UNIT – VIII
DEMAND SIDE MANAGEMENT – II

Load management, load priority technique, peak clipping, peak shifting, valley filling, strategic conservation, energy efficient. Management and Organization of Energy Conservation awareness Programs.

Load management

Load management is the process of balancing the supply of electricity on the network with the electrical load by adjusting or controlling the load rather than the power station output. This can be achieved by direct intervention of the utility in real time, by the use of frequency sensitive relays triggering circuit breakers (ripple control), by time clocks, or by using special tariffs to influence consumer behavior. Load management allows utilities to reduce demand for electricity during peak usage times, which can, in turn, reduce costs by eliminating the need for peaking power plants. In addition, peaking power plants also often require hours to bring on-line, presenting challenges should a plant go off-line unexpectedly. Load management can also help reduce harmful emission, since peaking plants or backup generators are often dirtier and less efficient than base load power plants. New load-management technologies are constantly under development — both by private industry and public entities.

Load Priority Technique

Load Priority Technique Works on individual loads priority for operation (in service and out of service). This is mainly influenced by the production schedule. The load priority could also be connected directly with the rate communication system (i.e., differential tariff system). However in the present work, while deciding priorities of various loads for operation, only production schedule is considered in consultation with the concerned section superintendents.

In developing load priority technique, non-interruptible loads are classified as high priority loads (to remain in ON condition) and the interruptible loads are classified as low priority loads. Two priority lists are prepared in consultation with the various section superintendents namely:-

1. Priority for switching OFF
2. Priority for switching ON

The load demand on the industry is continuously monitored at acceptable time intervals. If the demand exceeds beyond the permitted limit then the “Low Priority Loads” to the extent of exceeded value of load are cut-off. If the load demand is less than the permitted limit then the loads which were interrupted in the previous time slots were switched on based on the “priority for switching ON”.
The success of load priority technique is totally dependent upon the development of various load priorities for operation which will not disturb the production schedule and gives enough scope for reduction of load demand. This DSM alternative creates possibilities for the consumers to reduce peaks and fill out valleys in their load curves. Thus resulting in an almost flat load curve. It also helps to maintain consumer lifestyle by reducing the unscheduled outages. As there is a strict control over the maximum demand penalty for the consumer.

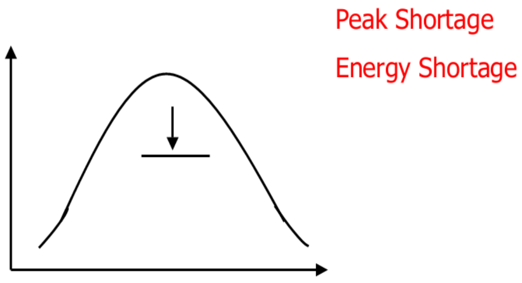
Peak Clipping

Clipping is a form of waveform distortion that occurs when an amplifier is overdriven and attempts to deliver an output voltage or current beyond its maximum capability. Driving an amplifier into clipping may cause it to output power in excess of its published ratings.

Reduction of the maximum demand for electric power from an electrical utility, often achieved by direct control of customer loads by signals directed to customer appliances.

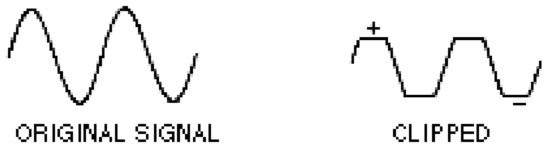
A common form of distortion in telephones and other auditory transmission systems in which the peaks of the waveform are flattened off—to only one or two per cent of their original height in severe peak clipping—transforming the waveform into a sequence of rectangular pulses. When applied to speech it has surprisingly little effect on its intelligibility, 80 or 90 per cent of words still being correctly interpreted by listeners when the clipping is severe.

The DISTORTION caused when the GAIN of an amplifier is increased to a point where the high points, or peaks, of the SIGNAL or WAVEFORM are cut off at a level where the amplifying circuits are driven beyond their overload point. Also called over-MODULATION.



Peak clipping may be avoided by gain reduction, COMPRESSION of the signal, or by the use of a LIMITER.

Compare: RECTIFICATION, SWITCH.



Positive and negative clipping of a sine wave.

Peak clipping—where the demand peaks (high demand periods) are "clipped" and the load is reduced at peak times. This form of load management has little overall effect of the demand but focuses on reducing peak demand.

