

Session4

Co-generation, also known as combined heat and power (CHP), is the simultaneous generation of electricity and useful heat from the same energy source. It can be implemented using various sources, including both conventional and non-conventional energy sources. Here are some examples of co-generation with different energy sources, including non-conventional ones:

Natural Gas Co-generation: Natural gas is a conventional energy source commonly used in co-generation systems. A gas turbine or reciprocating engine is used to generate electricity, and the waste heat produced during the process is captured and used for heating or other industrial processes. This improves the overall efficiency of the system by utilizing the heat that would otherwise be wasted.

Biomass Co-generation: Biomass, a non-conventional energy source, refers to organic materials such as wood chips, agricultural residues, or dedicated energy crops. Biomass can be burned in a boiler to produce steam, which is then used to generate electricity through a steam turbine. The waste heat from the combustion process can be utilized for heating purposes or industrial processes, making it a form of co-generation.

Waste Heat Recovery: Co-generation can also involve the recovery of waste heat from industrial processes or other sources. For example, in industries that generate high-temperature waste gases or steam, heat recovery systems can capture the waste heat and convert it into electricity using steam turbines or organic Rankine cycles (ORCs). This allows for the utilization of waste heat, increasing energy efficiency and reducing overall energy consumption.

Solar Thermal Co-generation: Solar thermal energy can be used for co-generation by concentrating sunlight using mirrors or lenses to generate high-temperature heat. This heat can be used to produce steam or drive a Stirling engine, which in turn generates electricity. The waste heat can be utilized for various applications, such as water heating or space heating, enhancing the overall efficiency of the system.

Geothermal Co-generation: Geothermal energy, another non-conventional source, involves harnessing the heat from the Earth's interior. In geothermal co-generation, high-temperature geothermal fluids are used to generate steam, which drives a turbine to produce electricity.

The residual heat from the steam is then utilized for heating applications, such as district heating or greenhouse operations.

Wind-Solar Hybrid Systems: Co-generation can also be achieved by combining different renewable energy sources. Wind-solar hybrid systems integrate wind turbines and solar panels to generate electricity. Excess electricity produced during periods of high wind or sunlight can be used for heating applications or stored for later use, ensuring a continuous supply of energy.

Co-generation with non-conventional energy sources offers the advantage of utilizing renewable resources and reducing greenhouse gas emissions. It also improves energy efficiency by capturing and utilizing waste heat that would otherwise be wasted. The specific implementation and design of co-generation systems may vary depending on factors such as energy demand, resource availability, and technological advancements.