

Aim: How can we improve the efficiency of energy production?

Energy Efficiency – The percentage of total energy input into an energy conversion device or system that

(1) does useful work

(2) is not converted to low-quality, useless heat (once again ... 2nd Law of Thermodynamics)

1. Cogeneration -

two useful forms of energy are produced from the same fuel source to increase efficiency:

CCP (combined-cycle power) v CHP (combined heat and power)

Examples:

A **combined-cycle power plant** uses both a gas and a steam turbine together to produce up to 50 percent more electricity from the same fuel than a traditional power plant. The waste heat from the gas turbine is routed to the nearby steam turbine, which generates extra power.

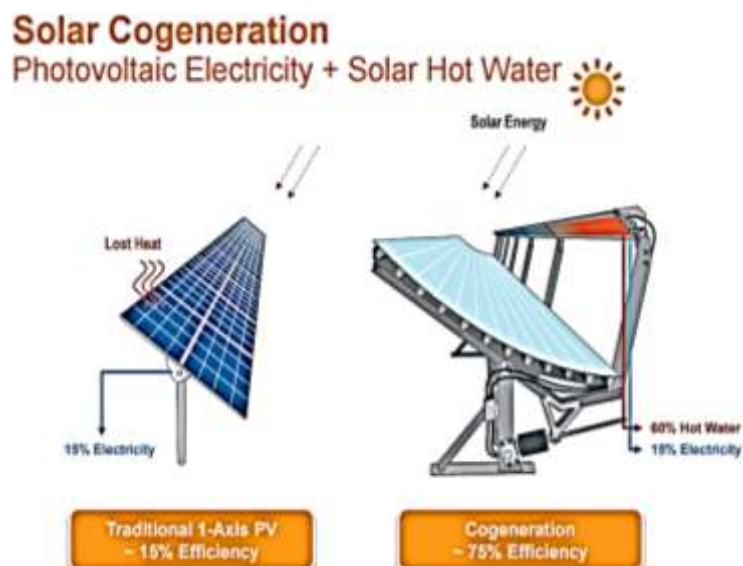
Combined Heat and Power Systems (CHP) is on-site electricity generation that captures the heat that would otherwise be wasted to provide useful thermal energy—such as steam or hot water—that can be used for space heating, cooling, domestic hot water and industrial processes.

Example 1:

In Germany, CHP plants are close as possible to, or even within, city limits. Their capacity and performance can be adapted to the heating demand of the service area. Waste heat from the power plant, which might otherwise be released through the stack or cooling devices, can instead be used to heat water. The combined heat and power cogeneration mode insures that the fuel will be used at high overall efficiencies of up to 90%. The heated water can then be conveyed over a short distance to the urban heating network.

Example 2:

Companies that specialize in solar power have designed systems with photovoltaic cells that generate electricity, but also heat water in private homes, office buildings, and campus dorm.



2. upgrade energy-wasting electric motors and other electrical appliances/machines

3. better building insulation highest R-value (resistance to heat flow) in climate zone

4. better government established automobile fuel-efficiency standards