Peak Clipping - Or the reduction of the system peak loads, embodies one of the classic forms of load management. Peak clipping is generally considered as the reduction of peak load by using direct load control. Direct load control is most commonly practiced by direct utility control of either service to customer facilities or of customers' appliances. While many utilities consider this as means to reduce peaking capacity or capacity purchases and consider control only during the most probable days of system peak, direct load control can be used to reduce operating cost and dependence on critical fuels by economic dispatch.

Peak Shifting

Peak Shifting is a highly cost-effective method of reducing electric utility expenses. When electric utility commercial or industrial customers use electricity can make a big difference on their monthly electric bills. By shifting the time of day that electric power is used, a commercial or industrial customer can reduce their "demand charge" portion of their electric bill during peak times of the day. This reduces the overall cost of power each month for the customer.

Unlike most products, electricity can't be stored after it's generated. Electricity must be generated - and consumed - at the time of demand by a utility's customer. Electricity usage continuously varies throughout the day, and varies from month-to-month and season-to-season. Each day, there are "peak" demand periods of usage during which time the electric utilities must generate additional amounts of electricity to meet these peak demands for all of their customers.

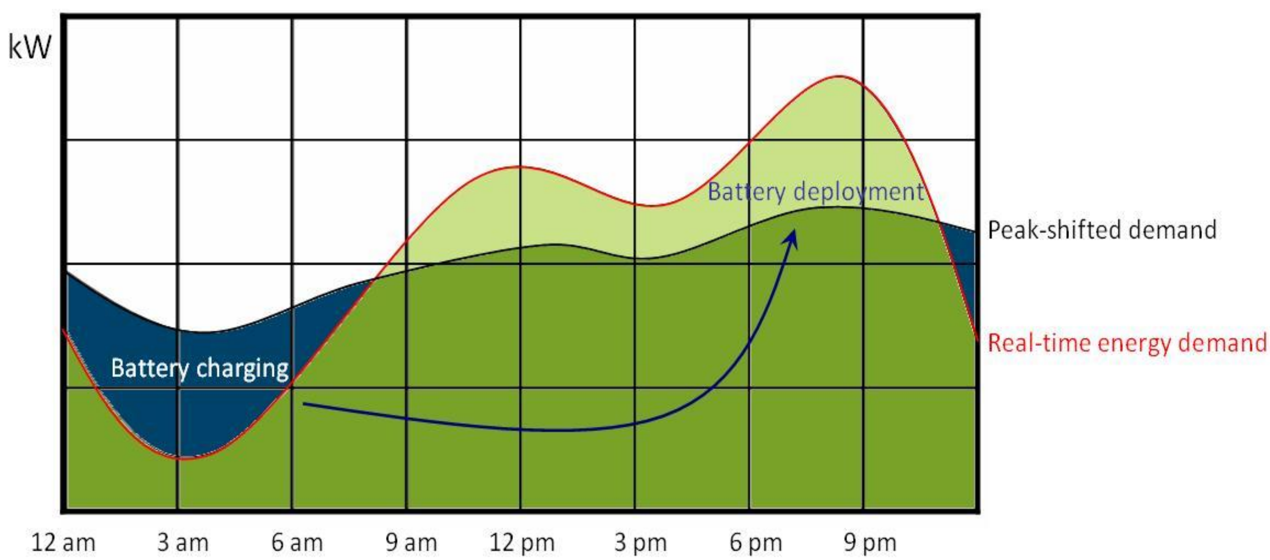
To meet this additional peak demand for electricity utilities use "peaking generators" also called "peaking plants" or simply "peakers." These peaking plants are the least efficient methods of generating power, meaning they generate less power with more fuel (and their associated greenhouse gas emissions) compared with the utility's base-load generators. These peaking plants typically burn oil or natural gas to produce the electricity and are brought on line only during "peak periods" of the day and run for short periods.

While peaking generators generally cost less to build than other types of generators, they also have relatively high fuel costs because they are typically much less efficient in the use of fuel.

Therefore, "Peak Shifting" is a method that addresses shifts the time of day when electricity is used; reducing the need for peaking plants and can reduce a commercial or industrial customer's electric bills, if correctly implemented.

Because the vast majority of electricity is generated in direct, instantaneous response to demand, costs of electricity differ dramatically between high demand ("on peak") and low demand ("off peak") periods.

