

Renewable energy • Reduction in greenhouse gas emissions

CONCEPT STUDY FOR COMBINED HEAT AND POWER PLANT

When plans were drawn up to construct a new power plant in Kuopio, Finland, ÅF took part from an early stage. The plant will use forest residues and peat to produce district heat and electricity. ÅF together with the client Kuopion Energia, was responsible for the concept study when planning the project and is now taking part in the construction.

Concept study

In a concept study a project is planned by sketching ideas and analyzing the results of different alternatives. This includes a mapping of the likely costs and the risks associated with the project. For the proposed combined heat and power plant in Kuopio, ÅF was responsible together with the client Kuopion Energia, for preparing the concept study. This resulted in a project plan that is now being realized, with ÅF as the main EPCM consultant. This means that ÅF is responsible for Engineering, Procurement and Construction Management, excluding the boiler and the fuel handling parts. The plant is scheduled to be operating by the end of 2011.



Illustration of the planned heat and power plant in Kuopio.

Fluidized bed technology

The plant will be using fluidized bed technology to burn forest residues and peat. In a fluidized bed the fuel floats in a combustion compartment that consists of a hot bed of sand, created by generating a powerful current of air through the bed. A fluidized bed is favourable when burning a combination of different fuels, as it can handle fuels that may be difficult to burn in a regular boiler. As the combustion temperature is relatively low, the emissions of nitrous oxide are also low.

Supply to the City of Kuopio

The combined heat and power plant in Kuopio is planned to have an effect of 149 MW. The heat being produced will be used for district heating in Kuopio, which is a city in southern Finland with almost 100,000 inhabitants. The electricity from the plant will be fed into the national grid. The new boiler replaces an older technology that has been in use for many years. In this way the total capacity, as well as the use of bioenergy, will increase, and oil consumption will be lower.

COMBINED HEAT AND POWER

Combined heat and power (CHP) is the simultaneous generation of usable heat and electric power in a single process. Steam from boiling water drives a turbine, which in turn drives generators producing electricity. The electricity is transferred out to the grid, and the remaining heat or steam is distributed to district heating systems or used in industry. Approximately 30-50 percent of the energy supplied is electricity.

Many different fuels can be utilized in CHP plants. These are, for example, fossil fuels (e.g. oil, coal, natural gas etc.), renewable fuels (e.g. wood chips, wood residues, energy crops etc.), and waste (e.g. domestic waste, industrial waste etc.). A CHP plant uses the energy content in the fuel more efficiently than traditional condensed power plants, which only generate electricity. Using the heat which could be said to be a by-product of electricity production in district heating systems or industry increases overall efficiency considerably.

In view of the fact that CHP plants in several countries are replacing old, coal-fired plants, the expansion of CHP plants can contribute to a great reduction in carbon dioxide emissions and thereby contribute to a sustainable society. For example, renewable fuels do not contribute to a net increase in carbon dioxide emissions which would add to the greenhouse effect. Together with other forms of renewable energy such as water and wind, CHP can help to construct a sustainable energy system. High fuel utilization rates as well as advanced flue gas cleaning, are also important aspects resulting in a reduction in greenhouse gases as well as pollution.

Within the heat and power sector, ÅF has a wide competence and experience of all possible issues from concept to realization of CHP plants, as well as investigations into potential policy instruments for CHP. Before the construction of new CHP plants, ÅF can perform studies visualizing the prerequisites for, and assumed results of, the new building as well as conducting environmental impact assessments of the new plant and drawing up pre-construction plans of distribution systems. In the realization phase, ÅF can act as EPCM consultant responsible for the Engineering, Procurement, and Construction Management. With its considerable expertise, ÅF can also perform all possible improvements in existing plants, such as process optimization and follow-up.