ELECTRICAL ENERGY CONSERVATION

Electrical Energy Conservation

- Electrical Energy Conservation implies:

1. Efficient use of available electrical energy.
2. Innovation and Adoption of new technology for minimizing losses and misuses in all sectors – Industrial,Transport,Agriculture and Residential etc.
3. Saving electricity leads to reduction in environmental pollution,which is good for society as a whole.

Basic needs 0f Energy conservation

- It is a vital infrastructure input for economical development of the country.
- Thermal power generation in India is about 80% with an efficiency of 30 to 35 %
- One unit consumption of energy require 4 units of primary fuel at generating station– Expensive physical resource
- Capacity cost about Rs 4 to 5 crores/MW with transmission & distribution cost further increase to 60% -- Expensive economic resource
- No arrangement available to store generated electrical power – Demand & Supply has to match instant to instant.
- Capacity created at Peak period remains ideal at off peak period

ELEMENTS OF ENERGY POLICY

The key elements of the energy policy followed by the Developing countries are :

- PROPER ENERGY PRICING
- FIERCELY COMPITITIVE MARKETS FORCING INDUSTRIES TO REDUCE PRICING
- ENERGY LABELLING & ENERGY EFFICIENCY STANDARDS – for EQUIPMENTS
- INCREASING CONSUMERS AWARENESS --- ABOUT ENERGY EFFICIENCY & PRESERVATION OF ENVIORNMENT
- STABLE POPULATION

Energy Scene in India

India has 01% of the total World's energy resource but 16% of the World's population.

Since independence and even today,the energy policy is oriented towards increasing the supply of coal,oil and electricity.

Our oil consumption has increased 5 folds in the past 27 years,after the energy crisis of 1973.About 72% of our oil requirement is met through imports.

It is definitely,better to improve energy efficiency rather than setup energy generation facilities to supply inefficient plants and inefficient equipments

ENERGY RESRVES

Energy	India reserve	World reserve	India reserve as % of World's
Oil (MT)	800	1,38,300	0.58
Gas(MOTE)	700	1,39,000	0.5
Coal (MT)	69,947	10,31,610	6.78
Hydel(MOTE)	30	218	13.76
Nuclear(MOTE)	02	596	0.34

(MOTE – Million Tonne of oil Equivalent)

SOURCE -- IRIEEN JOURNAL(Vol -- 11) / 2001

Energy Production in India

Energy	units	93 –94	95 –96	96-97	97-98	98 –99
Coal	MT	246.0	270.1	285.7	295.0	290.0
Power	MW	79753	83288	85940	89167	93650
Electricity generated	Billion KWH	324.1	379.9	394.5	420.4	448.4
Plant L.F	%	61.0	63.0	64.4	64.7	64.3
Crude oil	MT	27.0	34.5	32.9	33.8	32.0
Petroleum	MT	63.7	77.9	82.7	87.9	93.4

Source IRIEEN Journal 11(2001) – 1

Stages of Energy Conservation Programme

- House Keeping – proper procedure,utilization and equipment's maintenance.
- Process Improvement – modification of existing equipments and process
- Equipment replacement – by energy saver Equipments
- Use of Non conventional energy –solar,wind energy and gobar gas plant,
- Effective use of day lighting
- Task lighting

Electrical Energy Analysis

- Measuring the energy consumption & losses associated with each equipments and process.
- Identification of possible scope of energy saving.
- Computation of Connected load,the Maximum demand,Load and power factor.

Electrical Load Management

- It means the scheduling of loads and maintaining the load factor nearly 100% so that peak demand and demand charges can be reduced.Load scheduling is subjected to operational constraint and possibility of load scheduling. Demand can be controlled by:

1. Time Control – can be exercised,if cyclic energy consumption is consistence,
2. Manual Control – monitoring the variation in demand and sheds some load to keep Maximum demand within limit
3. Centralized Load Control –Monitoring the energy consumption to be done centrally to keep MD within limit.
4. Power Factor – Industrial loads are inductive so PF will be low causing more energy consumption.It is to be improved by providing shunt bank condenser at the end of the feeder.

Electrical Energy Saving Approach

- Lighting
- Industrial Motors
- Air-conditioning
- Water supply system (Pumps)
- Electric heating & Electrolysis

Save Energy in Lighting

- About 15% of the total energy consumption in any installation is in Lighting only so subject of lighting is concerned.Selection of most suitable lamp is based on its luminous efficiency,colour rendering characteristics,cost,useful life,maintainability and decorative quality.Energy efficient lighting means:

1. Use of efficient light source – Low energy SL&PL lamps are low pressure gas discharge lamps with high efficiency.
2. Optimum Optical efficacy
3. Good house keeping
4. Best designed system
5. Need based lighting by control of switching operation
6. For interior lighting effect of room surface finishes is essential

Energy cost Vs Lamp cost

Many techniques have been put to reduce the energy consumption in Lighting.The cost effectiveness of these methods depends upon energy costs,utility of system and cost of installation of new system.

The comparison shows how significant is the cost of energy to operate light installation ?

