

# Cogeneration

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Cogeneration (also combined heat and power or CHP) is the use of a power station to simultaneously generate both heat and electricity. Conventional power plants emit the heat created as a byproduct of electricity generation into the environment through cooling towers, as flue gas, or by other means. CHP captures the excess heat for domestic or industrial heating purposes, either very close to the plant, or - especially in eastern Europe - distributed through steam pipes to heat local housing ("district heating").

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## Overview

Thermal power plants (including those that use uranium or burn coal, petroleum, or natural gas) do not convert all of their available energy into electricity, with the excess being wasted as excess heat. By capturing the excess heat, CHP allows a more total use of energy than conventional generation, potentially reaching an efficiency of 70-90%, compared with approximately 50% for the best conventional plants. This means that less fuel needs to be consumed to produce the same amount of useful energy.

The use of CHP is limited by the fact that although it is more efficient than heat generated from other sources if the heat can be used on site or very close to it, it is less so when the heat needs to be transported over longer distances. Heat transmission over long distances requires thick, heavily insulated pipes, whereas electricity can be transmitted along a comparatively simple wire, and over much longer distances for the same energy loss.

Cogeneration plants are commonly found in district heating systems of big towns, universities, hospitals, hotels, prisons, oil refineries, paper mills, wastewater treatment plants, enhanced oil recovery wells and industrial plants with large heating needs.

Large or small, most cogeneration projects only produce, more or less, the amount of energy the facility requires. However, thermally enhanced oil recovery (TEOR) plants often produce a substantial amount of excess electricity. After generating electricity, these plants pump leftover steam into heavy oil wells so that the oil will flow more easily, increasing production. TEOR cogeneration plants in Kern County, California produce so much electricity that it cannot all be used locally and is transmitted to Los Angeles. [\[edit\]](#)

## Types of plant

Topping cycle plants produce electricity first, then the exhaust is used for heating. Bottoming cycle plants, which are rare, produce heat for an industrial process first, then electricity is produced using a waste heat recovery boiler. Bottoming cycle plants are only used when the industrial process requires very high temperatures, such as furnaces for glass and metal manufacturing.

Large cogeneration systems provide heating water and power for an industrial site or an entire town. Common CHP plant types are:

- Gas turbine CHP plants using the waste heat in the flue gas of gas turbines
- Combined cycle power plants adapted for CHP
- Steam turbine CHP plants using the waste heat in the steam after the steam turbine.

Smaller cogeneration units usually use a reciprocating engine or Stirling engine. They use the waste heat in the flue gas and cooling water of gas or diesel engines and replace the traditional gas- or oil-fired boiler (furnace) used in central heating systems. [\[edit\]](#)

## MicroCHP

"Micro cogeneration" is on the scale of one household or small business[1]. Instead of burning fuel to merely heat the house or hot water, some of the energy is converted to electricity in addition to heat. This electricity can be used within the home or business, or (if permitted by the network owner) sold back into the network. Existing MicroCHP

installations use three different technologies: internal combustion engines, stirling engines and fuel cells.  
[edit]

See also

- [Geothermal power in Iceland](#)
- [Trigeneration](#) [edit]

External links

- [www.mccree.com](http://www.mccree.com) - Air Products and Chemicals Cogeneration Plant (Orlando, Florida)
- [www.co-generationsystems.com](http://www.co-generationsystems.com) - Co-generation Equipment Provider
- UK micro CHP schemes:
- BBC News: [Power from the people](#)
- [BG Group Microgen](#)
- [Powergen WhisperGen](#)
- [M.I.T. algae reactor](#)
- [Stirling/ Oven](#)
- Associations:
- [CHP Association](#)
- [COGEN EUROPE](#) The European Association for the Promotion of Cogeneration

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