

## **DSM Tools and Techniques**

The most common DSM techniques can be classified as below:

- Energy Conservation and Efficiency Programs- to save energy
- Demand/Load Response Programs- To shift and reschedule energy consumption process

### **Energy Conservation and Efficiency programs**

It is said that Energy conserved is Energy generated.

Energy conservation and efficiency measures are the best alternative energy sources.

There are various opportunities and techniques available for reducing energy consumption such as efficient lighting, variable speed drives, solar hot water systems etc. These technologies reduce demand, help in lowering high peak prices and also reduce greenhouse gas emissions due to less stress on generating plants.

### **Load Response Programs (LRP)**

Load Response Programs are an effective part of Demand Side Management.

These are the actions undertaken in response to electricity supply position and wholesale market price of electricity. Or in other sense these refer to switching off or reschedule of non-essential and non-critical loads by the end users in response to the request of IMO or the utilities. This can lead to save the system network from exceeding its peak rating.

There are a large variety of load equipments and applications that can be switched on or off at a particular times to reduce electricity demand from the network.

## **Tools for DSM**

Every technology needs some tools to be used to achieve the desired results. Following are the main tools to be used for achieving DSM results:

### **Dynamic/Real Time Pricing**

The present deregulated market is based on real time system of supply and demand. Prices change time to time and hour to hour depending upon these two factors. By exposing customers to Real Time/Dynamic i.e. time-varying prices, they can have a better view of the prevailing market and the information and incentive to reduce their demand at peak times and to shift their usage from high priced periods to low-priced periods.

### **Time-of-Use Rates**

This is the tool or rate structure by which customers are offered different rates for electricity usage at different times of the day. Offering them lower rates for consumption at off-peak time can make them aware to use some of the power at those low-priced time for related equipments which have the flexibility of operation at different times.

### **Automated/Smart Metering**

Implementing Dynamic/ Real Time Pricing or Time-of-use rate structure and billing accordingly is not a complex program now. Automatic/Smart Metering successfully used by various utilities provide the best effective solution to this problem. This Automatic Meter Reading (AMR) system has the various other benefits which are customer oriented as well as utility oriented.

### **Web-based/Communication System**

This is a tool used along with the above to convey the customer about the prevailing demand, supply, prices on real time basis and the incentives and options for him, which are used by the customer to manage the demand. In addition, there are other methods like E-mail, Cell Phone, Pagers and Fax etc. which can be used as a communication tool to convey the required information and data.

### **Market Drivers for DSM/LRP technologies:**

Depending upon the supply and market position, there are two broad categories:

#### **Reliability-based programs:**

These programs operate in response to the system contingencies. That is why these can also be called as “contingency” programs. These are used whenever there is an emergency of power supply in case of acute shortage due to less generation or more demand or due to some other system constraints. These programs are also called Emergency Demand Response Program (EDRP)

#### **Market/Price based programs:**

These programs are based on market price signals of electricity. This category includes programs that use time-of-use (TOU) rates/Real Time Prices, Interruptible Rates and Two-part Tariff. These rates are intended to reduce consumer bills through the application of time-differentiated rates. The consumer participants of these programs that curtail their loads at critical times of very high prices can also be paid some extra financial incentive to help maintain system reliability.

These programs can include **Day Ahead Demand Response Program**, where the end users respond to price signals and reduce loads when the price exceeds their set Base Price on day to day or day-ahead time basis.

### **Types of Load Control:**

The two main methods can be used in the market to control the load at consumer premises depending upon the size of load and the infrastructure as:

**Direct Load Control-** Directly by IMO/Utility operator for large supply consumers in consultation with them after careful planning and installing required infrastructure.

**Load Control by Consumer-** Where only an information is send to the consumer about the quantity of load to be controlled along with the other related information and he has to take the action within the stipulated time

### **Participants of DSM/Load Response Programs**

Implementing these programs, we need a strong government support to through its various agencies. Ontario Energy Board (OEB), being regulatory agency in the energy market, can play a leading role in promoting these programs.

Other than the Ministry of Energy and OEB, following are the key potential participants for these programs who can promote, implement and monitor these programs:

- **Independent Electricity Market Operator (IMO)**- controlling the electricity grid and large supply consumers
- **Utilities/Suppliers**- supplying electricity to consumers for medium and small supply
- **Consumers**- being the end user of electricity

Each of these units has its own significant role to play. But the optimum results can be obtained by coordination of all of them. Government agencies can make various policies and regulations, provide incentives, subsidies and technical support for these programs and Utilities can implement these more effectively through different cost-effective and customized programs in coordination with the end-users i.e. the consumers.

### **Factors effecting Load Response Programs:**

However implementing these technologies and techniques is not always so cheap. Though there are many opportunities where we can apply these without any additional cost or investment. But to apply them at large scale for the whole market there are various factors to be considered as:

- Cost to the customer to shed and reschedule the load
- Time it takes to activate the load response
- The variation in wholesale price
- Losses to occur in case of reliability problems due to acute shortage
- Any losses in production by implementing these programs

### **DSM Program Approaches:**

Various approaches can be adopted to achieve benefits of Demand Side Management as:

- General information programs for customers about energy efficiency options.
- Information programs about specific DSM techniques appropriate for industry
- Financing programs to assist customers to pay for DSM measures
- Turnkey programs that provide complete services to design, finance, and install a package of efficiency measures at the consumer end.
- Alternative rate programs by the utilities like time-of-use rates and interruptible rates to shift loads to off-peak periods.
- Schemes and incentives to invest in energy conservation and efficiency programs
- Incentives for new innovations and technologies for Load Response/Load Management Programs.

### **DSM Programs Strategies**

The following strategy may be adopted to design and implement DSM program:

- Identify the sectors and end-users as the potential targets
- Visualize the needs of the targeted sectors
- Develop marketing strategies for the programs
- Develop the customized program
- Conduct analysis for cost-effectiveness
- Prepare a Program Execution Plan
- Implement programs
- Monitor programs for their deliverables and further modifications

