plant stress.

Economical per-unit generating costs.

Improvements have been made to the stability of the network.

There will be less upkeep needed at power plants.

Lower monthly power costs for households.

By decreasing the need for high-priced fuel imports, this improves the nation's energy security.

Long-term employment opportunities made possible by technological advancements.

PROBLEMS WITH THE DSM PROGRAM'S INFRASTRUCTURE

DSM offers several benefits, however the following issues prevent it from being widely implemented:

Since the government is primarily responsible for setting the amount and structure of energy prices, it is the government's purview to determine the electrical pricing structure. As a result, the policies are heavily influenced by the regional political environment.

While the government is ultimately responsible for enforcing DSM initiatives, the rules and regulations meant to back them up have lagged behind the actual reality.

The question of who should invest in and reap the rewards of DSM has emerged as a result of the energy sector's liberalization.

Very few people are familiar with DSM initiatives and the need of energy efficiency.

Since the vast majority of clients are illiterate, they will be completely unprepared to deal with any issues that may arise in the future.

Energy-efficient home appliances have been in demand ever since

Control drives and motors are more expensive than regular home appliances, hence people aren't buying them.

A breakdown in trust and communication between service providers and their customers.

Due to a lack of energy audits, businesses are unable to acquire accurate data on how they are currently using energy.

Inadequate funding for study and experimentation.

LXXIX: ADVOCACY FOR THE DSM PROGRAM

Despite the many real-world challenges, the following considerations make DSM program deployment relatively straightforward:

Effective policies and decisions made by government are crucial to the spread of DSM since government is the primary motivating factor.

Raising consumer understanding and enthusiasm is crucial in getting the DSM out there.

Energy-saving home electronics should be eligible for direct government subsidies.

Direct and indirect service from utilities employing renewable and alternative energy sources is provided to consumers.

Set aside money for study and experimentation.

LXXX. CONCLUSION

To build a new power plant that can keep up with demand, DSM has rethought the conventional approach. By optimizing consumption patterns and boosting terminal power consumption efficiency, DSM can not only meet the same power consumption function while reducing energy demand, but it can do so without sacrificing performance. DSM is a method for conserving resources and minimizing environmental impact.

improvement. DSM is a crucial resource for optimizing the utilization of existing power infrastructure. When applied to electricity systems, DSM can lessen the severity of electrical emergencies, lessen the frequency of blackouts, increase system reliability, lessen the need for costly imports, decrease energy prices, ease strain on the power grid and power plants, cut down on investments in the generation, transmission, and distribution networks, and help reduce emissions.

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