Running cost	FL 40W	HPMV125	HPSV70W	LPSV35
Per 1000 hrs	Rs	W Rs	Rs	W Rs
E/cost with Gear loss.	117	315	191	113
Lamp cost Per 1000hr	07	30	35	60
Total cost	124	345	226	173
E/cost as	94%	91%	85%	65%

Industrial Motors

Electric motors constitutes about 72% of the total industrial load, Where Induction motors are invariable used.Criteria for selection:

- Process requirement – General,Auto / Non auto control,variable speed etc
- Types of Motors and their starting arrangement– improved controls
- Electric power system requirement– operation at rated supply
- Availability,Reliability and maintenance requirements

Operational Improvements:

1. Operated at rated voltage and balanced supply.
2. Improve controls and regular maintenance
3. Improved cooling

Retrofit Improvement:

1. Replacement of oversized motors by lower ratings.
2. Replacement of old and inefficient motors by new motors

Energy conservation in water supply pumping installations

Electrical Pumps of varying capacities are commonly used for pumping water from the source to the overhead tank.The efficiency of the pumping station varies from 10 to 70%.Prevention of wastage and leakage can save energy up to 5%.Overhead storage tanks should be located at minimum height commensurate with pressure requirement.Regulation of discharge may be done by matching pumps and motors with required volume and pressure instead of using partial closed valve,which waste the energy considerably.

Railways cannot control energy prices,but can control energy consumption by raising the efficiency of energy use in pumping installations

Railways can also bring down cost of pumping water by improving the reliability of pumping installation in addition to raising the efficiency.

Energy conservation in Air-conditioning System.

Air-conditioning is another intensive operation.A combination of central AC with packed individual units may prove more energy efficient.It is proved that 1degree centigrade less cooling temp. can mean 8 to 10% less energy consumption.Inside temp.25 degC most reasonable for both human and equipments.Hence thermostatic control may be set from 23 to 25 deg.C.In winter room need not to be heated upto18deg.C.regular maintenance of the AC equipments are required for the saving of energy.The other means to achieve economies in energy consumption are:

1. Locating heaters etc outside AC areas
2. Prevention leakage of air from and into the AC areas.
3. Intake air to be limited to minimum.
4. Electronic voltage control for speed control of blowers to be provided
5. Air filters to be cleaned regularly.

Energy conservation in Electric Heating & Electrolysis.

Electric Heating

Temperature and Mode of heat transfer are the 2 main factors, which decides a particular form of heating to adopt.

Energy conservation in electric heating is possible mainly by

- Reducing heat losses
- Using more efficient equipment or processes.

Electrolysis:

Some of the measures that may be taken to effect saving in electric Energy consumed in electrolysis are given as:

- Storage batteries
- Electrolytic processes
- Recover waste heat
- Use of efficient controls & Rectifiers.

Electrical energy conservation monitoring measures in Indian Railways

Institutional arrangement have been strengthen both at Zonal and Divisional level for monitoring the energy saving approach and make necessary arrangement to implement the programme.

At Zonal level Deputy CME(fuel) is nominated as secretary and other members to look after the works of Energy Conservation plans and monitoring all the energy used every year

Similarly ADRM heads the divisional level to maintained the Conservation plans and make necessary efforts for proper utilization of energy.

In each Railway Workshop one energy officer of Deputy rank is nominated for coordination for proper energy utilization.

Electrical energy conservation monitoring measures in Indian Railways

Following are the efforts --

- Training --Energy conservation efforts will succeed only when one have trained people in implementing the energy conservation programme and energy audit technique. Indian Railways are conscious of it.
- Motivation and Incentives: -The aspect is fully considered and Rly. Personnel are given awards for their contribution towards saving energy in the Rly..
- Specific Energy Consumption—Energy consumed per unit of output is the specific energy consumption of the product.

ENERGY & ENVIORNMENT

The process of Energy generation,transmission and utilization leads to significant environment,pollution.

The Green house effect due to increase in the level ofCO2,Methane and other gases is leading to global warming.

The CO2 level in the atmosphere has increased from 280 ppm in 1980 to about 380 ppm at present.

The average temperature of the EARTHS'S atmosphere is likely to Increase by 1.5 to 04 deg.C in the next 05 years,if emission of Green house is not curbed.

Global warming may lead to rise in sea levels,significant change in rain fall patterns,increase in frequency of heat waves,storms and other unpredictable consequences.

The production of Chloro Fluoro Carbons (CFCS),which affects the ozone layer has been phased out and at the time developing countries have agreed to reduced Carbon emission.

The World is moving towards a SUBSTAINTIAL ENERGY FUTURE With emphasis on ENERGY EFFICIENCY & USING RENEVABLE ENERGY SOURCE.

Energy-Related Environmental issues

The use of fossil fuel(coal,oil & gas) has been harmful to environment.Their use lead to such rapid industrial development that effects on the environment were not studied or even considered until recently.Besides fossile fuels,nuclear energy also poses environmental risks.

Of all the energy-related environmental issues,there are 9 that are causing the greatest concern at the moment.They are:

- Green house effect – effect of the increased CO2& other gases collected in the earth atmosphere.
- Acid rain – rain that contains chemical pollution falls to earth.Dilute acid with absorption of SO2 & NOx-ingredient
- Nuclear waste
- Water pollution
- Depletion of ozone layer
- Smog
- Accident
- Power lines & pipe lines
- Water storages.

ELECTRICITY – A FRIEND AND A FOE

The impact of Electricity and its use in the modern times is phenomenal.

Electricity has come to be a part of our daily life and its important is felt most when there is a power failure.Although modern science has come out with alternatives in the event of power failure,the same is only a stop gap.The alternative again depend on the resumption of power,to charge the batteries etc,to be an effective stand by.

Therefore intense is needed for electricity,that its use has been largely negligent.While the above negligent acts have resulted in breakdowns of machinery and equipment,it has also brought about Catastrophes in the form of electrical shocks,fires and deaths.

Thank You