By installing energy storage on the grid, both utilities and consumers are able to shift their demand out of on-peak periods and into off peak periods, flattening their energy consumption profile:

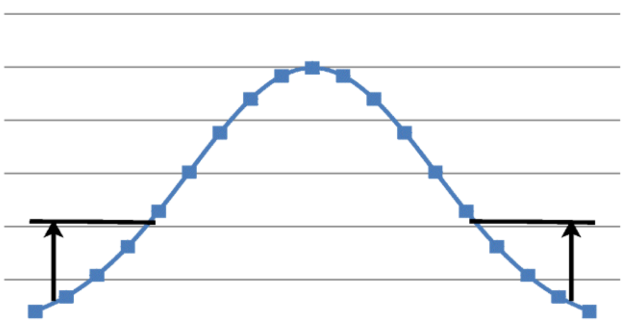


This reduces energy costs for the average user on the system, regardless of whether or not they are the user of time-shifted electricity. Commercial electric customers on time-of-use rate schedules have a compelling financial opportunity in the form of energy arbitrage. Peak shifting also lessens the total effect of electric vehicle charging on the grid, and makes electric vehicles less expensive per mile.

Valley Filling

The process of making an energy production and delivery system more efficient by encouraging additional energy use during periods of lowest system demand. Valley filling programs are usually accompanied by load shifting programs, often with the aim of shifting peak demand usage to low demand periods, but the term can refer to any program or strategy aimed at filling the valley. An essential component of nearly all demand-side management programs.

Valley Filling - Is the second classic form of load management and applies to both gas and electric systems. Valley filling encompasses building off-peak loads. This may be particularly desirable where the long-run incremental cost is less than the average price of energy. Adding properly priced off-peak load under those circumstances decreases the average price. Valley filling can be accomplished in several ways, one of the most popular of which is new thermal energy storage (water heating and/or space heating) that displaces loads served by fossil fuels.



Valley Filling

Valley filling—where the demand valleys (low demand periods) are “filled” by building off-peak capacities. This form of load manage-ment can be achieved by thermal energy storage (water heating or space heating) that displaces fossil fuel loads.

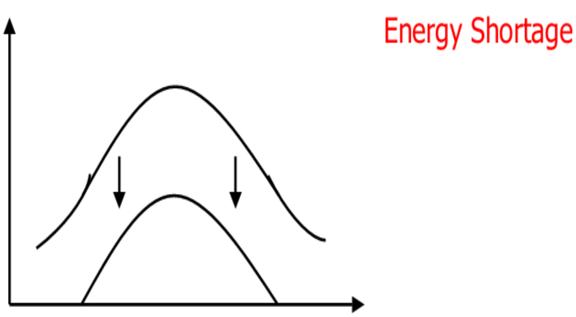
Strategic Conservation

Strategic Conservation - Is the load shape change that results from programs directed at end use consumption. Not normally considered load management, the change reflects a modification of the load shape involving a reduction in consumption as well as a change in the pattern of use. In employing energy conservation, the planner must consider what conservation actions would occur naturally and then evaluate the cost-effectiveness of possible intended programs to accelerate or stimulate those actions. Examples include weatherization and appliance efficiency improvement.

Strategic conservation is the load shape change that results from utility-stimulated programmes directed at end use consumption. This is represented schematically in figure II.

Figure II.—Strategic load conservation

Not normally considered load management, the change reflects a modification of the load shape involving a reduction in sales as well as a change in the pattern of use. In employing energy conservation, the utility planner must consider what conservation actions would occur naturally and then evaluate the cost-effectiveness of possible intended utility programmes to accelerate or stimulate those actions. An example is appliance efficiency improvement.



Strategic Conservation is a process that produces tools to aid decision makers in identifying, prioritizing, pursuing, and protecting those specific tracts of land that will most effectively and efficiently achieve the land trust's mission.

Energy Efficient Equipment

Energy consumed by appliances and equipment is a major source of greenhouse gas emissions in Australia. Improving the energy efficiency of appliances is a key objective for all Australian Governments.

The main policy tools that are used to improve the energy efficiency of appliances and equipment, in the residential, commercial and industrial sector, and save money for all Australians, are mandatory Minimum Energy Performance Standards (MEPS) and mandatory Energy Rating Labels.

Since 1986 the Energy Rating Label has appeared on refrigerators and freezers in New South Wales and Victoria. Since that time, the label has applied to more product lines and is used in both Australia and New Zealand, with all states and territories having regulations in place over time.

In 1992 a national body, the Equipment Energy Efficiency Program (E3) was established to coordinate these activities. On 30 May 2012 the Greenhouse and Energy Minimum Standards (GEMS) Bill 2012 was introduced into federal Parliament with a proposed commencement date of 1 October 2012. Providing that the legislation is passed, the E3 Program will operate under national legislation, replacing the patchwork of state regulations the E3 Program has been operating under to date.

