**The role of CHP in the future and potential business opportunities**

**Finland** is committed to increase the share of renewable energy production from current 27.5 percent to 38 percent by 2020. Majority of that increase will come from biomass that is used in CHP plants.

**Of especial importance** is the replacement of fossil fuels (with biomass) in CHP plants.

**The planned** increase will mean nearly 10,000 new jobs in the sector, e.g., supply chain and machinery.

**Due to technical, economical and energy security reasons** peat, coal and natural gas will also be used as a fuel in CHP plants in the future.

**Potential business opportunities**

The potential for exporting CHP and district heating technologies and know-how is huge. Areas of special interest, where growth is expected to be very high are China, Eastern Europe and Russia. This sector is an unexploited area where numerous opportunities exist. Potential export commodities could be separate power plants, their individual parts, DH systems (including refurbishments) or consultancy services.

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**Combined heat and power**

*Combined heat* and power (CHP) production or cogeneration is a form of energy generation where both electricity and useful heat are simultaneously utilised.

**The heat** that would otherwise be lost can be used to heat up cities or industrial processes.

CHP is singled out by the EU as one of the key technologies to reduce greenhouse gas emissions.

CHP plants can reach efficiency ratios (conversion of fuel into useful energy) up to over 90 percent compared to roughly 55 percent for conventional electricity generation.

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**One of the greatest advantages** of CHP is the fact that it enables large scale and efficient use of renewable fuels, such as biomass.

Cogeneration significantly reduces sulphur, nitrogen and small particle emissions which are hazardous to the health.

**Finland** is one of the leading countries in CHP generation. Around 40 percent of the total electricity generation is based on CHP while the EU average is around 10 percent.

**Some CHP** plants can also be used to generate district cooling. The process is similar to district heating – only the excess energy is used to cool down dwellings instead of heating them.

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**GLOBAL GROWTH POTENTIAL OF CHP (The scale is logarithmic)**

<table>
<thead>
<tr>
<th>Country</th>
<th>Installed CHP capacity (GW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>10</td>
</tr>
<tr>
<td>India</td>
<td>100</td>
</tr>
<tr>
<td>Russia</td>
<td>1000</td>
</tr>
<tr>
<td>UK</td>
<td>18</td>
</tr>
<tr>
<td>USA</td>
<td>55</td>
</tr>
</tbody>
</table>

Source: IEA 2008
District heating

District heating is a system for distributing heat (hot water or steam in a pipeline network) that has been generated in a separate boiler or a CHP plant. In environmental and energy efficiency terms district heating is an excellent choice, especially if it is generated in a CHP plant. In order for district heating to be economically viable sufficient heat load is required. District heat is also used to heat up hot tap water.

District heat is also used to heat up hot tap water.

**District heating has a significant role in the Finnish energy system:**

- Over 2.6 million people live in district heated dwellings.
- District heating covers about 50 percent of the heating market.
- In the biggest cities district heating has over 90 percent share of the heating market.
- Nearly 80 percent of the district heat used is based on combined heat and power production.

**District heating Industrial cogeneration**

Investments in CHP and district heating sector have been significant during the past ten years. 35 new CHP plants and about 300 new heat boilers have been built. Moreover, these plants primarily use renewable biomass and peat as fuel. New technology is far superior to the existing one in terms of emissions and efficiency. CO₂ emissions are reduced by 40 percent compared to the existing plants and over 50 percent with increased use of biomass.

**DISTRICT HEAT CASE STUDY**

- **Karava Energy’s Combined heat and power plant (2009)**
  - 21 MW electricity
  - 48 MW district heat
  - 10 MW process heat
  - Main fuel: biomass (c. 80%)
  - Production covers around 75 percent of city of Karava's heat demand and about 25 percent of the electricity demand.

**Industrial cogeneration**

Number of industrial sites have their own power plant which produces electricity and heat and/or steam to the industrial process. CHP is especially utilised in the chemical, steel and forest based industries. The plants typically use residue material or heat for fuel that would otherwise be wasted. Industrial CHP considerably increases the process's material and energy efficiency. Industrial CHP production can also provide heat for the local community via a district heating network. Industrial CHP will continue to have an important role in the future as industrial actors aim to expand into new sectors. For example bio-refineries will be producing biofuels in addition to heat and electricity.

**Industrial cogeneration plays an integral part in the Finnish energy mix:**

- In 2009 industrial CHP covered 12 percent of Finland’s electricity consumption.
- The forest industries cover majority of industrial CHP and over 70 percent of Finland’s renewable energy production.

Finland is a leading country in terms of utilisation of industrial CHP.

**INDUSTRIAL CHP CASE STUDY**

- **Kymi Voima CHP plant in Kuusankoski (2002)**
  - 76 MW electricity
  - 60 MW district heat
  - 120 MW process heat
  - Main fuel: biomass (c. 75%)

The plant produces electricity and process heat for an UPM industrial site and district heat and electricity for KSS Energy and the city of Kouvola.