

UNIT III**RENEWABLE SOURCES OF ENERGY.****3.1 Energy Definition**

Energy may be defined as, “any property, which can be converted into work.” (or) Energy is defined as, “the capacity to do work.”

- Forms of energy, some of immediately used to do work; others require some process of transformation.
- Life is unthinkable without energy. All the developmental activities in the world are directly or indirectly depends upon energy.
- Energy production and energy utilization are the indicators of a country’s progress.
- **Growing energy Needs**

Energy is essential to all human societies. All industrial process like, mining, transport, living, heating and cooling in buildings, all require energy. With the demands of growing population, the world is facing further energy deficit, Our life style is also changing from a simple way of life to luxurious life style. At present 95% of the commercial energy is available only from the fossil fuels like coal, oil and natural gas, and are not going to last for many years. It would be really ironic if fuel becomes more expensive than food.

Energy Distribution –World Scenario

- U.S.A and Canada 5% of the world’s population- consume 25% of the available world’s energy resources.
- It has been observed, that in U.S.A and Canada an average person consumes 300GJ (Giga Joules; equal to 60 barrels of oil) per year.
- But in poor countries like Bhutan, Nepal and Ethiopia, an average person consumes less than 1 GJ per year.
- So a person in a developed country consumes almost as much energy in a single day as one person consumes in a whole year in a poor country.

- From the above scenario it is clear that our life style and standard of living are closely related to energy needs.

3.1.1 Energy management

Definition

Energy management is planning and operation of energy production, energy consumption and energy distribution and storage.

For the advancement in the energy production, fossil fuel sources are shifted to alternative energy sources like solar, wind and biomass energy.

Apart from the growth in the energy sector, there is equivalent increase in business and organizations, which has brought tremendous competition in the market in terms of increasing environmental standards and reducing global warming, carbon foot print and greenhouse gas emissions.

Energy management introduced in an organization, can effectively manage how much energy they produce and how to controls and monitor. A large amount of energy and money can be saved by employing energy management principle. It can also help companies by not only improving productivity but also the quality that they offer using energy efficiency techniques and better materials and manufacturing process.

Objective (or) Aims of energy management

- Resource conservation.
- Climate protection.
- Cost savings and minimize waste.
- Minimize environmental effects.
- achieve complete environmental sustainability.

Principles of energy management

- It controls the costs of the energy function and product cost
- The last principle states that the major effort of an energy management program should be put into installing controls and achieving result.

Steps involved in the process of energy management

The following 5 steps are important in the process of energy management.

Step 1: Collecting and analyzing continuous data.

Step 2: Identify optimizations in equipment schedules, set points and flow rates to improve energy efficiency.

Step 3: Calculate return on investment. Units of energy saved can be metered and calculated just like units of energy delivered.

Step 4: Execute energy optimization solutions.

Step 5: Repeat step 2 to continue optimizing energy efficiency.

3.1.2 Energy conservation.

Energy conservation is the practice of using less energy in order to lower the costs and reduce environmental impact. This can be achieved by using

- (i) energy more efficiently (using less energy for a constant service),
- (ii) by reducing the amount of service used (by driving less).

Objectives (or) Aims of Energy Conservation

Energy conservation is the key element. The main objectives are

- to reduce overall energy demand,
- to lower energy cost,
- to reduce energy consumption,
- to lower the overall greenhouse gas emission.

Principles (or) Law of conservation of energy

The principle of energy of conservation states that energy can neither be created nor destroyed but it can be transformed from one type to another. According to this the total energy of an isolated system remains constant.

Importance of Energy conservation

Energy conservation is very important because of the following reasons.

- It reduces our usage of non-renewable energy resources (like fossil fuels).
- It also helps you to save money on energy costs including utility bills and other energy bills.

- It also cuts down on expanding development, where natural resource extraction is impacting natural areas.
- When we conserve energy more efficiently, we directly reduce the amount of greenhouse gas emissions entering the earth's atmosphere.
- It insists us to replace the energy, used, with an alternate energy source.

Ways to conserve energy (or) Conservation

There are 12 ways to start conserving energy.

1. Adjust your day-to-day behaviors

Example: Switch off lights (or) appliances when you do not need them.

2. Replace your light bulbs

Use energy efficient alternatives CFL and LED bulbs.

3. Use smart power strips

Use Smart power strips, which eliminate the energy waste problem.

4. Install a programmable (or) smart thermostat

It automatically turn-off (or) reduce heating and cooling during the time when you are asleep (or) away.

5. Purchase energy efficient appliances

These will consume less energy during use.

6. Reduce your water heating expense

Efficient water heaters can be 8% to 300% more energy efficient than a conventional storage water heater.

7. Install energy efficient windows

8. Wash your clothes in cold water.

9. Replacing dirty air filters regularly can reduce energy consumption up to 15%.

10. As microwave is more energy efficient, microwave oven can be used instead of ordinary stove.

11. Using natural light, like sun, we can reduce the energy consumption.

12. Dress appropriately for the weather inside and outside.