The Program will continue to be administered by the Australian Government (currently through the Department of Climate Change and Energy Efficiency), with continued input from state and territory governments and the New Zealand Government (through the Energy Efficiency Conservation Authority).

E3 reports to the Energy Efficiency Working Group (E2WG) under the National Framework for Energy Efficiency (NFEE), and ultimately to the Select Council on Climate Change. More recently the work of E3 has been adopted as a measure under the National Strategy on Energy Efficiency and the National Partnership Agreement on Energy Efficiency.

Products are considered for inclusion within the program on the basis that the community will benefit from their regulation. The individual product energy efficiency target is either the equivalent of world-best regulatory target or a more stringent level developed specifically for Australia. This market intervention has proved to be an extremely cost effective mechanism for reducing energy demand and greenhouse gases produced by consumer appliances, commercial and industrial equipment.

Efficient energy use, sometimes simply called energy efficiency, is the goal of efforts to reduce the amount of energy required to provide products and services. For example, insulating a home allows a building to use less heating and cooling energy to achieve and maintain a comfortable temperature. Installing fluorescent lights or natural skylights reduces the amount of energy required to attain the same level of illumination compared with using traditional incandescent light bulbs. Compact fluorescent lights use one-third the energy of incandescent lights and may last 6 to 10 times longer. Improvements in energy efficiency are most often achieved by adopting a more efficient technology or production process.

Energy efficiency and renewable energy are said to be the twin pillars of sustainable energy policy and are high priorities in the sustainable energy hierarchy. In many countries energy efficiency is also seen to have a national security benefit because it can be used to reduce the level of energy imports from foreign countries and may slow down the rate at which domestic energy resources are depleted.

Energy efficiency is "using less energy to provide the same service".

The best way to understand this idea is through examples: When you replace a single pane window in your house with an energy-efficient one, the new window prevents heat from escaping in the winter, so you save energy by using your furnace or electric heater less while still staying comfortable. In the summer, efficient windows keep the heat out, so the air conditioner does not run as often and you save electricity.

When you replace an appliance, such as a refrigerator or clothes washer, or office equipment, such as a computer or printer, with a more energy-efficient model, the new equipment provides the same service, but uses less energy. This saves you money on your energy bill, and reduces the amount of greenhouse gases going into the atmosphere.

Energy efficiency is not energy conservation. Energy conservation is reducing or going without a service to save energy. For example: Turning off a light is energy conservation. Replacing an incandescent lamp with a compact fluorescent lamp (which uses much less energy to produce the same amount of light) is energy efficiency.

Management and Organization of Energy Conservation awareness Programs

Most successful organizations and individuals set goals, develop plans to meet them and continually monitor their progress. To put together a plan that will work for the unique requirements of your company, follow these six easy steps:

- <u>Step 1 – Establish a clear vision</u>: Create goals that are specific, measurable, attainable, realistic and trackable ("SMART").
- <u>Step 2 – Create the team</u>: Appoint an energy champion who will develop the plan, obtain approval to proceed, build your team and manage

implementation. Build your team to include decision makers as well as a diverse group that represents your workplace.

- Step 3 – Know your workplace: Figure out who are your target audiences to determine the tools you will use to communicate with them. Consider the audience's size, where it's located and whether it is located in multiple facilities.
- Step 4 – Develop your communications plan: Identify and document what you need to say to your employees, and how to say it. Define your key messages; choose a communications style that is consistent with that used in your organization, and then list out the activities, schedule and budget you'll need to make your plan work.
- Step 5 – Implement your plan: Educate your employees/occupants/students in energy-conserving habits and behaviours. Deliver the activities you and your team have selected. Monitor the program and its effects, and lead by example.
- Step 6 – Recognize and reward: Reward those who have contributed to achieving your goals. Annual programs can help remind your employees and occupants of their energy-saving habits and accomplishments.

Load Management Options

Direct Load Control (DLC) – Utility has control of directly switching off customer loads
Interruptible Load Control (ILC) - Utility provides advance notice to customers to switch off loads
Time of Use (TOU) Tariffs – price signal provided – customer decides response

Load management programmes—changing the load pattern and encouraging less demand at peak times and peak rates:

- Load leveling
- Load control

Tariff incentives and penalties

Load leveling

Load levelling helps to optimize the current generating base-load without the need for reserve capacity to meet the periods of high demand.